Four Essays on Consumption Behavior in the Circular Economy

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Abstract

The circular economic (CE) model of production and consumption serves as a sustainable alternative to the prevailing linear "take-make-waste" model by significantly reducing the environmental impacts of economic growth. For the CE to be effective, consumer participation is essential. This thesis investigates consumer participation in the CE through four essays, focusing on product purchase and use behaviors that extend product lifespans (PLE), which is vital for the successful implementation of the CE. The first essay examines PLE-oriented product use behaviors, such as product care and upcycling. Based on a systematic literature review, this essay develops a conceptual framework that summarizes factors influencing these behaviors. This framework consists of two dimensions, product use stage and product value type, that explain how factors occurring at different product use stages shape consumers' perceptions of product value and PLE-oriented product use behaviors. The second and third essays employ qualitative (consumer interviews) and quantitative (survey) research methods, respectively, to study a specific PLE-oriented product use behavior identified in the first essay, namely consumer upcycling. This behavior is one of the most resource-efficient practices to realize the CE vision, more so than other practices like recycling, but remains under-explored. In these two essays, we examine the internal motivations behind consumer upcycling, and further explore its relationship with purchase of commercial upcycled products. The findings show that perceived competence is the strongest internal motivation for consumer upcycling, followed by waste prevention and frugality. Moreover, we reveal a positive relationship between consumer upcycling and purchase of upcycled products. This relationship is particularly evidenced by the finding that consumers who have motivations of waste prevention, social connectedness, and emotional attachment for

consumer upcycling are more inclined to buy upcycled products. The fourth essay investigates consumer evaluation of upcycled products, specifically by examining the effect of product's visual past identity discernibility, which is unique to upcycled products. In six experiments, we found that when upcycled products retain a high visual connection to their past identities, it negatively affects their evaluations through increasing perceived intrusiveness and decreasing perceived usefulness. Collectively, the four essays in this thesis enhance understanding of how consumers can contribute to the CE through their product purchase and use behaviors. The identified antecedents of these behaviors provide practical implications for practitioners to develop effective marketing strategies (e.g., communication, product design) to promote and facilitate consumers' adoption of these behaviors.

Résumé

Le modèle économique circulaire (CE) de production et de consommation représente une alternative durable au modèle linéaire prédominant "prendre-fabriquer-jeter" en réduisant de manière significative les impacts environnementaux de la croissance économique. Pour que le CE soit efficace, la participation des consommateurs est essentielle. Cette thèse examine la participation des consommateurs au CE à travers quatre essais, se concentrant sur les comportements d'achat et d'utilisation des produits qui prolongent la durée de vie des produits (PLE), ce qui est essentiel pour la mise en œuvre réussie du CE. Le premier essai examine les comportements d'utilisation des produits orientés PLE, tels que l'entretien des produits et le surcyclage. Basé sur une revue systématique de la littérature, cet essai développe un cadre conceptuel qui résume les facteurs influençant ces comportements. Ce cadre se compose de deux dimensions, le stade d'utilisation du produit et le type de valeur du produit, qui expliquent comment les facteurs se produisant à différents stades d'utilisation du produit façonnent les perceptions des consommateurs sur la valeur du produit et les comportements d'utilisation des produits orientés PLE. Les deuxième et troisièmes essais utilisent respectivement des méthodes de recherche qualitative (entretiens avec des consommateurs) et quantitative (enquête) pour étudier un comportement d'utilisation de produit orienté PLE spécifique identifié dans le premier essai, à savoir le surcyclage par les consommateurs. Ce comportement est l'une des pratiques les plus efficaces sur le plan des ressources pour réaliser la vision du CE, plus que d'autres pratiques comme le recyclage, mais il reste peu exploré. Dans ces deux essais, nous examinons les motivations internes derrière le surcyclage par les consommateurs, et explorons davantage sa relation avec l'achat de produits surcyclés commerciaux. Les résultats montrent que la compétence perçue est la motivation interne la plus forte pour le surcyclage par les

consommateurs, suivie de la prévention des déchets et de la frugalité. De plus, nous révélons une relation positive entre le surcyclage par les consommateurs et l'achat de produits surcyclés. Cette relation est particulièrement illustrée par la constatation que les consommateurs motivés par la prévention des déchets, la connexion sociale et l'attachement émotionnel à pratiquer le surcyclage sont plus enclins à acheter des produits surcyclés. Le quatrième essai examine l'évaluation par les consommateurs des produits surcyclés, en examinant spécifiquement l'effet de l'identité visuelle passée du produit, qui est propre aux produits surcyclés. Dans six expériences, nous avons constaté que lorsque les produits surcyclés conservent un lien visuel fort avec leurs identités passées, cela affecte négativement leurs évaluations en augmentant la perception de l'intrusion et en diminuant la perception de l'utilité. Collectivement, les quatre essais de cette thèse améliorent la compréhension de la manière dont les consommateurs peuvent contribuer au CE grâce à leurs comportements d'achat et d'utilisation de produits. Les antécédents identifiés de ces comportements fournissent des implications pratiques pour les praticiens afin de développer des stratégies marketing efficaces (par exemple, communication, conception de produits) pour promouvoir et faciliter l'adoption de ces comportements par les consommateurs.

Acknowledgements

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I would also like to thank my co-author, Prof. Rong Huang, who has been extremely helpful in providing valuable suggestions and assistance throughout my PhD journey. She has spent much of her precious time helping me develop and improve my research and sharing her ideas on many other aspects such as teaching and course selection. Her suggestions and ideas are always insightful, constructive, and thought-provoking. I have learned a great deal from her guidance.

I also wish to thank the other two thesis committee members, Prof. DaHee Han and Prof. Georges Zaccour, for attending my thesis proposal defense and providing great advice on my thesis. Additionally, when I developed the experimental study in my thesis, Prof. Han has given many constructive suggestions to help me find the research direction. Her feedback has always been prompt and insightful. I greatly appreciate it.

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Contribution to Original Knowledge

This thesis intends to contribute to the consumer behavior and circular economy (CE) literature in several ways. In Essay 1 (Chapter 2), I propose a novel framework for evaluating factors influencing consumers' CE-oriented product use behaviors. The originality of this framework lies in its focus on the product use stage. The extant literature on consumer behavior and CE has primarily focused on the product purchase and disposal stages while overlooking the product use stage, despite the significant impact of behavior at the use stage on the rate and manner of resource circulation. In Essays 2 and 3 (Chapter 3 and 4), I employ qualitative and quantitative research methods, respectively, to examine internal motivations behind a specific product use behavior identified in Essay 1, consumer upcycling. Further, the relationship between this behavior and purchase of upcycled products is explored. The originality of these two essays lies in two aspects. First, the extant literature has identified several external motivations that encourage consumer upcycling. However, to the best of my knowledge, Essays 2 and 3 are the first to thoroughly and empirically examine internal motivations that encourage this behavior. Second, while the extant literature has investigated consumer upcycling and purchase of upcycled products separately, these two essays for the first time attempt to associate these two behaviors, thereby contributing to a more comprehensive understanding of consumers' engagement in upcycling. In Essay 4 (Chapter 5), I examine the effect of a product attribute, visual past identity discernibility, on upcycled product evaluation. The originality of this essay lies in the novelty of the examined attribute. Prior research has investigated past identity which serves as detailed information about upcycled products but cannot be visually discerned from product appearance. In contrast, I examine how the visually discernible past identity in upcycled product appearance influences product evaluation.

Contribution of Authors

The five chapters in this essay have been developed with the collaboration and supervision of Prof. Emine Sarigollu, who has acted as my doctoral advisor since 2020, and Prof. Rong Huang, who is an Associate Professor of Marketing at Saint Anselm College and has acted as my co-author since 2020. Prof. DaHee Han, who has acted as my thesis committee member, contributed to the refinement of the research idea in Chapter 5.

For Chapter 1 (Overview of thesis/introduction), I prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I reviewed the draft and made revisions.

For Chapter 2 (Essay 1), Prof. Sarigollu provided the direction of the literature review. I performed the literature review and prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I reviewed the draft and made revisions.

For Chapter 3 (Essay 2), I developed the research idea which was refined by Prof. Sarigollu and Prof. Huang. Then I conducted data collection and analysis and prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I discussed the data results, reviewed the draft, and made revisions.

For Chapter 4 (Essay 3), it is a follow-up study of the one in the previous chapter. I conducted data collection and analysis and prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I discussed the data results, reviewed the draft, and made revisions.

For Chapter 5 (Essay 4), I developed the research idea which was refined by Prof. Sarigollu, Prof. Huang, and Prof. Han. Then I conducted data collection and analysis and prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I discussed the data results, reviewed the draft, and made revisions.

For Chapter 6 (General conclusions & future directions), I prepared the initial draft. Prof. Sarigollu, Prof. Huang, and I reviewed the draft, and made revisions.

CHAPTER 1 – OVERVIEW OF THESIS / INTRODUCTION

The circular economy (CE) model is proposed to alleviate resource shortage and environmental deterioration through maximizing the lifespan and value of resources in use and regenerating products and materials at the end of a product's service life (Singh and Ordoñez, 2015). In transitioning towards the CE, governments and businesses develop and support sustainable technology, business models, and waste management systems for facilitating extended and multiple life cycles of products or materials (Geissdoerfer et al., 2018; Wasserbaur et al., 2022). Their efforts have been complemented by considerable academic research into the supply-side solutions for the CE over the last decade. However, only 10% of peer-reviewed articles associated with the CE focus on consumers or users (Camacho-Otero et al., 2018). This is surprising, indeed, since transitioning from a linear-oriented society towards a CE-oriented society cannot succeed without the consumer engagement (Hobson et al., 2021). As a primary source of resource consumption, if the consumer fails to embrace circular consumption and persists in rapid and linear purchase-use-dispose consumption patterns, the efficacy of CE solutions implemented by the supply side would be significantly diminished (Corvellec et al., 2022).

Consumers can participate in the CE in various ways whilst engaging in and interacting with businesses and organizations, such as consumption of products made of reclaimed materials, adoption of product life-extension practices, and engagement in access-based business models and waste management systems. Despite the critical role of the consumer in the CE, there is a paucity of research on the consumption behavior in the CE (Hobson et al., 2021; Wastling et al., 2018; Govindan & Hasanagic, 2018). The current thesis aims to address this void by examining CE-oriented consumer behavior systematically in four essays. Essay 1 presents a

broad literature review summarizing factors influencing CE-oriented product use behavior. This is followed by Essays 2 to 4 which focus on a specific type of CE-oriented behavior, namely upcycling, in three empirical studies. Specifically, consumer upcycling and purchase of upcycled products are investigated. Consumer upcycling is a specific type of CE-oriented product use behavior, while purchase of upcycled products is associated with the commercialization of upcycling. In these empirical studies, previously unexamined or under-examined antecedents of these two behaviors are investigated. Understanding antecedents of CE behaviors can contribute to the development of effective strategies to promote consumers' engagement in the CE and thereby facilitate societal transition towards the CE.

Essay 1 is a literature review synthesizing factors influencing CE-oriented product use behavior, which encompasses behaviors facilitating the extension of product lifespan during use, such as product care, repair, and upcycle. A wide variety of factors encompassing product attributes, individual characteristics, and marketing interventions are considered. To develop a systematic framework to explain how these factors influence consumer product use behavior, this essay identifies two dimensions. The first dimension is consumer product use stage consisting of five sub-stages – namely, pre-acquisition, early-use, middle-use, late-use, and pre-disposal stages. These refined product use stages offer a dynamic perspective for understanding consumer product use behavior. The second dimension is consumer product value consisting of functional value, social value, and emotional value. This dimension helps elucidate underlying mechanisms through which various factors influence consumer product use behavior. The proposed product use framework suggests several promising future directions for research on product use behavior. For instance, future research could explore how interactions among different types of product value influence product use behavior. Additionally, this framework

provides valuable insights to suppliers, such as designers, producers, marketers who are interested in implementing the CE. For instance, it shows their decisions on price, product information presentation, product design, and post-purchase service may influence consumer tendency to extend product lifespans.

Essay 2 focuses on one of the CE-oriented product use behaviors identified in Essay 1 – consumer upcycling. Consumer upcycling refers to a process in which consumers transform or repurpose unwanted object(s) to a product which has equal or higher value than the current value of its component(s) (Sung et al., 2014). It is one of the most beneficial practices for environmental sustainability, more so than other practices such as recycling, and it constitutes a concrete exemplar of how consumers can participate in the CE (Coppola et al., 2021). Given the limited exploration of consumer upcycling in extant research, a qualitative study (consumer interviews) is conducted to obtain rich insights and understanding about consumer motivations underlying this behavior. Through inductive content analysis on consumer interviews, we identify three types of internal motivations for consumer upcycling: core-self, social-self, and object-self oriented motivations. Specific motivations in each type are further identified. Additionally, we point out potential consequences of consumer upcycling behavior at three levels: social, environmental, and business level. Taken together, all these qualitative findings reveal how consumers could take initiative to contribute to the CE through consumer upcycling behavior.

Essay 3, following-up to Essay 2, validates the role of internal motivations in consumer upcycling empirically by using survey methodology. Additionally, we explore how consumer upcycling motivations relate to purchase of upcycled products, a question inspired by the discovery in Essay 2 that consumers interested in upcycling are conceivably more willing to

purchase upcycled products (i.e., the business-level consequence of consumer upcycling in Essay 2). Building upon the qualitative findings in Essay 2 and relevant theories in the literature, we investigate seven internal motivations for consumer upcycling, namely waste prevention, frugality, perceived competence, perceived autonomy, social connectedness, social approval, and emotional attachment. We then test how these motivations relate to consumer upcycling as well as purchase of upcycled products through analysis of survey data with structural equation modeling. Results show that perceived competence is the strongest motivation for consumer upcycling, followed by waste prevention and frugality. Moreover, consumers who have motivations of waste prevention, social connectedness, and emotional attachment for consumer upcycling are more inclined to buy upcycled products.

To the best of our knowledge, Essay 2 and Essay 3 are the first attempts to bridge consumers' roles as creator and buyer in upcycling. From a theoretical perspective, these two essays enhance the understanding of consumer upcycling, purchase of upcycled products, and their relationships, with both qualitative and quantitative empirical evidence. From a practical perspective, this understanding provides implications for policy makers and marketers seeking to promote upcycling and the adoption of upcycled products. Specifically, they could strategically communicate and deliver various internal benefits (e.g., competence) to consumers, extending beyond the widely acknowledged environmental benefits, to encourage their engagement in these behaviors. Moreover, the positive relationship between consumer upcycling motivations and purchase of upcycled products implies the potential for their synergistic promotion.

Essay 4 furthers the previous essay by investigating the relationship between product design of upcycled products and consumer evaluation of these products. For upcycled products, one of the most essential attributes is the various degree of visual past identity discernibility, which

refers to the extent to which past identity of an upcycled product can be discerned from its appearance. This attribute is rooted in the upcycling process and reveals the distinctiveness of upcycled products in comparison to other product categories. More specifically, owing to product transformation in upcycling, an upcycled product encompasses two product identities: one representing the original category of the product before transformation (henceforth called "past identity"), and the other representing the new category of the product after transformation (henceforth called "present identity"). Moreover, due to the absence of degradation in upcycling, in contrast to recycling, visual elements associated with past identity of an upcycled product can be retained in its appearance. As a result, some upcycled products can clearly display both past and present identities, which is the situation of high visual past identity discernibility. While other upcycled products may only display present identity, which is the situation of low visual past identity discernibility. Essay 4 examines the effect of visual past identity discernibility on upcycled product evaluation using experimental methodology. Across six controlled experiments, Essay 4 shows that high visual past identity discernibility can negatively impact consumer evaluation of upcycled products (indicated by product attitudes, purchase intention, and willingness to pay). The underlying mechanism is that high visual past identity discernibility leads to higher perceived intrusiveness and thus lower perceived usefulness about upcycled products, which further negatively impacts consumer evaluation of upcycled products. Notably, these effects can also be generalized to new products that adopt visual product design emulating the design of high visual past identity discernibility in upcycled products. There are two main theoretical contributions in Essay 4. First, it contributes to the growing literature on upcycled products by identifying a novel and important factor (i.e., visual past identity discernibility) influencing upcycled product evaluation. Second, it contributes to the existing literature on

product design. Specifically, by demonstrating the effect of visual past identity discernibility (an aesthetic attribute) on perceived product usefulness (a functional attribute) and revealing the mechanism of perceived intrusiveness, it provides a new perspective to understand the relationship between two critical dimensions of product design – product aesthetics and product function. There are also two main practical implications in Essay 4. First, when source objects and upcycled products belong to different product categories, designers should conceal past identity in product appearance through craft techniques such as painting, cutting, or reshaping. Second, for new product designers, integrating visual elements of different product categories into appearance of a single product to resemble the design of high visual past identity discernibility in upcycled products, is not advisable.

CHAPTER 2 – ESSAY 1

CONSUMER PRODUCT USE BEHAVIOR THROUGHOUT THE PRODUCT LIFESPAN: A LITERATURE REVIEW AND RESEARCH AGENDA

Shi, T., Huang, R., & Sarigöllü, E. (2022). Consumer product use behavior throughout the product lifespan: A literature review and research agenda. Journal of environmental management, 302, 114114.

Abstract

Extending product lifespan has recently been recognized as an important strategy to achieve sustainable development. A substantial corpus of literature explores product lifespan from the perspective of product design or manufacturing practices, but the perspective of consumer has been largely overlooked. Addressing this void, this study systematically reviewed the literature on how consumer product use behavior influences the product lifespan. Insights gained from the review process guided our analysis on how product lifespan relates to consumer perceived value (comprising functional value, social value, and emotional value). We developed a five-stage framework to delineate the relationship between consumer perceived value and product use behavior across five-stages; namely, pre-acquisition, early use, middle use, late use, and pre-disposal. Furthermore, we identify promising directions for future scholarly work.

1. Introduction

Extending product lifespan is critical for sustainable consumption (Cooper, 2020; Panchal et al., 2021) and for achievement of goals set forth in the United Nations 2030 Agenda for Sustainable Development (UN General Assembly, 2015). A large corpus of literature explores product lifespan from the perspective of supply-side design and manufacturing practices (Van Nes and Cramer, 2005; Bovea and Pérez-Belis, 2018; Bocken et al., 2016; Ertz et al., 2019a, 2019b), especially through product lifecycle assessment. However, research is lacking from the perspective of demand-side. Yet, the consumer is an important stakeholder (Anandh et al., 2021) because consumption behavior directly affects the product lifespan, and sustainability goals contingent on consumption cannot be accomplished without the consumer involvement.

The necessity for consumers to reduce current levels of consumption has been stressed by the emerging discourse on sufficiency (e.g., Sheth et al., 2011; Freudenreich and Schaltegger, 2020). However, cutback in consumer purchases might lead to adverse consequences on consumer wellbeing, thus difficult to attain in the short-medium term. Instead, extending the time consumers use their products would reduce consumption with less unfavorable impact on wellbeing. Nonetheless, this topic has received little attention in research (e.g., Van Nes and Cramer, 2005; Bakker et al., 2014).

A few studies have explored what factors influence consumers' general intention to extend product lifespans (Evans and Cooper, 2016; Cox et al., 2013; Rivera and Lallmahomed, 2016) or what behaviors extend the product lifespan, such as repairing, upcycling, product care (Ackermann et al., 2018; Bovea et al., 2020; Nazlı, 2021; Coppola et al., 2021). However, the literature lacks a comprehensive insight on how the consumer uses and interacts with the product throughout its lifespan. The current paper addresses this void. We provide a review of the

literature on how consumer product use behaviors influence product lifespan and develop a comprehensive framework describing factors leading to those behaviors.

It became clear in the review process that an analysis of consumer product lifespan requires an understanding of how product lifespan relates to consumer value. We thus developed a framework delineating the relationship between consumer perceived value and product use behaviors across five-stages; namely, pre-acquisition, early use, middle use, late use, and pre-disposal. In each stage the consumer makes product use decisions based on the product's perceived value, comprising functional, social, and emotional values. Changes in consumer's perception of the product value over its lifespan influences product use behavior.

The remainder of this paper is structured as follows. First, the methodology is presented. Then, we introduce the five-stage model, describe three types of perceived product value, and analyze how these values are affected by different factors in different stages and lead to different product use behaviors. Finally, we provide direction for future researchers, and report summary of the findings.

2. Method

This study is based on the scoping review methodology, which is used to "map the key concepts underpinning a research area as well as to clarify working definitions, and/or the conceptual boundaries of a topic" (Peters et al., 2015, p. 6). Unlike the systematic review which focuses on a narrowly defined research question, the scoping review deals with broader issues (Arksey and O'Malley, 2005). Extending consumer product use is a comprehensive topic which encompasses different research areas including design, production, engineering, business, management, and consumer behavior, and is thus suitable for scoping review.

2.1 Identifying relevant studies

We searched five databases: Scopus, Web of Science, ABI/Inform, Business Source Complete, Google Scholar (from 2009 to 2021). A broad range of terms relevant to product use were included as follows: product use (/usage/experience), product attachment, person–product relationship, product–self–image, slow(er) consumption, product (/physical) obsolescence, psychological obsolescence, product lending/leasing/sharing. Since this review is based on perspective of the consumer, "consumer" is always included in search terms. The search yielded 41,447 articles.

2.2 Study selection

Of all the articles containing the keywords in title, abstract or keywords, we included those on consumer durables or semi durables, but excluded the remainder on fast moving consumer goods, nondurables/consumables, and services. Studies that were not written in English were also excluded. After removing duplications, we obtained 109 articles.

3. Content analysis and synthesis

3.1 Five stages of product use

This research developed a framework that delineates consumer product use behavior over time (Fig. 1). The framework is grounded in a comprehensive literature review which is summarized in Table 1 (in Supplementary Material). The framework organizes and integrates the literature on consumer product use behavior over five stages, namely, pre-acquisition, early-use, middle-use, late-use, and pre-disposal. By delineating product use behavior with respect to both the product's condition and the consumer-product relationship, this review advances the extant

literature which has assumed either an exclusively product-oriented (Bierly and Coombs, 2004; Nishijima, 2016) or a consumer-oriented (Ball and Tasaki, 1992) perspective.

This research does not ascribe specific time periods to demarcate product use stages since different products have their own technical lifespans (i.e., the time a product can function well) (Evans and Cooper, 2016), wear speed, and consumers exhibit different notions of product life. Instead, we describe product use stages according to condition of the product in terms of appearance and performance. We will next present the five stages, followed by factors that influence the consumer's product use behavior in each stage.

The first stage is pre-acquisition. The consumer starts to evaluate the product and forms an expectation of its lifespan (i.e., amount of time to keep the product) and possible use plans (i.e., when, where and how to use the product) (Day et al., 1991). The expectation influences subsequent product use behaviors and actual product lifespan (Evans and Cooper, 2016; Cox et al., 2013). If the product is expected to be used for a long time, it will be treated with care.

In early-use stage, the consumer owns the product for a short while, and the product is almost new and has no obvious signs of wear. Although the consumer is getting familiar with the product, she has not developed strong attachment to it because the product and the consumer do not yet share many common memories. The consumer continues evaluating the product and starts cultivating product use habits, such as keeping the product in possession, keeping it away from harm or damage, using it properly, and doing maintenance (Evans and Cooper, 2016; Wieser and Tröger, 2018). These early-formed habits are usually maintained until end of the product lifespan. Despite the product's new condition, the consumer can discard it. Indeed, product disposal decision can be made in any stage except pre-acquisition.

Middle-use stage is often the longest period in the product's use. The consumer has owned the product for a significant time. The product still functions well, although there might be some wear marks or minor problems. The consumer's attachment toward the product has accumulated over time and reaches highest (Ball and Tasaki, 1992). Due to long-time consumer-product interaction, some of the owner's properties (e.g., personal memories, strong emotional ties to people, or specific events) have been transferred to the product (Morales and Fitzsimons, 2007), thus the consumer experiences closer relationship with the product (Pierce et al., 2003). In this stage, the consumer mostly maintains the same product use habits as in the early-use stage unless external stimuli prompt a change. Additionally, this stage involves two new product use behaviors: hibernation and sharing. Hibernation refers to "dead storage period" when the product is no longer in use (Murakami et al., 2010, p 601). Sharing is the action of temporarily transferring the right to use to others including family, close kin, friends, or strangers with or without reward (Belk, 2014) and differs from permanent transferring (e.g., gifting, market transactions) which is considered product disposal. To recap, the product use behaviors in this stage mainly include changes in product use habits, hibernation, sharing and disposal.

In the last two stages, i.e., late-use and pre-disposal, the main function of the product has deteriorated. It is highly likely that the consumer will replace the product sometime during these two stages. Unlike the previous stages where factors driving product care and product disposal were of main concern, in the last two stages the focus turns to factors motivating extension of the product lifespan. In late-use stage, the product can be repaired, and the consumer can retain it to maintain relationship with it. However, in pre-disposal stage the product is beyond repair, thus the consumer can no longer use it as is and needs to build new relationship with it to retain it. Two different behaviors characterize the last two stages, repairing in late-use stage and upcycling

in pre-disposal stage. Repairing is an attempt to restore the product to its previous state, thus preserves the embedded energy and value in the product (Nazlı, 2021). Upcycling is to "reuse (of discarded objects or material) in such a way as to create a product of higher quality or value than the original" (Oxford Dictionary, 2021).

It should be noted that not all products necessarily go through all stages. For example, if a newly bought product breaks down and cannot be repaired, it will go from early-use stage to pre-disposal stage directly. Besides, the specific product use behaviors identified for each stage are not necessarily exclusive to a specific stage, rather they tend to be most prominent in that stage. For example, the consumer may upcycle a well-conditioned but unwanted product into another desired product in middle-use stage, rather than in pre-disposal stage.

3.2 Three values of product use

Product use behavior is influenced by perceived value the consumer derives from the product. Perceived value refers to "consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given" (Zeithaml, 1988, p 14), and includes functional value, social value, and emotional value (Sweeney and Soutar, 2001; Sanchez et al., 2006). Past research has studied influence of perceived value mostly on a specific consumer behavior, such as purchase or disposal (e.g., Yi and Jeon, 2003; Yoo and Park, 2016). In contrast, taking into consideration functional, social and emotional values, this research studies influence of perceived value on consumer product use behaviors throughout the product lifetime.

Functional value refers to a product's instrumental benefits and its ability to satisfy consumer's task-related needs (Jung et al., 2016; Hou et al., 2020). This value derives from both the product's perceived quality and performance, and the costs related to the product and its use (Sheth et al., 1991). Social value is the utility related to enhancement of social self-concept

(Sweeney and Soutar, 2001) and social relationships. A product can help a consumer express her values, social status, or affiliation (Belk, 1988; Mead et al., 2011) or help build or strengthen her relationships with others (Pillai and Krishnakumar, 2019). Emotional value refers to feelings or affective states the consumer associates with the product or its use, such as enjoyment, fun, or nostalgia (Sheth et al., 1991).

3.3 Influencing factors in five stages

Throughout the five stages, the consumer continuously evaluates the product value and determines her use behavior. In pre-acquisition stage, the consumer forms initial value perceptions and an expectation about the rate of value decline. During early-use and middle-use stages, perceived value changes: while certain values may decline, other values may emerge. Whereas, during late-use and pre-disposal stages, the consumer makes a trade-off between the remaining value of the product and the emerged value/cost from efforts (i.e., repairing, upcycling) to extend product lifespan.

Although factors in a former stage are likely to affect subsequent stages, this review elaborates each factor in the earliest stage it comes to play an important role in influencing product use behavior. We next present an analysis of factors that affect value perception throughout the product use leading to product lifespan extension behaviors.

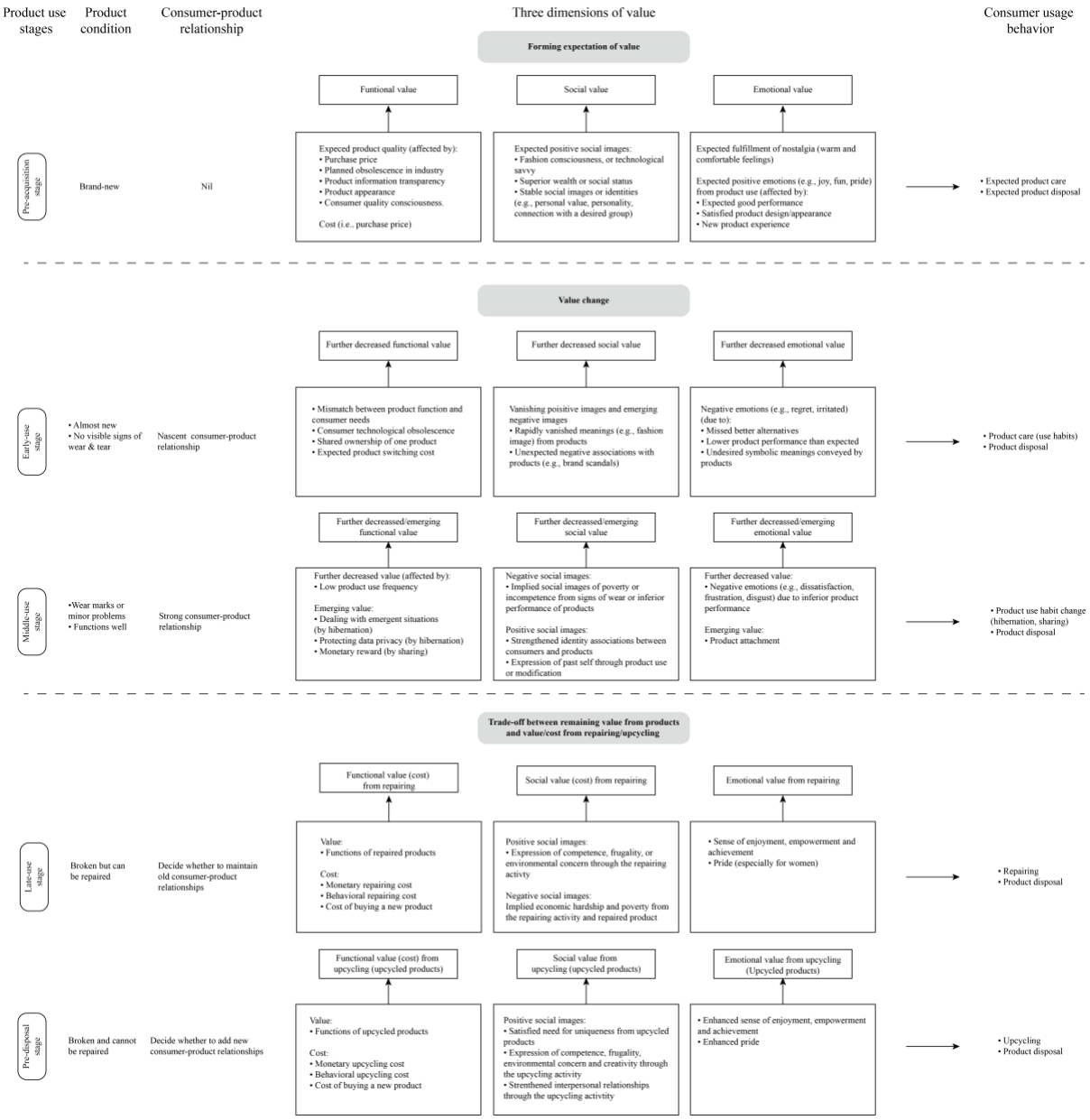


Fig. 1. Theoretical framework

3.3.1 Pre-acquisition stage: forming expectation of value

This stage marks the starting point for product value evaluation. Certain consumer characteristics will influence product use behavior. For example, consumers with environmental concern, thrift/product care habits or intention to rebel against unsustainable brand policies tend

to use a product carefully until the end of its life (Ertz et al., 2017; Cruz-Cárdenas and Arévalo-Chávez, 2018; Ackermann et al., 2018). In contrast, materialistic consumers who are affected by the social acquisitive and profligate expectations are likely to dispose of products before they break down (Podoshen and Andrzejewski, 2012; Joung, 2013). Besides, some demographic differences (e.g., age, gender) might also influence use behavior, albeit weakly (Evans and Cooper, 2016).

(1) Functional value and consumer product use

Expected functional value is formed based on expected product quality and cost, particularly the purchase price. High product quality motivates longer and more careful product use (Scott and Weaver, 2014), so does high cost which implies high loss for product disposal (Cox et al., 2013; Ackermann et al., 2021), and high expected quality, which result a long and careful product use (Madan and Suri, 2001).

Expected product quality is affected by four factors: 1) planned obsolescence in industry; 2) product information transparency; 3) product appearance; and 4) consumer quality consciousness. First, planned obsolescence refers to deliberate curtailment of a product's lifespan by manufacturers aiming to reduce production cost and increase sales (Cooper, 2004). This strategy tempers the consumer expectation of product quality (Echegaray, 2016). Second, product information transparency refers to the amount of quality-related information that is communicated to the consumer. Business can signal product quality by disclosing information, for instance on intended product lifespans, or providing product warranty (Cooper, 2005). However, offer of extended warranty or replacement may decrease consumers' confidence in product lifespans (Cox et al., 2013). Third, the relationship between product appearance and expected quality is mixed. Mugge et al. (2018) found that product appearance that scores high on

harmony (i.e., balanced, unified, and symmetric), moderate on novelty (i.e., innovative, distinctive), and somewhat above moderate level on weight (i.e., heavy, massive, stable) triggers the most positive performance quality perceptions. Finally, quality consciousness refers to the amount of attention consumers attribute to quality when purchasing products. If consumers value other features (e.g., lower price) more than quality, they would not expect a long product lifespan, thus are less likely to take care of products (Lang et al., 2013).

(2) Social value and consumer product use

Expected social value is formed based on expected role of the product in enhancing self-concept or symbolizing self-identity. If self-identity related meanings derived from the product are expected to last a long time, the product will be taken good care of and have a long lifespan, and vice versa.

Rapid decline in the product's social value occurs in two cases. First, if the consumer purchases a product to portray a self-image of fashion consciousness, or technological savvy, the product is expected to be discarded early (Cooper, 2005; Lang et al., 2013; Cox et al., 2013; Brouillat, 2015; Cruz-Cárdenas and Arévalo-Chávez, 2018). Hence, applying fashion thinking to durable products (e.g., watches, cell phones) is contrary to the notion of sustainability (Guiltinan, 2009; Bellezza et al., 2017). Second, if the product satisfies the consumer's desire to signal wealth or social status (i.e., conspicuous consumption), it is likely to be replaced with a new one when it no longer appears brand new (Cooper, 1994; O'cass and Frost, 2002).

Rapid decline in the product's social value may not occur if the consumer can derive stable self-related meanings from the product to construct social images or identities (Belk, 1988; Arnould and Thompson, 2005; Kumar and Noble, 2016) such as personal value, personality or

connection with a desired group (Diamond et al., 2009; Epp and Price, 2010; Trudel et al., 2016). In this case, the consumer will take good care of the product and keep it for a long time.

(3) Emotional value and consumer product use

Expected emotional value is formed based on either expected fulfillment of nostalgia associated with memorable experiences (Soukhathammavong and Park, 2019) or expected positive emotions from product use (Raghunathan and Irwin, 2001). Nostalgia relating to warm and comfortable feelings (Davis, 1979) is often expected from a souvenir which is a permanent experience recorder for the consumer (Sanchez et al., 2006). Thus, products like souvenirs are expected to be kept for a long time. Expected positive emotions (e.g., joy, fun, pride) can come from a product's expected good performance, design/appearance, or just new product experience. After a long use period, an old product may perform not as well as a new one, expected enjoyment may decline and the consumer may feel satiated or bored with the product (Kwon et al., 2020; Hou et al., 2020).

3.3.2 Early-use stage: value change

When the product enters the use phase, certain expected values such as functional value might decline with time as the product is no longer brand-new. Internal or external factors may accelerate the decline rate. Meanwhile, other values may emerge during the use phase. Decreasing and emerging values will determine the consumer product use behavior.

(1) Functional value and consumer product use behavior

Perceived functional value in this stage will not decline quickly because the product is almost new. For complex products, increasing product knowledge from use experience may lead to even higher perceived functional value (Burke, 2013) and help establish good use habits (Evans and Cooper, 2016). However, several factors may contribute to rapid decline of perceived

functional value and lead to bad use habits and even immature disposal: 1) mismatch between product function and consumer needs; 2) technological obsolescence; 3) shared ownership of the product.

Mismatch between product function and consumer needs is often attributed to exaggerated, misleading or overloading product information or the consumer's failure to evaluate personal needs carefully (e.g., impulse purchase) (Hausman, 2000; Verplanken and Herabadi, 2001; Cox et al., 2013; Spiteri Cornish, 2020). The mismatch can also result from a change in the consumer's living environment (e.g., major life events, moving residence, need for space) that may happen anytime during the use phase (Cruz-Cárdenas and Arévalo-Chávez, 2018; Laitala, 2014). If the consumer realizes the product no longer satisfies her needs, she may not treat it carefully or just discard it.

Technological obsolescence refers to the consumer dissatisfaction with the current product when she perceives it inferior to a new product with better features/functions (Wilson et al., 2017). This factor starts to play a role in this early stage because new product styles and models are updated frequently (Echegaray, 2016) and companies' trade-in policies provide incentives for early product replacement (Okada, 2001).

Shared ownership refers to the situation when the product is owned by more than one consumer. With shared ownership, functional value and hence responsibility of caring for the product is shared (Ackermann et al., 2018), which might reduce the consumer motivation to take good care of the product, thus speeding its wear out and disposal.

Perceived functional value in this stage is influenced by expected cost, particularly expected switching cost, including search costs, transaction costs, learning costs and setup costs (Klemperer, 1995; Jones et al., 2000; Burnham et al., 2003). If the consumer is concerned about

time scarcity, she is more likely to stay with her current product to avoid switching cost (Wu et al., 2014; Evans and Cooper, 2016).

(2) Social value and consumer product use behavior

The consumer may experience decline in social value due to factors such as rapidly vanished meanings (e.g., fashion image) from the product, or unexpected negative associations with the product such as brand scandals especially related to ethic problems (Wei and Bunjun, 2020). The consumer may give up the current product and consider a new one due to decreased social value.

(3) Emotional value and consumer product use behavior

Perceived emotional value in this stage will not decline rapidly except in several circumstances; for instance, the consumer may regret if she realizes she missed a better alternative in the market, or the product is not as good as expected (Lee and Cotte, 2009). Besides, the consumer may form negative emotions toward brands/products due to irritating or annoying symbolic meanings from marketer-controlled or non-marketer-controlled sources of information, such as brand slogan or news about unethical firm behavior (Romani et al., 2012). The resulting negative emotions may induce the consumer to treat products carelessly or discard them.

3.3.3 Middle-use stage: value change

As the product's condition changes and the consumer-product interaction accumulates over time, some new factors emerge to either speed up decline of certain values or offer new values. Two new behaviors, hibernation and sharing, are likely to occur in this stage.

(1) Functional value and consumer product use behavior

Perceived functional value based on the product performance decreases with time. The decline can be accelerated by low use frequency of a product (Goodman and Irmak, 2013) which may result from a low (or lack of) perceived fit with the product (Simpson et al., 2019) or varied use of product (but at very low frequency), leading to less care or immature disposal (Etkin and Sela, 2016).

Perceived functional value might increase through hibernation or sharing. Hibernated products could help the consumer deal with emergent situations when a spare product is needed (Wilson et al., 2017; Inghels and Bahlmann, 2021). In addition, if the product contains private personal data and the consumer does not know how to appropriately dispose of it (as in the case of cell phones, computers), it may be kept in a hibernation state (Yin et al., 2014; Kurisu et al., 2020; Islam et al., 2020). Functional value is also realized from monetary value obtained by shared products in the emerging sharing economy (Schor and Fitzmaurice, 2015).

(2) Social value and consumer product use behavior

Perceived social value can decrease or increase depending on how the consumer derives social value from the product. Perceived social value from the product's fashion or newness decline further because the product bears signs of wear or performs inferior, which may signal poverty or incompetence of the owner (Philp and Nepomuceno, 2020). Hence, the consumer might be reluctant to use the product with obvious old traces especially in public and may replace it with a new one.

However, long-term consumer-product interaction may increase perceived social value (i.e., showing past self). First, the identity associations with consumer are strengthened after a long use period, preventing disposal (Trudel et al., 2016). Second, the consumer may alter the product during use, which creates additional meanings for the product because the consumer has invested

effort in the product (Belk, 1988). Hence, the consumer is less likely to dispose of the product before it breaks down because the product preserves the owners' past and tell others what kind of person the owner is through the signs of use or modification (Kleine et al., 1993).

(3) Emotional value and consumer product use behavior

Perceived emotional value will increase with long-term consumer-product interaction which fosters product attachment (Schifferstein and Zwartkruis-Pelgrim, 2008). But this value may decrease with inferior product performance including function and appearance, especially for products designed with enhanced aesthetics (Wu et al., 2017; Buechel and Townsend, 2018) or "faultless forms and surfaces" (Guiltinan, 2009, p. 20). Because such design styles cause more salient reductions in beauty after long-term use, the consumer may feel dissatisfied, frustrated, or disgusted with the product, and will no longer protect it.

However, such undesired outcomes can be avoided if the product is designed with certain aesthetics appreciating the time elements, i.e., wear and tear adds value to the product (Kwan, 2012). Japanese Aesthetics "Wabi-Sabi" is a typical example, which offers long time enjoyment in product design.

3.3.4 Late-use stage: trade-off between remaining value from the product and value/cost of repairing

In this stage, the product has minor or major malfunctions. The consumer needs to spend additional effort to regain the product performance. In deciding whether to repair the product, the consumer trades off between remaining value and value/cost from repairing activity. If value is perceived to be higher than cost, the consumer will repair (Nazlı, 2021). Next, we discuss the value (cost) from repairing activity.

(1) Functional value and consumer product use behavior

Perceived functional value of a repairable product mainly comes from its original (remaining) functions and is negatively related to its repairing cost that includes monetary and behavioral repairing cost (Scott and Weaver, 2014; Jaeger-Erben et al., 2021). Monetary repairing cost is affected by the cost of repair service and spare parts (Cooper, 2000; King et al., 2006). Behavioral repairing cost is affected by consumers' repairing knowledge/skills (Gregson et al., 2009), required time and effort (Diddi and Yan, 2019), accessibility of repairing tools or service (Guiltinan, 2009; Harmer et al., 2019). Consumers often make the repair decision by comparing the repairing cost with the cost of buying a new product (Scott and Weaver, 2014). The literature discusses multiple ways to reduce repairing cost, such as product design facilitating repairing (e.g., modular design) (Van Nes and Cramer, 2005; Mashhadi et al., 2016) or long-term product warranties (Michaud et al., 2017). An index of "repairability" ratings by governments or industry regulators might impel manufacturers to adopt high-repairability oriented product design (Bracquene et al., 2021).

(2) Social value and consumer product use behavior

Perceived social value from repairing activity may provide the consumer an opportunity to express self, which in turn encourages repair intention. The consumer could show her competence, frugality, or environmental concern (Watson and Shove, 2008; Nazlı, 2021; Scott and Weaver, 2014) through this activity. However, if the consumer is concerned that others might associate repairing activity and repaired product with economic hardship and poverty, she may forgo repairing (Nazlı, 2021).

(3) Emotional value and consumer product use

Repairing may bring emotional value to consumers (van der Velden, 2021). Indeed, repairing activity generates a sense of enjoyment, empowerment, and achievement (Scott and

Weaver, 2014). Women can feel pride from repairing because they feel that they do not have to depend on men (Gelber, 1997; Wolf et al., 2015). Consumers who can derive positive emotions from repairing are thus more likely to engage in it (Scott and Weaver, 2014).

3.3.5 Pre-disposal stage: trade-off between remaining value from products and value/cost from upcycling

In this stage, the consumer is likely to discard the product since the original function cannot be restored. However, new value from the product by upcycling can encourage the consumer to extend the product lifespan. This behavior is affected by the remaining value in the product (e.g., useful materials, unique patterns) and the value/cost from upcycling activity/upcycled products. We next discuss the value (cost) from upcycling activity and upcycled products.

(1) Functional value and consumer product use behavior

Perceived functional value of an unrepairable product comes from the potentially upcycled version (Coppola et al., 2021). For example, unwanted clothes can be upcycled into a bag. If the consumer appreciates the function of an upcycled bag, she is likely to upcycle. But the functional value is negatively related to the cost of upcycling comprising monetary and behavioral cost (Sung, 2015, 2017; Coppola et al., 2021). Monetary cost includes the cost of tools or accessories needed to complete upcycling. Behavioral cost is determined by difficulties of upcycling (e.g., requisite creativity or complex skills), required time and effort. Consumers make the upcycling decision by comparing its cost with the cost of purchasing a new product, e.g., price, availability (Wolf and McQuitty, 2011; Wilson, 2016).

(2) Social value and consumer product use behavior

Consumers might perform upcycling due to a variety of social values brought by this behavior. First, upcycled products are often more unique than mass-produced ones, thus

satisfying the consumer need for uniqueness (Janigo et al., 2017; Coppola et al., 2021). Second, the consumer may derive a competent, frugal, environmentally friendly, and creative self-image image from upcycling activity (Wilson, 2016; Bhatt et al., 2019). Third, upcycling, sometimes as a group activity (e.g., with family members or community members), contributes to strengthening of interpersonal relationships (Landgren and Pasricha, 2011; Sung et al., 2019; Coppola et al., 2021).

(3) Emotional value and consumer product use behavior

The consumer might upcycle the product because it brings emotional value, such as fun or sense of accomplishment (Sung, 2017; Wilson, 2016). Expressing of creativity enhances positive feelings such as enjoyment and pride (Coppola et al., 2021). Personalized upcycled products may have unique appearance or bring good use experience, which also enhances positive feelings (Janigo et al., 2017; Wilson, 2016).

4. Discussion and future research

In the process of analyzing how consumer value perception influences product use behavior throughout the product lifetime, we identified promising directions for future work.

4.1 Interaction between different dimensions of perceived product value

In explaining consumer product use behavior, this paper considered the influence of three dimensions of value (functional, social, and emotional) independently. However, the three dimensions of value are not independent from one another and are usually correlated (Sweeney and Soutar, 2001). Future research could explore interactions between different values as well as different factors in influencing product use behavior. For example, social value and emotional value might be closely interwoven, such that high self-related social value (e.g., self-image) of

product can give high emotional value to consumers (e.g., product attachment). Emotional value emerging from upcycling or repairing activity can boost social value by enhancing creative or frugal self-image.

4.2 Theory development: systematic, integrated, and interdisciplinary study of extending product lifespan

Given the immense environmental potential associated with longer product lifespan, extending product lifespan is increasingly becoming an important research and public policy area. Consequently, a substantial body of research has accumulated on product lifespan in different disciplines, particularly natural sciences, engineering, and design (for e.g., research on circular economy or extending product lifespan (e.g., Special Issue of Journal of Cleaner Production, 2019)). However, that stream of literature mostly overlooks the demand-side, i.e., the consumer perspective. In contrast, management and social science literatures have taken the consumer perspective but focused mostly on consumers' choice of pro-environmental products (e.g., Barbarossa and De Pelsmacker, 2016; Al Mamun et al., 2018; Ertz et al., 2016), neglecting the post-choice consumption behavior, i.e., the product use behavior beyond initial purchase. Further research is needed on post-choice consumption behavior and the current paper is a step in that direction.

The respective streams of research on extending product lifespan in different disciplines have proceeded in parallel, with little cross-over, despite apparent synergy. Going forward calls for a systematic, integrated, and interdisciplinary study on extending product lifespan. We hope that the framework developed in this paper will benefit researchers in different disciplines and inspire them to follow-up with new interdisciplinary research on extending product lifespans integrating both the supply-side and demand-side perspectives.

4.3 Development of business models & strategies

Influence of the industry on consumer product use behavior needs further elaboration. Reviewing the literature, Sheth et al. (2011) concluded that although businesses are primarily concerned about issues of environmental sustainability, majority of their actions are compliance-driven rather than strategic, they lack a long-term perspective and, even more seriously, they do not address in a direct and systematic manner the sustainability concerns relating to one of the primary stakeholders, the consumer. Most recently, however, in response particularly to younger consumers' positive outlook toward anti-consumption-oriented values (e.g., forgoing unnecessary consumption, quality-based rather than trend-based consumption), some firms built and implement sustainable consumption focused business models. For instance, Patagonia downscaled their production, launched longer-product-lifespan-oriented initiatives (e.g., providing repair services) and integrated upcycling to business models (Lee et al., 2017; Petro, 2020; Ziesemer et al., 2021). Another noteworthy trend is the increased popularity of the resale business model which is adopted by companies like ThredUp. According to ThredUp's 2020 resale report, Gen Z are adopting second-hand fashion faster than any other age group. Beyond such positive but rather sparse endeavors, consumer focused business models need to be developed for systematic integration and enhancement of sustainability strategies in the product's production, acquisition, use and disposal phases.

Having identified that the industry has important impact on consumer product use behavior through our literature review, we subsequently provide guidance to producers on how to make product lifespan extension more convenient and desirable for the consumer. For example, in the pre-acquisition stage, producers could influence the consumer's expected product lifespan with their offer of price, quality-related information (such as, product lifespan labelling; durability;

upgradability; repairability) and product appearance. In the early-use stage, producers could provide convenient replacement service to remedy mismatch between product functions and consumer needs. Producers could also slow the speed of upgrading products, thereby alleviate pressure due to technological obsolescence. In the last three stages, producers could provide repairing service or guidance for inferior/damaged products. Future research could explore the joint impact of product design, marketing communication message, development of repair index and repair guidance on consumer product use behavior.

4.4 Paradigm change

Our review indicated that the current social paradigm is a barrier for the consumer to extend product lifespan. Within the traditional marketing framework, consumerism/materialism (using possessions to define success) (Richins and Dawson, 1992) and associations of old/repaired products with negative social images (e.g., poverty, failure) (Nazlı, 2021) are promoted to advance consumption and economic development (Kilbourne, 2004). Indeed, the dominant social paradigm discourages consumers from engaging in behaviors to extend product lifespan (Pandelaere, 2016). One positive trend, however, finds that younger consumers, relative to older generations, show greater passion for sustainable consumption (First Insight, 2019; Petro, 2020) which is promising for transition to a sustainable social paradigm. Younger consumers' positive outlook and behavior can be facilitated and encouraged by providing sufficient information, skills, and knowledge about sustainable consumption, and further persuasion/communication to disclaim from fashion and habit (Kreuzer et al., 2019).

Research is hence needed to identify effective public policy design for encouraging transition to a more socially beneficial social paradigm by influencing consumer product use behavior. Future research could explore the strategies (e.g., social campaigns, public

advertisements) such as developing associations between sustainable use behaviors (e.g., repairing) with positive social images (e.g., redefining consumers' notion of success and happiness) to change the social paradigm and improve the consumer well-being.

Research is also needed to provide guidance on policy and instruments (e.g., standards, taxes, subsidies, communications campaigns, education) to promote product lifespan extension. Input is needed on questions such as how to promote consumption reduction through extension of product lifespan? How to develop positively-valenced policies to encourage extension of product lifespan? How to make extension of product lifespan a convenient option for the consumer? How to redefine consumers' notion about success and happiness?

4.5 Repair & upcycling

Future research could further explore how repairing and upcycling behavior can be encouraged to extend product lifespan. Previous literature only considered their cost or functional value to the consumer but neglected the social or emotional value from these activities (Evans and Cooper, 2016; Cox et al., 2013). Further, since interactions between products and consumers can strengthen product attachment (Schifferstein and Zwartkruis-Pelgrim, 2008), repairing and upcycling may lead to stronger product attachment, which in turn brings more sustainable outcomes (e.g., Sung, 2017), thus a promising future research avenue.

5. Conclusions

This research systematically reviewed the literature on how consumer product use behavior influences the product lifespan. Our comprehensive review discovered that a strategy for engaging consumers in extending product lifespan needs to be based on an understanding of how product lifespan relates to consumer value. We thus developed a five-stage framework to

delineate factors that influence the consumer perceived value (i.e., functional value, social value, and emotional value) and value change leading to different product use behaviors.

This paper contributes to the literature on consumer product use in three ways: 1) This paper presents the first comprehensive and systematic review of all consumer product use behaviors that influence the product lifespan. These behaviors are assigned to different stages which are demarcated based on condition of the product and the consumer-product relationship. 2) By linking the three dimensions of perceived value to product use, this paper provides insights into the mechanisms underlying the relationships between product use behavior and its determinants. 3) Based on this literature review, we identified promising future research directions to advance the understanding of consumer product use behaviors related to product lifespan and explore strategies to encourage consumers to extend product lifespans.

This paper is valuable for practitioners interested in facilitating consumers' behavior for extending product lifespans. Notably, this paper provides suppliers, such as designers, producers, and marketers, an understanding as to how the price, quality-related information, product design and communications of product meanings, post-purchase service (e.g., repairing service) may influence the consumer tendency to extend product lifespans.

In closing, we acknowledge some limitations. First, we adopted the scoping literature review method and endeavored to incorporate relevant literature from different research fields. But there is a possibility that some factors or topics are missing in our framework which might be discovered in future research. Second, we did not consider value from various methods of product disposal which may influence the timing of discarding. For example, consumers who expect to receive money from reselling products (sometimes at a higher price than the original one) are likely to replace products early (Chu and Liao, 2010). Third, we only discuss the use of

new products and exclude the second-hand products, which are more complex because they have their use history that increase uncertainty regarding product conditions and relationships between new owners and products.

References

Ackermann, L., Mugge, R., & Schoormans, J. (2018). Consumers' perspective on product care: An exploratory study of motivators, ability factors, and triggers. *Journal of Cleaner Production, 183*, 380-391.

Ackermann, L., Schoormans, J. P., & Mugge, R. (2021). Measuring consumers' product care tendency: Scale development and validation. *Journal of Cleaner Production, 295*, 126327.

Al Mamun, A., Mohamad, M. R., Yaacob, M. R. B., & Mohiuddin, M. (2018). Intention and behavior towards green consumption among low-income households. *Journal of Environmental Management, 227*, 73-86.

Anandh, G., PrasannaVenkatesan, S., Goh, M., & Mathiyazhagan, K. (2021). Reuse assessment of WEEE: Systematic review of emerging themes and research directions. *Journal of Environmental Management, 287*, 112335.

Arksey, H., & O'malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology, 8*(1), 19-32.

Arnould, E. J., & Thompson, C. J. (2005). Consumer culture theory (CCT): Twenty years of research. *Journal of Consumer Research, 31*(4), 868-882.

Bakker, C., Wang, F., Huisman, J., & Den Hollander, M. (2014). Products that go round: exploring product life extension through design. *Journal of Cleaner Production, 69*, 10-16.

Barbarossa, C., & De Pelsmacker, P. (2016). Positive and negative antecedents of purchasing eco-friendly products: A comparison between green and non-green consumers. *Journal of Business Ethics, 134*, 229-247.

Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research, 15*(2), 139-168.

Belk, R. (2014). You are what you can access: Sharing and collaborative consumption online. *Journal of Business Research, 67*(8), 1595-1600.

Bellezza, S., Ackerman, J. M., & Gino, F. (2017). "Be careless with that!" Availability of product upgrades increases cavalier behavior toward possessions. *Journal of Marketing Research, 54*(5), 768-784.

Bhatt, D., Silverman, J., & Dickson, M. A. (2019). Consumer interest in upcycling techniques and purchasing upcycled clothing as an approach to reducing textile waste. *International Journal of Fashion Design, Technology and Education, 12*(1), 118-128.

Bierly III, P. E., & Coombs, J. E. (2004). Equity alliances, stages of product development, and alliance instability. *Journal of Engineering and Technology Management, 21*(3), 191-214.

Bocken, N. M., De Pauw, I., Bakker, C., & Van Der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 33*(5), 308-320.

Bovea, M. D., Ibáñez-Forés, V., & Pérez-Belis, V. (2020). Repair vs. replacement: Selection of the best end-of-life scenario for small household electric and electronic equipment based on life cycle assessment. *Journal of Environmental Management, 254*, 109679.

Bovea, M. D., & Pérez-Belis, V. (2018). Identifying design guidelines to meet the circular economy principles: A case study on electric and electronic equipment. *Journal of Environmental Management, 228*, 483-494.

Bracquené, E., Peeters, J., Alfieri, F., Sanfelix, J., Duflou, J., Dewulf, W., & Cordella, M. (2021). Analysis of evaluation systems for product repairability: A case study for washing machines. *Journal of Cleaner Production, 281*, 125122.

Brouillat, E. (2015). Live fast, die young? Investigating product life spans and obsolescence in an agent-based model. *Journal of Evolutionary Economics*, *25*(2), 447-473.

Buechel, E. C., & Townsend, C. (2018). Buying beauty for the long run:(Mis) predicting liking of product aesthetics. *Journal of Consumer Research*, *45*(2), 275-297.

Burke, P. F. (2013). Seeking simplicity in complexity: The relative value of ease of use (EOU)-based product differentiation. *Journal of Product Innovation Management*, *30*(6), 1227-1241.

Burnham, T. A., Frels, J. K., & Mahajan, V. (2003). Consumer switching costs: A typology, antecedents, and consequences. *Journal of the Academy of Marketing Science*, *31*(2), 109-126.

Chu, H., & Liao, S. (2010). Buying while expecting to sell: The economic psychology of online resale. *Journal of Business Research*, *63*(9-10), 1073-1078.

Cooper, T. (1994). Beyond recycling: The longer life option. London: New Economics Foundation.

Cooper, T. (2000). Product development implications of sustainable consumption. *The Design Journal*, *3*(2), 46-57.

Cooper, T. (2004). Inadequate life? Evidence of consumer attitudes to product obsolescence. *Journal of Consumer Policy*, *27*(4), 421-449.

Cooper, T. (2005). Slower consumption reflections on product life spans and the "throwaway society". *Journal of Industrial Ecology*, *9*(1-2), 51-67.

Cooper, T. (2020). Slower cycles: an essential characteristic of the circular economy. In the Circular Economy in the European Union (pp. 99-116). Springer, Cham.

Coppola, C., Vollero, A., & Siano, A. (2021). Consumer upcycling as emancipated self-production: Understanding motivations and identifying upcycler types. *Journal of Cleaner Production, 285*, 124812.

Cox, J., Griffith, S., Giorgi, S., & King, G. (2013). Consumer understanding of product lifetimes. *Resources, Conservation and Recycling*, *79*, 21-29.

Cruz-Cárdenas, J., & Arévalo-Chávez, P. (2018). Consumer behavior in the disposal of products: Forty years of research. *Journal of Promotion Management*, *24*(5), 617-636.

Davis, F. (1979). Yearning for yesterday: A sociology of nostalgia. New York: Free Press.

Day, D., Gan, B., Gendall, P., & Esslemont, D. (1991). Predicting purchase behaviour. *Marketing Bulletin*, *2*(5), 18-30.

Diamond, N., Sherry Jr, J. F., Muñiz Jr, A. M., McGrath, M. A., Kozinets, R. V., & Borghini, S. (2009). American Girl and the brand gestalt: Closing the loop on sociocultural branding research. *Journal of Marketing*, *73*(3), 118-134.

Diddi, S., & Yan, R. N. (2019). Consumer perceptions related to clothing repair and community mending events: A circular economy perspective. *Sustainability*, *11*(19), 5306.

Dwayne Ball, A., & Tasaki, L. H. (1992). The role and measurement of attachment in consumer behavior. *Journal of Consumer Psychology*, *1*(2), 155-172.

Echegaray, F. (2016). Consumers' reactions to product obsolescence in emerging markets: the case of Brazil. *Journal of Cleaner Production*, *134*, 191-203.

Epp, A. M., & Price, L. L. (2010). The storied life of singularized objects: Forces of agency and network transformation. *Journal of Consumer Research*, *36*(5), 820-837.

Ertz, M., Huang, R., Jo, M. S., Karakas, F., & Sarigöllü, E. (2017). From single-use to multi-use: Study of consumers' behavior toward consumption of reusable containers. *Journal of Environmental Management, 193*, 334-344.

Ertz, M., Karakas, F., & Sarigöllü, E. (2016). Exploring pro-environmental behaviors of consumers: An analysis of contextual factors, attitude, and behaviors. *Journal of Business Research*, *69*(10), 3971-3980.

Ertz, M., Leblanc-Proulx, S., Sarigöllü, E., & Morin, V. (2019a). Advancing quantitative rigor in the circular economy literature: New methodology for product lifetime extension business models. *Resources, Conservation and Recycling*, *150*, 104437.

Ertz, M., Leblanc-Proulx, S., Sarigöllü, E., & Morin, V. (2019b). Made to break? A taxonomy of business models on product lifetime extension. *Journal of Cleaner Production*, *234*, 867-880.

Etkin, J., & Sela, A. (2016). How experience variety shapes postpurchase product evaluation. *Journal of Marketing Research*, *53*(1), 77-90.

Evans, S., Cooper, T. (2016). Consumer influences on product lifespans. In Longer lasting products (pp. 345-376). Routledge.

First Insight survey. (2019). The state of consumer spending: Gen Z shoppers demand sustainable retail. Available online: https://www.firstinsight.com/white-papers-posts/gen-z-shoppers-demand-sustainability (accessed 16 October 2021).

Freudenreich, B., & Schaltegger, S. (2020). Developing sufficiency-oriented offerings for clothing users: Business approaches to support consumption reduction. *Journal of Cleaner Production*, *247*, 119589.

Gelber, S. M. (1997). Do-it-yourself: Constructing, repairing and maintaining domestic masculinity. *American Quarterly*, *49*(1), 66-112.

Goodman, J. K., & Irmak, C. (2013). Having versus consuming: Failure to estimate usage frequency makes consumers prefer multifeature products. *Journal of Marketing Research*, *50*(1), 44-54.

Gregson, N., Metcalfe, A., & Crewe, L. (2009). Practices of object maintenance and repair: How consumers attend to consumer objects within the home. *Journal of Consumer Culture*, *9*(2), 248-272.

Guiltinan, J. (2009). Creative destruction and destructive creations: Environmental ethics and planned obsolescence. *Journal of Business Ethics*, *89*, 19-28.

Harmer, L., Cooper, T., Fisher, T., Salvia, G., & Barr, C. (2019). Design, Dirt and Disposal: Influences on the maintenance of vacuum cleaners. *Journal of Cleaner Production*, *228*, 1176-1186.

Hausman, A. (2000). A multi-method investigation of consumer motivations in impulse buying behavior. *Journal of Consumer Marketing*, *17*(5), 403-426.

Hou, C., Jo, M. S., & Sarigöllü, E. (2020). Feelings of satiation as a mediator between a product's perceived value and replacement intentions. *Journal of Cleaner Production*, *258*, 120637.

Inghels, D., & Bahlmann, M. D. (2021). Hibernation of mobile phones in the Netherlands: The role of brands, perceived value, and incentive structures. *Resources, Conservation and Recycling*, *164*, 105178.

Islam, M. T., Dias, P., & Huda, N. (2020). Waste mobile phones: A survey and analysis of the awareness, consumption and disposal behavior of consumers in Australia. *Journal of Environmental Management*, *275*, 111111.

Jaeger-Erben, M., Frick, V., & Hipp, T. (2021). Why do users (not) repair their devices? A study of the predictors of repair practices. *Journal of Cleaner Production*, *286*, 125382.

Janigo, K. A., Wu, J., & DeLong, M. (2017). Redesigning fashion: An analysis and categorization of women's clothing upcycling behavior. *Fashion Practice*, *9*(2), 254-279.

Jones, M. A., Mothersbaugh, D. L., & Beatty, S. E. (2000). Switching barriers and repurchase intentions in services. *Journal of Retailing*, *76*(2), 259-274.

Joung, H. M. (2013). Materialism and clothing post-purchase behaviors. *Journal of Consumer Marketing*, *30*(6), 530-537.

Jung, H. J., Kim, H., & Oh, K. W. (2016). Green leather for ethical consumers in China and Korea: Facilitating ethical consumption with value–belief–attitude logic. *Journal of Business Ethics*, *135*, 483-502.

Kilbourne, W. E. (2004). Sustainable communication and the dominant social paradigm: can they be integrated?. *Marketing Theory*, *4*(3), 187-208.

King, A. M., Burgess, S. C., Ijomah, W., & McMahon, C. A. (2006). Reducing waste: repair, recondition, remanufacture or recycle?. *Sustainable Development*, *14*(4), 257-267.

Kleine III, R. E., Kleine, S. S., & Kernan, J. B. (1993). Mundane consumption and the self: A social-identity perspective. *Journal of Consumer Psychology*, *2*(3), 209-235.

Klemperer, P. (1995). Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade. *The Review of Economic Studies*, *62*(4), 515-539.

Kreuzer, C., Weber, S., Off, M., Hackenberg, T., & Birk, C. (2019). Shedding light on realized sustainable consumption behavior and perceived barriers of young adults for creating stimulating teaching–learning situations. *Sustainability*, *11*(9), 2587.

Kumar, M., & Noble, C. H. (2016). Beyond form and function: Why do consumers value product design?. *Journal of Business Research*, *69*(2), 613-620.

Kurisu, K., Miura, J., Nakatani, J., & Moriguchi, Y. (2020). Hibernating behavior for household personal computers. *Resources, Conservation and Recycling*, *162*, 105015.

Kwan, P. Y., 2012. Exploring Japanese art and aesthetic as inspiration for emotionally durable design. Design Ed Asia. Hongkong.

Kwon, T. A., Choo, H. J., & Kim, Y. K. (2020). Why do we feel bored with our clothing and where does it end up?. *International Journal of Consumer Studies*, *44*(1), 1-13.

Laitala, K. (2014). Consumers' clothing disposal behaviour–a synthesis of research results. *International Journal of Consumer Studies*, *38*(5), 444-457.

Landgren, T. M., & Pasricha, A. (2011). Transforming the fashion and apparel curriculum to incorporate sustainability. *International Journal of Fashion Design, Technology and Education*, *4*(3), 187-196.

Lang, C., Armstrong, C. M., & Brannon, L. A. (2013). Drivers of clothing disposal in the US: An exploration of the role of personal attributes and behaviours in frequent disposal. *International Journal of Consumer Studies*, *37*(6), 706-714.

Lee, M. S., Seifert, M., & Cherrier, H. (2017). Anti-consumption and governance in the global fashion industry: transparency is key. *Governing corporate social responsibility in the apparel industry after Rana Plaza*, 147-174.

Lee, S. H., & Cotte, J. (2009). Post-purchase consumer regret: Conceptualization and development of the PPCR scale. *Advances in Consumer Research*, *36*.

Madan, V., & Suri, R. (2001). Quality perception and monetary sacrifice: a comparative analysis of discount and fixed prices. *Journal of Product & Brand Management*, *10*(3), 170-184.

Mashhadi, A. R., Esmaeilian, B., Cade, W., Wiens, K., & Behdad, S. (2016). Mining consumer experiences of repairing electronics: Product design insights and business lessons learned. *Journal of Cleaner Production*, *137*, 716-727.

Mead, N. L., Baumeister, R. F., Stillman, T. F., Rawn, C. D., & Vohs, K. D. (2011). Social exclusion causes people to spend and consume strategically in the service of affiliation. *Journal of Consumer Research*, *37*(5), 902-919.

Michaud, C., Joly, I., Llerena, D., & Lobasenko, V. (2017). Consumers' willingness to pay for sustainable and innovative products: a choice experiment with upgradeable products. *International Journal of Sustainable Development*, *20*(1-2), 8-32.

Morales, A. C., & Fitzsimons, G. J. (2007). Product contagion: Changing consumer evaluations through physical contact with "disgusting" products. *Journal of Marketing Research*, *44*(2), 272-283.

Mugge, R., Dahl, D. W., & Schoormans, J. P. (2018). "What you see, is what you get?" Guidelines for influencing consumers' perceptions of consumer durables through product appearance. *Journal of Product Innovation Management*, *35*(3), 309-329.

Murakami, S., Oguchi, M., Tasaki, T., Daigo, I., & Hashimoto, S. (2010). Lifespan of commodities, part I: The creation of a database and its review. *Journal of Industrial Ecology*, *14*(4), 598-612.

Nishijima, D. (2016). Product lifetime, energy efficiency and climate change: a case study of air conditioners in Japan. *Journal of Environmental Management*, *181*, 582-589.

O'cass, A., & Frost, H. (2002). Status brands: examining the effects of non-product-related brand associations on status and conspicuous consumption. *Journal of Product & Brand Management*, *11*(2), 67-88.

Okada, E. M. (2001). Trade-ins, mental accounting, and product replacement decisions. *Journal of Consumer Research*, *27*(4), 433-446.

Oxford Dictionary. (2021). https://www.lexico.com/definition/upcycle (accessed 10 April 2021).

Panchal, R., Singh, A., & Diwan, H. (2021). Does circular economy performance lead to sustainable development?–A systematic literature review. *Journal of Environmental Management*, *293*, 112811.

Pandelaere, M. (2016). Materialism and well-being: The role of consumption. *Current Opinion in Psychology*, *10*, 33-38.

Peters, M., Godfrey, C., McInerney, P., Soares, C., Khalil, H., Parker, D. (2015). The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews.

Petro, G. (2020). Sustainable Retail: How Gen Z Is Leading The Pack. Available online: https://www.forbes.com/sites/gregpetro/2020/01/31/sustainable-retail-how-gen-z-is-leading-the-pack/?sh=3b17d1512ca3 (accessed 16 October 2021).

Philp, M., & Nepomuceno, M. V. (2020). When the frugal become wasteful: An examination into how impression management can initiate the end-stages of consumption for frugal consumers. *Psychology & Marketing*, *37*(2), 326-339.

Pierce, J. L., Kostova, T., & Dirks, K. T. (2003). The state of psychological ownership: Integrating and extending a century of research. *Review of General Psychology*, *7*(1), 84-107.

Pillai, R. G., & Krishnakumar, S. (2019). Elucidating the emotional and relational aspects of gift giving. *Journal of Business Research*, *101*, 194-202.

Podoshen, J. S., & Andrzejewski, S. A. (2012). An examination of the relationships between materialism, conspicuous consumption, impulse buying, and brand loyalty. *Journal of Marketing Theory and Practice*, *20*(3), 319-334.

Raghunathan, R., & Irwin, J. R. (2001). Walking the hedonic product treadmill: Default contrast and mood-based assimilation in judgments of predicted happiness with a target product. *Journal of Consumer Research*, *28*(3), 355-368.

Richins, M. L., & Dawson, S. (1992). A consumer values orientation for materialism and its measurement: Scale development and validation. *Journal of Consumer Research, 19*(3), 303-316.

Rivera, J. L., & Lallmahomed, A. (2016). Environmental implications of planned obsolescence and product lifetime: a literature review. *International Journal of Sustainable Engineering*, *9*(2), 119-129.

Romani, S., Grappi, S., & Dalli, D. (2012). Emotions that drive consumers away from brands: Measuring negative emotions toward brands and their behavioral effects. *International Journal of Research in Marketing*, *29*(1), 55-67.

Sánchez, J., Callarisa, L., Rodriguez, R. M., & Moliner, M. A. (2006). Perceived value of the purchase of a tourism product. *Tourism Management*, *27*(3), 394-409.

Schor, J. B., Fitzmaurice, C. J. (2015). Collaborating and connecting: the emergence of the sharing economy. In Handbook of research on sustainable consumption. Edward Elgar Publishing.

Schifferstein, H. N., & Zwartkruis-Pelgrim, E. P. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design*, *2*(3), 1-13.

Scott, K. A., & Weaver, S. T. (2014). To repair or not to repair: what is the motivation. *Journal of Research for Consumers*, *26*(1), 43-44.

Sheth, J. N., Newman, B. I., & Gross, B. L. (1991). Why we buy what we buy: A theory of consumption values. *Journal of Business Research*, *22*(2), 159-170.

Sheth, J. N., Sethia, N. K., & Srinivas, S. (2011). Mindful consumption: A customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, *39*, 21-39.

Simpson, D., Power, D., Riach, K., & Tsarenko, Y. (2019). Consumer motivation for product disposal and its role in acquiring products for reuse. *Journal of Operations Management*, *65*(7), 612-635.

Soukhathammavong, B., & Park, E. (2019). The authentic souvenir: What does it mean to souvenir suppliers in the heritage destination?. *Tourism Management*, *72*, 105-116.

Spiteri Cornish, L. (2020). Why did I buy this? Consumers' post-impulse-consumption experience and its impact on the propensity for future impulse buying behaviour. *Journal of Consumer Behaviour*, *19*(1), 36-46.

Sung, K. (2015). A Review on Upcycling: Current Body of Literature, Knowledge Gaps and a Way Forward,. Part I, Proceedings of the ICEES 2015: 17th International Conference on Environmental and Earth Sciences, Apr 13-14, 2015. Venice, Italy.

Sung, K. (2017). Sustainable production and consumption by upcycling (Doctoral dissertation, Nottingham Trent University (United Kingdom)).

Sung, K., Cooper, T., Kettley, S. (2019). Factors influencing upcycling for UK makers. *Sustainability*, 11(3), 870.

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of Retailing*, *77*(2), 203-220.

Terzioğlu, N. (2021). Repair motivation and barriers model: Investigating user perspectives related to product repair towards a circular economy. *Journal of Cleaner Production, 289*, 125644.

ThredUp resale report, 2020. https://www.thredup.com/resale/2020/ (accessed 25 October 2021).

Trudel, R., Argo, J. J., & Meng, M. D. (2016). The recycled self: Consumers' disposal decisions of identity-linked products. *Journal of Consumer Research*, *43*(2), 246-264.

UN General Assembly, (21 October 2015). Transforming our world : the 2030 Agenda for Sustainable Development, A/RES/70/1, available at: https://www.refworld.org/docid/57b6e3e44.html (accessed 14 May 2021).

Van Der Velden, M. (2021). 'Fixing the World One Thing at a Time': Community repair and a sustainable circular economy. *Journal of Cleaner Production, 304*, 127151.

Van Nes, N., & Cramer, J. (2005). Influencing product lifetime through product design. *Business Strategy and the Environment*, *14*(5), 286-299.

Verplanken, B., & Herabadi, A. (2001). Individual differences in impulse buying tendency: Feeling and no thinking. *European Journal of Personality*, *15*(1_suppl), S71-S83.

Watson, M., & Shove, E. (2008). Product, competence, project and practice: DIY and the dynamics of craft consumption. *Journal of Consumer Culture*, *8*(1), 69-89.

Wei, M. L., & Bunjun, B. (2020). 'We are not the shoes of white supremacists': a critical race perspective of consumer responses to brand attempts at countering racist associations. *Journal of Marketing Management, 36*(13-14), 1252-1279.

Wieser, H., & Tröger, N. (2018). Exploring the inner loops of the circular economy: Replacement, repair, and reuse of mobile phones in Austria. *Journal of Cleaner Production, 172*, 3042-3055.

Wilson, M. (2016). When creative consumers go green: Understanding consumer upcycling. *Journal of Product & Brand Management*, *25*(4), 394-399.

Wilson, G. T., Smalley, G., Suckling, J. R., Lilley, D., Lee, J., & Mawle, R. (2017). The hibernating mobile phone: Dead storage as a barrier to efficient electronic waste recovery. *Waste Management, 60*, 521-533.

Wolf, M., Albinsson, P. A., & Becker, C. (2015). Do-it-yourself projects as path toward female empowerment in a gendered market place. *Psychology & Marketing*, *32*(2), 133-143.

Wolf, M., & McQuitty, S. (2011). Understanding the do-it-yourself consumer: DIY motivations and outcomes. *AMS Review, 1*, 154-170.

Wu, F., Samper, A., Morales, A. C., & Fitzsimons, G. J. (2017). It's too pretty to use! When and how enhanced product aesthetics discourage usage and lower consumption enjoyment. *Journal of Consumer Research*, *44*(3), 651-672.

Wu, L. Y., Chen, K. Y., Chen, P. Y., & Cheng, S. L. (2014). Perceived value, transaction cost, and repurchase-intention in online shopping: A relational exchange perspective. *Journal of Business Research, 67*(1), 2768-2776.

Yi, Y., & Jeon, H. (2003). Effects of loyalty programs on value perception, program loyalty, and brand loyalty. *Journal of the Academy of Marketing Science*, *31*(3), 229-240.

Yin, J., Gao, Y., & Xu, H. (2014). Survey and analysis of consumers' behaviour of waste mobile phone recycling in China. *Journal of Cleaner Production, 65*, 517-525.

Yoo, J., & Park, M. (2016). The effects of e-mass customization on consumer perceived value, satisfaction, and loyalty toward luxury brands. *Journal of Business Research, 69*(12), 5775-5784.

Ziesemer, F., Hüttel, A., & Balderjahn, I. (2021). Young people as drivers or inhibitors of the sustainability movement: The case of anti-consumption. *Journal of Consumer Policy*, *44*(3), 427-453.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *Journal of Marketing*, *52*(3), 2-22.

The Bridge Between Essay 1 and Essay 2

In Essay 1, I examined product use behaviors that facilitate the product lifespan extension and thus benefit the circular economy (CE). Specifically, based on a systematic literature review, I built a conceptual framework consisting of two dimensions (i.e., product use stage and product value type) to summarize factors influencing these behaviors. This framework shows how factors occurring at different product use stages shape consumers' perceptions of product value and thereby influence product use behaviors.

Essay 2 links to Essay 1 in two ways. First, Essay 2 examines a specific product use behavior identified in Essay 1, namely consumer upcycling. This behavior is one of the most resource-efficient practices to realize the circular economy vision, more so than other practices like recycling. However, according to the literature review in Essay 1, consumer upcycling remains under-explored in prior research. As a response to this gap, Essay 2 uses a qualitative research method to obtain rich insights into this behavior. Second, Essay 1 highlights a gap in prior research on consumer upcycling, namely the oversight of social or emotional value associated with this behavior. Essay 2 addresses this gap by empirically exploring internal motivations of consumer upcycling, as social and emotional value in consumption typically relates to consumers' internal motivations (Babin et al., 1994).

CHAPTER 3 – ESSAY 2

A QUALITATIVE STUDY ON INTERNAL MOTIVATIONS AND CONSEQUENCES OF CONSUMER UPCYCLING

Shi, T., Huang, R., & Sarigöllü, E. (2022). A qualitative study on internal motivations and consequences of consumer upcycling. Journal of Cleaner Production, 377, 134185.

Abstract

This paper investigates consumer upcycling behavior, a consumer-determined Circular Economy (CE) practice. Consumer upcycling involves transforming or repurposing unwanted object(s) to an object which has equal or higher value than the current value of its component(s). Although it is one of the most beneficial practices for environmental sustainability, more so than other practices such as recycling, and it constitutes a concrete exemplar of how consumers can participate in the Circular Economy, literature on consumer upcycling is rather underdeveloped. Performing inductive content analysis on in-depth interviews of 34 consumers mainly from China, this paper develops a holistic framework representing the internal motivations and consequences of consumer upcycling. Specifically, three distinct dimensions of internal motivations for consumer upcycling are identified: core-self oriented, social-self oriented, and object-self oriented motivations. Further, consequences of consumer upcycling at three levels (social, environmental, and economic) are identified. We find that consumer upcycling may spur other consumer-focused pro-environmental behaviors (i.e., spillover effect) and engender positive attitude and behavior toward purchasing of upcycled products (i.e., switchover effect). All in all, this research contributes to the CE literature by providing insight on how consumers could take initiative to enable the Circular Economy.

1. Introduction

Global waste is expected to grow to 3.4 billion tons by 2050, more than double population growth over the same period, causing serious hazards to the environment, health, and prosperity (Kaza et al., 2018). Acknowledged as an effective system to curb the threats caused by increasing waste, the Circular Economy (CE) has been receiving much research attention lately. Although definitions abound, this concept mainly describes an economy "where the value of products, materials, and resources is maintained in the economy for as long as possible, and the generation of waste is minimized" (European Commission, 2015, p. 2). Embedded in the CE context, consumer upcycling refers to a process in which consumers transform or repurpose unwanted object(s) to a product which has equal or higher value than the current value of its component(s) (Sung et al., 2014). For instance, one could convert a podium into a TV stand, or repurpose a wine bottle into a vase. Although it is one of the most beneficial practices for environmental sustainability, more so than other practices such as recycling, and it constitutes a concrete exemplar of how consumers can participate in the Circular Economy, literature on consumer upcycling is rather underdeveloped. The current paper addresses this deficiency.

Consumer upcycling enables and facilitates the CE in multiple ways. First, consumer upcycling is one of the least resource intensive ways to extend product lifetime (Bridgens et al., 2018; Coppola et al., 2021). In this grass-roots CE practice, few external forces (e.g., facilities, logistics system) and raw resources are needed, and resource quality is not degraded. Second, along with reuse and consumer repairing, consumer upcycling assists and complements the success of companies' CE oriented product lifetime extension (PLE) strategy (Donati et al., 2020; Bakker et al., 2021). Companies provide the basis for PLE, but whether the strategy can achieve its intended goal (i.e., longer product lifetime) depends on how consumers use, not use,

and dispose of products. Third, consumer upcycling empowers consumers in the CE system and raises their awareness and perceived responsibility of enabling the CE. Given that the CE needs contribution from multiple important players, including the government, businesses, and consumers (Gue et al., 2020), consumer upcycling can facilitate the CE process by increasing the social recognition of CE among consumers, empowering consumers, and promoting the prosperity of sustainable business (upcycling business) by stimulating multiple roles taken by consumers (Sung, 2017; Singh et al., 2019; Kamleitner et al., 2019; Coppola et al., 2021). These roles include producer, designer, donor and buyer: 1) upcycling enthusiasts with good upcycling skills can start small- or medium-sized enterprises (producer); 2) consumers with good upcycling ideas and design skills may prompt companies to embark on upcycling and contribute to the integration of upcycling to mass-production (designer); 3) consumers with upcycling awareness could provide upcycling materials to industries and thus facilitate large-scale upcycling (donor); and 4) consumers engaged in upcycling behavior are more likely to purchase upcycled products as indicated by our research (buyer).

As consumer upcycling often requires more time and effort than other disposal methods, it may be underestimated due to the notorious "attitude-behaviour" gap (Kollmuss and Agyeman, 2002). This calls for a systematic investigation of motivations for consumer upcycling. In addition, a comprehensive understanding of consumer upcycling would not be complete without an examination of its consequences, particularly as they relate to the three universally recognized aims of the CE (i.e., society, environment, and economy) (Kirchherr et al., 2017; Korhonen et al., 2018). However, there is lack of research on these important topics, which the current study will address.

The purpose of the current research is to explore the internal motivations and consequences of consumer upcycling. Specifically, we aim to understand: 1) what internal factors inspire consumer upcycling at the end of product life? and 2) what are the potential consequences of consumer upcycling at the social, environmental, and economic levels? By analyzing qualitative evidence from consumer interviews, we provide a detailed elucidation of upcycling motivations that reveal how consumers take initiative to extend product life. By focusing on internal motivations, we complement and advance existing upcycling research that focus on external motivations. Moreover, by identifying the consequences of consumer upcycling, we provide an understanding on its impact on society, environment, and economy. Particularly, behavioral spillover from consumer upcycling to other sustainable consumption behaviors and switchover from consumer's own upcycling to purchase of upcycled products unambiguously indicate that consumer upcycling could provide a driving force for consumers to further enable the CE and waste prevention. Finally, this study enriches the upcycling research field by expanding the study context for the first time beyond the United Kingdom and European Union (Sung et al., 2019) to China.

The rest of this paper is organized as follows: Section 2 presents an overview of existing research on upcycling, motivations of consumer upcycling, and its consequences and discusses the research gaps; Section 3 describes the methodology used; Section 4 presents and discusses the findings about motivations and consequences; Section 5 concludes the paper and discusses theoretical implications. Section 6 reflects on the managerial implications; Finally, limitations and future research avenues are provided.

2. Theoretical Foundations

2.1 Conceptualization of Consumer Upcycling

2.1.1 Consumer Upcycling and Other CE Oriented Practices

Consumer upcycling differs from other CE oriented practices on three main dimensions: 1) physical form of waste in consumer upcycling and other CE oriented practices (i.e., material-level waste vs. product-level waste; Zink and Geyer, 2017; Jerome et al., 2022); 2) enabler type (i.e., consumer vs. industry; Camacho-Otero et al., 2018); and 3) diversity of purpose (i.e., same purpose vs. different purposes; Larrain et al., 2020; Deschamps et al., 2018). As shown in Appendix A (in Supplementary Material), consumer upcycling is differentiated as a product-level, consumer-enabling, and different-purpose-achieving CE oriented practice.

First, consumer upcycling is mainly a product-level practice, which relies on human's (consumer, designer, entrepreneur) re-thinking of the product's design and use (e.g., Den Hollander et al., 2017). That is, consumer upcycling is mainly conducted at the product-level and the product integrity is more likely to be kept (Den Hollander et al., 2017). Hence, consumer upcycling is different from material-level waste practices (closed-loop/open-loop recycling, material-level industrial upcycling, energy recovery) which requires innovative technologies (e.g., chemical technologies) on an industrial scale (e.g., Korley et al., 2021).

Second, the consumer-enabling feature highlights the crucial role of individuals' awareness, values, or attitudes (Camacho-Otero et al., 2018) in the CE context. It is unlikely that business practitioners such as designers and entrepreneurs who provide repair service or implement refurbishing, remanufacturing, and upcycling production make these CE related decisions merely based on personal and especially internal motivations.

Third, the different-purpose-achieving feature differentiates consumer upcycling from other product-level and consumer-enabling practices (i.e., consumers' other product life extension (PLE) practices: reuse facilitated by resale, sharing or donation, consumer repair) in terms of flexibility, value creation, consumer-object relationship, and behavioral motivation, as follows: 1) consumer upcycling can endow a variety of functions to the same waste objects to prevent resource quality reduction that is often caused by common practices such as leaving-the-waste in the trash or recycle bin (Singh, 2022). While other PLE practices are constrained to the original product purpose and hence not applicable to occasions where the original purpose of a product is no longer needed or cannot be satisfied, and the remaining value (such as packaging, fast-fashion clothing) is not high enough to be passed on to a new user; 2) consumer upcycling involves value creation for so called "zero-value" products through demolishing previous function and repurposing or transforming for new function, whereas other PLE practices are aimed at maintenance and extension of original product value. Further, in addition to the functional value or economic value of the upcycled products, other values such as sentimental value and self-identity related value are being created in consumer upcycling; 3) consumer upcycling entails a more dynamic, disruptive, and creative relationships between people and products due to the proactive and usually high-involved value-creation process. By contrast, the consumer-object relationships in other PLE practices are less dynamic and more passive; 4) finally, unlike other PLE practices mainly motivated by the environmental concern or frugality (Sarigöllü et al., 2021; Evers et al., 2018), consumer upcycling involves more internal motivations. One reason is, compared to other PLE practices, consumer upcycling is less expected by the society, that is, little or no social norms have been established by the society; whereas other PLC practices have been established as social norms and are expected in many countries or cultures.

2.1.2 Consumer Upcycling and other consumer making behaviors

Consumer upcycling and other consumer making behaviors (e.g., DIY, hobby-crafting) differ in various aspects. First, they take place at different stages of consumption. Consumer upcycling, created with waste or obsolescent objects, is a post-consumption process and is part of the CE. In contrast, other consumer making behaviors involve new objects and occur before initial consumption (Campbell, 2005) thus are part of linear, as opposed to circular, production.

Second, consumer upcycling and other consumer making activities differ in terms of media or materials. In making activities with raw materials/media, consumers are driven by resultant product identity (e.g., resultant function or aesthetic value) (Campbell, 2005; Wolf and McQuitty, 2011); while in upcycling with used objects, consumers can be driven not only by resultant product identity but also by past product identity (e.g., original, or time-shaped aesthetics, extended self in waste objects) (Coppola et al., 2021). Additionally, creating a new life for waste objects through upcycling is inherently more moral than creating an initial product life with new objects/materials. Hence consumer upcycling may entail moral implications for both the individual and the society.

Third, the production process in consumer upcycling and other consumer making activities also differs. The main challenge in upcycling process is to overcome constraints of original product design to create new forms, functions, or values. In many cases of consumer upcycling, advanced crafting skills are not necessary especially in repurposing, which makes upcycling more easily learned and widely accepted. For other consumer making activities, step-by-step tutorials or good crafting skills are usually required. Therefore, these activities tend to be performed as a matter of personal taste rather than for common good.

Although there are clear distinctions between consumer upcycling and DIY or crafting activities, there are indeed similarities between them. For instance, they may both involve creative process and self-expressive functions (Campbell, 2005). Further, they both need design and production of the final work. Hence, personal skills, competence, judgement, labor, and creativity are engaged in both activities.

2.2 Motivations of consumer upcycling

The extant literature generally identifies external motivations for consumer upcycling, such as environmental concern (Sung et al., 2014; Wilson, 2016), or economic savings (Zimring, 2017; Johnson, 2017). However, research on eco-friendly behavior revealed that the "attitude-behaviour" gap is more likely to occur when a certain practice involves more behavioral costs (Steg et al., 2014), indicating the importance of internal motivations. Accordingly, external motivations (i.e., forces outside the self initiate, pressure, or coerce one's actions) (Deci and Ryan, 1985) like environmental concern expected by the society and economic savings imposed by economic conditions might not be effective for the habituation of consumer upcycling. Instead, internal motivations (i.e., oneself initiates and sustains of one's actions) might be more important for consumer upcycling.

As consumer upcycling is a self-production practice (Coppola et al., 2021) that involves investment of self-energy, some internal motivations ascribed to crafting may be relevant, such as expected positive emotions (e.g., a sense of joy, accomplishment, fun) and personal fulfillment (e.g., perceived competence, autonomy) (Wilson, 2016; Sung, 2017; Coppola et al., 2021). However, consumer upcycling differs from mere crafting in its inherently moral feature (i.e., value creation from waste), past identities embedded in objects used for upcycling (Kamleitner et al., 2019), and its everyday-life context (Sung et al., 2015) which may imply more

social interactions (Pachucki et al., 2010). To sum up, upcycling may enable consumers to build connections with their own past or with people around them, or with just the good old times.

Therefore, it is likely that various unique internal motivations underlie consumers' upcycling behavior or intention. The current study provides rich insights into motivations of upcycling beyond that of the extant literature by identifying additional meanings consumers derive from the process of upcycling.

2.3 Consequences of Consumer Upcycling

Consequences of consumer upcycling are seldom considered in the literature. Such lack of consequence analysis is indeed prevalent in most sustainable consumption literature (Camacho-Otero et al., 2018). Despite limited research on consequences of consumer upcycling, several outcomes have been proposed, including reduction of waste by extending product lifespan and curbing consumption (Wilson, 2016; Coppola et al., 2021), higher attachment to upcycled products relative to mass-produced products (Sung et al., 2015; Bridgens et al., 2018), and positive emotions such as pride and excitement to consumers (Sung, 2017; Bridgens et al., 2018; Coppola et al., 2021).

However, a systematic and holistic analysis of consumer upcycling consequences is lacking in the literature. The consequences of consumer upcycling at the economic level are still unknown but essential for a better understanding of the consumers' role in the CE. Further, extant research lacks analysis of how consumer upcycling, as a CE solution, contributes to the main aims of the CE. The current research addresses these deficiencies. We take the economic level into consideration and provide a systematic and detailed description of consequences brought by consumer upcycling and thereby position it in the bigger context of the CE.

3. Method

The aim of the current study is to gain new and deeper insights into the internal motivations and potential consequences of consumer upcycling behavior. As a relatively underexplored topic which involves person-specific experience to be interpreted and integrated, qualitative research methods are suitable (Belk et al., 2012). We thus used semi-structured interviews which involve implementation of a few predetermined questions developed based on previous literature and provide flexibility of unscheduled probes and follow-up questions arising from the interview process itself.

The interview guideline (see Appendix B in Supplementary Material) was carefully prepared and pretested. Prior to the interview, participants were given brief introduction to the topic and were asked to submit sample photographs of their upcycled projects, if any. These photographs provided vivid visual information and facilitated exploration of participants' upcycling experience. The interviews began with some grand-tour questions (McCracken, 1988) about the participant's background (e.g., education, jobs, product disposal behavior, and frequency of upcycling), followed by questions about the participants' upcycling experiences including procedures, motivations, feelings/emotions, attitudes/evaluations. Then, the participants were asked about their experiences of buying upcycled products and their attitudes toward such products. At the end, the participants were encouraged to add any theme-related comments they might have.

3.1 Data Collection

Two well-established sampling methods -- convenience sampling and snowball sampling -- were used (Lune and Berg, 2017). First, within the authors' social networks, we identified

several people who would be most able to inform us on our main research questions concerning motivations and consequences of consumer upcycling. Second, using snowball sampling we requested the initial participants to refer to us people in their social networks with upcycling experiences and also inform them of our project.

Interviews with 34 individuals were conducted mainly through videoconference calls in summer 2020 (see Appendix C in Supplementary Material for a summary of participant profiles) because Covid-19 restricted the in-person interaction. Most of the participants live in east China and two participants were non-Chinese. These two participants were included because of their rich upcycling experiences and potential revelation of differences in consumer upcycling due to different cultural backgrounds. The sample consisted of more women than men which is consistent with the finding that women are more willing to do upcycling than men (Sung, 2017). Interviews lasted between 20 and 60 minutes. With the participant permission, each interview is recorded and transcribed, resulting in 339 pages of text.

During the interviews, various upcycling projects were vividly described by the participants. Depending on the degree of transformation of objects, these projects could be roughly categorized into two groups – upcycling mainly based on repurposing (i.e., upcycling with no or slight transformation) and upcycling mainly based on creation (i.e., upcycling with moderate or big transformation). Appendix C (in Supplementary Material) includes examples of participants' upcycling projects, and their respective upcycling type and product category of the resultant products.

3.2 Analysis

A recursive and inductive content analysis (Lune and Berg, 2017; Gioia et al., 2012) was conducted using Atlas.TI. The first two authors independently began the analysis by identifying

initial themes/first-order coding (i.e., languages used by informants) in the data and grouping them into categories. Meanwhile, they were tagged inductively to describe internal motivations and consequences of consumer upcycling based on the chronological flow (Saldaña, 2009). Internal motivations refer to what internal rewards consumers anticipate from consumer upcycling before an upcycling project starts, while consequences refer to changes at the social, environmental, and economic level after consumer upcycling is (successfully) realized. Hence, in our interviews, reasons, relevant established beliefs/principles on the internal aspect are considered as internal motivations of consumer upcycling since they occur before the upcycling behavior. Whereas feeling, thinking, and behavior during or after the upcycling behavior are considered as consequences of consumer upcycling since they are induced by consumers' upcycling process or resultant upcycled objects. These first-order codes were then translated into English and shared with the third author for discussion. Next, we cycled between further data processing and consultation with the relevant literature to assemble the first-order categories into second-order themes. The resultant second-order themes were finally aggregated into dimensions that make up the basis of the emergent framework. Following the Gioia et al.'s methodology (2012) for increasing qualitative rigor in inductive research, we created a figure (see Appendix D in Supplementary Material) to summarize our process.

4. Results

4.1 Internal Motivations of Consumer Upcycling

The analysis revealed three types of motivations underlying consumer upcycling that relate respectively to: 1) core-self of individuals; 2) social-self with others; and 3) object-self (figure 1). Core-self refers to characteristics that comprise one's self-identification, such as cognitive

capability, emotion and one's values or morals (Judge et al., 2003; Tangney et al., 2007). Social-self is based on the social nature of the self, suggesting that one's social relationship with others also contributes to self-identity. Object-self reflects consumers' intention of extending self to the outside world through means of products/objects around them (Belk, 1988). We will next unpack how core-self, social-self, and object-self oriented motivations foster upcycling behavior.

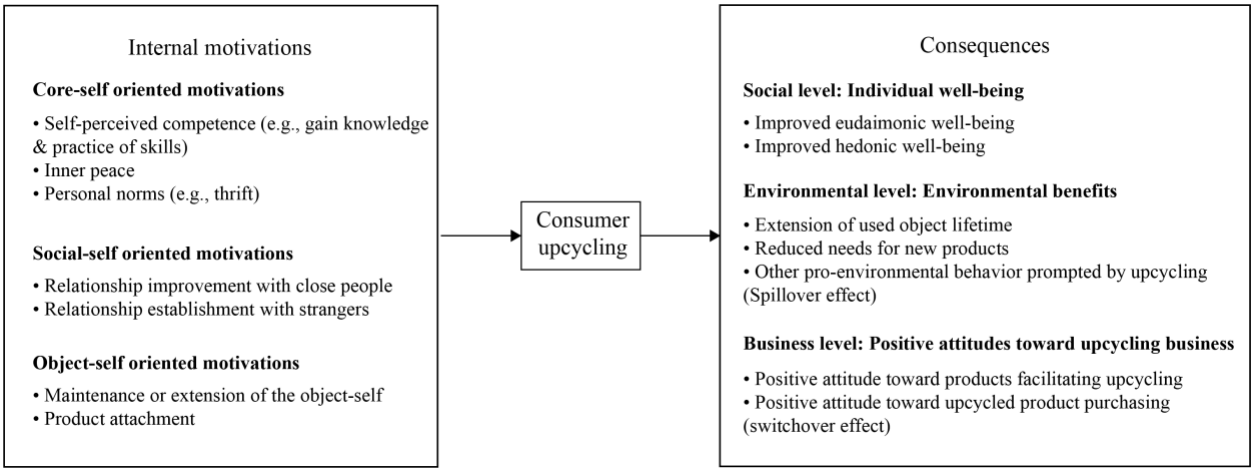


Fig. 1. A conceptual model of internal motivations and consequences of consumer upcycling

4.1.1 Core-self Oriented Motivations

The participants mentioned various motivations related to characteristics of core-self which lend themselves to be grouped under three categories: self-perceived competence, inner peace, and personal norms.

Self-perceived competence. Competence refers to one's ability or capacity to interact effectively with her/his environment and effectiveness in carrying out goals (White, 1959). Our participants expect to experience a sense of competence by upcycling because of three elements provided by this activity: 1) knowledge and practice of skills; 2) optimal challenge; and 3) sense of control over objects. We will further elaborate on these aspects.

Consumers expect new knowledge and practice of skills from upcycling because they can learn about features of materials and manual skills (e.g., sewing, cutting, weaving, and painting) in upcycling. A retired woman, Mae, who used to work in a garment factory, likes making hats from clothing leftovers because she can practice manual skills and thus attain sense of competence from her upcycled hats.

Consumers expect optimal challenge from upcycling in the sense that they combine creative upcycling ideas, unfamiliar manual skills and unexpected problems, in a way which is just about manageable and interesting (Rani et al., 2005). For instance, Sally, an Arts teacher, constantly challenges herself to maintain a creative mind by producing novel ideas for upcycling. Alice, an upcycling enthusiast, reports that she enjoys the challenge of using upcycling materials for an unexpected function (e.g., upcycling a discarded wooden guitar into a planter). These challenges are often assessed by consumers before upcycling to ensure their manageability, as illustrated by Marie:

> *The upcycling I want to do wouldn't fail. I assess whether I can succeed in the upcycling project in advance. If I think I am unable to complete it, I won't start it.*

Consumers expect a sense of control over objects from upcycling because they make decisions regarding the materials, the outcomes and the whole process based on their own interest and intention. Same upcycling materials (e.g., unwanted clothes) could be upcycled into shoes (Sammy), hats (Mae), or a chair cushion (Sarah). Shirley said, "I like the process of upcycling things all by myself from the beginning to the end." Jane deems upcycling as a means to "acquire control over life". Sense of control also comes from the flexibility in acquiring and

disposing objects. With upcycling, consumers could break the "buy-use-throw-buy" circle: buying is not the only way to get a desired object and throwing away is not the only way to deal with seemingly useless objects.

Inner peace. Our data also reveal that participants engage in upcycling for emotion regulation in pursuit of inner peace. Mitchell (2001) defined inner peace as a state of well-being not contingent on the presence of external or internal pleasurable stimuli. Inner peace involves feeling free from distress (Barnett and Wood, 2008). Participant Hanna finds upcycling as a good way to defend against stress. Kali states that doing upcycling eradicates her mental clutter, resulting in a peaceful mind. Kate shares a similar feeling:

> *I feel that making things relaxes me…I often do upcycling while listening to music or audiobooks. Then my mind will calm down…When I come across problems, I will turn to upcycling to escape and enter another world where I can be relaxed and calm.*

Personal norms. Besides the desire for self-perceived competence and inner peace, consumer upcycling is motivated by a desire to conform to personal norms. Personal norms refer to self-expectations based on internalized values, reflecting commitment with internalized values (Schwartz, 1975). Two moral norms were frequently mentioned by our participants—thrift and environmental concern for upcycling.

Thrift is about the best, most efficient use of limited resources (Chancellor and Lyubomirsky, 2011), which can be realized by consumer upcycling. Rena associates upcycling with her view of self—a frugal person, even though upcycling is not necessitated by her economic means. Hanna recalls that her mother often used unwanted objects to make something

for her family. Her mother's thrifty behavior was cultivated when she lived in an impoverished environment as a child. Further, intergenerational influence can also nurture the norm of thrift. Wendy stated that thriftiness has been a norm in her family for three generations. Her family members are accustomed to keeping unwanted plastic objects or waste papers and try to upcycle them.

Environmental concern is another personal norm motivating upcycling behavior, which represents consumers' desire to benefit the society by reducing waste, extending product lifetime, and reducing consumption, beyond purchasing of green products. The participants wish to demonstrate positive impact on the environment by implementing upcycling. Alice expresses that environmental concern is her main motivation for doing upcycling for many years:

> *I'm very concerned about the environment. I don't like to see things go to landfill…So, I think there is a creative way that we can all be transforming objects into useful things again…I post my upcycling projects on my blog to inspire others and encourage them to be more environmentally aware.*

Rosie upcycles empty gel ink pen refills due to her concern for the environment. She explains that refills are solid materials and upcycling them could save resources. Even if upcycled objects have limited aesthetic and functional value, she still considers upcycling as worthwhile for its environmental value.

4.1.2 Social-self Oriented Motivations

Social-self oriented motivations refer to the fact that people engage in upcycling in order to maintain or build relationships with others including people close to them (i.e., family members, friends) and strangers.

Relationship improvement with close people. In our data, participants connect with family members or friends through (1) upcycling together with them; (2) sharing upcycling procedure/method with them; (3) sending upcycled objects as gifts to them. Family members could be partners or audiences of upcycling activities, which also generates good conversation topic among friends. Sammy shows her upcycled objects to her visitors. Lucy cannot wait to share her upcycling experience with neighbors after completing upcycling:

> *When I succeeded in transforming plastic wine bottles into containers in which I can grow scallions and garlics, I shared the making process with my neighbors the next day.*

The opportunity of interacting with people through upcycling inspires more people to engage in upcycling. As several participants such as Emily who have never or seldom done upcycling mentioned, they are willing to do more upcycling if with friends. Additionally, some of those well-upcycled products are sent to others as gifts. Mae's friends appreciate the unique upcycled hats Mae made for them. Although such gifts cost little money or may not look perfect, they symbolically contain love because of the handmade feature (Fuchs et al., 2015).

Relationship establishment with strangers. Participants also mention that they build relationships with strangers through upcycling. There are emerging communities on upcycling where consumers could share their ideas with others or seek upcycling ideas from others. Some

people with creative upcycling ideas and skills attract many followers and become "upcycling experts". A blogger called "Craftsman Geng"[1] who is mentioned by several participants, shares his upcycling ideas with more than two million followers on Weibo.com. In the Facebook upcycling group created by Alice and her friends, group members aim to connect with others and contribute to the virtual community by sharing their upcycling works and comment on others' works. Therefore, upcycling offers a good cause to connect with strangers, especially with those who are skilled in upcycling.

4.1.3 Object-self Oriented Motivations

Maintenance or extension of the object-self. Our data reveal that participants are motivated to upcycle products to maintain their object-self or to further their self-identity to the external world. For instance, the self-identity of Jack, an expert on building computers, is closely integrated with his knowledge of CPUs of computers. Jack explains his upcycling as follows:

> *A CPU is an expensive component in a computer…It is also technology-rich…It would be a pity if I threw it away like rubbish even though it has broken down… Since the size of the CPU is suitable, I decided to transform it into a pendant…I showed it to my friends as if it is my treasure.*

The object-self does not necessitate expensive or complex objects. Cheap and simple objects can also be parts of object-self:

[1] https://www.weibo.com/u/3108949955?refer_flag=1005050010_&is_all=1

> *I once saw an old man upcycling ring pull cans into fine ornaments on a side street…His previous work is recycling ring pull cans. After retirement, he got obsessed with upcycling ring pull cans. He makes ornaments with slices cut from cans... Although some of these ornaments are for sale, he doesn't make a living from them. (Gemma)*

Cheap and simple ring pull cans are part of the old man's self because these objects represent his previous job where he had spent long years before retirement. Upcycling provides a means for him to maintain relationship with cans, his object-self, after he retired.

The participants also state that upcycling vintage products such as furniture or jewelry connects them to the past. Indeed, the so-called "past" includes both the past of a focal participant, or the collective past of a society. In this way, one's self-identity is woven together with the times. Like Juliet puts it:

> *I always search for vintage or antique products because I could connect with the past through those products. They have very good aesthetic design and style. Once I re-purposed a vintage ginger jar into a vase. I also upcycle vintage furniture, by repairing it, or changing the sofa covers.*

Product attachment. Another motivation related to object-self is product attachment. Product attachment refers to the emotional bond that a consumer experiences with a special and significant object (Schifferstein and Zwartkruis-Pelgrim, 2008), which may stem from either the pleasure provided by the product (e.g., aesthetic value); the sense of belongingness (to a certain

group) brought by the product; or the memories/stories endowed to the product (Mugge et al., 2010; Page, 2014). Nancy upcycled her wedding dress into a vest for her daughter to revive relevant good memories:

> *I wore this dress when I got married. It is really nice. But now I can't fit into it anymore. So, I transformed it into a vest for my daughter…The red vest looks very beautiful on my daughter.*

Participant Rosie contributed a photograph of the coat hanger upcycled by her father. She explained that the coat hanger is made of two old spindles that existed before she was born. The long history carried by the spindles is preserved through upcycling and passed along to the next generation. Compared to preserving old objects in a "treasure box", upcycling can help people build a closer connection to the precious old times. Time will dilute memories if old objects no longer appear in life (Sekeres et al., 2016).

4.2 Consequences of Consumer Upcycling

This study reveals three types of consequences from consumer upcycling; 1) benefits to individual consumers by improving well-being; 2) benefits to society by advancing environmental sustainability; and 3) benefits to business by increasing consumers' positive attitudes toward upcycling business. These consequences occur after one or more upcycling projects are implemented. However, there is a possibility that experienced positive consequences could act as motivations to encourage more consumer upcycling, consistent with the reinforcement theory (Conger, 1956).

4.2.1 Social Level: Individual Well-being

Individual well-being is a psychological outcome that mainly arises from satisfaction of internal needs through upcycling. It comprises eudaimonic well-being and hedonic well-being (Ryan and Deci, 2001). Eudaimonic well-being refers to the degree to which a person is fully functioning and focuses on the person's self-realization. Hedonic well-being focuses on happiness and defines well-being in terms of pleasure attainment and pain avoidance. This consequence is important because it increases the acceptability of the CE solution and makes upcycling attractive to consumers (Murray et al., 2017; Camacho-Otero et al., 2018).

Improved eudaimonic well-being. The extant literature indicates that, when the three selves are well developed (i.e., three types of motivations are satisfied), eudaimonic well-being improves as a result (e.g., Ahuvia, 2005; Patrick et al., 2007). Improved eudaimonic well-being is also captured from our participants' narratives about positive evaluations of self, such as self-perception as a creative or smart person. Kali is a typical example who evaluated herself more positively after upcycling:

> *In the past, I thought I was not good at DIY and clumsy at doing such projects.…Later I tried an upcycling project and found that I could actually make it. I become more confident and am now willing to try a more difficult project.*

Besides the general positive evaluation of self, some participants offered more specific evaluations such as improved practical abilities (Jack), sensitive to beauty in life (Kate, Patty), and patience (Sarah). Besides these specific self-improvement, a general sense of accomplishment resulting from these improvements was frequently mentioned in our interviews.

Improved hedonic well-being. Hedonic well-being, too, is a consequence of consumer upcycling. Previous research suggests that hedonic well-being, in many cases, is a by product of eudaimonic well-being (Ryan and Deci, 2001). Specifically, pride can be experienced when a sense of accomplishment is felt (Tracy and Robins, 2007). Empirically, our data confirms enhanced hedonic well-being from upcycling. Besides pride, upcycling activities induce other positive emotions such as happiness, enjoyment, fun, and surprise. Tessa recalls that she felt very happy when upcycling an old carpet into insoles and continues to have a good feeling whenever she sees the upcycled insoles. Alice highlights that upcycling is a great way for her to overcome negative emotions generated during the pandemic. Flexibility in upcycling and unexpected upcycling outcomes can bring fun and surprise to our participants. Patty describes one of her impressive upcycling projects as follows:

> *I once transformed bottles into a stethoscope. At first, I didn't know how to make it. When I finally succeeded, I felt very happy. It was really fun. You can use it to listen to people's heart beats…When you see these bottles, it is difficult to imagine that they can be transformed into a stethoscope. When I actually transformed them, they were no longer ordinary bottles.*

Positive feedback from others may further enhance both types of well-being from upcycling. Participants reported receiving positive comments about their creativity, thrift, or environmental concern when they shared their upcycling work with others. Such positive feedback may confirm and enhance one's positive self-evaluations, thus increasing well-being.

Participants did not report much negative emotions related to upcycling activity. Several factors may account for this fact: (1) No 'cost' occurs because upcycling is transforming something "useless" to something useful. Failure in upcycling was not regarded as a real "failure" by our participants. (2) The 'failing' experience is indeed part of the learning process for upcyclers who often chose projects that constitute optimal challenge for them. (3) Participants regard upcycling as a novel experiment and are well prepared for failure mentally.

4.2.2 Environmental Level: Environmental Benefits

Environmental benefits are mainly brought by upcycling behavior per se because upcycling contributes to reduction of waste and overconsumption, and this outcome may or may not be realized or intended by consumers.

Extension of used object lifetime. First, upcycling unwanted objects into useful ones can unquestionably extend the lifetime of objects, thus slowing down material flows. Besides, consumers' higher attachment to upcycled objects, as opposed to mass-produced objects due to their personalized feature, may further postpone the replacement (Richins, 1994; Page, 2014). Sally expresses high retention tendency of upcycled objects:

> *The upcycled things I made are different from those bought from outside…I will keep them until they don't work at all…If I can't bear the wear of appearance, I will redesign the appearance and continue to retain them.*

Reduced needs for new products. Second, product-level upcycling reduces the need for a new product (Szaky, 2014), hence reducing the use of raw materials (material efficiency) and

energy for production, ultimately reducing greenhouse gas emissions (Cooper et al., 2016). As Richard mentions, upcycling helps avoid the trouble of buying new products.

Besides, feeling of internal creativity engendered by upcycling could curb the temptation to purchase new products (Ruppert-Stroescu et al., 2015). The desire for novelty brought by new products can be satisfied through reusing an old object in a new way. Our participants use “fun”, “novel”, “unique”, “creative” and “fresh” to describe their upcycling process or upcycled objects.

Other pro-environmental behavior promoted by upcycling. Third, consumer upcycling can produce additional environmental benefits through a spillover effect; that is, upcycling behavior can enhance environmental awareness and sensitivity, and thus may prompt other pro-environmental behaviors.

> *In the past, I was not an environmentally friendly person. Upcycling changed me…I started to pay attention to environmental problems such as pollution and green product purchasing, although some issues are not closely related to my present life. (George)*

Mae and Sally both find that doing upcycling with their children could instill a sense of environmental awareness. Increased environmental awareness may inspire other pro-environmental behaviors, which concords the findings of literature that people tend to behave in line with the beliefs they hold about themselves (Koriat, 2012). Some participants reported their behavioral changes inspired by upcycling. Rena reports that if she is unable to make use of certain unwanted objects due to lack of ideas or skills, she will donate them to others who need them. Gemma finds upcycling enhances her awareness of saving resources such as water,

electricity, and paper, as well as reminding her to purchase products made of environmentally friendly materials. Alice mentioned her second-hand purchasing of an old sewing machine table base from a thrift store because of her confidence in her upcycling skills. Kali mentions specific behavioral changes that resulted from her upcycling experience:

> *Upcycling makes my environmental awareness stronger. Now, for my unwanted possessions, I will donate them instead of throwing them away. I have even given up using disposable gel pens…*

4.2.3 Economic Level: Increased Positive Attitudes toward Upcycling Business

The economic-level consequence includes consumers' positive attitudes toward products facilitating upcycling and upcycled products. Products facilitating upcycling refer to those designed in a modular or other smart way so that products can be upcycled by consumers or companies when original functions are not needed (Bridgens et al., 2018). Upcycled products refer to those produced with used objects/materials by companies (Kamleitner et al., 2019). Next, we analyze upcycling's consequences inductively and comparatively.

Positive attitude toward products facilitating upcycling. First, according to our interviews, participants interested in upcycling are more willing to pay extra price for product design facilitating upcycling. 79% of them are willing to pay about 10%-20% higher price for such product design because of their stronger intention to extend product lifespan developed from their upcycling experiences. For instance, Sally gave an example:

I buy jellies for my son. The package of the jellies can be easily transformed into a toy duck. I forgot the price. But if the jellies with traditional packaging are priced 10 yuan, I am willing to pay 15 yuan for the same jellies with packaging that can be further reused.

Positive attitude toward upcycled product purchasing. Second, the current research finds that participants' own upcycling experiences heighten their interest in purchasing upcycled products as well as their tendency to switchover, i.e., alternate roles between being a producer and a buyer of upcycled products. Many participants express high willingness to pay for such products. The positive attitude and appreciation for upcycled products result from individual's own upcycling experiences. First, upcycling experiences make people appreciate the creativity and handmade skills involved in upcycled products especially when related upcycling skills are beyond their abilities.

I bought a sculpture made of old nails, screws and nuts in a small shopping mall. This sculpture is very interesting and amazes me. The seller brought together useless things and gave them a new life. This creativity appeals to me…What's more, I am unable to accomplish this upcycling…I think such makers and I are similar in some ways. So, I am always attracted by such makers and their works. (Wendy)

Second, people with rich upcycling experiences feel more connected to other upcyclers and appreciate their work. Jack is willing to pay more for upcycled products if he deems much effort spent on them. For people who value creativity and handmade skills, like Patty, upcycled products are more attractive, and they should not be priced cheap. Third, for people with

upcycling experiences, buying old products is acceptable, and the history of old products is even fascinating to them. This is consistent with Kamleitner et al. (2019)'s finding that past identity salience of products could boost product demand through inducing consumers' narrative thoughts about these products' biographies. Upcycling experience makes upcyclers realize that the lifetime of an old object is being extended, and the object history is being preserved. As Jessica explains:

> *I may buy upcycled ceramics or ornaments…What I focus on is that upcycled products carry stories of their previous owners. I think these products convey some cultural meanings.*

Similarly, upcyclers demonstrate higher interest for upcycling brands. For instance, Jessica is impressed with the brand story of Freitag:

> *Green production or recycled production is a widely used term, but this company is really established based on upcycling. Their idea of environmental protection is not a publicity stunt. … When you see someone carry Freitag bag on the street, you may think the bag looks a bit old. If you understand the brand, you will be loyal to it.*

This finding is of relevance to individual craft hobbyists, artists, or tinkerers who sell upcycled products online (e.g., Etsy) or offline, as well as large companies such as Freitag and What We Make which implement upcycling as a production strategy or a product differentiation strategy.

5. Conclusions and Discussion

Informed by in-depth interviews, this paper develops a comprehensive and systematic framework to describe the internal motivations and consequences of consumer upcycling. We identify three types of internal motivations for consumer upcycling: core-self oriented motivations, social-self oriented motivations, and object-self oriented motivations. Further, we identify consequences of consumer upcycling at three levels: the social level (individual well-being), the environmental level (environmental benefits), and the economic level (increased positive attitudes toward upcycling business).

This research contributes to the extant literature theoretically from the following perspectives. First, although a substantial corpus of literature explores CE from the perspective of supply side (industry and businesses), the perspective of consumer has been largely overlooked. This study addresses this gap in the literature. We contribute to the CE literature at large by establishing the consumers' role in the CE domain by delineating how consumers can participate, enable, and contribute to the CE through individual upcycling.

Given that consumer upcycling is yet to be deemed as a social norm (as compared to other PLE activities, such as recycling, or green purchase), it is important to identify what motivates this behavior. This study finds that the value related to consumers' distinct selves (i.e., core self, social self and object self) underlies the consumer motivation for upcycling and provides insights for bridging the gap between the industry/business side and the consumer side toward promoting the CE. Specifically, our study reveals that in addition to the functional value or economic value derived from PLE activities, mainly motivated by the environmental concern or frugality, as extensively cited in the previous literature (Sarigöllü et al., 2021; Evers et al., 2018), other values such as sentimental value and self-identity related values are created in consumer upcycling.

Further, compared to other PLE practices, consumer upcycling entails a more dynamic, disruptive, and creative relationships between people and products due to its proactive and usually high-involved value-creation process. Therefore, this research contributes to the CE literature by offering a comprehensive landscape of how consumers can perform as an enabler, participator and contributor to the CE domain from the self-identity and value-creation perspective.

Second, our findings from the in-depth study of consumer upcycling contribute to the knowledge on consumer motivations of PLE related activities. In particular, we provide a systematic framework of how consumers are motivated by self-development to engage in consumer upcycling, thus help address the prevalent concern about the "attitude-behaviour" gap in this inconvenient behavior (Hobson et al., 2021). Moreover, these internal motivations highlight that consumer upcycling as a CE solution could contribute to various aspects of human well-being, for which the social-level consequence analysis provides further evidence. This delineated association between consumer upcycling and human well-being demonstrates that upcycling helps satisfy a socially desirable aim, which is rarely discussed albeit necessary aim of the CE (Kirchherr et al., 2017).

Third, the consequences analysis of consumer upcycling contributes to the CE literature by demonstrating how different PLE activities can relate to one another. Specifically, this research finds that consumer upcycling may spur other consumer-focused pro-environmental behaviors such as green purchase or recycling (i.e., spillover effect) and it also engenders positive attitude and behavior toward purchasing of upcycled products (i.e., switchover effect). Further, our research sheds light on the mechanism of spillover effects among PLE practices; that is, PLE practices can be shared by similar internal motivations relating to self-identity. Finally, the

spillover effects may involve different consumption stages (e.g., switchover from consumer's own upcycling at the post-consumption stage to purchase of upcycled products at the purchasing stage), which contributes to current discussion that engagement of multi-stages consumers is important in order to enable the CE (Kirchherr et al., 2017; Camacho-Otero et al., 2020).

Fourth, this research contributes to the theory of CE by expanding the study context for the first time beyond UK and US to China. First of all, by studying upcycling behavior in a collectivist culture (compared to an individualist culture), our research sheds light on the social-self and the PLE practices among consumers. Compared to people in individualistic cultures, people in collectivist societies tend to define self-concept based on social embeddedness and interdependence with others within their groups (Brewer and Chen, 2007). Most participants in our research mentioned their interactions with family members, neighbours or friends about upcycling before, during or after upcycling process, which suggests the social value brought by upcycling. This finding is notable as it means local community-based interventions might be effective in promoting consumer upcycling in the collectivist context. Second, China provides a rich context for researchers to explore consumer motivations for CE related activities. Specifically, in China, the Confucian values of frugality is rooted (Kim, 2009), and people had experienced economic hardship and limited resources before the open-reform policy in 1978 (Lin et al., 2004). Our findings contribute to the western-context based literature by demonstrating the strong influence of frugality and thrift value on consumers' upcycling practice much more so than consumers in developed countries (Santor et al., 2020; Nørgård, 2013). On the other hand, we have also witnessed the development and improvement of wealth after the open-reform policy in the past 40 years, and people do not have to re-use or upcycle products to cope with the economic hardship. When experiencing such drastic improvements in economic resources, we

further demonstrate that consumers' active engagement in upcycling are motivated not only by frugality value or resource scarcity, but also by their pursuit of self-identify and improvement of subjective wellbeing, demonstrating the robustness of internal motivation behind the PLE activities.

Finally, this research contributes to the CE literature by revealing that the consumers can seek and aim to promote their well-being by conducting PLE practices, which is rarely investigated in the current CE literature (Kirchherr et al., 2017; Geissdoerfer et al., 2017).Specifically, our research finds that by creating new functional value from the 'zero' valued products, consumers can create a new positive relationship with objects, which contributes to their well-being. Further, the creation process that combines consumers' understanding of objects and investment of one's self (e.g., energy, attention) endows objects with new meanings and thus increases objects' capacity for revealing consumers' identities. These positive consumer-object relationships make consumers' surrounding environment beyond a physical place, but a vital source of meaning, belonging, and identity (Roster et al., 2016), which has a positive impact on consumer well-being (Sigmon et al., 2002).

6. Managerial Implications

Our research findings provide a profound understanding of the internal motivations underlying consumer upcycling, based on which we offer managerial implications.

First, businesses that are currently engaged in upcycling practice can derive rich meanings from the consumer upcycling process beyond the green value, and thus can better communicate the upcycling concept to consumers and scale up their businesses. For example, the process of designing upcycled products can be showcased to communicate the individual's competence,

creativity and autonomy; or, the history of elements of upcycled products can be presented as valuable treasures that connect the individual's object-self to a past time.

Second, our results indicate positive relationship between consumer upcycling and upcycled product purchasing. The dynamic relationships among materials, people, time, and places in upcycling may give consumers a fresh feeling about the upcycling concept and upcycled products sold in the market. Hence, consumer reluctance to purchase upcycled products can be mitigated.

Third, if consumers do not have enough time, tools, or skills to do upcycling, they might be encouraged to donate their upcyclable materials to upcycling businesses to give them a second life. Finally, with a good understanding of upcycling, consumers may also consider upcycling business as a meaningful career choice and build their own business by designing unique upcycled products and develop brands. Therefore, understanding consumer upcycling and well communicating upcycling concept contributes to the scaling up of upcycling business.

Even managers of businesses which are not currently involved in upcycling practices are aware of consumers' increased concern for the environment and may feel the pressure to engage in environmentally sustainable practices (Cerri et al., 2018). The understanding our research provides on what consumers do with their products after purchase, even when the product cannot meet the original functions, may inspire managers in their new product design and development, or give them ideas for organizing collaborations and co-creation activities with consumers, which may improve the bond between the brand and consumers. Second, businesses looking to engage in environmentally sustainable practices might be encouraged to integrate "re-"cycling into their new product production and try to ease consumer "up-"cycling at the end of product life by providing modular design, practical upcycling ideas and upcycling service (e.g., glass

cutting), thereby enhancing green or CE related brand image. Third, our finding that consumers are willing to pay a higher price for new products that facilitate end-of-life upcycling indicates a good business opportunity. Longer interaction between consumers and products may further improve consumers' positive attitudes toward the brands because of familiarity. This confirms that considering upcycling in product design does not conflict with businesses' profit goal.

7. Limitations and Future Research

Although this paper provides fruitful insights into how consumers enable the CE and PLE through their upcycling behavior, it has several limitations. The first set of limitations arises due to the inherent nature of qualitative research methodology used in this study. Although the use of convenience and snowball sampling was appropriate for qualitative research, they do not permit statistical generalizations of our findings to the population. The resultant imbalance of gender in our sample, although consistent with previous empirical work, requires careful interpretation of the findings. Interviewees recruited through authors' social networks usually share similar cultural backgrounds, which benefits the interpretation process (Sadler et al., 2010) but hinders the understanding across different cultural contexts. Future researchers are invited to conduct cross-cultural studies when further probing factors influencing consumer upcycling. Finally, the inherent subjectivity of qualitative research does not permit confirmation of causal relationships between motivational factors, behavior, and consequences. For instance, motivations identified might arise from the positive outcomes of previous upcycling experiences. Therefore, experiments and surveys are needed to confirm and quantify the relationships between the variables in our conceptual model.

Second, we limit the focal behavior to a relatively private and simple context in the sense that all participants in our research conduct upcycling at home on their own or with family

members. Future research could use non-participant observation or case study method to examine how upcycling communities and careers are developed.

Third, the type of consumer upcycling (repurposing vs. recreating) and the upcycled product category (e.g., clothes, home decoration) listed in Appendix C (in Supplementary Material) might have different motivations and consequences which were not revealed in our research. Future research is suggested to investigate how the upcycling type and product category influence upcycling motivations and consequences.

Fourth, although the current research revealed positive outcomes from the social, environmental, and economic perspectives, we recognize that there might be unwanted negative side effects of consumer upcycling. For example, incorrectly upcycling objects whose materials are not designed for reuse may cause adverse health problems or consumer disappointment, at the least. Future research can investigate how consumers and industries can collaborate to optimize the product/material lifespan.

Finally, as a post-consumption behavior, upcycling might also be related to consumption behavior. Future research can investigate how different CE-oriented behaviors such as reusing, repairing, upcycling, recycling, donation, upcycled/recycled/second-hand product purchasing, and initial consumption behavior are interlinked.

Supplementary Material

Appendix A

Consumer upcycling and other CE oriented practices

Physical form	Same purpose (Closed-loop)	Different purposes (Open-loop)
	Human (Consumer, Designer, Entrepreneur) centered; Value maintenance; Restricted.	**Human (Consumer, Designer, Entrepreneur) centered; Value creation; Flexible.**
Product-level	**Reuse (C)** Reuse by another consumer of unwanted product which fulfils its original function and is still in good condition (Kirchherr et al., 2017). It is usually facilitated by resale, sharing and donation. **Consumer repair (C)** Consumer's repair and maintenance of defective product so it can be used with its original function (Kirchherr et al., 2017). **Repair service (I)** Repair and maintenance of defective product, which is provided by the product's company or a third-party (Fachbach et al., 2022). **Refurbish (I)** Restore an old product and bring it up to date (Kirchherr et al., 2017). **Remanufacture (I)** Use parts of discarded product in a new product with the same function (Kirchherr et al., 2017).	**Consumer upcycling (C)** Consumers transform or repurpose unwanted object(s) to a product which has equal or higher value than the current value of its component(s) (Sung et al., 2014). **Product-level industrial upcycling (I)** Companies or consumers create useful products out of waste or unwanted materials for sale (Sung, 2017).
	Technology centered; Value maintenance; Restricted.	**Technology centered; Value creation or reduction; Flexible.**
Material-level	**Closed-loop recycling (I)** Recycled material substitutes the original virgin material and is used for creating a new version of the same product (Larrain et al., 2020).	**Material-level industrial upcycling (I)** Industrial nutrient (material) waste is converted into something of similar or greater value in its second life (McDonough & Braungart, 2013). **Open-loop recycling/downcycling (I)** The properties of recycled materials differ from those of the virgin materials and have lower value (Larrain et al., 2020). **Energy recovery (I)** Incineration of materials with energy recovery (Kirchherr et al., 2017).

Purpose

Enabler: **C - Consumer; I - Industry.**

Appendix B

Information sheet for participants before interview

Dear Sir/Madam,

I would like to invite you to participate in a research project titled Individual upcycling.

Individual upcycling is defined as a process in which individuals transform or repurpose unwanted object(s) to a product which has equal or higher value than the current value of its component(s). We can also call it “Trash to Treasure” in an informal way. For example, unwanted clothes, packages (e.g., bottles, boxes, bags), furniture, and appliances can be upcycled into useful objects instead of being thrown away. Repairing objects to maintain their original use is not individual upcycling.

Should you choose to participate in this study, you will be asked to take part in an informal interview about individual upcycling. I will seek your permission to record the interview. I expect that the interview will take about 30 minutes to complete. The exact duration of the interview, however, will be entirely up to you.

In addition to the interview, you may be asked to show

- picture(s) of 1~2 upcycled product(s) transformed by you (if you never engaged in upcycling, you could show upcycled products made by your family members).
- picture(s) of 1~2 products you want to upcycle in the future.
- picture(s) of 1~2 upcycled products you find very impressive (from your life or the Internet).

If you cannot take pictures of these objects, you can describe them to me.

All the information you provide will be confidential and only available to members of our research project. To ensure that you remain anonymous throughout the study, I will not use your name or any personally identifying information: during the processing of data; in the final report;

or, in the instance that the study (or any part of it) be published. Remember, you don't have to talk about anything you don't want to talk about, and you may end the interview at any time.

Interview guide

Theme	Main questions	Follow up questions
Demographics & Warm-up questions	1. Name; Gender; Age; Education; Occupation; City and country of Residence. 2. How busy do you feel about life compared to others around you? How do you usually spend your free time on weekends, holidays or after school or work? What hobbies do you have? 3. How do you usually deal with your unwanted objects?	2.1. Why are you interested in [this hobby]? 2.2. Do you have any hobbies related to creating or making something? 3.1. How often do you upcycle objects? 3.2. What kind of unwanted objects do you usually choose to upcycle?
Upcycling experience	4. Have you or your family members ever engaged in upcycling? Could you tell me the story of the upcycled project? 5. Why did you (he/she) upcycle the object instead of throwing it away? Is there any other reason? 6. During the process of upcycling, did you experience any emotion? When you saw your accomplishment of upcycling, did you experience any emotion? 7. Is there any change about yourself after doing upcycling? 8. Do you like to do upcycling on your own or with your family members or friends? Why? 9. Did you ever share this upcycled object with others online or offline? 10. How long will you plan to use the upcycled object? 11. Do you have any failed attempts in upcycling? 12. When you want to do upcycling, you can search for ideas online or think of ideas on your own. Which way do you prefer? Why? 13. Is there any reason not to do upcycling? 14. Will you invite others to do upcycling? Why?	4.1 When did you (he/she) transformed the object? 4.2 What is its original form and use? What is the current use? 4.3. How was the object transformed? Is it difficult? 4.4. How did you (he/she) think of the upcycling idea? 4.5. How creative do you think this idea is? 6.1. Why did you feel [this emotion]? 7.1. What changes? 9.1. How did you feel when you shared it? 11.1. When you failed in upcycling, how did you feel? 11.2. Would this failed experience influence your motivations to do other upcycling? Why? 11.3. If upcycling projects are not easy, are you willing to try? Why? 14.1. If you want to persuade your family members or friends to do upcycling, what will you say?
Potential upcycling experience	15. Is there anything you want to upcycle at your home?	15.1. How will you plan to upcycle it?

		15.2. Why do you want to upcycle this object? 15.3. How creative do you think this idea is? 15.4. Where will you seek upcycling ideas?
Others' impressive upcycling behavior	16. Have you ever seen an impressive upcycling project in your life or from the Internet? Could you tell me about the upcycling project?	16.1. Where did you find the upcycled object? 16.2. What is the original form and use? 16.3. What is the current form and use? 16.4. When you saw the upcycled object for the first time, what feelings did you have? 16.5. If you have similar unwanted materials at home, are you willing to learn how to upcycle these materials? Why?
Upcycling business	17. Have you bought any upcycled products before? 18. If there is a thrift shop in your community and both old products and upcycled products are sold in this shop, will you buy old products to upcycle them based on your needs or buy finished upcycled products that can satisfy your needs? 19. Some companies are trying to adjust the design of their products to make them easier to be upcycled. But this kind of design may cost more. Are you willing to pay more for products with such a design?	17.1. What kind of products did you buy? 17.2. Why did you buy the upcycled products? 18.1. Which one do you prefer? Why? 18.2. What kind of upcycled products will you buy? 19.1. On average, how many percent of the original price are you willing to pay more for them?

Appendix C

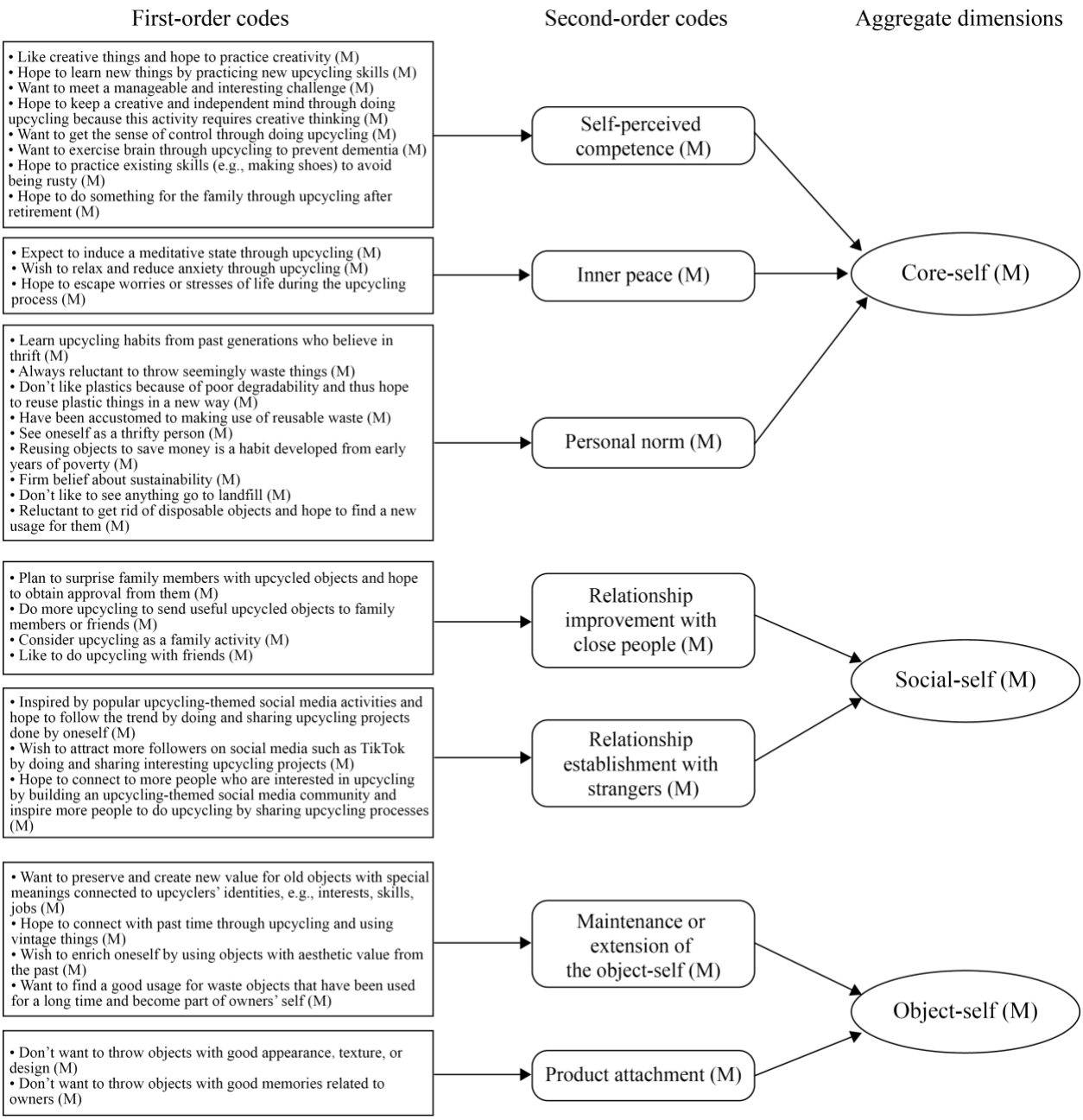
List of participants

Pseudonym	Age	Gender	Occupation	Education	Example upcycling project in interview	Repurposed/ Recreated	Type of upcycled products
Wendy	23	Female	Student	Master	Unwanted boxes → decorations	Recreated	Decoration/Art
Sammy	60	Female	Retired (previous job, worked in a shoes factory)	Primary school	Unwanted clothes → shoes	Recreated	Clothes
Mae	52	Female	Retired (previous job, worked in a garment factory)	Junior high school	Clothing waste → hats	Recreated	Accessary
Sally	27	Female	Arts teacher	Bachelor	Bottles → flowerpots	Repurposed	Home decoration
Patty	23	Female	Student	Master	Bottles → a toy stethoscope	Recreated	Toy
Laura	26	Female	Works in a Semiconductor Materials Company	Master	Unwanted bottles → vases	Repurposed	Home decoration
Kali	26	Female	Student	PhD	Cores of rolling papers → a storage box	Recreated	Organizer
Jane	26	Female	Works in a shopping mall	Bachelor	A moon cake box → a storage box	Repurposed	Organizer
Mandy	22	Female	Student	Bachelor	Used food jars → Clutter organizers	Repurposed	Organizer
Jack	26	Male	Student	Master	A CPU → a key pendant	Recreated	Accessary
Sarah	40	Female	Works in an insurance company	Bachelor	Unwanted clothes → a chair cushion	Recreated	Other household goods
Marie	55	Female	Retired (previous job, worked in a wire rope factory)	Junior high school	An oiler → a container for growing mung beans sprouts	Repurposed	Utensil
Alex	20	Female	Student	Bachelor	Expired beans → a model simulating cyanobacteria	Recreated	Decoration/Art
Lucy	55	Female	Works in a garment factory	Junior high school	Wine bottles → containers for growing scallions or garlic	Repurposed	Utensil
Nancy	55	Female	Works in a garment factory	Junior high school	Old wedding clothes→ children's clothes	Recreated	Clothes

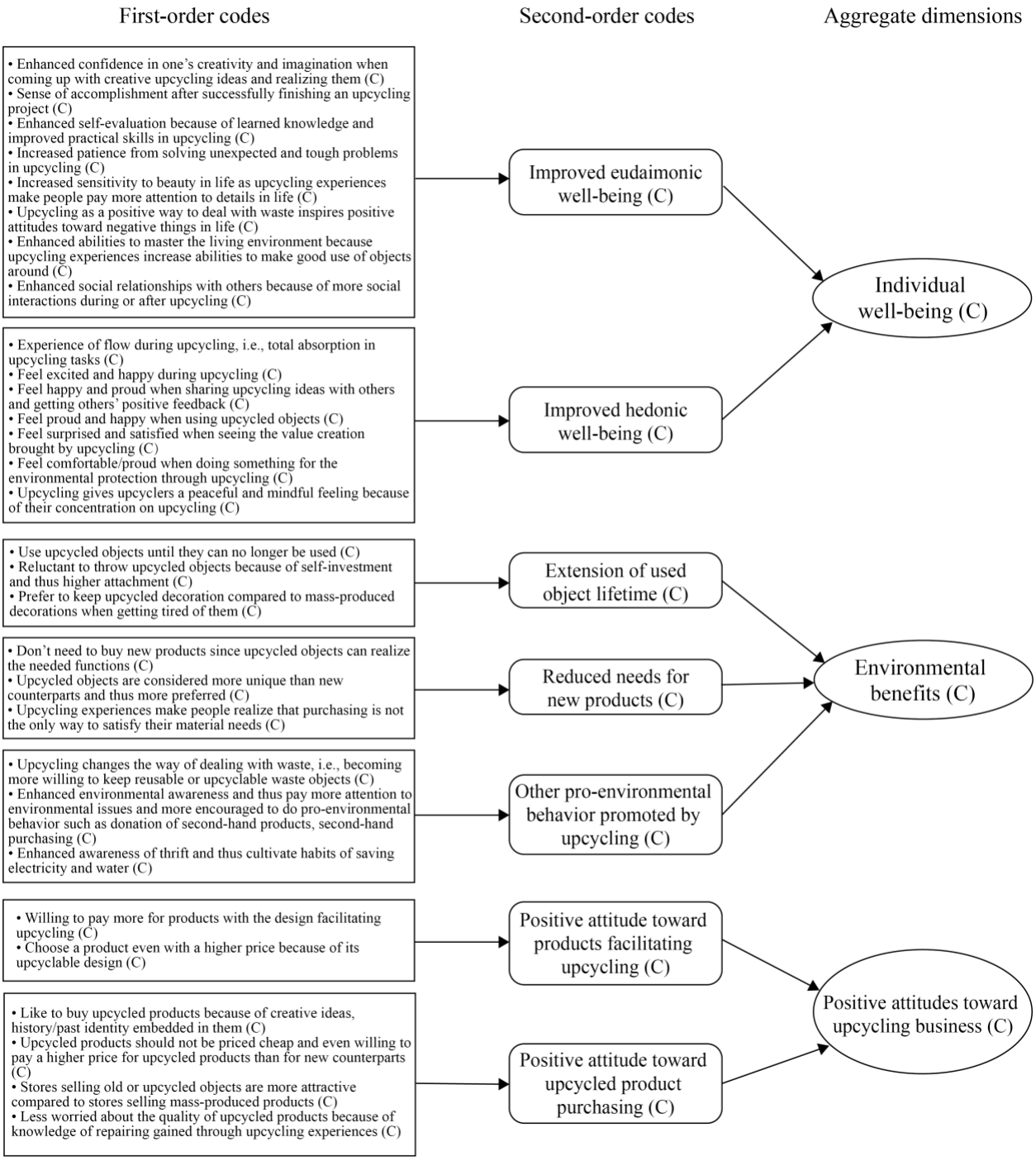
Rena	47	Female	Works in a garment factory	Junior high school	Clothes → shoes	Recreated	Shoes
Shirley	26	Female	Works in a telecom	Bachelor	Old woolen yarn → a doll	Recreated	Toy
Judy	58	Female	Works in a garment factory	High school	Down coats → interior pillows	Repurposed	Bedding essential
Hanna	26	Female	Student	PhD	Old jeans → a storage bag	Recreated	Organizer
Faye	27	Female	Student	Master	A bottle → a tool	Recreated	Utensil
Emily	47	Female	Works in a garment factory	High school	None		
Tessa	46	Female	Works in a biopharmaceutical company	Junior high school	A broken pot → a container for rice	Repurposed	Utensil
Rachel	59	Female	Retired (previous job, worked in a garment factory)	High school	Bottles → flowerpots	Repurposed	Home decoration
Rosie	26	Female	Student	PhD	Bottles → wind chime	Recreated	Decoration/Art
Jessica	26	Female	Works in a consulting company	Master	Packages → storage boxes	Repurposed	Organizer
Richard	23	Male	Student	Master	Used dental flosses → tools for cleaning keyboards	Repurposed	Utensil
Kate	21	Female	Student	Bachelor	An oiler → a container for growing vegetables.	Repurposed	Utensil
George	21	Male	Student	Bachelor	Useless silver materials → a ring	Recreated	Jewelry
Gemma	23	Female	Student	Bachelor	Bottles → flowerpots	Repurposed	Home decoration
Simon	26	Male	Works in a bank	Bachelor	A solid-state disk → a mobile hard disk drive	Repurposed	Digital product
Alice	53	Female	Retired	Bachelor	An old discarded bathroom light → a garden light	Recreated	Gardening decoration
Clark	21	Male	Student	Bachelor	An old bucket → a flowerpot	Repurposed	Home decoration
Juliet	47	Female	Professor	PhD	A vintage ginger jar → a vase	Repurposed	Home decoration
Bella	24	Female	Works in a university	Bachelor	Useless bottles → Vases	Repurposed	Home decoration

Appendix D

Code structure



Note: "M" represents motivation.



Note: "C" represents consequence.

Appendix E

Sample upcycling projects from our interviews

Upcycled hat made from clothing waste

Upcycled shoes made from unwanted cloth

Upcycled doll made from used woolen yarn

Upcycled coat hanger made from old spindles

Upcycled ring made from used silver wire

Upcycled cat house made from unwanted box

Upcycled planter made from used foam box

Upcycled decoration made from unwanted sock

Upcycled blanket made from old cotton yarn

References

Ahuvia, A. C. (2005). Beyond the extended self: Loved objects and consumers' identity narratives. *Journal of Consumer Research*, *32*(1), 171-184.

Bakker, C. A., Mugge, R., Boks, C., & Oguchi, M. (2021). Understanding and managing product lifetimes in support of a circular economy. *Journal of Cleaner Production*, *279*, 123764.

Barnett, G., & Wood, J. L. (2008). Agency, relatedness, inner peace, and problem solving in sexual offending: How sexual offenders prioritize and operationalize their good lives conceptions. *Sexual Abuse*, *20*(4), 444-465.

Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research*, *15*(2), 139-168.

Belk, R., Fischer, E., Kozinets, R. V. (2012). Qualitative Consumer and Marketing Research. Sage.

Brewer, M. B., & Chen, Y. R. (2007). Where (who) are collectives in collectivism? Toward conceptual clarification of individualism and collectivism. *Psychological Review*, *114*(1), 133.

Bridgens, B., Powell, M., Farmer, G., Walsh, C., Reed, E., Royapoor, M., ... & Heidrich, O. (2018). Creative upcycling: Reconnecting people, materials and place through making. *Journal of Cleaner Production*, *189*, 145-154.

Camacho-Otero, J., Boks, C., & Pettersen, I. N. (2018). Consumption in the circular economy: A literature review. *Sustainability*, *10*(8), 2758.

Camacho-Otero, J., Tunn, V. S., Chamberlin, L., & Boks, C. (2020). Consumers in the circular economy. In Handbook of the circular economy. Edward Elgar Publishing.

Campbell, C. (2005). The craft consumer: Culture, craft and consumption in a postmodern society. *Journal of Consumer Culture*, *5*(1), 23-42.

Cerri, J., Testa, F., & Rizzi, F. (2018). The more I care, the less I will listen to you: How information, environmental concern and ethical production influence consumers' attitudes and the purchasing of sustainable products. *Journal of Cleaner Production*, *175*, 343-353.

Chancellor, J., & Lyubomirsky, S. (2011). Happiness and thrift: When (spending) less is (hedonically) more. *Journal of Consumer Psychology*, *21*(2), 131-138.

Conger, J. J. (1956). II. Reinforcement theory and the dynamics of alcoholism. *Quarterly Journal of Studies on Alcohol*, *17*(2), 296-305.

Cooper, S., Skelton, A. C., Owen, A., Densley-Tingley, D., & Allwood, J. M. (2016). A multi-method approach for analysing the potential employment impacts of material efficiency. *Resources, Conservation and Recycling*, *109*, 54-66.

Coppola, C., Vollero, A., & Siano, A. (2021). Consumer upcycling as emancipated self-production: Understanding motivations and identifying upcycler types. *Journal of Cleaner Production*, *285*, 124812.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109-134.

Den Hollander, M. C., Bakker, C. A., & Hultink, E. J. (2017). Product design in a circular economy: Development of a typology of key concepts and terms. *Journal of Industrial Ecology*, *21*(3), 517-525.

Deschamps, J., Simon, B., Tagnit-Hamou, A., & Amor, B. (2018). Is open-loop recycling the lowest preference in a circular economy? Answering through LCA of glass powder in concrete. *Journal of Cleaner Production*, *185*, 14-22.

Donati, F., Aguilar-Hernandez, G. A., Sigüenza-Sánchez, C. P., de Koning, A., Rodrigues, J. F., & Tukker, A. (2020). Modeling the circular economy in environmentally extended input-output tables: Methods, software and case study. *Resources, Conservation and Recycling*, *152*, 104508.

European Commission. (2015). Closing the loop – an EU action plan for the circular economy. https://eur-lex.europa.eu/legal-content/EN/TXT/DOC/?uri=CELEX:52015DC0614&from=EN (2015) accessed 1 June 2022.

Evers, U., Gruner, R. L., Sneddon, J., & Lee, J. A. (2018). Exploring materialism and frugality in determining product end-use consumption behaviors. *Psychology & Marketing*, *35*(12), 948-956.

Fuchs, C., Schreier, M., & Van Osselaer, S. M. (2015). The handmade effect: What's love got to do with it?. *Journal of Marketing*, *79*(2), 98-110.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *Journal of Cleaner Production*, *143*, 757-768.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, *16*(1), 15-31.

Gue, I. H. V., Promentilla, M. A. B., Tan, R. R., & Ubando, A. T. (2020). Sector perception of circular economy driver interrelationships. *Journal of Cleaner Production*, *276*, 123204.

Hobson, K., Holmes, H., Welch, D., Wheeler, K., & Wieser, H. (2021). Consumption Work in the circular economy: A research agenda. *Journal of Cleaner Production*, *321*, 128969.

Jerome, A., Helander, H., Ljunggren, M., & Janssen, M. (2022). Mapping and testing circular economy product-level indicators: A critical review. *Resources, Conservation and Recycling*, *178*, 106080.

Johnson., 2017. Encyclopedia of emerging industries / written and edited by Drew D. Johnson. (Seventh edition.). Gale, Cengage Learning.

Judge, T. A., Erez, A., Bono, J. E., & Thoresen, C. J. (2003). The core self-evaluations scale: Development of a measure. *Personnel Psychology*, *56*(2), 303-331.

Kamleitner, B., Thürridl, C., & Martin, B. A. (2019). A Cinderella story: How past identity salience boosts demand for repurposed products. *Journal of Marketing*, *83*(6), 76-92.

Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: a global snapshot of solid waste management to 2050*. World Bank Publications.

Kim, T. (2009). Confucianism, modernities and knowledge: China, South Korea and Japan. In International handbook of comparative education (pp. 857-872). Springer, Dordrecht.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*, 221-232.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?. *Environmental Education Research*, *8*(3), 239-260.

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: the concept and its limitations. *Ecological Economics*, *143*, 37-46.

Koriat, A. (2012). The self-consistency model of subjective confidence. *Psychological Review*, *119*(1), 80.

Korley, L. T., Epps III, T. H., Helms, B. A., & Ryan, A. J. (2021). Toward polymer upcycling—adding value and tackling circularity. *Science*, *373*(6550), 66-69.

Larrain, M., Van Passel, S., Thomassen, G., Kresovic, U., Alderweireldt, N., Moerman, E., & Billen, P. (2020). Economic performance of pyrolysis of mixed plastic waste: Open-loop versus closed-loop recycling. *Journal of Cleaner Production*, *270*, 122442.

Lin, J. Y., Cai, F., Li, Z. (2004). The China miracle: Development strategy and economic reform (Revised Edition). The Chinese University of Hong Kong Press.

Lune, H., Berg, B. L. (2017). Qualitative research methods for the social sciences. Pearson.

McCracken, G. (1988). The long interview, Newbury Park, CA: Sage.

Mitchell, D. W. (2001). The way of Buddhism: Introducing the Buddhist experience (p. 368). Oxford University Press.

Mugge, R., Schifferstein, H. N., & Schoormans, J. P. (2010). Product attachment and satisfaction: understanding consumers' post-purchase behavior. *Journal of Consumer Marketing*, *27*(3), 271-282.

Murray, A., Skene, K., & Haynes, K. (2017). The circular economy: an interdisciplinary exploration of the concept and application in a global context. *Journal of Business Ethics*, *140*, 369-380.

Nørgård, J. S. (2013). Happy degrowth through more amateur economy. *Journal of Cleaner Production*, *38*, 61-70.

Pachucki, M. A., Lena, J. C., & Tepper, S. J. (2010). Creativity narratives among college students: Sociability and everyday creativity. *The Sociological Quarterly*, *51*(1), 122-149.

Page, T. (2014). Product attachment and replacement: implications for sustainable design. *International Journal of Sustainable Design*, *2*(3), 265-282.

Patrick, H., Knee, C. R., Canevello, A., & Lonsbary, C. (2007). The role of need fulfillment in relationship functioning and well-being: a self-determination theory perspective. *Journal of Personality and Social Psychology*, *92*(3), 434.

Rani, P., Sarkar, N., & Liu, C. (2005). Maintaining optimal challenge in computer games through real-time physiological feedback. In D. Schmorrow (ed.), Foundations of Augmented Cognition, (pp. 184-192). Hillsdale, NJ: Lawrence Erlbaum.

Richins, M. L. (1994). Valuing things: The public and private meanings of possessions. *Journal of Consumer Research*, *21*(3), 504-521.

Roster, C. A., Ferrari, J. R., & Jurkat, M. P. (2016). The dark side of home: Assessing possession 'clutter'on subjective well-being. *Journal of Environmental Psychology*, *46*, 32-41.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, *52*(1), 141-166.

Ruppert-Stroescu, M., LeHew, M. L., Connell, K. Y. H., & Armstrong, C. M. (2015). Creativity and sustainable fashion apparel consumption: The fashion detox. *Clothing and Textiles Research Journal*, *33*(3), 167-182.

Sadler, G. R., Lee, H. C., Lim, R. S. H., & Fullerton, J. (2010). Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nursing & Health Sciences*, *12*(3), 369-374.

Saldaña, J. (2009). Coding Manual for Qualitative Researchers. Thousand Oaks, CA: Sage.

Santor, D. A., Fethi, I., & McIntee, S. E. (2020). Restricting our consumption of material goods: an application of the theory of planned behavior. *Sustainability*, *12*(3), 800.

Sarigöllü, E., Hou, C., & Ertz, M. (2021). Sustainable product disposal: Consumer redistributing behaviors versus hoarding and throwing away. *Business Strategy and the Environment*, *30*(1), 340-356.

Sekeres, M. J., Bonasia, K., St-Laurent, M., Pishdadian, S., Winocur, G., Grady, C., & Moscovitch, M. (2016). Recovering and preventing loss of detailed memory: differential rates of forgetting for detail types in episodic memory. *Learning & Memory*, *23*(2), 72-82.

Schifferstein, H. N., & Zwartkruis-Pelgrim, E. P. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design*, *2*(3), 1-13.

Schwartz, S. (1975). The justice of need and the activation of humanitarian norms. *Journal of Social Issues*, *31*(3), 111-136.

Sigmon, S. T., Whitcomb, S. R., & Snyder, C. R. (2002). Psychological home. In Psychological sense of community (pp. 25-41). Springer, Boston, MA.

Singh, A. (2022). Indicators and ICTs application for municipal waste management. *Waste Management & Research*, *40*(1), 24-33.

Singh, J., Sung, K., Cooper, T., West, K., & Mont, O. (2019). Challenges and opportunities for scaling up upcycling businesses–The case of textile and wood upcycling businesses in the UK. *Resources, Conservation and Recycling*, *150*, 104439.

Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental psychology*, *38*, 104-115.

Sung, K. (2017). Sustainable production and consumption by upcycling, Doctoral dissertation, Nottingham Trent University (United Kingdom).

Sung, K., Cooper, T., & Kettley, S. (2014). Individual Upcycling Practice: Exploring the Possible Determinants of Upcycling Based on a Literature Review. Sustainable Innovation 2014, 19th International Conference, Copenhagen, Denmark.

_____ (2015). An exploratory study on the links between individual upcycling, product attachment, and product longevity. Proceedings of Product Lifetimes And The Environment (PLATE) 2015 Conference, Nottingham, 17-19, 349-356.

Sung, K., Cooper, T., & Kettley, S. (2019). Factors influencing upcycling for UK makers. *Sustainability*, *11*(3), 870.

Szaky, T. (2014). Outsmart waste: The modern idea of garbage and how to think our way out of it, Berrett-Koehler Publishers.

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review Psychology*, *58*, 345-372.

Tracy, J. L., & Robins, R. W. (2007). The psychological structure of pride: a tale of two facets. *Journal of Personality and Social Psychology*, *92*(3), 506.

White, R. W. (1959). Motivation reconsidered: the concept of competence. *Psychological Review*, *66*(5), 297.

Wilson, M. (2016). When creative consumers go green: Understanding consumer upcycling. *Journal of Product & Brand Management*, *25*(4), 394-399.

Wolf, M., & McQuitty, S. (2011). Understanding the do-it-yourself consumer: DIY motivations and outcomes. *AMS Review*, *1*, 154-170.

Zimring, C. A. (2017). Aluminum upcycled: Sustainable design in historical perspective. JHU Press.

Zink, T., & Geyer, R. (2017). Circular economy rebound. *Journal of Industrial Ecology*, *21*(3), 593-602.

The Bridge Between Essay 2 and Essay 3

In Essay 2, I conducted a qualitative study to explore consumer upcycling which is a resource-efficient way to extend product lifespans and contribute to the circular economy (CE). Through inductive content analysis on consumer interviews, I identified three types of internal motivations: core-self, social-self, and object-self oriented motivations. And specific motivations in each type were further identified. Additionally, I showed potential consequences of consumer upcycling behavior at three levels: social, environmental, and business level. In general, Essay 2 provides an enriched understanding of consumer upcycling.

Essay 3 links to Essay 2 in three ways. First, Essay 3 examines the same CE-oriented behavior as Essay 2 – consumer upcycling, but uses a quantitative research method (i.e., survey). Second, same as Essay 2, Essay 3 focuses on internal motivations behind consumer upcycling. The internal motivations in Essay 3 are proposed based on the qualitative findings in Essay 2 and relevant theories in the literature. Third, inspired by the discovery in Essay 2 that consumers interested in upcycling are conceivably more willing to purchase upcycled products (i.e., the business-level consequence of consumer upcycling), Essay 3 explores how consumer upcycling motivations relate to purchase of commercial upcycled products.

CHAPTER 4 – ESSAY 3

THE ROLE OF INTERNAL MOTIVATIONS IN CONSUMER UPCYCLING AND THE ROLE TRANSITION FROM CREATOR TO BUYER

Shi, T., Huang, R., & Sarigöllü, E. (2024). The role of internal motivations in consumer upcycling intention and purchase intention of upcycled products. European Journal of Marketing. [Under 3rd round review]

Abstract

Upcycling is an efficient enabler for the circular economy (CE). A substantial corpus of literature explores upcycling from the supply side, but the perspective from the demand side (i.e., the consumer) has been largely overlooked. Addressing this void and considering consumers' dual role (i.e., creator, buyer) in upcycling, this research studies the relationship between internal motivations and individuals' 1) consumer upcycling intention; and, 2) purchase intention of upcycled products. Online survey data from 470 participants interested in consumer upcycling were analyzed using covariance-based structural equation modeling. Perceived competence is found as the strongest motivation for consumer upcycling, followed by waste prevention and frugality. Furthermore, consumers who have motivations of waste prevention, social connectedness, and emotional attachment for consumer upcycling are more inclined to purchase upcycled products, implying the role transition from creator to buyer.

1. Introduction

Circular economic model of production and consumption, which is an alternative to the current linear model of take-make-waste, has been attracting increasing research attention. While the emergent circular economy (CE) literature has focused on the supply-side (production) perspective, it has mostly overlooked the consumption side, i.e., the nature of consumers' behavior (Hobson et al., 2021), except for a few CE-oriented behaviors such as recycling. In response to this gap, the current research investigates consumer upcycling, a consumer-enabled and CE-oriented practice (Shi et al., 2022b), which is less conspicuous and less studied than recycling although it has more beneficial and sustainable circular effects on the environment (Bridgens et al., 2018; Coppola et al., 2021). For example, upcycling one kilogram of textile waste can save 20,000 liters of water and prevent 20 kg of CO_2 emissions (McDonough and Braungart, 2013). These savings become particularly significant considering that 50% to 80% of fabric waste can be upcycled (Aus et al., 2021).

Upcycling refers to a process in which unwanted object(s) or waste materials are transformed into a product which has equal or higher value than the current value of its components (Sung, 2017), as illustrated by examples in Appendix A. Consumers can exert circular effect mainly by doing upcycling themselves (i.e., creator) or by purchasing upcycled products (i.e., buyer). Although commercialization of upcycled products for consumers, as in fashion and furniture, cannot be isolated from the growing practice of consumers' own upcycling behavior (Wilson, 2016; Yu and Lee, 2019), their relationship has not been studied. Considering their promising synergy on sustainable circular effects, the current research investigates the underexplored consumer upcycling behavior per se as well as the relationship between consumer upcycling and the upcycling business.

Consumer upcycling contributes to the CE in multiple ways. First, it represents the least resource-intensive method to extend the lifespan of products (Bridgens et al., 2018; Coppola et al., 2021) and maximize the utility of used materials (Wilson, 2016). Second, it promotes recognition of the CE among consumers and inspires other CE-oriented behaviors (Shi et al., 2022b). Third, consumer upcycling (in which consumers act as creators) encourages the growth of upcycling businesses – a subset of CE businesses – by enabling consumers to assume roles as producers, designers, donors or buyers (Sung, 2017; Kamleitner et al., 2019; Coppola et al., 2021). Specifically, 1) upcycling enthusiasts with strong upcycling skills can establish small- or medium-sized enterprises (as producers); 2) consumers with creative upcycling ideas and design skills may prompt companies to embark on upcycling and contribute to integration of upcycling to mass-production (as designers); 3) consumers awareness of upcycling could provide upcycling materials to industries, facilitating large-scale upcycling (as donors); and 4) consumers engaged in individual upcycling might be more amenable to purchasing upcycled products to support upcycling businesses (as buyers). In the marketplace, consumers in producer and designer roles have spurred the emergence of upcycling brands such as Freitag and various upcycling stores on Etsy.com. Meanwhile, those in buyer roles have influenced established brands like Patagonia and Cyclus to introduce upcycling collections. In essence, consumer upcycling empowers individuals with the agency to support the CE and inspires business models that effectively enhance the CE.

Despite its significance, only a limited body of literature has studied consumer upcycling, consisting mostly of qualitative exploratory designs which identify various motivations for consumer upcycling (e.g., Shi et al., 2022b; Coppola et al., 2021; Sung et al., 2019). However, these studies fail to validate, with quantitative methods, the impact of motivations on consumer upcycling, particularly internal motivations, which are expected to be more effective in

encouraging relatively effortful pro-environmental behaviors like upcycling (Aitken et al., 2016). In addition, although consumers can assume multiple roles in upcycling, prior research has not studied distinct effects of motivations on different consumer roles. Addressing these deficiencies in the literature, the current study uses the survey method and quantitative analysis to explore internal motivations underlying consumer upcycling as well as to identify distinct effects of motivations for different consumer roles, i.e., creator and buyer. That is, in addition to examining the influence of the identified internal motivations on consumer upcycling intention, this research also examines how these motivations for consumer upcycling impact purchase intention of upcycled products, thereby demonstrating consumers' transition from creator role in consumer upcycling to buyer role in purchase of upcycled products, referred to as the role transition effect.

This study makes three main contributions to the CE literature. First, it responds to the call for research on the role of consumers in the CE (Hobson et al., 2021), and for the first time provides insights into how to bridge different consumer roles in the CE. We find that consumers could proactively engage in an effective CE solution, namely upcycling, as creators, and in addition, advance the vitality of CE businesses as buyers. Second, this study advances knowledge on consumer upcycling and upcycled product consumption by quantifying the relationship between internal motivations and consumer upcycling intention and exploring how these motivations explain purchase intention of upcycled products (indicating the role transition from creator to buyer). The current study's exploratory findings lay down sound foundations for future upcycling research to test potential causal relationships between internal motivations and consumer upcycling as well as to investigate the underlying mechanisms concerning the role transition in upcycling. Third, this study provides managerial implications for CE practitioners including policymakers and managers of upcycling businesses. Knowledge about internal

motivations for consumer upcycling informs effective communication strategies for policymakers to promote consumer upcycling. It also assists managerial decision making for product development and innovation, since businesses need to consider design and production of items that carry inherent value for consumers.

2. Conceptual development

2.1 Consumer upcycling and purchase of upcycled products

Consumer upcycling is a CE-oriented practice that enables individuals to act as creators to transform otherwise useless objects and materials into desired products (Shi et al., 2022b). Through this behavior, consumers not only extend the lifespan of objects that would otherwise be sent to landfills but also conserve the raw materials needed for new products. It is important to note that in consumer upcycling, old materials are circulated exclusively on the consumer side. This underscores the resource-efficient nature of the behavior, as it eliminates multiple resource-consuming activities, such as waste collection and transportation, which are required by many other CE-oriented practices.

Besides engaging in upcycling themselves, consumers can also support upcycling by purchasing upcycled products. In recent years, various industries have embraced upcycling (Sung et al., 2019), fostering the consumer's role as a buyer. For instance, the fashion industry has seen the introduction of upcycled products by established brands (e.g., Adidas, Urban) and emerging upcycling brands (e.g., Frankie Collective, Zero Waste Daniel). Moreover, Etsy, a marketplace dedicated to handmade and vintage items, serves as an ideal platform for small-scale upcycling businesses, enabling individual designers to sell their handmade upcycled products. In the fields of food, furniture, and construction, upcycling is also an emerging practice (Singh et

al., 2019). The success of these upcycling businesses can significantly expand the upcycling practice and thereby contribute to the CE. However, this success cannot be isolated from consumers' support as buyers.

We propose that the roles of consumers in upcycling – creator and buyer – are interconnected. On the one hand, purchase of upcycled products may serve as a supplement to consumer upcycling. People may undertake simple upcycling projects even if they lack sufficient time or upcycling skills, but they could be deterred if they perceive the process as complex or time-consuming. In such cases, they might instead be inclined to purchase upcycled products if they have already embraced the upcycling practice. On the other hand, as upcycling is a grassroots activity (Coppola et al., 2021), consumers' understanding of upcycling in a business context is closely linked to their personal upcycling experiences as creators in their everyday lives. Thus, the inherent upcycling concept, embedded in upcycled products and differentiating them from other products, has the potential to attract consumers. Therefore, adopting the creator perspective in upcycling can enhance understanding of purchase of upcycled products and facilitate generation of valuable implications for the upcycling business.

2.2 Factors influencing consumer upcycling and purchase of upcycled products

Research on consumer upcycling and purchase of upcycled products has proceeded in parallel, with little crossover despite apparent synergy, thus limiting the incorporation of research insights for advancement of the CE. Consumer upcycling literature primarily explores motivations that influence consumer upcycling, such as the intention to save money, environmental concern, expected enjoyment, and the expression of creativity (Wilson, 2016; Sung, 2017; Bridgens et al., 2018; Coppola et al., 2021). In contrast, literature on purchase of upcycled products focuses on influence of product attributes (as opposed to consumer

characteristics or motivations), such as various dimensions of product value and perceived specialness or creativity derived from the past identity of upcycled products (Yu and Lee, 2019; Kamleitner et al., 2019). In these studies, upcycled products were regarded as type of innovative products, much like other new products with which consumers do not have any prior experience. Taken together, extant research has not examined the relationship between consumer upcycling and purchase of upcycled products.

The current research addresses this void by advancing understanding of the drivers of consumer upcycling and purchase of upcycled products, as well as, revealing how consumers' engagement in consumer upcycling influences their purchase of upcycled products. Specifically, this research: 1) examines the relationship between internal motivations and consumer upcycling intention; and 2) explores how internal motivations for consumer upcycling influence purchase intention of upcycled products and thus imply consumers' role transition from creator to buyer. Internal motivations refer to forces internal to the self as initiator or sustainer of one's actions. Such forces typically include a natural inclination toward competence, autonomy, relatedness or value, and goals or regulations which are internalized to oneself (Ryan and Deci, 2000). We focus on internal motivations for two reasons. First, despite being more effective in promoting relatively effortful pro-environmental behaviors like upcycling (Aitken et al., 2016), internal motivations (Osbaldiston and Sheldon, 2003) for consumer upcycling are under-investigated. Previous studies mainly considered motivations arising from outcomes of this behavior, usually representing forces external to the self. Second, internal motivations are more effective in role transition in the same person (Ertz et al., 2022). Specifically, internal motivations are effective in the transfer of knowledge and attitude from one behavior entailing one role to another associated behavior entailing a different role. In the current research context, the role transition effect

transpires as consumers' knowledge and attitudes toward consumer upcycling are transferred to purchase of upcycled products (i.e., from creator to buyer). The following sections will present how we identify internal motivations for consumer upcycling and develop hypotheses concerning the relationship between the internal motivations and consumer upcycling intention, as well as purchase intention of upcycled products.

3. Theoretical elaboration and hypothesis development

Our theoretical examination of internal motivations for consumer upcycling is grounded in a thorough understanding of this behavior's essence. Consumer upcycling encompasses three core features: 1) being sustainable; 2) value creation; and 3) using old materials (Shi et al., 2022b). The feature of being sustainable refers to the ability of consumer upcycling to maximize the utility of materials and minimize waste. The feature of value creation involves transforming useless materials into valuable products without degrading them. The feature of using old materials means that materials for consumer upcycling have been previously used, often retaining visible traces in their appearance. These three core features differentiate consumer upcycling from other sustainable behaviors (e.g., recycling) and crafting activities. Consumers who are cognizant of these key features from their own upcycling behavior are more likely to purchase upcycled products.

Drawing on theories and concepts related to the three core features of consumer upcycling, as well as relevant qualitative findings from existing literature, we have identified seven internal motivations for consumer upcycling: waste prevention, frugality, perceived competence, perceived autonomy, social connectedness, social approval, and emotional attachment. We hypothesize that these motivations are positively related to consumer upcycling intention. In addition, based on our theoretical exploration of whether these seven internal motivations also

influence purchase of upcycled products and thereby imply the role transition from creator to buyer, we propose that five of them – waste prevention, perceived autonomy, social connectedness, social approval, and emotional attachment – are positively related to purchase intention of upcycled products.

3.1 Internal motivations related to the feature of being sustainable

Existing research on sustainable behavior has provided solid empirical evidence that personal norms, defined as "self-expectations that are based on internalized values to engage in a certain behavior" (Harland et al., 1999, p. 2507), are critical internal motivations for ethical behaviors such as recycling, energy use, green consumption, product reuse, and water conservation (Balundė et al., 2020). We expect that personal norms will also be motivations for ethical consumer upcycling, more so than social norms, because this behavior has not been advocated through policies or regulations (unlike recycling, for example) and is not widely expected as a social norm (Bridgens et al., 2018). Based on prior qualitative research on consumer upcycling (Wilson, 2016; Coppola et al., 2021), we propose two specific personal norms as potential internal motivations for consumer upcycling: waste prevention and frugality.

Although consumer upcycling and purchase of upcycled products both possess the sustainable feature due to their resource saving and waste reduction outcomes, whether the personal norms related to consumer upcycling influence purchase of upcycled products, thereby demonstrating the role transition from creator to buyer, remains uncertain. The reason is that, beyond their shared beneficiary (i.e., the environment), consumer upcycling and purchase of upcycled products benefit different entities. Consumer upcycling benefits individual consumers, whereas purchase of upcycled products benefits the industry. Further elaboration is presented below.

3.1.1 Waste prevention

Waste prevention refers to preventing waste generation from the outset; hence it is the most straightforward and effective method to deal with waste. It emphasizes the highest priority in the waste hierarchy, i.e., taking measures before a substance, material, or product becomes waste, such as avoidance, reduction, and reuse, excluding recycling (Zorpas and Lasaridi, 2013). Waste prevention motivation reflects an individual's inherent tendency to minimize resource consumption and waste generation (Cox et al., 2010). This motivation has been found to drive various pro-environmental behaviors such as anti-consumption, planned use, and repair (Guillard, 2018; Shi et al., 2022a). Since consumer upcycling enables consumers to repurpose objects that would otherwise become waste, this behavior aligns with waste prevention motivation. Therefore, we propose:

H1a. Waste prevention motivation is positively related to consumer upcycling intention.

Further, purchase of upcycled products also aligns with waste prevention motivation. Thus, consumers with this motivation are likely to transition from creator to buyer. Previous research suggests that consumers with this motivation exhibit a high level of mindfulness in their purchasing decisions; they tend to choose products that consume fewer resources and generate less waste, such as products with minimal packaging, refillable products, and second-hand products (Zorpas and Lasaridu, 2013). Since upcycled products are made from used or waste materials and thus can significantly reduce waste (Kamleitner et al., 2019; Yu and Lee, 2019), purchasing these products aligns well with waste prevention motivation. In addition, existing research shows that consumers with a strong personal ecological norm often engage in multiple pro-environmental behaviors to maintain self-consistency (Ye et al., 2022). Hence, it is likely

that consumers engage in both consumer upcycling and purchase of upcycled products to maintain consistency with their waste prevention motivation. Collectively, we propose that

H1b. Waste prevention motivation is positively related to purchase intention of upcycled products.

3.1.2 Frugality

Frugality is a personal norm that emphasizes the optimal and efficient use of limited resources (Chancellor and Lyubomirsky, 2011). While often associated with minimizing financial waste (i.e., saving money), this motivation is not necessarily attributed to consumers' financial constraints; instead, it can manifest as a lifestyle choice, a belief system, or a virtue that consumers voluntarily choose to adopt (Muradian, 2019). Frugal consumers typically pursue two main objectives: 1) maximizing the utility of purchased products, and 2) minimizing expenditures when acquiring new products (Fujii, 2006). To meet the first objective, frugal consumers often prolong the use of products, repair fixable products, and find alternative uses for unfixable products (Shi et al., 2022a). To meet the second objective, they tend to purchase second-hand, discounted, or bulk products that offer high cost-effectiveness (Kapitan, 2021). Consumer upcycling, as an approach to reclaim the remaining value of a discarded or broken item for a new purpose and concurrently avoid additional expenditure on purchasing a new product for that purpose, aligns with both frugality objectives (Shi et al., 2022a, 2022b). Accordingly, we propose that frugality is a motivation for consumer upcycling.

H2a. Frugality motivation is positively related to consumer upcycling intention.

However, purchase of upcycled products may not align with frugality motivation. For consumers with this motivation, the role transition from creator to buyer may not occur. As the upcycled product market is relatively new, many consumers lack experience in assessing prices accurately. Furthermore, attributes of upcycled products can lead to conflicting consumer perceptions regarding their prices. On the one hand, the handmade and green attributes of upcycled products, coupled with the lack of economies of scale in their production, tend to elevate consumers' price expectations (Singh et al., 2019), and hence reduce the purchase intention of frugal consumers. On the other hand, the use of old materials and old appearance of upcycled products might lead consumers to infer low prices, and thus increase the purchase intention of frugal consumers, as evidenced in studies on second-hand consumption (Lang and Zhang, 2019). These conflicting price inferences are likely to result in uncertainty (i.e., no definite direction) about the relationship between frugality motivation and purchase of upcycled products. Therefore, there is a null hypothesis for frugality motivation.

H2b. There is no relationship between frugality motivation and purchase intention of upcycled products.

3.2 Internal motivations related to the feature of value creation

The second core feature of consumer upcycling is value creation, which is initiated by individuals actively engaged in this process (Sung et al., 2019). This feature fits with Self-Determination Theory (SDT), which identifies innate motivations in human value creation activities (Gilal et al., 2019). Hence, we use this theory as a foundation for identifying internal motivations associated with this feature. SDT suggests that individuals have three basic needs – competence, autonomy, and relatedness (Ryan and Deci, 2000) – which can motivate creation-

oriented activities such as undertaking creative tasks, assembling self-created products, purchasing self-designed products, and participating in DIY projects (Moreau and Herd, 2010; Watson and Shove, 2008). In addition, when the social aspect of creation activities (i.e., relatedness in SDT) is prominent, two distinct motivations emerge: social connectedness and social approval. For example, Watson and Shove (2008) describe DIY as a social practice that connects consumers with their family, friends, and neighbours, suggesting social connectedness motivation. Moreau and Herd (2010) highlight consumers' desire to compare themselves with others when customizing products, indicating social approval motivation. Based on these insights, we consider the following four motivations for consumer upcycling: perceived competence, perceived autonomy, social connectedness, and social approval.

Whether these four motivations can promote purchase of upcycled products and thus the role transition from creator to buyer, depends on consumers' involvement in the value creation process as buyers. Although buyers have limited access to the crafting process of upcycled products, the creation of non-standardized upcycled products may indeed integrate consumer input in the form of provision of upcycling materials, customization requirements, and consumer reviews (Re and Magnani, 2022). Therefore, we contend that the motivations concerning the value creation process of consumer upcycling can partially explain purchase of upcycled products. We will discuss this in more detail below.

3.2.1 Perceived competence

Competence, a basic psychological need that energizes human activity, refers to individuals' confidence in interacting with their internal and external environments (Ryan and Deci, 2000). This need can be satisfied through acquiring skills and knowledge. Consumer behavior research indicates that consumers usually seek learning opportunities in consumption

activities in two ways: 1) by purchasing products that facilitate acquisition of new knowledge or practice of skills, such as new technology products (Nikou and Economides, 2017); and 2) by participating in production process of products, thereby enhancing their product knowledge and crafting skills (Roberts et al., 2014). Consumer upcycling aligns with the latter way, as the process of making valuable products from old materials provides a rich context for learning. First, it enhances creative thinking skills (Gilhooly et al., 2007). As most products are designed with predetermined uses (Moreau et al., 2001), consumer upcycling challenges consumers to think out of the box and devise novel uses for products. Second, altering a product's original purpose necessitates that consumers not only acquire knowledge of material characteristics (e.g., rigidity, waterproof performance), but also learn and refine crafting skills (e.g., sewing) (Coppola et al., 2021). Therefore, we hypothesize that

H3a. Perceived competence motivation is positively related to consumer upcycling intention.

However, perceived competence motivation may not explain purchase of upcycled products and thus may not involve the role transition from creator to buyer. Unlike consumer upcycling, which allows consumers to exercise and enhance their skills during the value creation process, purchase of upcycled products barely involves learning. First, upcycled product per se, or use of upcycled product, does not contribute to consumer learning. Although upcycling is an innovative business practice, upcycled products typically fall into traditional product categories in terms of their usage, and thus do not require learning (Bridgens et al., 2018). Second, consumer participation in upcycled products' creation process is limited. Although consumers may sometimes engage in this process by specifying customization preferences, donating materials, or providing feedback (Re and Magnani, 2022), actual crafting work is performed by businesses. Consequently, opportunities for consumers to expand their knowledge and practice crafting skills

in the co-production process are limited. Hence, we have a null hypothesis for perceived competence motivation.

H3b. There is no relationship between perceived competence motivation and purchase intention of upcycled products.

3.2.2 Perceived autonomy

Autonomy refers to the sense of choice and volition in regulating one's behavior (Ryan and Deci, 2000). Perceived autonomy in consumption can be enhanced by making product choices free from external influences (Wertenbroch et al., 2020), such as adhering to preferred consumption patterns (Carrington et al., 2021), selecting products that express individuality (Newholm and Hopkinson, 2009), and making informed choices (Anker, 2020). Building upon these insights, we surmise that perceived autonomy motivation can explain consumer upcycling due to flexible consumption patterns and high degree of individuality associated with this behavior. Specifically, consumer upcycling enables consumers to create desired products with existing items and preserve items that would otherwise be discarded. In other words, consumer upcycling provides a sense of autonomy in acquiring and disposing of products, thereby liberating consumers from the traditional linear consumption pattern determined by external actors like manufacturers and policymakers (Shi et al., 2022b; Bridgens et al., 2018; Coppola et al., 2021). Additionally, the prevailing system of mass production and marketing often obliges consumers to accept standard products (Bardakci and Whitelock, 2004), which stifles consumer individuality (Watson and Shove, 2008). Consumer upcycling empowers consumers to reclaim their individuality and enhance self-expression by enabling them to customize products based on personal preferences. We propose that:

H4a. Perceived autonomy motivation is positively related to consumer upcycling intention.

Perceived autonomy motivation can also positively affect purchase of upcycled products, which means consumers with this motivation are likely to transition from creator to buyer. The reason is these purchases are consistent with consumers' desires for individuality and deviation from traditional consumption patterns. First, the inherent uniqueness of upcycled products can enhance consumers' perceived individuality (Lee, 2016). Often, upcycling materials bear unique patterns from their long history of use, sometimes adding an irreproducible vintage appeal to the products (Kamleitner et al., 2019; Yu and Lee, 2019). For instance, Freitag, an upcycled fashion brand, asserts that no two Freitag bags are identical, each marked by distinct traces from their upcycling materials (i.e., reclaimed truck tarps) (Schmitt et al., 2022). Moreover, some upcycling businesses on Etsy.com invite consumers to contribute their own items for upcycling. Such customization, integrating consumers' input into the resultant upcycled products, further boosts consumers' perceived individuality in consumption (Lee, 2016). Second, the production method of upcycled products deviates from traditional linear production methods and mainstream consumerism. Thus, these products are often considered non-mainstream (Sung et al., 2019). Consumption of such non-mainstream products has been found to reinforce consumers' perceived autonomy (Warren and Campbell, 2014). Note that these perceptions and understandings of autonomy in upcycled product consumption are closely linked to consumers' experiences of autonomy in their individual upcycling endeavors.

H4b. Perceived autonomy motivation is positively related to purchase intention of upcycled products.

3.2.3 Social connectedness

Social connectedness refers to the human desire to build and maintain relationships with others (Grieve et al., 2013). In consumer behavior research, this motivation is reflected in consumers' participation in brand communities, knowledge-sharing communities, and social media groups (Snyder and Newman, 2019). Consumer upcycling, as a practice challenging traditional production and consumption models, is emerging as a social movement (Sung et al., 2019) and fostering community formation. Growing public interest in upcycling is partially driven by its social- benefits (e.g., environmental protection) and its inherent creativity. Both factors have been found to be significant contributors to social movements and community development (Shepard, 2012; Weijo et al., 2018). Moreover, modern digital technologies diminish geographical barriers, thereby further facilitating the prosperity of upcycling communities. Currently, various online (e.g., Facebook groups) and offline (e.g., upcycling workshops) upcycling communities have been established (Bridgens et al., 2018; Sung, 2021). These platforms enable consumers interested in upcycling to connect with like-minded others. Within these communities, consumers share upcycling knowledge and collaboratively enhance their upcycling experiences (Coppola et al., 2021). By doing consumer upcycling, individuals can engage in meaningful social interactions in these communities and develop a sense of collective identity (Chatzidakis, 2021). Consequently,

H5a. Social connectedness motivation is positively related to consumer upcycling intention.

Social connectedness motivation can also positively affect purchase of upcycled products, which implies consumers' role transition from creator to buyer under this motivation, because marketplaces for these products typically involve significant social interactions. First, the

transaction process for upcycled products often involves more social interactions than that of standard products. When consumers purchase non-standardized upcycled items or send their own items to businesses for customized upcycled products, meaningful dialogues with retailers or designers – who are typically upcycling experts – inevitably occur. This interaction, particularly in latter scenario, is likely to foster a strong connection between consumers and retailers/designers (Etgar, 2008). Second, in addition to engaging in consumer upcycling, purchase of upcycled products is an important way to participate in upcycling communities. As upcycling is a grassroots activity (Coppola et al., 2021), the upcycling industry is dominated by small-scale businesses run by individuals. In this context, upcycling communities often function as marketplaces (Sung, 2021). These communities enable consumers to establish and sustain relatively close relationships with favored upcycling retailers/designers, and to develop an "upcycled product consumer" identity through interactions with other consumers (Sung, 2017; Sung et al., 2019). As such, it is hypothesized that:

H5b. Social connectedness motivation is positively related to purchase intention of upcycled products.

3.2.4 Social approval

Social approval refers to individuals' concern about how others think of them and their desire to be socially accepted (Twenge and Im, 2007). The need for social approval prompts consumers to adopt behaviors that reflect socially desirable attributes, such as conspicuous consumption, innovative consumption, and pro-environmental behavior (Neave et al., 2020; Farrow et al., 2017). This need is a relevant motivation for consumer upcycling because several socially desirable attributes can be revealed through this behavior. First, in consumer upcycling,

individuals have to come up with alternative uses for objects, which is an effective way to express creativity (Coppola et al., 2021). Second, consumer upcycling allows individuals to demonstrate their impressive crafting skills and aesthetic taste, particularly when they upcycle something old, ugly, and useless into something new, beautiful, and useful (Shi et al., 2022b). Third, engaging in consumer upcycling reveals a commitment to waste prevention and environmental protection, thereby enhancing a consumer's pro-environmental identity (Sung, 2017). Finally, the highly customized nature of resultant upcycled products meets consumers' desire to express individual uniqueness (Tian et al., 2001). Therefore, we propose that

H6a. Social approval motivation is positively related to consumer upcycling intention.

Social approval motivation can also have a positive influence on purchase of upcycled products, thereby prompting consumers' role transition from creator to buyer under this motivation, as these purchases allow consumers to showcase two socially desirable attributes. First, using upcycled products instead of regular ones made from new materials demonstrates a pro-environmental identity (Yu and Lee, 2019), a feature accentuated by the visible old traces on the products (Kamleitner et al., 2019). Second, upcycled products, as a novel and highly distinctive sustainable product category (Adıgüzel and Donato, 2021), offer consumers an opportunity to express their uniqueness. The tendency of consumers to select innovative products to display their uniqueness and gain social approval has been extensively studied in previous research (Sadik-Rozsnyai and Bertrandias, 2019). Therefore, proposed formally:

H6b. Social approval motivation is positively related to purchase intention of upcycled products.

3.3 Internal motivations related to the feature of using old materials

The last core feature of upcycling is using old materials. The primary reason consumers retain old objects is their emotional value; typically, the greater the emotional value of an object, the longer it tends to be kept (Belk, 1989). Emotional value is associated with the feelings or affective states evoked by objects and is linked to the users' authentic self because the memories and experiences tied to the objects form a story that helps individuals make sense of who they are (Belk, 1988). To capture and conceptualize emotional value from a consumer perspective, product attachment theory and the concept of emotional attachment have been developed and are widely used in consumer behavior research (Shu and Peck, 2011). Given that consumer upcycling is a way to retain old objects, we consider emotional attachment a potential internal motivation for consumer upcycling.

3.3.1 Emotional attachment

Emotional attachment refers to the emotional bond connecting an individual with a specific target (Jiménez and Voss, 2014). Research has consistently shown a positive relationship between emotional attachment and consumer behaviors that extend product lifespan, such as product care, repair, and delayed replacement (Shi et al., 2022a). Besides, incorporating product designs that foster emotional connections between consumers and products has been recognized as an effective strategy for enhancing product longevity (Chapman, 2012). Based on these findings and considering that consumer upcycling is a method of extending product lifespan, consumers' emotional attachment to their objects is a motivation for this behavior. This behavior can preserve and enhance emotional value in old objects through two mechanisms. First, by creating a second life for old objects through consumer upcycling, individuals can revive

cherished memories and meanings associated with these objects, which is particularly valuable when these bear positive significance (Türe and Ger, 2016). Second, consumers' interactions with upcycled products generate new memories and experiences, which bridge the past, present, and future of the consumers, thereby constructing a cohesive narrative about the self (Curasi et al., 2004). Consequently, we hypothesize that

H7a. Emotional attachment is positively related to consumer upcycling intention.

Emotional attachment is also expected to positively influence purchase of upcycled products. This means consumers with this motivation are likely to transition from creator to buyer. Similar to upcycled products created by consumers, commercial upcycled products are also made from old objects. Although these old objects may not hold personal memories for a specific consumer, they may have witnessed people, events, culture in the past and thus become representatives of past human societies (Keith and Silies, 2015). Due to historical narrative embedded in such old objects, upcycled products that are made from these objects can evoke a collective nostalgia – a group-level emotion (Wildschut et al., 2014). Research suggested that consumers who like to preserve memories and history, denoted as having high nostalgia proneness, tend to have a strong preference for nostalgia-evoking products (Holbrook and Schindler, 2003; Sarial-Abi et al., 2017). Hence, consumers who have the motivation of emotional attachment for consumer upcycling and exhibit relatively high nostalgia proneness are more likely to purchase nostalgia-evoking upcycled products. Proposed formally,

H7b. Emotional attachment is positively related to purchase intention of upcycled products.

4. Methodology

4.1 Questionnaire design

We employ survey methodology in this research to test the hypotheses outlined above. An online survey was chosen because of its cost-effectiveness for gathering data from a widely dispersed sample and its high level of anonymity (Alreck and Settle, 2004). Online surveys have been extensively used in quantitative exploration of motivations or antecedents of consumer behavior (Chylinski and Chu, 2010; Lervik-Olsen et al., 2024). In the questionnaire, definitions of consumer upcycling and upcycling businesses with photo illustrations were presented (see the Appendix A). The proposed constructs in the hypotheses were measured using pre-developed scales adapted from previous research and items generated from previous qualitative research on consumer upcycling motivations. Participants indicated their responses on a seven-point Likert scale from 1 = "does not describe me at all" to 7 = "describes me extremely well" for motivations and from 1 = "not at all" to 7 = "extremely" for behavioral intentions.

In this questionnaire, seven motivation-constructs and two behavioral intentions were measured. The order of presentation of the seven motivations was randomized within the survey to address order effects. The Appendix B provides the measurement scales.

4.2 Data collection and sample

To test the hypotheses outlined above, the questionnaire was administered using Qualtrics, with participants recruited through Amazon Mechanical Turk (MTurk). To enhance data quality, MTurk functions were optimized through CloudResearch. Specifically, we 1) targeted participants located in the US who were over the age of 18; 2) solicited participants approved by CloudResearch, who had passed attention and engagement measures; 2) blocked duplicate IP

addresses to prevent multiple submissions from the same participant; 3) excluded the top 6% of experienced workers who had completed 60% of human intelligence tasks (HITs). The initial sample included 648 respondents. However, participants who failed attention checks in the questionnaire or exhibited fast response behavior (i.e., submitting a page containing over three questions in less than three seconds) or straight-lining behavior (i.e., choosing the identical option for at least five consecutive questions) were excluded. Additionally, as the study objective was to explore motivations for consumer upcycling, participants who indicated that they were not interested in doing upcycling at all were not allowed to continue the questionnaire and were thus removed from further analysis. Consequently, the final sample comprised 470 respondents (64.9% female; Mean $_{age}$ = 39.3, SD = 12.28). A summary of the sample's demographics is presented in Table 1.

Table 1

Sample profile

Variable	Dimension	%
Gender	Female	64.9
	Male	33
	Non-binary/third gender	1.7
	Prefer not to say	0.4
Age	≤ 35 years	48.3
	> 35 years	51.7
Years of education	≤ 11 years	15.1
	> 11 years	84.9
Household income	< $29,999	27.4
	$30,000−$49,999	20
	$50,000−$99,999	36
	$100,000−$149,999	10.2
	> $150,000	6.4

4.3 Measures assessment

The measurement model included all multi-item latent variables: waste prevention, frugality, perceived competence, perceived autonomy, social connectedness, social approval, emotional attachment, consumer upcycling intention, and purchase intention of upcycled products. The psychometric properties of the measures were evaluated in several steps. First, before checking psychometric properties, we assessed the sampling adequacy. The Kaiser-Meyer-Olkin (KMO) index was 0.92, well above the minimum threshold of 0.6 (Pallant, 2020), indicating that the data could be reliably tested using factor analysis.

Second, confirmation factor analysis (CFA) was performed with a covariance-based structural equation modeling technique in MPlus 8.0. The model fit the data well ($\chi^2[524]$ = 1143.502, root mean square error of approximation (RMSEA) = 0.050, standardized root mean square residual (SRMR) = 0.033; comparative fit index (CFI) = 0.988, Tucker-Lewis index (TLI) = 0.986) (Bagozzi and Yi, 1988). Standardized factor loadings for constructs (Table 2) were significant and exceeded 0.7 (Fornell and Larcker, 1981). Moreover, both Cronbach's alpha and composite reliability (CR) for each latent construct were greater than 0.7 (Bagozzi and Yi, 1988). Hence, all latent constructs exhibited sufficient composite reliability and convergent validity.

Third, discriminant validity was assessed by examining the square root of the average variance extracted (AVE) for each construct and the heterotrait-monotrait (HTMT) ratio (Fornell and Larcker, 1981; Henseler et al., 2015). The square root of the AVE for each construct, shown on the diagonal in Table 3, exceeded the inter-construct correlations, providing evidence for sufficient discriminant validity. The HTMT index is the average of the heterotrait–heteromethod correlations relative to the average monotrait–heteromethod correlations. The results indicate that all HTMT values were below the threshold of 0.85 (Table 4), further confirming

discriminant validity. In addition, the highest observed correlation value between independent variables (i.e., perceived competence and perceived autonomy) was 0.74, well below the benchmark of 0.8 (Reisinger and Turner, 1999). Thus, violation of multicollinearity was not evident.

Table 2

Results for reliability and convergent validity in CFA.

Scales	Standardised Factor loading in CFA	T-value in CFA	Cronbach's alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
WP			0.92	0.95	0.83
WP1	0.94	106.31			
WP2	0.96	129.22			
WP3	0.95	129.67			
WP4	0.79	41.24			
FR			0.90	0.93	0.77
FR1	0.89	60.00			
FR2	0.91	66.72			
FR3	0.90	62.75			
FR4	0.81	47.64			
PC			0.90	0.93	0.71
PC1	0.79	39.17			
PC2	0.84	49.07			
PC3	0.88	70.65			
PC4	0.89	63.77			
PC5	0.82	40.40			
PA			0.88	0.91	0.71
PA1	0.80	44.84			
PA2	0.86	58.16			
PA3	0.89	64.85			
PA4	0.81	41.10			
SC			0.95	0.96	0.83
SC1	0.84	68.72			
SC2	0.85	64.72			
SC3	0.94	127.86			
SC4	0.98	231.91			
SC5	0.93	114.34			
SA			0.90	0.93	0.76
SA1	0.85	52.47			
SA2	0.89	69.89			
SA3	0.91	76.20			

SA4	0.83	43.91			
EA			0.96	0.97	0.91
EA1	0.93	137.37			
EA2	0.97	191.69			
EA3	0.95	149.54			
CUI			0.91	0.94	0.84
CUI1	0.89	60.55			
CUI2	0.92	78.73			
CUI3	0.94	78.12			
PIUP			0.94	0.95	0.86
PIUP1	0.94	111.37			
PIUP2	0.95	113.71			
PIUP3	0.89	85.23			

Note: Measurement Model fit: $\chi^2[524]= 1143.502$; RMSEA=0.050; SRMR=0.033; CFI=0.988; TLI=0.986.

WP: Waste prevention; FR: Frugality; PC: Perceived competence; PA: Perceived autonomy; SC: Social connectedness; SA: Social approval; EA: Emotional attachment; CUI: Consumer upcycling intention; PIUP: Purchase intention of upcycled products.

Table 3

Means, standard deviations, correlation matrices and the square root of AVE

Variables	M	SD	1	2	3	4	5	6	7	8	9
WP	5.70	1.22	0.91								
FR	5.40	1.27	0.47**	0.88							
PC	5.32	1.17	0.49**	0.53**	0.84						
PA	4.25	1.50	0.40**	0.44**	0.74**	0.84					
SC	3.19	1.58	0.31**	0.18**	0.52**	0.53**	0.91				
SA	2.98	1.45	0.26**	0.14**	0.44**	0.45**	0.66**	0.87			
EA	4.59	1.75	0.21**	0.21**	0.50**	0.55**	0.40**	0.38**	0.95		
CUI	5.64	1.22	0.48**	0.53**	0.55**	0.44**	0.18**	0.11*	0.23**	0.92	
PIUP	4.87	1.41	0.44**	0.30**	0.40**	0.40**	0.40**	0.28**	0.30**	0.40**	0.93

Note: * p <= 0.05, ** p <= 0.01.

WP: Waste prevention; FR: Frugality; PC: Perceived competence; PA: Perceived autonomy; SC: Social connectedness; SA: Social approval; EA: Emotional attachment; CUI: Consumer upcycling intention; PIUP: Purchase intention of upcycled products.

Table 4

HTMT results

Variables	1	2	3	4	5	6	7	8	9
WP									
FR	0.43								
PC	0.45	0.48							
PA	0.37	0.43	0.75						
SC	0.30	0.18	0.51	0.53					
SA	0.25	0.16	0.43	0.47	0.65				
EA	0.18	0.17	0.48	0.54	0.39	0.38			
CUI	0.41	0.48	0.51	0.43	0.16	0.10	0.20		
PIUP	0.40	0.31	0.40	0.40	0.39	0.27	0.30	0.37	

Note: WP: Waste prevention; FR: Frugality; PC: Perceived competence; PA: Perceived autonomy; SC: Social connectedness; SA: Social approval; EA: Emotional attachment; CUI: Consumer upcycling intention; PIUP: Purchase intention of upcycled products.

4.4 Common method bias

Due to homology of the data and the possibility of respondent social desirability, the survey could suffer from common method bias (CMB). To mitigate this, we employed both procedural and statistical control methods. In terms of the procedural control, we measured the variables using multiple items that were simple and clear. Besides, we randomized the order of the independent variables in the questionnaire to minimize participant prediction effects. In terms of the statistical control, we applied Harman's single factor test (Harman, 1976). Our analysis, including all indicators, generated nine principal components (with an eigenvalue greater than 1). The first principal component explained 35.48% of the total variance, which was below the 50% threshold, suggesting a low likelihood of common method bias. To warrant this conclusion, we adopted another version of Harman's single-factor test using confirmatory factor analysis,

positing that all items load onto one factor. The results indicated significantly poorer model fit: χ^2 [560] = 15185.219, RMSEA = 0.236, SRMR = 0.208, CFI = 0.706, TLI = 0.687. This suggests that common method bias is not a serious concern in this research.

5. Hypotheses testing results

We employed the covariance-based structural equation modeling (SEM) using Mplus 8.0 to explore how the identified internal motivations relate to consumer upcycling intention and purchase intention of upcycled products. Several demographic variables, including gender, age, education, and income entered the model as covariates. Since past experience can predict future behavioral intentions (Knussen et al., 2004), we included past upcycling frequency (on a scale of 0 (never) to 7 (several times a week)) as a control variable for consumer upcycling intention and past upcycled product purchasing experience (0 = no, 1 = yes) as a control variable for purchase intention of upcycled products. The full structural model demonstrated an excellent fit to the data (χ^2 [724] = 1498.806; RMSEA = 0.048, SRMR = 0.069; CFI = 0.985, TLI = 0.983). Table 5 presents the structural paths.

5.1 Internal motivations for consumer upcycling intention

First, we report the results of hypotheses regarding upcycling intention. Three motivations, namely waste prevention ($\beta = 0.165$, $p < 0.001$), frugality ($\beta = 0.133$, $p = 0.001$), and perceived competence ($\beta = 0.349$, $p < 0.001$) are positively and significantly related to consumer upcycling intention, supporting H1a, H2a, and H3a. However, the relationships of perceived autonomy ($\beta = 0.000$, $p = 0.998$), social connectedness ($\beta = -0.048$, $p = 0.370$), social approval ($\beta = -0.073$, $p = 0.111$), and emotional attachment ($\beta = 0.016$, $p = 0.693$) with consumer upcycling intention are not significant. Therefore, H4a, H5a, H6a, and H7a are not supported.

5.2 Internal motivations and purchase intention of upcycled products (role transition from creator to buyer)

Second, we report the results of hypotheses regarding purchase intention of upcycled products. Waste prevention ($\beta = 0.243$, $p < 0.001$), social connectedness ($\beta = 0.177$, $p = 0.001$), and emotional attachment ($\beta = 0.099$, $p = 0.015$) are positively and significantly related to consumer upcycling intention (i.e., H1b, H5b, and H7b are supported). The remaining four motivations, namely frugality ($\beta = 0.045$, $p = 0.342$), perceived competence ($\beta = 0.011$, $p = 0.867$), perceived autonomy ($\beta = 0.102$, $p = 0.130$), and social approval ($\beta = -0.052$, $p = 0.299$) were not significantly related to purchase intention of upcycled products. Thus, H2b and H3b were supported, but H4b and H6b were not supported.

5.3 Control variables and consumer upcycling intention and purchase intention of upcycled products

Third, we report the relationship between control variables and consumer upcycling intention, as well as purchase intention of upcycled products. Specifically, past upcycling frequency is positively related to consumer upcycling intention ($\beta = 0.283$, $p < 0.001$), indicating that consumers who have done more upcycling in the past are more likely to continue this behavior in the future. None of the demographic variables (i.e., age, gender, income, and education) show a significant relationship with this behavior.

Past purchasing behavior is found to be significantly related to purchase intention of upcycled products ($\beta = 0.724$, $p < 0.001$), suggesting that consumers who have bought upcycled products before are more likely to do so again in the future. In addition, age ($\beta = 0.016$, $p < 0.001$) and gender ($\beta = 0.369$, $p < 0.001$) have positive relationships with purchase intention of

upcycled products, indicating that older and female consumers have higher intention to purchase upcycled products.

Table 5

Analysis results

Path	Coefficient	T-value	Result
Waste prevention → Consumer upcycling intention	**0.165**	**4.295****	H1a supported
Waste prevention → Purchase intention of upcycled products	**0.243**	**5.891****	H1b supported
Frugality → Consumer upcycling intention	**0.133**	**3.302****	H2a supported
Frugality → Purchase intention of upcycled products	0.045	0.951	H2b supported
Perceived competence → Consumer upcycling intention	**0.349**	**6.076****	H3a supported
Perceived competence → Purchase intention of upcycled products	0.011	0.167	H3b supported
Perceived autonomy → Consumer upcycling intention	0.000	0.002	H4a rejected
Perceived autonomy → Purchase intention of upcycled products	0.102	1.515	H4b rejected
Social connectedness → Consumer upcycling intention	-0.048	-0.897	H5a rejected
Social connectedness → Purchase intention of upcycled products	**0.177**	**3.223****	H5b supported
Social approval → Consumer upcycling intention	-0.073	-1.592	H6a rejected
Social approval → Purchase intention of upcycled products	-0.052	-1.039	H6b rejected
Emotional attachment → Consumer upcycling intention	0.016	0.394	H7a rejected
Emotional attachment → Purchase intention of upcycled products	**0.099**	**2.430***	H7b supported
Age → Consumer upcycling intention	0.004	1.024	
Age → Purchase intention of upcycled products	**0.016**	**4.257****	
Gender → Consumer upcycling intention	0.103	1.093	
Gender → Purchase intention of upcycled products	**0.369**	**3.868****	
Income → Consumer upcycling intention	-0.012	-0.938	

Income → Purchase intention of upcycled products	0.004	0.285
Education → Consumer upcycling intention	-0.009	-0.940
Education → Purchase intention of upcycled products	0.001	0.078
Past upcycling frequency → Consumer upcycling intention	**0.283**	**12.181****
Past upcycled purchasing experience → Purchase intention of upcycled products	**0.724**	**7.658****
$\chi 2$	(724)1498.806	
CFI	0.985	
TLI	0.983	
RMSEA	0.048	
SRMR	0.069	

Note: * p <= 0.05, ** p <= 0.01.

6. Discussion

This research reveals a significant connection between the consumer's two roles in upcycling, namely creator and buyer. Overall, these two consumer roles are not independent but interrelated. Consumers' prior experience and knowledge about upcycling, derived from their personal experiences as creators, shape their attitudes toward upcycled products as buyers.

Consumer upcycling and purchase of upcycled products, corresponding to these two roles, are influenced by seven internal motivations in different manners, as indicated by the findings. Firstly, of the two internal motivations that relate to sustainable nature of upcycling, waste prevention motivation can act as a driver for both consumer upcycling intention and purchase intention of upcycled products, whereas frugality motivation only increases consumer upcycling intention. The significant impacts of waste prevention motivation and frugality motivation on consumer upcycling intention, corroborate the qualitative findings in consumer upcycling literature (Wilson, 2016; Coppola et al., 2021). Additionally, these results are consistent with

findings in the broader literature of sustainable post-consumption behaviors, specifically avoiding food waste, delaying product replacement, and repairing products (Shi et al., 2022a).

Regarding the role of these two internal motivations in consumers' role transition from creator to buyer, only waste prevention motivation positively influences purchase intention of upcycled products, thereby prompting the role transition. This means that consumers can recognize similar waste prevention benefits from purchase of upcycled products as they do from consumer upcycling. This result is in line with Yu and Lee (2019), who empirically confirmed that perceived green value has a positive significant effect on upcycled product attitude and thus purchase intention. It also aligns with broader pro-environmental behavior research findings in that engagement in one pro-environmental behavior has the potential to catalyze another, particularly when the two behaviors are conceptually linked (Maki et al., 2019). In contrast, frugality motivation does not relate to purchase intention of upcycled products, thus not involving consumers' role transition from creator to buyer. This result is consistent with prior research that demonstrated a negative relationship between consumers' frugality and green purchase intention because the green feature usually indicates premium prices (Wang et al., 2021). Future research should undertake a comprehensive examination of the factors that influence consumers' expectations about pricing of upcycled products.

Second, regarding the four internal motivations associated with the value creation process in upcycling, we found that consumer upcycling intention is only driven by consumers' perceived competence motivation. This finding furthers previous qualitative studies that proposed consumers do upcycling to learn something new or cultivate their creativity (Coppola et al., 2021; Wilson, 2016; Bridgens et al., 2018). It is also consistent with broader literature that identified the need for competence as a key factor motivating consumers' value creation

activities such as co-production in a business context or self-production at home (e.g., DIY, repair) (Etgar, 2008; Watson and Shove, 2008).

However, the other three internal motivations (i.e., perceived autonomy, social connectedness and social approval) do not significantly motivate consumer upcycling intention. These findings differ from prior studies which show that consumers engage in product creation or co-production activities for autonomy or uniqueness (Cherrier, 2007), and that the anti-consumption ethos and creativity in these activities can lead to social interactions (Chatzidakis et al., 2021; Weijo et al., 2018). The current study's finding of insignificance of perceived autonomy motivation could partially be explained by the fact that most consumers lack adequate time and crafting skills to manage their possessions autonomously through upcycling. In addition, the absence of significant effects of social connectedness motivation and social approval motivation on consumer upcycling intention might be partially attributed to the participant pool being exclusively composed of US consumers. Notably, within the US, consumerism remains a dominant paradigm (Wolff, 2020), and consumer upcycling as a form of resistance to consumerism (Coppola et al., 2021; Schmitt et al., 2022) has not emerged as a salient social practice. Hence, future research is needed to be conducted in other countries and cultures to further explore the generalizability of our finding.

Despite its insignificant effect on consumer upcycling intention, we find that social connectedness motivation can positively influence purchase intention of upcycled products, implying that consumers with this motivation are likely to transition from creator to buyer. This finding suggests that, in a society where consumerism is dominant and consumer upcycling is not necessarily socially desirable, purchase of commercialized upcycled products can facilitate people to build connections and be engaged in social community/activity due to the involvement

in value co-creation process and the unique value in upcycled products. This result aligns with prior research emphasizing social functions inherent in co-production activities and brand communities (Haverila et al., 2021). Future research is needed to provide deeper understanding on how the role transition effect under social connectedness motivation occurs without the direct effect on consumer upcycling.

As expected, perceived competence motivation does not influence purchase intention of upcycled products, thus not promoting the role transition from creator to buyer. This result is consistent with previous research which emphasizes the association between consumers' perceived competence and value creation /co-creation process but rarely links this motivation to purchasing behavior (Roberts et al., 2014). Contrary to our expectations, perceived autonomy motivation and social approval motivation do not affect purchase intention of upcycled products, and hence not drive the role transition from creator to buyer, which can be partially attributed to limited prevalence of upcycling businesses. Although upcycling businesses exhibit a growth trajectory, consumers have not been widely exposed to upcycled products, as compared to other pro-environmental products like recycled products (Adıgüzel and Donato, 2021). This scarcity constrains consumers' choices, hence decreasing perceived autonomy. Additionally, given the limited social awareness of this emerging green product category, consumers might face challenge in obtaining social approval through using upcycling products despite their pro-environmental and innovative features. The non-significant social approval motivation is in line with Yu and Lee's research (2019) which did not find a relationship between social value and purchase of upcycled products.

Emotional attachment motivation relating to use of old objects, an indispensable element of upcycling, was found insignificant in motivating consumer upcycling; a finding which differs

from prior qualitative research (Coppola et al., 2021; Shi et al., 2022b). This finding may be explained by consumers' concern about whether their old objects can be successfully upcycled. An unsuccessful attempt to upcycle a beloved old object may worsen its condition. Therefore, consumers may be inclined to hibernate an object of attachment (Haws et al., 2012) instead of upcycling it. If consumers are emotionally attached to an old object, they prefer to preserve its integrity as it is (Graul et al., 2022).

However, emotional attachment motivation can have a positive effect on purchase intention of upcycled products, which indicates that consumes with this motivation are likely to transition from creator to buyer. While Yu and Lee (2019) suggested that emotional value can promote purchase intention towards upcycled products, their conceptualization of emotional value centered around consumers' general positive emotions. In contrast, our findings revealed one specific positive emotion – collective nostalgia; since the emotional attachment motivation of consumer upcycling mirrors consumers' nostalgia proneness (Holbrook and Schindler, 2003) and upcycled products are linked to collective history due to their use of old objects. Although this proneness does not lead consumers to preserve their own nostalgia-evoking old objects through upcycling, potentially attributed to certain barriers (e.g., skills), it does motivate consumers to buy similarly nostalgia-evoking upcycled products, which is consistent with prior studies revealing a positive relationship between consumers' nostalgia proneness and vintage/second-hand consumption (Sarial-Abi et al., 2017). Future research could substantiate the impact of collective nostalgia in purchase of upcycled products and offer a more nuanced view about what kind of old objects in upcycled products can more effectively evoke a sense of collective nostalgia.

At a broader level, our findings suggest another perspective to study consumer upcycling (creator) and purchase of upcycled products (buyer), as the internal goals achieved through consumers' actions involve different entities. Considering its three fundamental elements (i.e., sustainable feature, value creation process, and use of old objects), three main entities – self, others, and objects – could be reflected in upcycling. These three entities align with William James' self-concept theory (1890) which posits that self has constituent aspects of a spiritual (self), social (others) and material (object) nature, and Russell Belk's "extended self" theory (1988) which argues that relationships in consumption revolve around the self, others, and objects. Relating our findings to these three entities, we can infer that consumer upcycling predominantly engages the self, because the motivations of waste prevention, frugality, and perceived competence are all linked to fundamental self-evaluation of one's self-worth and capabilities (Chang et al., 2012). In contrast, purchase of upcycled products involves all three entities, because waste prevention motivation pertains to the self, social connectedness motivation aligns with others, and emotional attachment motivation corresponds to objects. Future research could delve deeper into this perspective.

7. Theoretical implications

This research contributes to extant literature in several ways. First, it provides preliminary findings demonstrating that consumers' two roles (i.e., creator and buyer) in upcycling can be linked and, for the first time, sheds light on how to bridge these different consumer roles. Prior upcycling studies often overlooked the relationship between consumer upcycling and purchase of upcycled products. This oversight may be attributed to the prevailing linear consumption paradigm (i.e., product purchase-use-throw away) where purchase of products initiates consumption and is not influenced by subsequent stages of use and disposal. Departing from this

paradigm, this research reveals that consumers' anticipated benefits from upcycling as creators during the product use stage influence their interest in upcycled products as buyers.

Additionally, identifying the relationship between consumers' different roles (i.e., the role transition effect) in upcycling provides valuable insights for other CE-oriented practices. Consumers can contribute to the CE by adopting behaviors that extend product lifetime, participating in waste management programs, purchasing CE-oriented products or service, promoting CE-oriented practices, and establishing small CE businesses. In these practices, consumers play different roles (e.g., initiator, participant, buyer, user, advocator, and seller). While recent research has begun to recognize the diverse roles consumers can take to participate in the CE (Shevchenko et al., 2023), it mostly presents a typology of these roles without delving into their interrelations. Our findings encourage researchers to go beyond mere categorization of consumer roles in the CE and to explore the connections between these roles. Such an investigation facilitates the development of strategies to promote consumers' multi-role participation in the CE, thereby contributing more widely and profoundly to its advancement.

Second, this research extends the literature on consumer upcycling by quantitatively exploring internal motivations for this behavior. Most studies in this domain rely on qualitative methods to examine various drivers of consumer upcycling, yet they fail to adequately investigate internal motivations (Wilson, 2016; Sung et al., 2019; Coppola et al., 2021). Addressing this void, this research identified potential internal motivations based on extensive literature and then quantified their relationship with consumer upcycling intention, thereby demonstrating the unique effectiveness of each motivation in explaining this behavior. The findings show that three internal motivations of perceived competence, waste prevention, and frugality are significantly related to consumer upcycling intention. Importantly, they indicate that

unlike other morally motivated behaviors, consumer upcycling may not suffer from the attitude-behavior gap (Kollmuss and Agyeman, 2002), as perceived competence – a fundamental human psychological need – shows a stronger relationship with this behavior than the other two personal norms.

Third, this research contributes insights into upcycled product consumption. While several studies have distinguished upcycled products from other green options by emphasizing their perceived specialness and creativity (Kamleitner et al., 2019; Caprioli et al., 2023), questions remain about who the target consumers of these products are. Our research reveals that three motivations for consumer upcycling, i.e., waste prevention, social connectedness, and emotional attachment, are positively related to purchase intention of upcycled products. In other words, consumers who have these three motivations for consumer upcycling are more likely to purchase upcycled products, thus representing a target consumer base for these products. It is worth noting that the latter two motivations do not directly relate to consumer upcycling intention, suggesting that consumers who desire social connectedness or seek products that evoke emotional attachment are more likely to purchase upcycled products rather than engaging in upcycling themselves. Future research could further explore the distinctions between consumers' creator role and buyer role in upcycling.

8. Practical implications

The findings of this research have implications for managers of upcycling businesses and policymakers. First, this research establishes and empirically validates the relationships between three internal motivations – waste prevention, frugality, and perceived competence – and consumer upcycling intention. Since perceived competence has the strongest relationship with this intention, communication messages promoting consumer upcycling could emphasize the

sense of competence derived from this behavior. For instance, advertising campaigns could strategically link consumer upcycling with creativity expression or the development of crafting skills. To facilitate the learning of upcycling knowledge and skills and thus enhance perceived competence from consumer upcycling, policymakers can establish video-sharing and social media platforms to share easy-to-make upcycling projects and provide step-by-step instructions. In addition, educating consumers about the superior benefits of waste prevention over other waste management practices like recycling can be achieved by explaining the waste hierarchy to consumers and providing real data to illustrate how upcycling significantly contributes to waste reduction and resource conservation. Moreover, the finding about frugality suggests that consumer upcycling represents a way to achieve environmental benefits without compromising consumers' economic interests. Hence, frugal consumers represent a promising target segment for upcycling initiatives.

Second, the results regarding purchase of upcycled products have important implications for upcycling businesses. We found that consumers who have motivations of waste prevention, social connectedness, and emotional attachment for consumer upcycling are more willing to purchase upcycled products. These motivations can serve as a basis for psychographic segmentation. In promoting upcycled products, managers could target consumers with these motivations. For instance, they could partner with companies or organizations running waste management programs to introduce upcycled products to their members who may prioritize waste prevention. They could also promote their products in upcycling communities where consumers are more likely to have the motivation of social connectedness. Furthermore, vintage product buyers could be a potential target segment, as they may have greater proneness to form emotional attachments to old items.

From another perspective, these three motivations can be interpreted as benefits consumers expect from upcycled products. Hence, upcycling businesses could provide these benefits or make them salient to consumers. For instance, they could showcase scientific data highlighting the resource conservation and waste reduction achieved through the upcycling production method to demonstrate how purchase of upcycled products aligns with consumers' desire to reduce waste. Considering the positive relationship between social connectedness and purchase intention of upcycled products, these businesses could build their own upcycling communities or organize upcycling workshops. Moreover, upcycling businesses can exploit emotional attachment through storytelling techniques. By crafting emotive narratives around the history of old upcycling materials, they can facilitate emotional connections between consumers and upcycled products.

9. Limitations and future research

This research has several limitations. First, the data for the survey were collected from consumers in the US, so the generalizability of the results beyond this population can be questioned. Consumers with different cultural backgrounds, such as historical/political rooted frugality cultures (e.g., Confucian values of frugality), cultural materialism, or pro-environmental social norms, may have different motivations for consumer upcycling and purchase of upcycled products. Cross-cultural research is recommended in the future to explore the influence of cultural context.

Second, although this research is, to the best of our knowledge, the first quantitative study to connect consumer upcycling behavior to purchase behavior of upcycled products through examining the connection between internal motivations for consumer upcycling and purchase intention of upcycled products, we did not identify the mechanism underlying this connection.

We suspect that consumer upcycling motivations may affect how consumers perceive the value of upcycled products and their attitudes toward them. Future research could further clarify the connection between consumer upcycling and purchase of upcycled products by examining the mediating roles of perceived product value.

Third, our research does not support causal inferences. Although motivation is likely to drive behavior, the behavior in turn may reinforce motivation. These causal or reinforcement effects need to be further investigated using experimental methods. For example, researchers could use certain stimuli to prompt specific motivations and examine their causal effects.

Fourth, due to the limitations of the survey method, our research only measured consumers' self-reported behavioral intentions rather than actual behavior. Future research should employ other methods to investigate how actual consumer upcycling and actual purchase of upcycled products are affected by different motivations.

10. Conclusion

While upcycling is an emerging trend that enables both consumers and businesses to contribute to the circular economy, empirical research on this topic remains limited. In this research, we explore and identify several internal upcycling motivations for consumer upcycling, namely waste prevention, frugality, perceived competence, perceived autonomy, social connectedness, social approval, and emotional attachment, based on existing theories and concepts related to the unique and core features of consumer upcycling as well as previous relevant qualitative findings. By empirically testing their relationships with consumer upcycling intention and purchase intention of upcycled products, we found that perceived competence is the strongest motivation for consumer upcycling intention, followed by waste prevention and frugality. In addition, consumers who have motivations of waste prevention, social

connectedness, and emotional attachment for consumer upcycling are more likely to purchase upcycled products, implying the role transition from creator to buyer. These results significantly contribute to the upcycling literature by deepening our understanding of consumer upcycling and purchase of upcycled products and bridging the consumer roles of creator and buyer in upcycling. Indeed, consumers can assume various other roles in upcycling and the broader circular economy. Future research should investigate the interconnections and synergies among different consumer roles and identify effective strategies to encourage consumers to assume multiple roles in the circular economy, thereby facilitating the social transition toward the circular economy.

Appendix A

Examples of consumer upcycling

Examples of upcycled businesses

Appendix B

Item statements

Constructs	Item statements	Sources
Waste prevention		
WP1	I can help fight against waste by doing upcycling.	Developed in keeping with the definition of waste prevention (Cox et al., 2010) and relevant qualitative findings on consumer upcycling (Coppola et al., 2021)
WP2	Doing upcycling is a good way for me to prevent waste.	
WP3	I can help reduce waste by doing upcycling.	
WP4	Minimizing waste is one of my goals in doing upcycling.	
Frugality		
FR1	Doing upcycling is consistent with my value of spending money carefully.	Adapted from Lastovicka et al., 1999
FR2	Doing upcycling can help me get the most from my money.	
FR3	Doing upcycling can help me use money wisely.	
FR4	Doing upcycling fits with my principle of frugality.	
Perceived competence		
PC1	Doing upcycling can make me feel capable and effective.	Adapted from Beard and Ragheb, 1983.
PC2	I can learn new things when doing upcycling.	
PC3	I can experience satisfaction from taking on interesting challenges when doing upcycling.	
PC4	I can get the feeling of accomplishment from doing upcycling.	
PC5	Doing upcycling is a good way to develop my creativity.	
Perceived autonomy		
PA1	Doing upcycling can make me feel free to be who I am.	Adapted from La Guardia et al., 2000
PA2	I can have a say in what happens and express my opinion by doing upcycling.	
PA3	Doing upcycling can make me feel in control of what I am doing.	
PA4	Doing upcycling can make me feel that I could influence the life of objects.	
Social connectedness		
SC1	I can meet new and different people by engaging in upcycling (e.g., share my upcycling experiences online).	Adapted from Beard and Ragheb, 1983 and Carlson et al., 2008.
SC2	Doing upcycling is a good topic for interacting and socializing with new and different people.	
SC3	I can feel belongingness to an upcycling community (online or offline) by engaging in upcycling.	
SC4	I can obtain a sense of community with others who also do upcycling.	
SC5	I can get connected to a community of people who are interested in upcycling.	
Social approval		
SA1	I can gain others' respect by doing upcycling.	Developed based on Sweeney and Soutar's work (2001)
SA2	Doing upcycling can bring me recognition.	
SA3	I can gain approval from others by doing upcycling.	
SA4	I can impress others with my upcycling projects.	
Emotional attachment		
EA1	By upcycling I can keep old objects that I am emotionally attached to.	Adapted from Sivadas and Venkatesh, 1995.
EA2	By upcycling I can preserve old objects that remind me of my memories and experiences.	
EA3	By upcycling I can retain old objects that I am sentimental about.	

Consumer upcycling intention		
CUI1	Are you willing to do upcycling in the future?	Adapted from Aaker et al., 2010
CUI2	How likely are you to upcycle your unwanted but upcyclable objects in the future?	
CUI3	Will you consider upcycling your unwanted objects in the future?	
Purchase intention of upcycled products		
PIUP1	How likely are you to buy upcycled products?	Adapted from Aaker et al., 2010
PIUP2	How interested are you in buying upcycled products?	
PIUP3	How willing are you to buy upcycled products?	

References

Aaker, J., Vohs, K. D., & Mogilner, C. (2010). Nonprofits are seen as warm and for-profits as competent: Firm stereotypes matter. *Journal of Consumer Research, 37*(2), 224-237.

Adıgüzel, F., & Donato, C. (2021). Proud to be sustainable: Upcycled versus recycled luxury products. *Journal of Business Research, 130*, 137-146.

Aitken, N. M., Pelletier, L. G., & Baxter, D. E. (2016), Doing the difficult stuff: Influence of self-determined motivation toward the environment on transportation proenvironmental behavior. *Ecopsychology*, 8(2), 153-162.

Alreck, P.L., & Settle, R.B. (2004), The Survey Research Handbook , 3rd ed., McGraw-Hill/Irwin, New York, NY.

Anker, T. (2020). Autonomy as license to operate: establishing the internal and external conditions of informed choice in marketing. *Marketing Theory*, *20*(4), 527-545.

Arslan, G. (2018). Psychological maltreatment, social acceptance, social connectedness, and subjective well-being in adolescents. *Journal of Happiness Studies*, *19*, 983-1001.

Aus, R., Moora, H., Vihma, M., Unt, R., Kiisa, M., & Kapur, S. (2021). Designing for circular fashion: integrating upcycling into conventional garment manufacturing processes. *Fashion and Textiles, 8*, 1-18.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*, 74-94.

Balundė, A., Jovarauskaitė, L., & Poškus, M. S. (2020). Exploring adolescents' waste prevention via value-identity-personal norm and comprehensive action determination models. *Journal of Environmental Psychology*, *72*, 101526.

Bardakci, A., & Whitelock, J. (2004). How “ready” are customers for mass customisation? An exploratory investigation. *European Journal of Marketing*, *38*(11/12), 1396-1416.

Beard, J. G., & Ragheb, M. G. (1983). Measuring leisure motivation. *Journal of leisure research*, *15*(3), 219-228.

Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research*, *15*(2), 139-168.

Belk, R. W. (1989). Extended self and extending paradigmatic perspective. *Journal of Consumer Research*, *16*(1), 129-132.

Bridgens, B., Powell, M., Farmer, G., Walsh, C., Reed, E., Royapoor, M., ... & Heidrich, O. (2018). Creative upcycling: Reconnecting people, materials and place through making. *Journal of Cleaner Production*, *189*, 145-154.

Carlson, B. D., Suter, T. A., & Brown, T. J. (2008). Social versus psychological brand community: The role of psychological sense of brand community. *Journal of Business Research*, *61*(4), 284-291.

Carrington, M., Chatzidakis, A., Goworek, H., & Shaw, D. (2021). Consumption ethics: A review and analysis of future directions for interdisciplinary research. *Journal of Business Ethics*, *168*, 215-238.

Chancellor, J., & Lyubomirsky, S. (2011). Happiness and thrift: When (spending) less is (hedonically) more. *Journal of Consumer Psychology*, *21*(2), 131-138.

Chang, C. H., Ferris, D. L., Johnson, R. E., Rosen, C. C., & Tan, J. A. (2012). Core self-evaluations: A review and evaluation of the literature. *Journal of Management*, *38*(1), 81-128.

Chapman, J. (2012), Emotionally durable design: objects, experiences and empathy. Routledge.

Chatzidakis, A., Maclaran, P., & Varman, R. (2021). The regeneration of consumer movement solidarity. *Journal of Consumer Research*, *48*(2), 289-308.

Cherrier, H. (2007). Ethical consumption practices: co-production of self-expression and social recognition. *Journal of Consumer Behaviour: An International Research Review*, *6*(5), 321-335.

Chylinski, M., & Chu, A. (2010). Consumer cynicism: antecedents and consequences. *European Journal of Marketing*, *44*(6), 796-837.

Coppola, C., Vollero, A., & Siano, A. (2021). Consumer upcycling as emancipated self-production: Understanding motivations and identifying upcycler types. *Journal of Cleaner Production*, *285*, 124812.

Cox, J., Giorgi, S., Sharp, V., Strange, K., Wilson, D. C., & Blakey, N. (2010). Household waste prevention—a review of evidence. *Waste Management & Research*, *28*(3), 193-219.

Curasi, C. F., Price, L. L., & Arnould, E. J. (2004). How individuals' cherished possessions become families' inalienable wealth. *Journal of Consumer Research*, *31*(3), 609-622.

Ertz, M., Boily, É., Sun, S., & Sarigöllü, E. (2022). Role transitions at the prosumer level: spillover effects in the collaborative economy from an interactive marketing perspective. *European Journal of Marketing*, *56*(10), 2721-2748.

Etgar, M. (2008). A descriptive model of the consumer co-production process. *Journal of the Academy of Marketing Science*, *36*, 97-108.

Farrow, K., Grolleau, G., & Ibanez, L. (2017). Social norms and pro-environmental behavior: A review of the evidence. *Ecological Economics*, *140*, 1-13.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39-50.

Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. *Journal of Environmental Psychology*, *26*(4), 262-268.

Gilal, F. G., Zhang, J., Paul, J., & Gilal, N. G. (2019). The role of self-determination theory in marketing science: An integrative review and agenda for research. *European Management Journal*, *37*(1), 29-44.

Gilhooly, K. J., Fioratou, E., Anthony, S. H., & Wynn, V. (2007). Divergent thinking: Strategies and executive involvement in generating novel uses for familiar objects. *British Journal of Psychology*, *98*(4), 611-625.

Graul, A. R., Brough, A. R., & Isaac, M. S. (2022). How emotional attachment influences lender participation in consumer-to-consumer rental platforms. *Journal of Business Research*, *139*, 1211-1217.

Grieve, R., Indian, M., Witteveen, K., Tolan, G. A., & Marrington, J. (2013). Face-to-face or Facebook: Can social connectedness be derived online?. *Computers in Human Behavior*, *29*(3), 604-609.

Guillard, V. (2018). Anticonsumption consciousness in pursuit of sustainability. *Journal of Public Policy & Marketing*, *37*(2), 274-290.

Harland, P., Staats, H., & Wilke, H. A. (1999). Explaining proenvironmental intention and behavior by personal norms and the Theory of Planned Behavior 1. *Journal of Applied Social Psychology*, *29*(12), 2505-2528.

Harman, H. H. (1976), *Modern factor analysis,* University of Chicago press.

Haverila, M., McLaughlin, C., Haverila, K. C., & Viskovics, J. (2021). Brand community motives and their impact on brand community engagement: variations between diverse audiences. *Management Decision*, *59*(9), 2286-2308.

Haws, K. L., Naylor, R. W., Coulter, R. A., & Bearden, W. O. (2012). Keeping it all without being buried alive: Understanding product retention tendency. *Journal of Consumer Psychology*, *22*(2), 224-236.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*, 115-135.

Hobson, K., Holmes, H., Welch, D., Wheeler, K., & Wieser, H. (2021). Consumption Work in the circular economy: A research agenda. *Journal of Cleaner Production*, *321*, 128969.

Holbrook, M. B., & Schindler, R. M. (2003). Nostalgic bonding: Exploring the role of nostalgia in the consumption experience. *Journal of Consumer Behaviour: An International Research Review*, *3*(2), 107-127.

James, W. (1890), *The principles of psychology*, London, UK: Macmillan.

Jiménez, F. R., & Voss, K. E. (2014). An alternative approach to the measurement of emotional attachment. *Psychology & Marketing*, *31*(5), 360-370.

Kamleitner, B., Thürridl, C., & Martin, B. A. (2019). A Cinderella story: How past identity salience boosts demand for repurposed products. *Journal of Marketing*, *83*(6), 76-92.

Kapitan, S., Mittal, S., Sundie, J. M., & Beal, D. J. (2021). What a great deal… I need that! Updating need drives frugal consumers' responses to deep discounts. *Journal of Business Research*, *134*, 467-479.

Keith, S., & Silies, M. (2015). New life luxury: Upcycled Scottish heritage textiles. *International Journal of Retail & Distribution Management*, *43*(10/11), 1051-1064.

Knussen, C., Yule, F., MacKenzie, J., & Wells, M. (2004). An analysis of intentions to recycle household waste: The roles of past behaviour, perceived habit, and perceived lack of facilities. *Journal of Environmental Psychology*, *24*(2), 237-246.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?. *Environmental Education Research*, *8*(3), 239-260.

La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: a self-determination theory perspective on attachment, need fulfillment, and well-being. *Journal of Personality and Social Psychology*, *79*(3), 367.

Lang, C., & Zhang, R. (2019). Second-hand clothing acquisition: The motivations and barriers to clothing swaps for Chinese consumers. *Sustainable Production and Consumption*, *18*, 156-164.

Lastovicka, J. L., Bettencourt, L. A., Hughner, R. S., & Kuntze, R. J. (1999). Lifestyle of the tight and frugal: Theory and measurement. *Journal of Consumer Research*, *26*(1), 85-98.

Lee, E. J. (2016). How perceived cognitive needs fulfillment affect consumer attitudes toward the customized product: The moderating role of consumer knowledge. *Computers in Human Behavior*, *64*, 152-162.

Lervik-Olsen, L., Andreassen, T. W., & Fennis, B. M. (2024). When enough is not enough: behavioral and motivational paths to compulsive social media consumption. *European Journal of Marketing*, *58*(2), 519-547.

Maki, A., Carrico, A. R., Raimi, K. T., Truelove, H. B., Araujo, B., & Yeung, K. L. (2019). Meta-analysis of pro-environmental behaviour spillover. *Nature Sustainability, 2*(4), 307-315.

McDonough, W. and Braungart, M., The upcycle: Beyond sustainability— Designing for abundance. Macmillan, UK, 2013.

Moreau, C. P., & Herd, K. B. (2010). To each his own? How comparisons with others influence consumers' evaluations of their self-designed products. *Journal of Consumer Research*, *36*(5), 806-819.

Moreau, C. P., Markman, A. B., & Lehmann, D. R. (2001). "What is it?" Categorization flexibility and consumers' responses to really new products. *Journal of Consumer Research*, *27*(4), 489-498.

Muradian, R. (2019). Frugality as a choice vs. frugality as a social condition. Is de-growth doomed to be a Eurocentric project?. *Ecological Economics*, *161*, 257-260.

Neave, L., Tzemou, E., & Fastoso, F. (2020). Seeking attention versus seeking approval: How conspicuous consumption differs between grandiose and vulnerable narcissists. *Psychology & Marketing*, *37*(3), 418-427.

Newholm, T., & Hopkinson, G. C. (2009). I just tend to wear what I like: contemporary consumption and the paradoxical construction of individuality. *Marketing Theory*, *9*(4), 439-462.

Nikou, S. A., & Economides, A. A. (2017). Mobile-Based Assessment: Integrating acceptance and motivational factors into a combined model of Self-Determination Theory and Technology Acceptance. *Computers in Human Behavior*, *68*, 83-95.

Osbaldiston, R., & Sheldon, K. M. (2003). Promoting internalized motivation for environmentally responsible behavior: A prospective study of environmental goals. *Journal of Environmental Psychology*, *23*(4), 349-357.

Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*, Routledge.

Re, B., & Magnani, G. (2022). Value co-creation in circular entrepreneurship: An exploratory study on born circular SMEs. *Journal of Business Research*, *147*, 189-207.

Reisinger, Y., & Turner, L. (1999). Structural equation modeling with Lisrel: application in tourism. *Tourism Management*, *20*(1), 71-88.

Roberts, D., Hughes, M., & Kertbo, K. (2014). Exploring consumers' motivations to engage in innovation through co-creation activities. *European Journal of Marketing*, *48*(1/2), 147-169.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68.

Sadik-Rozsnyai, O., & Bertrandias, L. (2019). New technological attributes and willingness to pay: the role of social innovativeness. *European Journal of Marketing*, *53*(6), 1099-1124.

Sarial-Abi, G., Vohs, K. D., Hamilton, R., & Ulqinaku, A. (2017). Stitching time: Vintage consumption connects the past, present, and future. *Journal of Consumer Psychology*, *27*(2), 182-194.

Schmitt, B., Brakus, J. J., & Biraglia, A. (2022). Consumption ideology. *Journal of Consumer Research*, *49*(1), 74-95.

Shepard, B. (2012). Play, Creativity, and Social Movements: If I Can’t Dance, It’s Not My Revolution, New York, NY: Routledge.

Shevchenko, T., Saidani, M., Ranjbari, M., Kronenberg, J., Danko, Y., & Laitala, K. (2023). Consumer behavior in the circular economy: Developing a product-centric framework. *Journal of Cleaner Production*, *384*, 135568.

Shi, T., Huang, R., & Sarigöllü, E. (2022a). Consumer product use behavior throughout the product lifespan: A literature review and research agenda. *Journal of Environmental Management*, *302*, 114114.

Shi, T., Huang, R., & Sarigöllü, E. (2022b). A qualitative study on internal motivations and consequences of consumer upcycling. *Journal of Cleaner Production*, *377*, 134185.

Shu, S. B., & Peck, J. (2011). Psychological ownership and affective reaction: Emotional attachment process variables and the endowment effect. *Journal of Consumer Psychology*, *21*(4), 439-452.

Singh, J., Sung, K., Cooper, T., West, K., & Mont, O. (2019). Challenges and opportunities for scaling up upcycling businesses–The case of textile and wood upcycling businesses in the UK. *Resources, Conservation and Recycling*, *150*, 104439.

Sivadas, E., & Venkatesh, R. (1995). An examination of individual and object-specific influences on the extended self and its relation to attachment and satisfaction. *Advances in Consumer Research*, *22*(1).

Snyder, D. G., & Newman, K. P. (2019). Reducing consumer loneliness through brand communities. *Journal of Consumer Marketing*, *36*(2), 337-347.

Sung, K. (2017). Sustainable production and consumption by upcycling: understanding and scaling-up niche environmentally significant behaviour (Doctoral dissertation, Nottingham Trent University).

Sung, K. (2021, October). Evaluating two interventions for scaling up upcycling: Community event and upcycling plaza. In *IOP Conference Series: Materials Science and Engineering* (Vol. 1196, No. 1, p. 012001). IOP Publishing.

Sung, K., Cooper, T., & Kettley, S. (2019). Factors influencing upcycling for UK markers. *Sustainaibility, 11*(3), 870.

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of Retailing, 77*(2), 203-220.

Tian, K. T., Bearden, W. O., & Hunter, G. L. (2001). Consumers' need for uniqueness: Scale development and validation. *Journal of Consumer Research, 28*(1), 50-66.

Türe, M., & Ger, G. (2016). Continuity through change: Navigating temporalities through heirloom rejuvenation. *Journal of Consumer Research, 43*(1), 1-25.

Twenge, J. M., & Im, C. (2007). Changes in the need for social approval, 1958–2001. *Journal of Research in Personality, 41*(1), 171-189.

Wang, H., Ma, B., Bai, R., & Zhang, L. (2021). The unexpected effect of frugality on green purchase intention. *Journal of Retailing and Consumer Services, 59*, 102385.

Warren, C., & Campbell, M. C. (2014). What makes things cool? How autonomy influences perceived coolness. *Journal of Consumer Research, 41*(2), 543-563.

Watson, M., & Shove, E. (2008). Product, competence, project and practice: DIY and the dynamics of craft consumption. *Journal of Consumer Culture, 8*(1), 69-89.

Weijo, H. A., Martin, D. M., & Arnould, E. J. (2018). Consumer movements and collective creativity: The case of restaurant day. *Journal of Consumer Research, 45*(2), 251-274.

Wertenbroch, K., Schrift, R. Y., Alba, J. W., Barasch, A., Bhattacharjee, A., Giesler, M., ... & Zwebner, Y. (2020). Autonomy in consumer choice. *Marketing Letters, 31*, 429-439.

Wildschut, T., Bruder, M., Robertson, S., van Tilburg, W. A., & Sedikides, C. (2014). Collective nostalgia: A group-level emotion that confers unique benefits on the group. *Journal of Personality and Social Psychology*, *107*(5), 844.

Wilson, M. (2016). When creative consumers go green: Understanding consumer upcycling. *Journal of Product & Brand Management*, *25*(4), 394-399.

Wolff, R. D. (2020). Ideological state apparatuses, consumerism, and US capitalism: Lessons for the left. In Rethinking Marxism (pp. 223-235). Routledge.

Ye, J., Yao, Y., & Li, L. (2022). The more involved, the more willing to participate: An analysis of the internal mechanism of positive spillover effects of pro-environmental behaviors. *Journal of Cleaner Production*, *375*, 133959.

Yu, S., & Lee, J. (2019). The effects of consumers' perceived values on intention to purchase upcycled products. *Sustainability*, *11*(4), 1034.

Zorpas, A. A., & Lasaridi, K. (2013). Measuring waste prevention. *Waste Management*, *33*(5), 1047-1056.

The Bridge Between Essay 3 and Essay 4

In Essay 3, I conducted a quantitative study to examine consumer upcycling, a specific circular-economy-oriented behavior. Specifically, I proposed seven internal motivations (i.e., waste prevention, frugality, perceived competence, perceived autonomy, social connectedness, social approval, and emotional attachment) for consumer upcycling and used the survey method to explore how these motivations relate to consumer upcycling. Results showed that perceived competence is the strongest motivation for consumer upcycling, followed by waste prevention and frugality. Additionally, I investigated how the seven internal motivations relate to consumers' willingness to buy upcycled products that were made from reclaimed materials and thus contributing to the circular economy. Results showed that consumers who are motivated by waste prevention, social connectedness, and emotional attachment to do upcycling are more inclined to buy upcycled products. These results enhance the understanding of consumer upcycling with quantitative evidence.

Essay 4 links to Essay 3 in the sense that both essays explore factors influencing consumer evaluation of upcycled products, but from different perspectives. In Essay 3, I examined how the purchase of upcycled products is associated with internal motivations for consumer upcycling. These internal motivations represent consumer characteristics. While in Essay 4, I investigate how consumer evaluation of upcycled products is impacted by the visual discernibility of their past identity (i.e., product category of source objects) in appearance (called "visual past identity discernibility" in Essay 3). This factor relates to the visual design of upcycled products and hence serves as a product attribute.

CHAPTER 5 – ESSAY 4

THE EFFECT OF VISUAL PAST IDENTITY DISCERNIBILITY ON EVALUATION OF UPCYCLED PRODUCTS

Abstract

An upcycled product can have visual elements evoking consumers' associations with two entirely different product categories reflecting its original (source) and new (transformed) identity. This visual product design deviates from the conventional norm where visual elements of a single product are typically designed to convey only one product category. Does this atypical design increase the appeal of products? Six experiments in this essay demonstrate that the design of displaying two (vs. one) product categories in the appearance of a single product can lead to less positive product evaluation. This is because such design increases consumers' perceived intrusiveness and thus decreases their perceived product usefulness. Results also show generalizability of these effects to new products. This research enriches the understanding of both upcycled product consumption and product design. Managerial implications and suggestions for future research are provided.

1. Introduction

One of the most efficient strategies to deal with the issues of resource scarcity and waste generation is circular economy (CE), which refers to a system in which the value of materials is preserved as long as possible (Korhonen et al., 2018). Upcycling, as an approach to transform or repurpose discarded objects into products of equal or higher value than their original form, has been recognized as an important CE practice (Bridgens et al., 2018). Unlike recycling, upcycling does not involve the degradation of old objects into raw materials; instead, it concerns the reuse of old objects through craftmanship for different purposes. For instance, a discarded cabinet can be upcycled into a sofa; used jeans can be upcycled into backpacks. With the commercialization of this practice by individuals or enterprises, upcycled products emerge as a new type of sustainable product in the market. The number of companies producing upcycled products has been increasing over the past decade. For instance, according to the fashionunited.com website[2], in the Netherlands, the number of upcycling companies has grown from seven in 2013 to about one hundred and forty in 2023. Globally, a growing number of small upcycling businesses are being established on e-commerce platforms such as Etsy.com. A search for upcycled products on Etsy yields over 600,000 results in the United States alone. In addition, some well-established enterprises, such as Patagonia and Adidas, are incorporating upcycled products into their collections. The growth of these upcycling businesses is important because these businesses can catalyze the shift towards a circular pattern on both the supply and demand sides. On the supply side, upcycling businesses play a significant role in slowing or closing material cycles in

[2] https://fashionunited.uk/news/background/making-something-new-from-something-existing-is-in-this-is-upcycling/2024010873425

production (e.g., upcycle leftover or deadstock products into new products) (Ellen MacArthur Foundation 2013; Long and Gui, 2023). While on the demand side, upcycling businesses can educate, remind, and motivate consumers to adopt a circular consumption pattern through marketing of upcycled products and promotion of the upcycling concept (Bridgens et al., 2018; Singh et al., 2019). Considering the significance of upcycling businesses and upcycled products for the CE and the environment, the current research aims to examine factors influencing consumers' evaluation of upcycled products.

As stated above, upcycling involves the transformation from an object into something different without degradation. Hence, creating an upcycled product is basically redesigning an object functionally and visually, to transform it from an old past identity (i.e., product category of source object) to a new present identity (i.e., product category of resulting upcycled product). In practice, the redesign encompasses two parts: processing (including removal, retention, and modification) of old functional and visual elements from source objects, and creation of new functional and visual features for upcycled products (Bridgens et al., 2018). Despite the critical role of product design in the production of upcycled products, there is a lack of understanding about how product design impacts evaluation of these products. The current research contributes to this understanding by examining an important, but largely unexplored, visual aspect of upcycled product design (Caprioli et al., 2023).

Specifically, we examine the visual design regarding past identity of upcycled products by focusing on a key attribute: the degree to which past identity of upcycled products can be visually discerned from product appearance, termed as "visual past identity discernibility". In some upcycled products, visual past identity discernibility is relatively high, which means these products are designed to display both past and present identities in appearance. For instance, in

an upcycled side table made from a discarded suitcase (see figure 1), both the past identity (suitcase) and present identity (side table) are clearly displayed in appearance. While in other upcycled products, visual past identity discernibility is low, which means these products are designed to only display present identity in appearance, just like conventional counterparts. Managers could maneuver along a continuum of the visual past identity discernibility (i.e., from high to low) while producing upcycled products. Does the degree of visual past identity discernibility impact consumer evaluation of upcycled products? If so, how does this attribute influence consumer evaluation of these products? What mechanism works underlying the differential impact of visual past identity discernibility on consumer evaluation? These questions are yet to be explored. The current research is aimed to address them.

Figure 1 An upcycled side table made from a discarded suitcase.

Across five experiments with diverse products, we demonstrate that high visual past identity discernibility can decrease consumer evaluation of upcycled products because it induces perceived intrusiveness, which in turn decreases consumers' perceived usefulness of these products, thereby negatively impacting product attitude, purchase intention, and willingness to pay. Notably, these effects are also observed in new products, suggesting that higher perceived intrusiveness, lower perceived usefulness, and more negative product evaluation are consumers'

general reactions to a product displaying two product categories in appearance, not limited to the upcycled product category.

This research makes important contributions to the growing literature on CE-oriented consumption and upcycled products. First, we enrich the research about CE-oriented consumption by examining consumer evaluation of upcycled products. Upcycled products are made from reclaimed materials. Hence, consumers' wider adoption of these products can benefit resource circulation and contribute to the CE. Second, we identify a new factor, namely visual past identity discernibility, influencing consumer evaluation of upcycled products. Past identity has been investigated in previous research (Kamleitner et al., 2019; Adıgüzel and Donato, 2021; Kim et al., 2022; Caprioli et al., 2023), which acts as detailed information about source objects of upcycled products but not relates to visual product design. In contrast, we relate past identity to visual product design by exploring the visual form in which past identity can be discerned from product appearance. Results show that high visual discernibility of past identity can negatively impact consumer evaluation of upcycled products. Third, we examine the usefulness aspect of upcycled products, which is under-explored but largely determines consumers' acceptance of these products. Results show that perceived usefulness of upcycled products can be negatively influenced when consumers can visually discern past identity from product appearance.

This research also contributes to the literature on product design. First, we provide a novel perspective about the relationship between two critical dimensions of product design – product aesthetics and product function – by demonstrating the negative effect of visual past identity discernibility (an aesthetic attribute) on perceived product usefulness (a functional attribute). Second, we identify a new form of atypical product design, i.e., the design of high visual past

identity discernibility, and reveal a new mechanism underlying the effect of atypical product design on product evaluation, i.e., perceived intrusiveness. Third, this research contributes to the understanding of how consumers' knowledge about product categories plays a role in their perceptions about visual product design. We show that this knowledge can prevent consumers from favoring the visual design which associates a single product with different product categories.

Additionally, the current research provides an insightful understanding and guidance for managers to design and promote upcycled products as well as new products. For upcycled product designers, when they upcycle old objects into products belonging to different product categories, it is better to conceal past identity in product appearance through craft techniques. Similarly, for new product designers, it may not be wise to use visual elements of different product categories in a single product. If the design of high visual past/dual identity discernibility is inevitable or deemed necessary, managers can emphasize product usefulness through marketing strategies to mitigate the decreased perceived product usefulness due to such design.

2. Theoretical background

2.1 Upcycled products and visual past identity discernibility

Upcycled products are produced through transforming old or discarded materials into something useful and often beautiful (Yu and Lee, 2019). Although they share the objective of reusing old resources and curtailing waste generation with recycled and second-hand products (Wilson, 2016), upcycled products have distinctive environmental advantages. Compared to recycled products, upcycled products are more resource efficient because their production avoids material degradation, thus requiring less input of additional resources such as water and energy (Bridgens et al., 2018). Compared to second-hand products, upcycled products have higher

flexibility in resource reuse. They can be created through repurposing or transforming old, broken, or discarded items (Singh et al., 2019), whereas second-hand products are usually limited to those in good condition or of relatively high quality (Sihvonen and Turunen, 2016).

In addition to these distinctive environmental advantages, some upcycled products can have distinctive appearance. Of note, such appearance is usually not the result of designers' artistic expression, as is often the case with new products. Instead, it relates to how designers process visual elements related to past identity of upcycled products. If visual elements that can evoke the association with past identity are retained, the resulting upcycled products would display both past and present identities in appearance, thereby making product appearance distinctive. We characterize this design in which past identity of an upcycled product can be easily discerned from its appearance as high visual past identity discernibility. In contrast, if visual elements that can evoke the association with past identity are removed or modified, upcycled products would only display present identity in appearance. This design is characterized by low visual past identity discernibility. Since visual product design determines consumers' initial impression of products (Jia et al., 2014), different degrees of visual past identity discernibility may significantly influence consumer evaluation of upcycled products. However, it is still an open question whether upcycled products with higher visual past identity discernibility or those with lower visual past identity discernibility are more attractive to consumers.

Several research on upcycled products seems to imply consumers' preference for upcycled products with high visual past identity discernibility because past identity of upcycled products is considered an attractive attribute from the consumer perspective. For instance, Kamleitner et al. (2019) found that, a salient past identity in upcycled products can prompt consumers' narrative thinking, thus increasing perceived specialness of these products and consequently enhancing

product evaluation. This positive effect is more prominent if upcycled products are produced by luxury brands (Hemonnet-Goujot et al., 2022). Additionally, Caprioli et al. (2023) showed that a past identity of an upcycled product, which is different from (vs. same as) its present identity, can bring the experience of an aha! moment, thereby enhancing perceived product creativity. All these studies suggested that consumers hold positive perceptions about past identity of upcycled products. However, in these studies, past identity serves as conceptual-level information, because in their experiments, it was communicated to participants mainly through text messages. There is no visual cue about past identity in product appearance. Hence, the scenario where past identity manifests as a visual attribute in product appearance (i.e., high visual past identity discernibility) has never been considered in prior research. Moreover, the positive perceptions about conceptual past identity identified in prior research may not necessarily translate to positive perceptions about visual past identity. There are two reasons. First, consumers may engage in distinct cognitive process when evaluating visual past identity in upcycled products compared to evaluating their conceptual past identity, given that humans process conceptual and perceptual information differently (Lindsay and Norman, 2013). Second, consumers may form perceptions about visual past identity before conceptual past identity, because humans tend to process perceptual information before conceptual information (Pashko, 2016). Therefore, the investigation of visual past identity in upcycled products can provide a new and important understanding of upcycled product consumption.

Another pertinent research area is product design research which has investigated several forms of atypical visual design, such as atypical shape, atypical color, atypical typeface, and futuristic/retro design style (Berkowitz, 1987; Garber et al., 2000; Mugge and Schoormans, 2012; Goode et al., 2013; Dam et al., 2024). But the atypical form of high visual past identity

discernibility, the focus of the current research, has not been investigated. Moreover, regarding the effect of atypical visual product design on product preference, a definitive conclusion is lacking. Some argued that consumers prefer typical products (Veryzer Jr et al., 1998), while others argued that consumers prefer moderately atypical products than typical or extremely atypical products (Celhay and Trinquecoste, 2015). But the threshold between moderately and extremely atypicality is ambiguous, which means we cannot decide whether the design of high visual past identity discernibility is moderately or extremely atypical. Consequently, consumers' preference for this design cannot be inferred based on its atypicality. Collectively, understanding the consumer response to high visual past identity discernibility needs further exploration. And this understanding can enrich our knowledge of product design.

Before elaborating on the effect of visual past identity discernibility on product evaluation, we would like to discuss the operationalization of this construct. In the current research, visual past identity discernibility was operationalized via the retainment (high) or removal (low) of typical and salient visual elements that can easily evoke consumers' associations with past identity of upcycled products. Typicality of visual elements ensures recognizability of past identity (category of source objects). Consumers recognize product category based on product category schema in mind. This schema refers to consumers' prior knowledge about product attributes, especially typical visual attributes, associated with each product category (Lautman, 1991). With this schema, consumers can infer a product category based solely on partial typical visual attributes, even in the absence of the entire product. While salience of visual elements ensures noticeability of past identity, which means the elements can be detected without the observer intending to do so. If typical visual elements were difficult to be noticed, for instance being located at the bottom of products, they may not capture the observer's attention to prompt

a response. In the example of an upcycled side table in Figure 1, the reason that the handle and two locks in the front side can easily evoke consumers' association with past identity, a suitcase, is high typicality of these elements for the suitcase category and their salient locations in the side table. As a result, the visual past identity discernibility of the upcycled side table is high. If these elements are removed, visual past identity discernibility would be low. Although the size or quantity of visual elements may also lead to different levels of visual past identity discernibility, the granular level investigation is beyond the scope of our research.

In addition to the retainment of typical and salient visual elements, high visual past identity discernibility in upcycled products needs two other conditions: 1) consumers' relatively high familiarity with past and present identity, and 2) disparity between past and present identity. Regarding the first condition, if past and/or present identity is not familiar to consumers, past identity may not be easily discerned with consumers' product category schema. Regarding the second condition, if past and present identity cannot be easily differentiated (e.g., upcycling a useless jam jar into a cookie jar), past identity may not be easily discerned either. We didn't manipulate these two conditions to operationalize visual past identity discernibility so as not to induce confounding effects of product categories. Instead, we consistently selected upcycled products with familiar and easily distinguishable past and present identity.

2.2 Visually discernible past identity as a source of perceived intrusiveness

How does visual past identity discernibility influence consumers' perception about upcycled products? We propose that high (vs. low) visual past identity discernibility in upcycled products can lead to consumers' higher perceived intrusiveness – that is, if consumers can more easily discern past identity from upcycled product appearance, they will perceive higher intrusiveness. Perceived intrusiveness is a psychological reaction to objects that interfere with people's

cognitive processing of focal tasks (Li et al., 2002). To understand why high visual past identity discernibility in upcycled products causes this perception, we first examine the mechanism behind individuals' perceived intrusiveness about visual objects.

Visual objects are perceived intrusive when they have three attributes: high visual salience, low semantic compatibility, and low personal relevance. High visual salience means that an object has noticeable visual properties (e.g., bright color). Low semantic compatibility indicates that the meaning of a visual object does not match its context. And low personal relevance means that a visual object is not relevant for the individual. Either diminishing visual salience or increasing semantic compatibility or personal relevance can mitigate the perception of intrusiveness. Importantly, these three attributes have been corroborated by studies in different research streams. According to advertising research, advertisements become intrusive when they have feature such as large size (high visual salience), low alignment between ad content and ad context (low semantic compatibility), and mismatch between ad content and individual's personal consumption goals (low personal relevance) (Li et al., 2002; Freeman et al., 2022; de Groot, 2022). According to psychological research, visual noise (e.g., black dots within text) becomes intrusive when they have feature such as high density or high dynamic level (high visual salience), along with its inherent meaningless and irrelevant nature (low semantic compatibility and low personal relevance) (Munsinger and Gummerman, 1967; Chubala et al., 2018; Gao et al., 2011). According to landscape research, large and spatially close (high visual salience) industrial constructions located in natural landscapes, such as motorways, wind turbines, are often perceived intrusive by viewers (Jiang and Kang, 2017). This perception arises also because of natural semantic disparity between artificial and natural categories (low semantic compatibility) and viewers' instructed focus on natural landscapes rather than industrial

constructions in research settings (low personal relevance) (Jiang and Kang, 2017; Carver et al., 2012; Rosch, 1975).

Taken together, research on different types of intrusive visual objects has provided solid evidence supporting the three attributes—namely, high visual salience, low semantic compatibility, and low personal relevance—that contribute to perceived intrusiveness of a visual object. In the current research, we contend that high visual past identity discernibility in upcycled products can cause perceived intrusiveness because, in this condition, visual elements indicating past identity possess all three aforementioned attributes that lead to perceived intrusiveness.

The first attribute, high visual salience, is the direct outcome of high visual past identity discernibility. Literally, high visual discernibility implies high visual salience. Hence, high visual past identity discernibility conceptually reflects the attribute of high visual salience of visual elements indicating past identity. In addition, high visual salience is also reflected in the way we manipulate high visual past identity discernibility – retaining typical and salient visual elements indicating past identity. Due to the typicality and salience of these visual elements, they can easily attract consumers' attention and activate their product category schema in mind almost automatically (Fiske 1982), and thus are hardly neglected.

The second attribute, low semantic compatibility, is due to consumers' "single category belief". This belief refers to consumers' tendency to categorize one product into a single category stored in their product category schema (Rajagopal and Burnkrant, 2009). It implies that, oftentimes, only elements belonging to the same product category are deemed semantically compatible in a single product (Campbell and Goodstein, 2001). This is particularly true for visual elements because consumers mainly rely on visual elements such as shape, color, texture, to identify product categories (Murphy and Smith 1982; Tversky and Hemenway, 1984).

However, the single category belief can be challenged in the upcycled product context. When an upcycled product exhibits high visual past identity discernibility, it means a single product has visual elements belonging to two different product categories (i.e., past identity and present identity). According to the single category belief, the visual elements indicating past identity would not be deemed semantically compatible with those indicating present identity. Sometimes, elements associated with different product categories can become compatible in a single product if consumers build a new category for this product. This situation often occurs in hybrid or multi-functional products (El Amri, 2019). However, in upcycled products, building new categories are rarely the case. For one thing, the selection of upcycling materials (i.e., past identity) is highly flexible (Bridgens et al., 2018), preventing the creation of limited number of new categories. For the other, past identity of upcycled products hardly adds any new function to their present identity, which makes the creation of new categories less meaningful.

The third attribute, low personal relevance, can be explained by two reasons. First, visual elements indicating past identity are weakly related to consumers from the functional perspective. Due to the functional change in upcycling, visual elements indicating past identity of upcycled products are usually not useful for main functions of present identity. Hence, from the functional perspective, consumers would perceive these visual elements irrelevant. Second, visual elements indicating past identity are weakly related to consumers from the emotional perspective. Most upcycled products are made from old objects which have been previously owned and used by others. Research suggests that old products with traces of previous ownership can reduce consumers' perceived emotional connection with the products because these traces remind consumers that the products are previously owned by others (Kim, 2017; Zhao et al., 2023). Visual elements indicating past identity in upcycled products serve as traces reminding

consumers of others' use history, thus reducing consumers' perceived emotional connection with them.

In short, high visual past identity discernibility is prone to cause higher perceived intrusiveness because in this condition, visual elements indicating past identity of upcycled products exhibit high visual salience, low semantic compatibility, and low personal relevance. Whereas in the low visual past identity discernibility condition, these elements are not salient, which further makes their low semantic compatibility and low personal relevance not obvious. Hence, perceived intrusiveness is lower.

2.3 Effect of perceived intrusiveness on perceived usefulness

According to prior research, perceived intrusiveness about a visual object can result in individuals' overall negative attitudes toward the object or the entire context with the object (Ha, 1996; Li et al., 2002). For instance, if individuals perceive an advertisement on a website as intrusive, they are likely to develop negative attitudes towards both the advertisement and the website itself (Youn and Kim, 2019; Luna Cortés and Royo, 2013). Or if individuals perceive industrial constructions in natural landscapes as intrusive, the overall landscape quality will be perceived low (Jiang and Kang, 2016). Accordingly, we infer that perceived intrusiveness about upcycled products can negatively affect consumers' overall product evaluation. Further, we propose that perceived product usefulness mediates this effect. Specifically, perceived intrusiveness reduces perceived usefulness of upcycled products and in turn impacts consumer evaluation of these products negatively, which is to be elaborated in the following sections.

The negative effect of perceived intrusiveness on perceived usefulness of upcycled products occurs through two routes: diminished attention towards these products and expectation of more limited product usage scenarios. Diminished attention arises from consumers' cognitive

avoidance reaction towards intrusive upcycled products. Prior research has shown that when encountering intrusive visual objects, individuals tend to avoid them cognitively, often by paying less attention to them (Iyadurai et al., 2019; Huo et al., 2021; Çelik et al., 2023). For instance, intrusive visual noise in text results in individuals' less attention to the text, subsequently leading to lower recall of the text (Vasques et al., 2016). Similarly, intrusive advertisements lead to reduced consumer attention to the advertisements and thus lower recall of the brands or products mentioned in them (Ha, 1996; Youn and Kim, 2019; Schmidt and Maier, 2022). In this vein, perceived intrusiveness about upcycled products is expected to result in consumers' less attention to upcycled products. Attention denotes the amount of mental effort or cognitive capacity allocated to an object (MacKenzie, 1986). Consumers' diminished attention towards upcycled products implies that they do not use sufficient cognitive capability to process product information. However, understanding the usage of upcycled products requires consumers' elaborative thinking regarding the alternative use of their past identities, which is a cognitively demanding process (Mumford et al., 2013; Zhang and Markman, 2001; Celsi and Olson, 1988) because of consumers' ingrained association of a product with its initial usage. As the elaborative thinking about product information is prevented by diminished attention towards upcycled products, consumers' understanding of upcycled product usage is lacking. Consequently, upcycled product usefulness is perceived lower (Bhattacherjee and Sanford, 2006; Hagerty and Aaker, 1984). In contrast, in low visual past identity discernibility condition, consumers' attention and cognitive processing of upcycled products are not negatively affected because perceived intrusiveness is low. Hence, upcycled product usefulness is perceived relatively higher.

The second route, expectation of more limited product usage scenarios, arises from individuals' behavioral avoidance reaction towards intrusive upcycled products. Prior research has suggested that when encountering intrusive visual objects, in addition to cognitive avoidance, individuals also tend to avoid them behaviorally, i.e., physically distancing themselves from the objects. For instance, advertising intrusiveness can lead consumers to bypass or skip the advertising content, use ad-blocking tools to prevent exposure, or avoid revisiting the websites displaying the advertisements (Shavitt et al., 2004; Goldstein et al. 2014; Çelik et al., 2023). Such behavioral avoidance can also occur for intrusive upcycled products, reflected in consumers' tendency to avoid using these products if these products are perceived intrusive in potential usage scenarios. As product usage scenarios typically align with present identity of upcycled products and do not match with their past identity, in many of these usage scenarios, perceived intrusiveness stemming from past identity may persist. As a result, consumers would expect that suitable usage scenarios for intrusive upcycled products are limited, which leads to low perceived usefulness of these products (MacInnis and Price, 1987; Sarkar and Chakrabarti, 2011). For instance, imagine an upcycled mirror made from a tennis racket. The handle of the tennis racket is retained and makes the past identity of tennis racket visually discernible. On the basis of prior reasoning that high visual past identity discernibility leads to higher perceived intrusiveness, consumers would perceive intrusive about the mirror. This perception would not be mitigated in many mirror usage scenarios such as bedroom, bathroom, dining room, because these scenarios typically do not match the tennis racket. Then consumers would find the usage scenarios for the mirror are limited and thus perceive the mirror is not that useful. In contrast, in low visual past identity discernibility condition, upcycled products have relative high versatility like their conventional counterparts. Hence, perceived usefulness is relatively higher. Taken

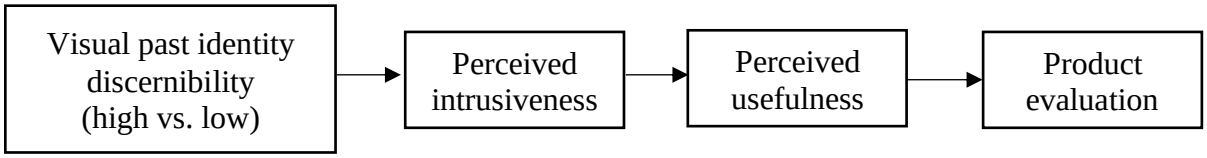
together, we contend that perceived intrusiveness resulting from high visual past identity discernibility in upcycled products can reduce perceived usefulness of these products.

2.4 Role of perceived usefulness in product evaluation

Perceived usefulness can impact product evaluation in a positive way, which is particularly true for sustainable and innovative products. Regarding sustainable products, such as recycled, second-hand products (Kim et al., 2021; De Guimarães et al., 2021), perceived usefulness has been found to significantly and positively influence product evaluation. This feature is even prioritized over the sustainable feature (Luchs and Kumar, 2017), which means many consumers are not willing to compromise on usefulness in favor of sustainability. Regarding innovative products, numerous empirical studies have shown that perceived usefulness also contributes to consumers' positive product attitudes (Szymanski et al., 2007; Li et al., 2015; Hasan et al., 2019; Xu, 2020). This finding was further corroborated by King and He's (2006) meta-analysis. Since upcycled products have been regarded as a type of sustainable and relatively innovative products (Bridgens et al., 2018), higher perceived usefulness of upcycled products is expected to contribute to more positive product evaluation.

In summary, we propose high visual past identity discernibility of upcycled products leads to consumers' high perceived intrusiveness about these products. This perception, in turn, decreases consumers' assessments of product usefulness, and consequently impacts product evaluation negatively.

Figure 2: Theoretical framework



3. Overview of experiments

We test our hypotheses across five experiments. Experiment 1A and 1B provide support for the main effect: high (vs. low) visual past identity discernibility negatively impacts upcycled product evaluation (purchase intention). Experiment 2 explores the mechanism underlying the main effect: high (vs. low) visual past identity discernibility leads to higher perceived intrusiveness and thus lower perceived product usefulness, which further negatively impacts upcycled product evaluation (purchase intention, product attitude). Experiments 3a and 3b lend further support to the main effect and the proposed mechanism by using products in fashion industry. Experiment 4 generalizes our findings to the new product category. In addition to seeking support for our proposed mechanism regarding perceived intrusiveness and usefulness, we explore potential alternative processes including perceived cleanness (Experiment 1B), conceptual fluency (Experiment 2), and perceptual fluency (Experiment 2) in our experiments.

Experiment 1A & 1B: Main effect

Experiment 1A and 1B were aimed to examine the main effect of visual past identity discernibility on upcycled product evaluation with two different product stimuli. We predict that high visual past identity discernibility decreases upcycled product evaluation.

4. Experiment 1A

4.1 Method

Design and Participants. The first experiment used a one-factor (visual past identity discernibility: high vs. low) between-subjects design, with random assignment. Eighty-five US-

based participants were recruited from Amazon Mechanical Turk (MTurk) (M_{age} = 40.45, SD = 11.25; 54.1% female) for this online experiment.

Procedure and Stimuli. After reading an introductory page, participants were presented a brief text description about an upcycled wall clock. Specifically, they were provided information regarding the definition of upcycled products ("Upcycled products are the result of converting old or used objects or materials into something useful and often beautiful"), a fictious brand name, and the materials from which the upcycled wall clock was made (i.e., its past identity): a used cast iron pan. Below the description, a product image was presented, which was used to manipulate visual past identity discernibility (high vs. low). Adobe Photoshop was used to create the image of the upcycled wall clock for each condition, making it vary in the degree of visual past identity discernibility while maintaining uniformity in other aspects (figure 3). In the high visual past identity discernibility condition, the entire shape of the pan was kept, which makes the cast iron pan identity visually discernible. Whereas in the low visual past identity discernibility condition, the two handles and lips of the pan were cut, which led to a smooth, round clock face, resembling the appearance of a conventional wall clock.

Figure 3 Stimuli of Experiment 1A

High visual past identity discernibility

Low visual past identity discernibility

Measures. After viewing the product information, participants indicated purchase intention ("How likely are you to buy this wall clock?", "How probable are you to buy this wall clock?", "Is there any chance that you will buy this wall clock?", 1 = "not at all likely/not at all probable/not a chance at all", and 7 = "very likely/very probable/very good chance"; α = .97; Tezer and Bodur, 2020). As a manipulation check, all participants were asked to rate the visual past identity discernibility ("Without any product information, I instantly know what this wall clock was made out of", "My guests would instantly know what this wall clock was made out of if I showed it to them", "This wall clock clearly shows what it was made out of", 1 = "strongly disagree", 7 = "strongly agree"; α = .98; Kamleitner et al., 2019). Before reporting the demographics, participants answered one question about the upcycling material ("please write down what this wall clock was made out of"), which was used as an attention check. Participants who didn't provide answers related to the cast iron pan were excluded. Finally, participants reported their demographics.

4.2 Results and discussion

Attention Check. After removing participants who failed the attention check, we had a sample of 79 participants (M_{age} = 40.3, SD = 10.93; 53.2% female) for the analyses.

Manipulation Check. We first examined our manipulation of visual past identity discernibility and found that participants in the high visual past identity discernibility condition can more easily discern the past identity (i.e., cast iron pan) from the appearance of the upcycled wall clock than those in the low discernibility condition (M_{high} = 5.89, SD = 1.04; M_{low} = 2.40, SD = 1.33, F (1, 77) = 169.23, p < .001, η_p^2 = .687), suggesting a successful manipulation.

Main Result. A one-way analysis of variance (ANOVA) with visual past identity discernibility (high vs. low) as the independent variable and purchase intention as the dependent variable was conducted, revealing that participants had lower purchase intention for the upcycled wall clock in the high visual past identity discernibility condition (M_{high} = 3.24, SD = 1.80; M_{low} = 4.05, SD = 1.80, F (1, 77) = 4.068, p = .047, η_p^2 = .050) than those in the low discernibility condition. Thus, supporting our proposition, Experiment 1A demonstrated that, when the past identity of an upcycled product is more (vs. less) visually discernible, participants have lower purchase intention for it.

Discussion. Although participants were informed about the past identity of the upcycled product in both visual past identity discernibility conditions, it is likely that the visual elements indicating past identity in product appearance serve as a salient cue to make consumers associate the product with old materials, which decreases perceived cleanness of products (Meng and Leary, 2021). Therefore, in Experiment 1B, in addition to replicating the main effect with a different stimulus, we tested a potential alternative process based on perceived cleanness.

5. Experiment 1B

5.1 Method

Design and Participants. Same as Experiment 1A, Experiment 1B used a one-factor (visual past identity discernibility: high vs. low) between-subjects design, with random assignment. Two hundred and two US-based participants from MTurk (M_{age} = 41.3, SD = 11.48; 64.9%female) completed this experiment.

Procedure and Stimuli. All participants read a brief text description of an upcycled wall shelf made from an old skateboard and viewed an image of it below the description. In the

description, information about the definition of upcycled products, a fictious brand name, and the materials from which the upcycled wall shelf was made: an old skateboard, was included. The two images of the upcycled wall shelf were created with Adobe Photoshop to manipulate visual past identity discernibility. In the high visual past identity discernibility condition, the upcycled wall shelf had the two elevated ends of the skateboard, a typical visual feature indicating the skateboard identity. In the low visual past identity discernibility condition, the upcycled wall shelf didn't have the two ends and looked similar to a regular wall shelf (see figure 4).

Figure 4. Stimuli of Experiment 1B

High visual past identity discernibility

Low visual past identity discernibility

Measures. After viewing the product introduction, participants reported their purchase intention as in experiment 1A. Perceived cleanness, as an alternative explanation, was measured with a single item ("To what extent do you think this wall shelf is clean?"; Meng and Leary, 2021). Other questions including manipulation check, attention check, and demographic variables were consistent with those in experiment 1A.

5.2 Results and discussion

Attention Check. Participants who failed the attention check were excluded from the data, leaving a sample of 179 participants (M_{age} = 41.2, SD = 11.27; 65.4%female) for the analyses.

Manipulation Check. The manipulation of visual past identity discernibility was successful. Participants in the high visual past identity discernibility condition were more able to discern the past identity (i.e., skateboard) from the appearance of the upcycled wall shelf than those in the low discernibility condition (M_{high} = 5.33, SD = 1.60; M_{low} = 2.24, SD = 1.46, F (1, 177) = 182.881, $p < .001$, $\eta_p^2 = .508$).

Main Result. A one-way ANOVA with the visual past identity discernibility (high vs. low) as the independent variable and purchase intention as the dependent variable revealed a significant main effect. Participants had lower purchase intention for the upcycled wall shelf (M_{high} = 3.18, SD = 1.69; M_{low} = 3.78, SD = 1.87, F (1, 177) = 5.031, p = .026, $\eta_p^2 = .028$) in the high visual past identity discernibility, than those in the low discernibility condition.

Alternative Explanation. A one-way ANOVA on perceived cleanness revealed that visual past identity discernibility did not significantly alter participants' perceived cleanness of the upcycled wall shelf (M_{high} = 5.39, SD = 1.28; M_{low} = 5.57, SD = 1.51, F (1, 177) = .693, p = .406, $\eta_p^2 = .004$). This result suggests that perceived cleanness could not explain the difference in upcycled product evaluation caused by visual past identity discernibility.

Discussion. In sum, Experiments 1A and 1B both provided preliminary evidence supporting the negative effect of high (vs. low) visual past identity discernibility on purchase intention of upcycled products. Experiment 1B further showed that this effect could not be explained by the difference in perceived cleanness.

6. Experiment 2: Mediation effect of perceived intrusiveness and perceived usefulness

Experiment 2 was designed with three objectives in mind. First, the main effect of visual past identity discernibility on upcycled product evaluation was expected to be replicated. Second, we more deeply explored how the visual past identity discernibility influences upcycled product evaluation through examining the underlying mechanism: perceived intrusiveness and perceived usefulness. Specifically, we expect that high (vs. low) visual past identity discernibility leads to higher perceived intrusiveness and thus lower perceived usefulness of these products, which further decreases upcycled product evaluation. Third, we incorporated product attitude as an additional dependent variable to capture consumer evaluation of upcycled products on a different aspect. Fourth, we sought to address two additional potential alternative explanations for our proposed effect of visual past identity discernibility on upcycled product evaluation: conceptual fluency and perceptual fluency. Conceptual fluency refers to the ease with which the semantic meaning of an object can be comprehended, which can be negatively impacted by the inclusion of attributes not aligning with consumers' prior product schema in mind (Lee and Labroo, 2004). Perceptual fluency refers to the ease with which the physical properties of an object can be processed, which can be negatively impacted by unfamiliar perceptual features in an object (Jacoby and Dallas, 1981). As high visual past identity discernibility in upcycled products means incorporating visual elements that do not match consumers' prior knowledge about present identity of these products and thus serves as an unfamiliar perceptual feature, this feature may lead to low conceptual fluency or low visual fluency, thereby negatively influencing product evaluation. Thus, we also measured these two constructs and examined their potential underlying roles in the effect of visual past identity discernibility on upcycled product evaluation.

6.1 Method

Design and Participants. As in previous experiments, this experiment used a one-factor (visual past identity discernibility: high vs. low) between-subjects design, with random assignment. Two hundred and forty-nine US-based participants were recruited from MTurk (M_{age} = 39.8, SD = 12.18; 68.3% female).

Procedure and Stimuli. All participants were instructed to read a brief text description of an upcycled bathroom tissue holder made from a discarded fire extinguisher. The definition of upcycled products, a fictious brand name, and the materials from which the bathroom tissue holder was made (i.e., its past identity): a discarded fire extinguisher, were included in the description. Below the description, an image of the upcycled bathroom tissue holder was presented. In the high visual past identity discernibility condition, participants viewed a product image in which the entire shape of the fire extinguisher was preserved in the upcycled bathroom tissue holder. In the low visual past identity discernibility condition, participants viewed a product image in which the upper portion including the operating levers and the pressure gauge (typical visual features of the fire extinguisher identity) were absent (see Figure 5).

Figure 5 Stimuli of Experiment 2

High visual past identity discernibility

Low visual past identity discernibility

Measures. After the product introduction, we measured product evaluation by asking participants to indicate their purchase intention as well as product attitude ("To what extent do you think this upcycled bathroom tissue holder is appealing?" "To what extent do you have positive feelings regarding this upcycled bathroom tissue holder?" "To what extent do you like this upcycled bathroom tissue holder" $\alpha = .97$). Afterwards, participants completed the measures of our theorized mechanisms: perceived intrusiveness and perceived usefulness: perceived intrusiveness was measured with three items adapted from Li et al. (2002) ("When you see this upcycled bathroom tissue holder, to what extent do you feel it is bothersome/distracting/disturbing?" 1 = "not at all", 7 = "very", $\alpha = .85$); perceived usefulness was measured with three items adapted from Dahl and Moreau (2002) ("To what extent do you think this upcycled bathroom tissue holder is effective/practical/useful?" 1 = "not at all", 7 = "very", $\alpha = .90$). Additionally, the variables representing the two alternative explanations were measured: conceptual fluency was measured with four items adapted from Luffarelli et al. (2019) ("To what extent do you think something seems weird about this upcycled bathroom tissue holder (reversed code)?" "For you, to what extent is the association with a fire extinguisher fitting for this upcycled bathroom tissue holder?" "For you, to what extent is the association with a fire extinguisher a good match for this upcycled bathroom tissue holder" "For you, how easy is it to associate an upcycled bathroom tissue holder with a fire extinguisher?" 1 = "not at all", 7 = "very", $\alpha = .86$); perceptual fluency was measured with four items adapted from Philipp-Muller et al. (2023) ("For you, to what extent is the visual appearance of this upcycled bathroom tissue holder easy to interpret/fluent to view/difficult to view/easy to express?" 1 = "very difficult"/ "not fluent at all", 7 = "very easy"/ "very fluent", $\alpha = .78$). Finally, the manipulation check and attention check were conducted and demographic variables were collected.

6.2 Results and discussion

Attention Check. After removing participants who failed the attention check, we had a sample of 237 participants (*M* age = 40.19, SD = 12.26; 70% female) for the analyses.

Manipulation Check. A one-way ANOVA revealed that participants in the high visual past identity discernibility condition found it easier to discern the past identity (fire extinguisher) from the appearance of the upcycled bathroom tissue holder than those in the low discernibility condition (M_{high} = 6.33, SD = 1.21; M_{low} = 4.15, SD = 1.93, F (1, 235) = 108.944, $p < .001$, η_p^2 = .317), confirming the effectiveness of the manipulation of visual past identity discernibility.

Main results. In line with previous results, a one-way multivariate analysis of variance (MANOVA) revealed that participants in the high visual past identity discernibility condition had lower purchase intention (M_{high} = 2.51, SD = 1.81; M_{low} = 2.99, SD = 1.95, F (1, 235) = 3.920, p = .049, η_p^2 = .016) and less positive attitudes toward the upcycled bathroom tissue holder (M_{high} = 3.21, SD = 2.16; M_{low} = 3.80, SD = 2.10, F (1, 235) = 4.535, p = .034, η_p^2 = .019), than those in the low discernibility condition.

In terms of the two variables associated with the mechanism, a one-way MANOVA revealed that participants in the high visual past identity discernibility condition had higher perceived intrusiveness (M_{high} = 2.79, SD = 1.72; M_{low} = 2.30, SD = 1.56, F (1, 235) = 5.196, p = .024, η_p^2 = .022) and lower perceived usefulness (M_{high} = 4.50, SD = 1.69; M_{low} = 5.09, SD = 1.56, F (1, 235) = 7.833, p = .006, η_p^2 = .032) compared to those in the low discernibility condition.

Mediation. To test the underlying roles of perceived intrusiveness and perceived usefulness in the effect of visual past identity discernibility on product evaluation indicated by

purchase intention and product attitude, we performed two separate bootstrapping-based sequential mediation analyses (PROCESS model 6; 5,000 bootstrap samples; Hayes 2017) for purchase intention and product attitude, respectively. Results showed that there was an overall significant sequential mediation for the "visual past identity discernibility → perceived intrusiveness → perceived usefulness → purchase intention" effect (b = -.09, SE = .05; 95% CI: -.19, -.01). High (vs. low) visual past identity discernibility of upcycled products led to higher perceived intrusiveness (b = .49, SE = .21, t = 2.28, p = .024), which in turn decreased perceived usefulness (b = -.41, SE = .06, t = -6.95, p < .001), which subsequently decreased purchase intention (b = .46, SE = .07, t = 6.65, p < .001). The same sequential mediation effect ("visual past identity discernibility → perceived intrusiveness → perceived usefulness → product attitude") was observed when the dependent variable was product attitude (b = -.12, SE = .06; 95% CI: -.24, -.02).

Alternative Explanations. Regarding the two potential alternative explanations, a one-way MANOVA revealed that there was no significant effect on neither conceptual fluency (M_{high} = 3.44, SD = 1.78; M_{low} = 3.72, SD = 1.77, F (1, 235) = 1.502, p = .222, η_p^2 = .006) nor perceptual fluency (M_{high} = 5.40, SD = 2.08; M_{low} = 5.09, SD = 1.85, F (1, 235) = 1.546, p = .215, η_p^2 = .007). These results ruled out the conceptual fluency and perceptual fluency as alternative explanations.

Discussion. Overall, Experiment 2 replicated the main effect of visual past identity discernibility on product evaluation with a different product stimulus and further tested the underlying mechanism. Specifically, this experiment demonstrated that when the past identity of an upcycled product is more (vs. less) visually discernible, participants perceived higher intrusiveness, which caused lower perceived product usefulness and consequently lower

purchase intention and less positive product attitudes. This experiment further showed that the difference in visual past identity discernibility did not result in significant difference in conceptual fluency and perceptual fluency, which hence ruled out these two potential alternative explanations.

Experiment 3A & 3B: Replicate the main effect and mediation effect in fashion industry

Experiment 3A and 3B sought to generalize the findings of Experiment 2 in a different sector, fashion industry. In previous experiments, furniture and homeware products were used as experimental stimuli. These products were selected due to the widespread adoption of the upcycling practice in furniture and homeware industry. Fashion industry is another sector where the upcycling practice is prevalent, because, in this industry, substantial volumes of waste is generated annually while a considerable portion of the waste remains in good condition, making it suitable for upcycling. To check the generalizability of our findings in fashion industry, we employed two types of bags (i.e., messenger bag, backpack) as the experimental stimuli in these two experiments.

7. Experiment 3A

7.1 Method

Design and Participants. As in previous experiments, this experiment used a one-factor (visual past identity discernibility: high vs. low) between-subjects design, with random assignment. Three hundred and six US-based participants were recruited from MTurk (M_{age} = 38.2, SD = 10.67; 64.1% female).

Procedure and Stimuli. Similar to previous experiments, all participants were provided with a text description of an upcycled messenger bag made from old jeans, along with an image of the product. The past identity, jeans, was clearly stated in the description. Visual past identity discernibility was manipulated through product image created with Adobe Photoshop. In the high visual past identity discernibility condition, several typical visual features of jeans were retained, including the pockets and the waistband adorned with a belt loop. These features are expected to help participants identify the jeans identity from the appearance of the upcycled messenger bag. In the low visual past identity discernibility condition, those typical features were removed, thus preventing consumers from associating the upcycled messenger bag with jeans based on appearance (see Figure 6).

Figure 6 Stimuli of Experiment 3A

High visual past identity discernibility

Low visual past identity discernibility

Measures. After the product introduction, purchase intention, product attitude, perceived intrusiveness, perceived usefulness, manipulation check, attention check, and demographic variables were measured the same way as in Experiment 2.

7.2 Results and discussion

Attention Check. We excluded 31 participants who failed to pass the attention check, resulting in a final sample of 276 participants (M_{age} = 38.5, SD = 10.88; 64.9% female).

Manipulation Check. The visual past identity discernibility was successfully manipulated. Compared to participants in the low visual past identity discernibility condition, those in the high discernibility condition can more easily discern the past identity, jeans, from the appearance of the upcycled messenger bag (M_{high} = 6.43, SD = 1.03; M_{low} = 5.64, SD = 1.38, F (1, 274) = 29.858, $p < .001$, $\eta_p^2 = .098$).

Main results. A one-way MANOVA revealed that participants in the high visual past identity discernibility condition have lower purchase intention (M_{high} = 3.01, SD = 1.86; M_{low} = 3.54, SD = 1.79, F (1, 274) = 5.700, $p = .018$, $\eta_p^2 = .020$) and less positive product attitudes (M_{high} = 3.51, SD = 1.88; M_{low} = 4.15, SD = 1.74, F (1, 274) = 8.534, $p = .004$, $\eta_p^2 = .030$) toward the upcycled messenger bag than those in the low discernibility condition.

Regarding the two process variables, a one-way MANOVA revealed that participants in the high visual past identity discernibility condition have higher perceived intrusiveness (M_{high} = 2.85, SD = 1.87; M_{low} = 2.25, SD = 1.52, F (1, 274) = 8.700, $p = .003$, $\eta_p^2 = .031$) and lower perceived usefulness (M_{high} = 4.89, SD = 1.33; M_{low} = 5.32, SD = 1.31, F (1, 274) = 7.102, $p = .008$, $\eta_p^2 = .025$) of the upcycled messenger bag than those in the low discernibility condition.

Mediation. To test the underlying roles of perceived intrusiveness and perceived usefulness, we performed two separate bootstrapping-based sequential mediation analyses (PROCESS model 6; 5,000 bootstrap samples; Hayes 2017) for purchase intention and product attitude, respectively. Results showed that there was an overall significant sequential mediation

for the "visual past identity discernibility → perceived intrusiveness → perceived usefulness → purchase intention" effect (b = -.11, SE = .04; 95% CI: -.20, -.04). High (vs. low) visual past identity discernibility of upcycled products led to higher perceived intrusiveness (b = .61, SE = .21, t = 2.95, p = .004), which in turn decreased perceived usefulness (b = -.29, SE = .04, t = -6.68, p < .001), which subsequently decreased purchase intention (b = .63, SE = .08, t = 8.15, p < .001). The same sequential mediation effect ("visual past identity discernibility → perceived intrusiveness → perceived usefulness → product attitude") was observed when the dependent variable was product attitude (b = -.13, SE = .05; 95% CI: -.24, -.04).

Discussion. Experiment 3A generalized the negative effect of high visual past identity discernibility on the upcycled product evaluation and the underlying mechanism of perceived intrusiveness and perceived usefulness to the fashion industry. Experiment 3B aimed to extend Experiment 3A by adding a different dependent variable, willingness to pay.

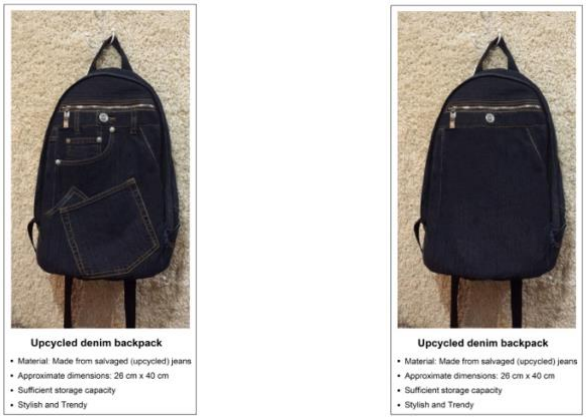
8. Experiment 3B

8.1 Method

Design and Participants. As in previous experiments, this experiment used a one-factor (visual past identity discernibility: high vs. low) between-subjects design, with random assignment. Two hundred and forty-nine US-based participants were recruited from MTurk (M_{age} = 40.3, SD = 11.90; 63.9% female).

Procedure and Stimuli. All participants were provided with a product description of an upcycled backpack made from old jeans. The way we manipulated visual past identity discernibility with the product image is similar to that used in Experiment 3A (see Figure 7).

Figure 7 Stimuli of Experiment 3B



High visual past identity discernibility

Low visual past identity discernibility

Measures. After the product introduction, participants were asked to indicate their purchase intention, product attitude, and willingness to pay ("For a backpack with comparable materials and product size, you can expect to pay between $10 and $200 at most U.S. stores. What is the maximum amount you would pay for this upcycled backpack?"). The measures for the two process variables, namely, perceived intrusiveness and perceived usefulness, as well as the manipulation check, attention check, and demographic variables were the same as in Experiment 2 and Experiment 3A.

8.2 Results and discussion

Attention Check. After excluding participants who failed to pass the attention check, we had 231 valid responses (M_{age} = 40.8, SD = 11.95; 64.1% female) for the analyses.

Manipulation Check. The manipulation of visual past identity discernibility was successful. Participants in the high visual past identity discernibility condition found it easier to discern the past identity, jeans, from the appearance of the upcycled backpack than those in the

low discernibility condition (M_{high} = 6.18, SD = 1.17; M_{low} = 4.66, SD = 1.79, F (1, 229) = 58.305, p < .001, η_p^2 = .203).

Main Results. A one-way MANOVA on the dependent variables revealed that participants in the high visual past identity discernibility condition had lower purchase intention (M_{high} = 3.40, SD = 1.98; M_{low} = 3.86, SD = 1.71, F (1, 229) = 3.473, p = .064, η_p^2 = .015), less positive product attitudes (M_{high} = 4.06, SD = 2.05; M_{low} = 4.60, SD = 1.62, F (1, 229) = 4.890, p = .028, η_p^2 = .021), and lower willingness to pay (M_{high} = 24.20, SD = 14.63; M_{low} = 28.47, SD = 16.28, F (1, 229) = 4.395, p = .037, η_p^2 = .019) for the upcycled backpack than those in the low discernibility condition.

Additionally, a one-way MANOVA on the process variables revealed that participants in the high visual past identity discernibility condition had higher perceived intrusiveness (M_{high} = 2.19, SD = 1.65; M_{low} = 1.64, SD = 1.12, F (1, 229) = 8.694, p = .004, η_p^2 = .037) and lower perceived usefulness (M_{high} = 4.99, SD = 1.55; M_{low} = 5.37, SD = 1.26, F (1, 229) = 4.171, p = .042, η_p^2 = .018) about the upcycled backpack than those in the low discernibility condition.

Mediation. Regarding the underlying roles of perceived intrusiveness and perceived usefulness, the mediation analyses revealed a significant indirect effect of visual past identity discernibility → perceived intrusiveness → perceived usefulness → purchase intention (b = -.06, SE = .03; 95% CI: -.13, -.02), which was consistent with previous studies. High (vs. low) visual past identity discernibility of upcycled products led to higher perceived intrusiveness (b = .55, SE = .19, t = 2.95, p = .004), which in turn decreased perceived usefulness (b = -.22, SE = .06, t = -3.36, p < .001), which subsequently decreased purchase intention (b = .53, SE = .08, t = 6.98, p < .001). The same sequential mediation effect was observed when the dependent variable was

product attitude (*b* = -.08, SE = .04; 95% CI: -.16, -.02) or willingness to pay (*b* = -.30, SE = .15; 95% CI: -.67, -.07).

Discussion. In sum, both Experiment 3A and Experiment 3B replicated the findings of Experiment 2 in a different industry sector, fashion industry. Specifically, these experiments demonstrated that, for upcycled fashion products such as upcycled bag, high visual past identity discernibility can cause higher perceived intrusiveness and thus lower perceived usefulness, thereby decreasing consumer evaluation of upcycled products. Moreover, Experiment 3B confirmed the robustness of these findings by incorporating willingness to pay as the indicator of product evaluation. In the last experiment, we explored whether the findings could be generalized to the new product category.

9. Experiment 4: Generalization to new product category

Previous experiments provided convergent evidence that high visual past identity discernibility can negatively impact the evaluation of upcycled products through increasing perceived intrusiveness and thus decreasing perceived product usefulness. Although varying degrees of visual past identity discernibility are typically observed in upcycled products, new product manufacturers may employ a similar design strategy that emulate high visual past identity discernibility, potentially aiming to enhance product uniqueness. For instance, Marc Jacobs, a renowned US fashion brand, introduced the brand new "Deconstructed Denim Tote bag" in which consumers can discern a jeans identity from the bag based on typical visual elements of jeans. In Experiment 4, we aimed to generalize our findings to the new product category by incorporating a new product condition. We propose that, if consumers can discern two product identities from a new product, they will also perceive higher intrusiveness and lower product usefulness, thus evaluating the new product less positively.

9.1 Method

Design and Participants. This experiment used a 2 (visual dual identity discernibility: high vs. low) × 2 (product type: upcycled product vs. new product) between-subjects design, with random assignment. "Dual identity" is used here because "past identity" is not applicable for new products. Four hundred and fifty US-based participants were recruited from MTurk (M_{age} = 40.5, SD = 12.57; 63.1% female).

Procedure and Stimuli. All participants were provided with a text description of a mirror and its image. Visual dual identity discernibility was manipulated through product image. In the high visual dual identity discernibility condition, the entire shape of the tennis racket was retained. In the low visual dual identity discernibility condition, the handle of the tennis racket was cut, thus making the mirror look like a conventional one (see figure 8). Product type was manipulated with statement in product description. Participants in the upcycled product condition were told that the mirror "was made from an old tennis racket". In the new product condition, participants were told that the mirror "is designed to look like a tennis racket" (high visual dual identity discernibility condition) or the mirror "is designed to look like the head of a tennis racket" (low visual dual identity discernibility condition).

Figure 8 Stimuli of Experiment 4

High visual past identity discernibility

Low visual past identity discernibility

Measures. After the product introduction, consistent with previous experiments, participants were asked to indicate their purchase intention, product attitude, willingness to pay, perceived intrusiveness, and perceived usefulness. Finally, the manipulation check, and the attention check were conducted, and the demographic information was collected.

9.2 Results and discussion

Attention Check. Fifty-three participants were excluded for failing the attention check, resulting in a sample of 397 participants (M_{age} = 40.5, SD = 12.42; 62.0% female).

Manipulation Check. The visual dual identity discernibility was successfully manipulated. Participants in the high visual dual identity discernibility condition found it easier to discern the tennis racket identity from the appearance of the mirror than those in the low discernibility condition (M_{high} = 5.54, SD = 1.44; M_{low} = 3.69, SD = 1.78, F (1, 395) = 129.787, p < .001, η_p^2 = .247).

Main results. A two-way MANOVA on purchase intention (F (1, 393) = .097, p = .756, η_p^2 = .000), product attitude (F (1, 393) = .402, p = .527, η_p^2 = .001), and willingness to pay (F (1,

393) = .060, p = .807, η_p^2 = .000) didn't reveal any interaction effect between visual dual identity discernibility and product type. However, the main effects of visual dual identity discernibility on the three dependent variables are all significant. High (vs. low) dual identity discernibility generally led to lower purchase intention (M_{high} = 2.38, SD = 1.68; M_{low} = 3.31, SD = 1.66; F (1, 393) = 31.058, p < .001, η_p^2 = .073), less positive product attitudes (M_{high} = 3.21, SD = 1.90; M_{low} = 3.85, SD = 1.73; F (1, 393) = 12.292, p < .001, η_p^2 = .030), and lower willingness to pay (M_{high} = 23.57, SD = 17.05; M_{low} = 28.92, SD = 16.34; F (1, 393) = 10.424, p = .001, η_p^2 = .026). Additionally, the main effects of product type on the three dependent variables are also significant. Participants generally have higher purchase intention ($M_{upcycled}$ = 3.10, SD = 1.79; M_{new} = 2.58, SD = 1.63; F (1, 393) = 9.415, p = .002, η_p^2 = .023), more positive product attitudes ($M_{upcycled}$ = 3.91, SD = 1.79; M_{new} = 3.14, SD = 1.82; F (1, 393) = 17.801, p < .001, η_p^2 = .043), but lower willingness to pay ($M_{upcycled}$ = 24.56, SD = 15.35; M_{new} = 27.90, SD = 18.20; F (1, 393) = 4.177, p = .042, η_p^2 = .011) for the upcycled mirror than for the new mirror. Contrast analyses revealed that, among participants in the upcycled product condition, those in the high visual dual identity discernibility condition had lower purchase intention (M_{high} = 2.66, SD = 1.73; M_{low} = 3.54, SD = 1.76, F (1, 393) = 13.880, p < .001, η_p^2 = .034), less positive product attitude (M_{high} = 3.65, SD = 1.88; M_{low} = 4.16, SD = 1.66, F (1, 393) = 4.136, p = .043, η_p^2 = .010), and lower willingness to pay (M_{high} = 22.05, SD = 14.43; M_{low} = 25.06, SD = 19.24, F (1, 393) = 4.465, p = .035, η_p^2 = .011). Similarly, among participants in the new product condition, those in the high visual dual identity discernibility condition had lower purchase intention (M_{high} = 2.10, SD = 1.59; M_{low} = 3.08, SD = 1.52, F (1, 393) = 17.266, p < .001, η_p^2 = .042), less positive product attitude (M_{high} = 2.78, SD = 1.83; M_{low} = 3.52, SD = 1.75, F (1,

393) = 8.546, p = .004, η_p^2 = .021), and lower willingness to pay (M_{high} = 25.06, SD = 19.24; M_{low} = 30.87, SD = 16.64, F (1, 393) = 6.015, p = .015, η_p^2 = .015)

Likewise, a two-way MANOVA on the two process variables, perceived intrusiveness (F (1, 393) = .097, p = .756, η_p^2 = .000) and perceived usefulness (F (1, 393) = 2.036, p = .154, η_p^2 = .005), didn't reveal any interaction effect between visual dual identity discernibility and product type. However, there are significant main effects of visual dual identity discernibility on the two variables. High (vs. low) visual dual identity discernibility generally led to higher perceived intrusiveness (M_{high} = 2.15, SD = 1.33; M_{low} = 1.71, SD = 1.13; F (1, 393) = 12.405, p < .001, η_p^2 = .031) and lower perceived usefulness (M_{high} = 4.08, SD = 1.61; M_{low} = 5.39, SD = 1.36; F (1, 393) = 78.122, p < .001, η_p^2 = .166). There was also a significant main effect of product type on perceived usefulness (F (1, 393) = 8.666, p = .003, η_p^2 = .022) but not perceived intrusiveness (F (1, 393) = 1.141, p = .286, η_p^2 = .003). Participants perceived higher usefulness for upcycled products than for new products ($M_{upcycled}$ = 4.96, SD = 1.54; M_{new} = 4.50, SD = 1.69). Contrast analyses revealed that, among participants in the upcycled product condition, those in the high visual dual identity discernibility condition had higher perceived intrusiveness (M_{high} = 2.10, SD = 1.42; M_{low} = 1.63, SD = .89, F (1, 393) = 7.367, p = .007, η_p^2 = .018) and lower perceived usefulness (M_{high} = 4.40, SD = 1.61; M_{low} = 5.50, SD = 1.24, F (1, 393) = 27.542, p < .001, η_p^2 = .065). Similarly, among participants in the new product condition, those in the high visual dual identity discernibility condition had higher perceived intrusiveness (M_{high} = 2.20, SD = 1.24; M_{low} = 1.80, SD = 1.33, F (1, 393) = 5.141, p = .024, η_p^2 = .013) and lower perceived usefulness (M_{high} = 3.76, SD = 1.55; M_{low} = 5.28, SD = 1.48, F (1, 393) = 52.549, p < .001, η_p^2 = .118).

Mediation. To test whether perceived intrusiveness and perceived usefulness mediated the effect of visual dual identity discernibility on product evaluation in both upcycled and new product conditions, we performed sequential mediation analyses for the two product types respectively. In the upcycled product condition, consistent with previous experiments, there was a significant indirect effect of visual dual identity discernibility → perceived intrusiveness → perceived usefulness → purchase intention (b = -.17, SE = 0.07; 95% CI: -.31, -.05). High (vs. low) visual dual past identity discernibility of upcycled products led to higher perceived intrusiveness (b = .47, SE = .17, t = 2.83, p = .005), which in turn decreased perceived usefulness (b = -.56, SE = .08, t = -7.22, p < .001), which subsequently decreased purchase intention (b = .64, SE = .08, t = 7.73, p < .001). The same indirect effect can be observed in product attitude (b = -.18, SE = .07; 95% CI: -.33, -.05) and willingness to pay (b = -1.03, SE = .42; 95% CI: -1.96, -.30). In the new product condition, we observed the same indirect effect in purchase intention (b = -.06, SE = .03; 95% CI: -.14, -.004), product attitude (b = -.08, SE = .04; 95% CI: -.18, -.006), and willingness to pay (b = -.38, SE = .25; 95% CI: -1.00, -.02).

Discussion. Overall, Experiment 4 replicated the findings of the previous experiments with a different stimulus and generalized these findings to the new product category. Specifically, Experiment 4 demonstrated that, for both upcycled and new products, if consumers can visually discern two product identities from the appearance of a single product, they will perceive higher intrusiveness and lower product usefulness, thus evaluating the product more negatively.

10. General discussion

Across four experiments involving a variety of products, we explored the impact of a visual attribute of upcycled products, namely, visual past identity discernibility, on consumer evaluation of these products. We found that when consumers can more easily discern past

identity from appearance of upcycled products, they will have less positive evaluation of these products (Experiments 1-4) compared to upcycled products with low visual past identity discernibility. We also propose and find evidence in support of a mechanism: high visual past identity discernibility in upcycled products can increase perceived intrusiveness, which in turn decreases perceived product usefulness, and thus negatively impacts consumer evaluation of these products (Experiments 2-4). It is worth noting that the effect of visual past identity discernibility on the evaluation of upcycled products could not be explained by potential alternative explanations including perceived cleanness, conceptual fluency, and perceptual fluency. We found that different degrees of visual past identity discernibility did not significantly alter consumers' perceptions of cleanness (Experiment 1B), conceptual fluency (Experiment 2), and perceptual fluency (Experiment 2) about upcycled products. Moreover, in Experiment 4, we examined whether our findings could be replicated in the new product category. This examination is attributed to the market trend of the unique design which integrates visual elements from different product categories into appearance of a single product. We discovered that when a new product exhibiting two categories in its appearance, similar to an upcycled product with high visual past identity discernibility, it is also perceived more intrusive, less useful, and thus less positively evaluated by consumers. This means, in the context of upcycled products, the negative impact of high visual past identity discernibility does not result from consumers' negative perceptions about past identity of upcycled products, but from the visual form of high visual past identity discernibility.

11. Theoretical implications

This research contributes to the growing body of literature on upcycled products and to the extant literature on product design. With regard to the upcycled product literature, this research makes contributions in three ways.

First, we demonstrate a novel factor influencing consumer evaluation of upcycled products. Prior studies have shown that past identity is an important attribute in upcycled products because it has the potential to increase consumers' interest in these products through inducing narrative thoughts and enhancing perceived creativity (Caprioli et al., 2023; Kamleitner et al., 2019). In these studies, past identity of upcycled products is conveyed to their participants conceptually through marketing messages (e.g., "I (an upcycled table) was made from an old pallet"), but cannot be visually discerned from product appearance. Essentially, past identity in these studies represents a non-perceptual attribute of source objects of upcycled products. In contrast, in the current research, we investigate visual past identity discernibility, which, although related to source objects, is more of a perceptual attribute of upcycled product design. Since this visual aspect of past identity has never been studied but plays a crucial role in forming consumers' initial impression of upcycled products, the investigation of visual past identity discernibility contributes to the understanding of upcycled product consumption.

Second, we pay attention to the under-explored perceived usefulness of upcycled products. The existing studies on upcycled products has predominantly focused on the aspect of originality (e.g., specialness) (Caprioli et al., 2023; Kamleitner et al., 2019). However, for innovative products like upcycled products, originality and usefulness both play crucial roles in influencing consumers' acceptance (Moldovan et al., 2011). Originality can increase consumers' intention to adopt innovative products only when a certain level of product usefulness is achieved (Li et al.,

2015). Hence, understanding factors influencing perceived usefulness of upcycled products is important. This research adds to this understanding by revealing a visual attribute that influences perceived usefulness of upcycled products.

Third, more broadly, this research responds to calls for consumption in the CE context. Despite extensive research on sustainable consumption or green consumption, motivating consumers to participate in CE-oriented consumption behavior is still in its infancy stage (Shevchenko et al., 2023). Upcycled products are created with old materials. The widespread acceptance of these products can significantly contribute to the reduced consumption of raw materials and waste generation, thus facilitating the move to the circular economy. This research investigates consumers' acceptance of upcycled products by showing that, while upcycled products are pro-environmentally friendly due to their upcycling production method, the atypical product appearance emerging from this production method can adversely impact consumers' acceptance of these products.

With regard to the product design literature, this research makes contributions in three ways. First, this research responds to the call for empirical research on the relationships among product aesthetics, product function, and consumer response (Townsend et al., 2011). In prior research, product aesthetics and product function, as two basic dimensions of product design, are typically examined separately regarding their impacts on product or brand evaluation (Biliciler et al., 2022; Page and Herr, 2002; Veryzer and Hutchinson, 1998). Only a few studies empirically associate these two dimensions by exploring the boundaries of their relationships (Hagtvedt et al., 2014; Schnurr et al., 2017) or their interactive effects on marketing outcomes (Jindal et al., 2016). However, in these studies, product aesthetics is consumers' holistic perceptions of product appearance. In contrast, the current research focuses on a specific and clearly defined

visual feature, namely visual past/dual identity discernibility, and demonstrates its negative effect on product function (indicated by perceived product usefulness) and consumer evaluation of products. This extends the knowledge of the intricate relationships among product aesthetics, product function, and consumer response.

Second, this research contributes to research on design typicality. Atypical product design is a common practice used by producers to make their products stand out in the market (Desai and Ratneshwar, 2003). Despite its potential for differentiation, atypical product design has been found to cause several negative evaluations of products, such as lower perceived functionality and reduced aesthetic appeal (Landwehr et al., 2013; Schnurr, 2017). In contrast to these research where the form of atypical design was randomly selected, the current research investigated a clearly defined form of atypical design: high visual past/dual identity discernibility. We found that this atypical form has a negative impact on perceived product usefulness and consequently on overall product evaluation, which is consistent with previous research on atypical product design. Additionally, regarding the mechanism underlying the negative effect of atypical product design on product evaluation, prior research primarily concentrated on processing fluency (Landwehr et al., 2013; Pleyers, 2021). While the current research revealed a new mechanism, namely perceived intrusiveness, to explain the negative effect of atypical product design on product evaluation. Given that this mechanism has never been studied in product design literature, it constitutes a novel insight in this research domain.

Third, this research provides a new perspective on the relationship between product category schema and consumer perceptions about visual product design. Previous research has indicated that product category schema can help consumers efficiently process visual product design and infer product information (e.g., product benefits), when the design corresponds with

those stored in the schema (Meyers-Levy and Tybout, 1989; Kreuzbauer and Malter, 2005). In contrast, if a visual product design fails to evoke any schema, consumers' processing of visual product design and associated product information may become less fluent and efficient (Moreau et al., 2001). In the current research, we studied a new scenario involving product category schema and consumer perceptions about visual product design. Specifically, we found that if the visual product design in a single product can evoke two different category schemas, consumers will have negative perceptions, i.e., perceived intrusiveness, which subsequently leads to lower perceived product usefulness and less positive product evaluation. This suggests that, in a single product, evoking either no product category schema or multiple schemas is not desirable for consumers.

12. Practical implications

This research has clear managerial implications. First, given the uniqueness of past identity inherent in upcycled products, upcycling businesses are inclined to accentuate this feature to consumers, thereby enhancing product appeal, as suggested by extant research. One common method to make this feature salient is presenting past identity in upcycled product appearance, which has been widely adopted in the upcycled product market. However, our findings point to a different perspective. Despite the distinctiveness of past identity, visually presenting it in the appearance of upcycled products can adversely affect product appeal due to increased perceived intrusiveness and decreased perceived product usefulness. Therefore, for upcycling businesses, although they can highlight the specialness or creativity of upcycled products by informing consumers of past identity, it is not advisable to visually exhibit past identity in product appearance. In practice, during the upcycling process, designers of upcycled products ought to

devise strategies to conceal past identity of these products through actions such as painting, cutting, or reshaping.

Second, the practical implication for upcycled product businesses also extend to new product businesses. Possibly inspired by upcycled products, new product manufacturers may incorporate visual elements from two product categories in a single product to enhance product creativity or uniqueness. We do not doubt about this positive outcome of enhanced product creativity or uniqueness. But this research uncovers a potential risk: high perceived intrusiveness and low perceived usefulness, which would offset the positive outcome and result in an overall negative product evaluation. Therefore, for new products, particularly those emphasizing usefulness or functionality, visual product design which incorporates visual elements from two product categories in a single product is not recommended.

Third, the mechanism involving product usefulness implies a strategy to mitigate the negative effect of high visual past/dual identity discernibility: emphasizing product usefulness. Sometimes, the design of high visual past/dual identity discernibility is unavoidable or deemed necessary. For instance, in upcycled products, concealing past identity may cause high production costs. Or in new products, designers may prioritize product creativity. In such cases, marketers can promote products by emphasizing product usefulness, thereby alleviating reduced perceived product usefulness caused by the design of high visual past/dual identity discernibility.

13. Future research directions

In this research, we primarily investigated the negative effect of high visual past identity discernibility on consumer evaluation of upcycled products and the underlying mechanism. Based on the mechanism found in this research, future research could explore the moderators to mitigate or reverse the effect along two pathways. The first pathway is related to perceived

intrusiveness. Literature suggests that consumers perceive upcycled products with high visual past identity discernibility as intrusive, possibly because the visually discernible past identity has the features of high visual salience, low semantic compatibility, and low personal relevance. Future research could explore whether reducing visual salience (e.g., employing smaller or fewer visual elements indicating past identity), enhancing semantic compatibility (e.g., specifying product use contexts that align with both the past and present identity), or increasing personal relevance (e.g., targeting consumers for whom past identity holds special meanings) could mitigate or reverse the negative effect of high visual past identity discernibility. The second pathway is related to perceived usefulness. Literature suggests that use demonstration can increase perceived product usefulness (Heiman and Muller, 1996). In this sense, if visual elements indicating past identity of upcycled products are demonstrated to be useful in the potential usage scenarios, consumers may perceive upcycled products with high visual past identity discernibility as more useful. The negative effect of high visual past identity can thus be mitigated or even reversed. In addition, literature suggests that perceived usefulness may carry less weight in product evaluation when consumers prioritize the hedonic aspects of products (Chitturi et al., 2007). Hence, if consumers are primed with a hedonic consumption goal or have a dispositional preference for hedonic value over utilitarian value in consumption, they may allocate less attention to the usefulness of upcycled products. Consequently, the negative effect of high visual past identity discernibility on perceived product usefulness is likely to be mitigated.

Additionally, as this research investigates product appearance design, it is important to recognize that our findings might be influenced by prevailing consumption culture in society, especially on the aspect of aesthetic preference. For instance, while CE is proposed as a global

strategy to address issues of resource scarcity and waste generation, the prevalence of CE-oriented consumption varies across different countries and regions. In regions where upcycled products or upcycling practices are popular, consumers may have become accustomed to encountering a product displaying multiple categories in its appearance. Or they may be glad to see the repurposing of old objects for new purposes. With increased familiarity with upcycled products or awareness of circular consumption practices, consumers may perceive products displaying multiple categories in appearance less intrusive. Future research could test our findings in online or offline communities where upcycled products or upcycling practices are popular.

References

Adıgüzel, F., & Donato, C. (2021). Proud to be sustainable: Upcycled versus recycled luxury products. *Journal of Business Research, 130,* 137-146.

Berkowitz, M. (1987). Product shape as a design innovation strategy. *Journal of Product Innovation Management, 4*(4), 274-283.

Bhattacherjee, A., & Sanford, C. (2006). Influence processes for information technology acceptance: An elaboration likelihood model. *MIS quarterly,* 805-825.

Biliciler, G., Raghunathan, R., & Ward, A. F. (2022). Consumers as naive physicists: how visual entropy cues shift temporal focus and influence product evaluations. *Journal of Consumer Research, 48*(6), 1010-1031.

Bridgens, B., Powell, M., Farmer, G., Walsh, C., Reed, E., Royapoor, M., ... & Heidrich, O. (2018). Creative upcycling: Reconnecting people, materials and place through making. *Journal of Cleaner Production, 189,* 145-154.

Campbell, M. C., & Goodstein, R. C. (2001). The moderating effect of perceived risk on consumers' evaluations of product incongruity: Preference for the norm. *Journal of consumer Research, 28*(3), 439-449.

Caprioli, S., Fuchs, C., & Van den Bergh, B. (2023). On breaking functional fixedness: How the aha! Moment enhances perceived product creativity and product appeal. *Journal of Consumer Research, 50*(1), 48-69.

Carver, S., Comber, A., McMorran, R., & Nutter, S. (2012). A GIS model for mapping spatial patterns and distribution of wild land in Scotland. *Landscape and Urban Planning, 104*(3-4), 395-409.

Celhay, F., & Trinquecoste, J. F. (2015). Package graphic design: Investigating the variables that moderate consumer response to atypical designs. *Journal of Product Innovation Management, 32*(6), 1014-1032.

Çelik, F., Çam, M. S., & Koseoglu, M. A. (2023). Ad avoidance in the digital context: A systematic literature review and research agenda. *International Journal of Consumer Studies, 47*(6), 2071-2105.

Celsi, R., & Olson, J. (1988). The role of involvement in attention and comprehension processes. *Journal of Consumer Research, 15,* 210-224.

Chitturi, R., Raghunathan, R., & Mahajan, V. (2007). Form versus function: How the intensities of specific emotions evoked in functional versus hedonic trade-offs mediate product preferences. *Journal of Marketing Research, 44*(4), 702-714.

Chubala, C., Surprenant, A. M., Neath, I., & Quinlan, P. T. (2018). Does dynamic visual noise eliminate the concreteness effect in working memory?. *Journal of Memory and Language, 102*, 97-114.

Dahl, D. W., & Moreau, P. (2002). The influence and value of analogical thinking during new product ideation. *Journal of Marketing Research, 39*(1), 47-60.

Dam, C., Hartmann, B. J., & Brunk, K. H. (2024). Marketing the past: a literature review and future directions for researching retro, heritage, nostalgia, and vintage. *Journal of Marketing Management,* 1-25.

de Groot, J. I. M. (2022). The personalization paradox in Facebook advertising: The mediating effect of relevance on the personalization–brand attitude relationship and the moderating effect of intrusiveness. *Journal of Interactive Advertising, 22*(1), 57-74.

De Guimarães, J. C. F., Severo, E. A., Klein, L. L., Dorion, E. C. H., & Lazzari, F. (2023). Antecedents of sustainable consumption of remanufactured products: a circular economy experiment in the Brazilian context. *Journal of Cleaner Production, 385,* 135571.

Desai, K. K., & Ratneshwar, S. (2003). Consumer perceptions of product variants positioned on atypical attributes. *Journal of the Academy of Marketing Science, 31,* 22-35.

El Amri, D. (2019). How do consumers categorize new hybrid products?. *Psychology & Marketing, 36*(5), 444-454.

Ellen MacArthur Foundation. (2013). Towards the circular economy: Economic and business rationale for accelerated transition. Ellen MacArthur Foundation.

Fielder, K. (1982). Causal schemata: Review and criticism of research on a popular construct. *Journal of Personality and Social Psychology, 42*(6), 1001.

Freeman, J., Wei, L., Yang, H., & Shen, F. (2022). Does in-Stream video advertising work? Effects of position and congruence on consumer responses. *Journal of Promotion Management, 28*(5), 515-536.

Gao, X., Stine-Morrow, E. A., Noh, S. R., & Eskew, R. T. (2011). Visual noise disrupts conceptual integration in reading. *Psychonomic Bulletin & Review, 18,* 83-88.

Garber Jr, L. L., Hyatt, E. M., & Starr Jr, R. G. (2000). The effects of food color on perceived flavor. *Journal of Marketing Theory and Practice, 8*(4), 59-72.

Goldstein, D. G., Suri, S., McAfee, R. P., Ekstrand-Abueg, M., & Diaz, F. (2014). The economic and cognitive costs of annoying display advertisements. *Journal of Marketing Research, 51*(6), 742-752.

Goode, M. R., Dahl, D. W., & Moreau, C. P. (2013). Innovation aesthetics: The relationship between category cues, categorization certainty, and newness perceptions. *Journal of Product Innovation Management, 30*(2), 192-208.

Ha, L. (1996). Advertising clutter in consumer magazines: Dimensions and effects. *Journal of Advertising Research, 36*(4), 76-85.

Hagerty, M. R., & Aaker, D. A. (1984). A normative model of consumer information processing. *Marketing Science, 3*(3), 227-246.

Hagtvedt, H., & Patrick, V. M. (2014). Consumer response to overstyling: Balancing aesthetics and functionality in product design. *Psychology & Marketing, 31*(7), 518-525.

Hasan, R., Lowe, B., & Petrovici, D. (2019). An empirical comparison of consumer innovation adoption models: implications for subsistence marketplaces. *Journal of Public Policy & Marketing, 38*(1), 61-80.

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications.

Heiman, A., & Muller, E. (1996). Using demonstration to increase new product acceptance: Controlling demonstration time. *Journal of Marketing Research, 33*(4), 422-430.

Hemonnet-Goujot, A., Kessous, A., & Magnoni, F. (2022). The effect of sustainable product innovation on the consumer–luxury brand relationship: The role of past identity salience. *Journal of Business Research, 139*, 1513-1524.

Huo, H., Liu, Z., & Min, Q. (2021). Social media advertising reactance model: a theoretical review. *Internet Research, 31*(3), 822-845.

Iyadurai, L., Visser, R. M., Lau-Zhu, A., Porcheret, K., Horsch, A., Holmes, E. A., & James, E. L. (2019). Intrusive memories of trauma: A target for research bridging cognitive science and its clinical application. *Clinical Psychology Review, 69,* 67-82.

Jacoby, L. L., & Dallas, M. (1981). On the relationship between autobiographical memory and perceptual learning. *Journal of Experimental Psychology: General, 110*(3), 306.

Jia, J. S., Shiv, B., & Rao, S. (2014). The product-agnosia effect: How more visual impressions affect product distinctiveness in comparative choice. *Journal of Consumer Research, 41*(2), 342-360.

Jiang, L., & Kang, J. (2016). Effect of traffic noise on perceived visual impact of motorway traffic. *Landscape and Urban Planning, 150*, 50-59.

Jiang, L., & Kang, J. (2017). Perceived integrated impact of visual intrusion and noise of motorways: influential factors and impact indicators. *Transportation Research Part D: Transport and Environment, 57,* 217-223.

Jindal, R. P., Sarangee, K. R., Echambadi, R., & Lee, S. (2016). Designed to succeed: Dimensions of product design and their impact on market share. *Journal of Marketing, 80*(4), 72-89.

Kamleitner, B., Thürridl, C., & Martin, B. A. (2019). A Cinderella story: How past identity salience boosts demand for repurposed products. *Journal of Marketing, 83*(6), 76-92.

Kim, J. (2017). The ownership distance effect: the impact of traces left by previous owners on the evaluation of used goods. *Marketing Letters, 28,* 591-605.

Kim, N. L., Woo, H., & Ramkumar, B. (2021). The role of product history in consumer response to online second-hand clothing retail service based on circular fashion. *Journal of Retailing and Consumer Services, 60,* 102457.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management, 43*(6), 740-755.

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: the concept and its limitations. *Ecological economics, 143*, 37-46.

Kreuzbauer, R., & Malter, A. J. (2005). Embodied cognition and new product design: Changing product form to influence brand categorization. *Journal of Product Innovation Management, 22*(2), 165-176.

Landwehr, J. R., Wentzel, D., & Herrmann, A. (2013). Product design for the long run: Consumer responses to typical and atypical designs at different stages of exposure. *Journal of Marketing, 77*(5), 92-107.

Lautman, M. R. (1991). End-benefit segmentation and prototypical bonding. *Journal of Advertising Research, 31*(3), 9–18.

Lee, A. Y., & Labroo, A. A. (2004). The effect of conceptual and perceptual fluency on brand evaluation. *Journal of Marketing Research, 41*(2), 151-165.

Li, G., Zhang, R., & Wang, C. (2015). The role of product originality, usefulness and motivated consumer innovativeness in new product adoption intentions. *Journal of Product Innovation Management, 32*(2), 214-223.

Li, H., Edwards, S. M., & Lee, J.-H. (2002). Measuring the intrusiveness of advertisements: scale development and validation. *Journal of Advertising, 31*(2), 37–47.

Lindsay, P. H., & Norman, D. A. (2013). Human information processing: An introduction to psychology. Academic press.

Long, X., & Gui, L. (2024). Waste not want not? The environmental implications of quick response and upcycling. *Manufacturing & Service Operations Management, 26*(2), 612-631.

Luchs, M. G., & Kumar, M. (2017). "Yes, but this other one looks better/works better": How do consumers respond to trade-offs between sustainability and other valued attributes?. *Journal of Business Ethics, 140,* 567-584.

Luffarelli, J., Stamatogiannakis, A., & Yang, H. (2019). The visual asymmetry effect: An interplay of logo design and brand personality on brand equity. *Journal of Marketing Research, 56*(1), 89-103.

Luna Cortés, G., & Royo Vela, M. (2013). The antecedents of consumers' negative attitudes toward SMS advertising: A theoretical framework and empirical study. *Journal of Interactive Advertising, 13*(2), 109-117.

MacKenzie, S. B. (1986). The role of attention in mediating the effect of advertising on attribute importance. *Journal of Consumer Research, 13*(2), 174-195.

MacInnis, D. J., & Price, L. L. (1987). The role of imagery in information processing: Review and extensions. *Journal of Consumer Research, 13*(4), 473-491.

Meng, M. D., & Leary, R. B. (2021). It might be ethical, but I won't buy it: Perceived contamination of, and disgust towards, clothing made from recycled plastic bottles. *Psychology & Marketing, 38*(2), 298-312.

Meyers-Levy, J., & Tybout, A. M. (1989). Schema congruity as a basis for product evaluation. *Journal of Consumer Research, 16*(1), 39-54.

Moldovan, S., Goldenberg, J., & Chattopadhyay, A. (2011). The different roles of product originality and usefulness in generating word-of-mouth. *International Journal of Research in Marketing, 28*(2), 109-119.

Moreau, C. P., Markman, A. B., & Lehmann, D. R. (2001). "What is it?" Categorization flexibility and consumers' responses to really new products. *Journal of Consumer Research, 27*(4), 489-498.

Mugge, R., & Schoormans, J. P. (2012). Newer is better! The influence of a novel appearance on the perceived performance quality of products. *Journal of Engineering Design, 23*(6), 469-484.

Mumford, M. D., Giorgini, V., Gibson, C., & Mecca, J. (2013). Creative thinking: Processes, strategies and knowledge. In Handbook of research on creativity (pp. 249-264). Edward Elgar Publishing.

Munsinger, H., & Gummerman, K. (1967). Identification of form in patterns of visual noise. *Journal of Experimental Psychology, 75*(1), 81.

Murphy, G. L., & Smith, E. E. (1982). Basic-level superiority in picture categorization. *Journal of Verbal Learning and Verbal Behavior, 21*(1), 1-20.

Page, C., & Herr, P. M. (2002). An investigation of the processes by which product design and brand strength interact to determine initial affect and quality judgments. *Journal of Consumer Psychology, 12*(2), 133-147.

Pashko, S. (2016). Implications of the differences between our perceptual and conceptual views. *Psychology & Neuroscience, 9*(2), 267.

Philipp-Muller, A., Costello, J. P., & Reczek, R. W. (2023). Get your science out of here: When does invoking science in the marketing of consumer products backfire?. *Journal of Consumer Research*, *49*(5), 721-740.

Pleyers, G. (2021). Shape congruence in product design: Impacts on automatically activated attitudes. *Journal of Retailing and Consumer Services*, *61*, 101935.

Rajagopal, P., & Burnkrant, R. E. (2009). Consumer evaluations of hybrid products. *Journal of Consumer Research*, *36*(2), 232-241.

Rosch, E. (1975). Cognitive representations of semantic categories. *Journal of Experimental Psychology: General*, *104*(3), 192.

Sarkar, P., & Chakrabarti, A. (2011). Assessing design creativity. *Design Studies*, *32*(4), 348-383.

Schmidt, L. L., & Maier, E. (2022). Interactive ad avoidance on mobile phones. *Journal of Advertising*, *51*(4), 440–449.

Schnurr, B. (2017). The impact of atypical product design on consumer product and brand perception. *Journal of Brand Management*, *24*(6), 609-621.

Shavitt, S., Vargas, P., & Lowrey, P. (2004). Exploring the role of memory for self‐selected ad experiences: Are some advertising media better liked than others?. *Psychology & Marketing*, *21*(12), 1011-1032.

Shevchenko, T., Saidani, M., Ranjbari, M., Kronenberg, J., Danko, Y., & Laitala, K. (2023). Consumer behavior in the circular economy: Developing a product-centric framework. *Journal of Cleaner Production*, *384*, 135568.

Sihvonen, J., & Turunen, L. L. M. (2016). As good as new–valuing fashion brands in the online second-hand markets. *Journal of Product & Brand Management*, *25*(3), 285-295.

Singh, J., Sung, K., Cooper, T., West, K., & Mont, O. (2019). Challenges and opportunities for scaling up upcycling businesses–The case of textile and wood upcycling businesses in the UK. *Resources, Conservation and Recycling, 150,* 104439.

Szymanski, D. M., Kroff, M. W., & Troy, L. C. (2007). Innovativeness and new product success: Insights from the cumulative evidence. *Journal of the Academy of Marketing Science, 35,* 35-52.

Tezer, A., & Bodur, H. O. (2020). The greenconsumption effect: How using green products improves consumption experience. *Journal of Consumer Research, 47*(1), 25-39.

Townsend, J. D., Montoya, M. M., & Calantone, R. J. (2011). Form and function: A matter of perspective. *Journal of Product Innovation Management, 28*(3), 374-377.

Tversky, B., & Hemenway, K. (1984). Objects, parts, and categories. *Journal of Experimental Psychology: General, 113*(2), 169.

Vasques, R., Garcia, R. B., & Galera, C. (2016). Short-term memory recall of visual patterns under static and dynamic visual noise. *Psychology & Neuroscience, 9*(1), 46.

Veryzer Jr, R. W., & Hutchinson, J. W. (1998). The influence of unity and prototypicality on aesthetic responses to new product designs. *Journal of Consumer Research, 24*(4), 374-394.

Wilson, M. (2016). When creative consumers go green: Understanding consumer upcycling. *Journal of Product & Brand Management, 25*(4), 394-399.

Xu, B. (2020). A competitive resource: consumer-perceived new-product creativity. *Journal of Product & Brand Management, 29*(7), 999-1010.

Youn, S., & Kim, S. (2019). Understanding ad avoidance on Facebook: Antecedents and outcomes of psychological reactance. *Computers in Human Behavior, 98,* 232-244.

Yu, S., & Lee, J. (2019). The effects of consumers' perceived values on intention to purchase upcycled products. *Sustainability, 11*(4), 1034.

Zhang, S., & Markman, A. B. (2001). Processing product unique features: Alignability and involvement in preference construction. *Journal of Consumer Psychology*, *11*(1), 13-27.

Zhao, T., Lu, Y., Wang, V. L., Wu, B., Chen, Z., Song, W., & Zhou, L. (2023). Shared but unhappy? Detrimental effects of using shared products on psychological ownership and consumer happiness. *Journal of Business Research, 169,* 114306.

CHAPTER 6 – GENERAL CONCLUSIONS & FUTURE RESEARCH

Altogether, this thesis investigates consumer behavior that contributes to the circular economy (CE), with a particular emphasis on upcycling related behaviors, specifically consumer upcycling and purchase of upcycled products. Essay 1 systematically reviews the existing literature to develop a comprehensive framework of factors that influence CE-oriented product use behaviors including consumer upcycling. This framework demonstrates how different factors, occurring at different stages of product use, influence consumers' assessment of different types of product value (i.e., functional, social, and emotional value), thereby shaping their product use behaviors. Essay 2 and Essay 3 center on a specific product use behavior examined in Essay 1: consumer upcycling. They identify the internal motivations driving this behavior and show its potential consequences. By integrating qualitative evidence from Essay 2 and quantitative evidence from Essay 3, two main results can be derived. First, perceived competence is the predominant motivation for consumer upcycling, followed by waste prevention and frugality motivations. Second, consumer upcycling is intimately linked with purchase of upcycled products. This link is evidenced by the finding that consumers with certain consumer upcycling motivations (i.e., waste prevention, social connectedness, and emotional attachment) display a heightened willingness to buy upcycled products. Essay 4 adds the understanding of upcycled product consumption by demonstrating the role of a product factor – visual past identity discernibility – which is rooted in upcycling process and reveals distinctiveness of upcycled products. Following a series of controlled experiments, Essay 4 shows that high visual past identity discernibility in upcycled products decreases consumer evaluation of these products because this product attribute leads to consumers' perceived higher intrusiveness and thus lower perceived product usefulness.

This thesis offers contributions to the research domains of CE, sustainable consumption, and upcycling in several ways. First, prior research in CE has investigated various approaches – including technology, supply chain, business models, waste management – that supply-side actors (e.g., companies, governments) can take to facilitate the transition towards the CE. How the consumer, another critical actor in the CE, contributes to the CE is underexplored (Kirchherr et al., 2017; Hobson et al., 2021). Focusing on the consumer perspective, this thesis advances the CE research domain by enhancing understanding of the consumer in the CE, both in breadth and depth. In terms of breath, a systematic literature review of various CE-oriented product use behaviors was conducted in the first essay. In terms of depth, the remaining three essays empirically studied one specific CE-oriented product use behavior – consumer upcycling, and consumption of one particular type of CE-oriented product – upcycled products.

Second, this thesis provides rich insights into several specific sustainable consumption behaviors that are under-explored in existing literature, namely, purchase of upcycled products and various product use behaviors such as upcycling. While sustainable consumption encompasses sustainable behavior throughout all stages of consumption, including purchase, use, and disposal, scholarly attention has predominantly focused on the purchase and disposal stages over the use stage (Prothero et al., 2011). Essays 1, 2, and 3 in this thesis address this deficiency by delving into factors influencing product use behavior. Additionally, despite abundant research on purchase behavior of sustainable products, there exists a dearth of research on purchase of upcycled products, a new type of sustainable products in the market. Essay 3 and 4 fill this gap by examining the consumer attributes, specifically internal motivations of consumer upcycling, associated with the purchase of upcycled products (Essay 3), and a product feature influencing this behavior (Essay 4).

Third, this thesis identifies several new antecedents of sustainable consumption. Existing studies in the sustainable consumption domain revolve around two types of antecedent factors: human-related factors (e.g., consumer motivation, social influence) and product-related factors (e.g., packaging, brand) (Hosta and Zabkar, 2021). Human-related factors mostly have an other-benefiting orientation (White et al., 2019), as the sustainable feature mainly benefits other people or the environment (De Groot and Steg, 2009). To broaden the group of sustainable consumers, more attention should be paid to factors with a self-benefiting orientation, a broader human inclination (Taylor and Brown, 1988). Moreover, self-benefiting factors can cause more positive spillover in sustainable behavior, thereby leading to more environmental benefits (Maki et al., 2019). Essay 2 and 3 contribute to the understanding of self-benefiting factors in sustainable behavior by delineating several specific self-benefiting factors (i.e., internal motivations) that influence upcycling related behaviors. Regarding product-related factors, the emphasis of previous research is largely on marketing messages about products rather than their physical appearance (Olsen et al., 2014), possibly because appearance of sustainable products is often assumed to be identical to that of conventional alternatives. However, not all sustainable products have conventional product appearance; some are intentionally designed in an unconventional way, while others naturally acquire unconventional appearances due to their sustainable features. Since product appearance often shapes consumers' first impression of products, it is important to investigate how unconventional product appearance influences sustainable consumption. Essay 4 adds to this understanding by identifying a novel factor (i.e., visual past identity discernibility) related to unconventional appearance of upcycled products.

Fourth, this thesis contributes to the literature on upcycling from the consumer perspective, by offering three novel findings. First, consumer upcycling can be an internally motivated

sustainable behavior. Prior research has predominantly focused on the sustainable feature of this behavior and emphasized motivations external to consumers such as environmental concern and economic savings (Wilson, 2016; Coppola et al., 2021). Essay 2 and 3 demonstrate that consumer upcycling can be motivated by various internal motivations. Second, consumers' different roles in upcycling are interconnected. Prior research has investigated consumers' creator role and buyer role separately, without considering their connection. Essay 2 and 3 show the positive relationship between consumers' creator role (consumer upcycling) and buyer role (purchase of upcycled products) in upcycling. Third, product appearance plays an important role in consumption of upcycled products. Despite the prevalence of upcycled products with unconventional appearance in the market, prior research has concentrated on upcycled products with conventional appearance. Essay 4 examines the unconventional appearance of upcycled products by investigating a visual attribute – visual past identity discernibility – that captures a crucial facet of their unconventional appearance. This essay analyzes the impact of this attribute on consumer evaluation of upcycled products and its underlying mechanism.

The theorizing and findings of the four essays open several avenues for future research. First, future research can examine company-side factors encouraging consumer upcycling. Our findings suggested various consumer-side factors (e.g., internal motivations) influencing consumers' intention to do upcycling. Since companies are the main providers of products for consumer upcycling, factors related to companies are also likely to impact consumers' willingness to do upcycling with their products. For instance, factors such as modular or easy-to-disassemble product design, minimalist product aesthetics, useful upcycling suggestions in product instruction, and accessible upcycling services, may incentivize consumers to consider upcycling at the end of a product's lifecycle. For companies, incorporating upcycling into their

products and services can yield two main benefits. Firstly, it enhances a company's sustainable image. Unlike abstract sustainability labels or claims, promoting upcycling represents a concrete practice, thereby authentically demonstrating a company's commitment to sustainable development. In addition, the feasibility of upcycling of a product can increase consumers' perceived value of the product, potentially leading to an increased willingness to pay. Consequently, a company's profits may benefit from it.

Second, future research can explore the interactions between consumer attributes and product features on purchase of upcycled products. This thesis examined the influence of consumer attributes (i.e., motivations of consumer upcycling) and a product feature (i.e., visual past identity discernibility) separately. It might be interesting to investigate how consumer attributes moderate the effects of upcycled product features on consumers' preference for upcycled products. For instance, for the feature of visual past identity discernibility studied in this thesis, consumer attributes like uniqueness seeking might moderate its effect on upcycled product evaluation. In addition to this feature, there are many other features in upcycled products that are not commonly observed in other product categories. For instance, the selection of old objects for upcycling can range widely; some old objects are just commonplace items such as beer bottles, while some carry certain special meanings such as luxury brand products and items laden with cultural connotations. The producer of upcycled products can also exhibit diversity; upcycled products can be produced by big companies, artisans, or individuals interested in upcycling. Besides investigating the impacts of these features on upcycled product evaluation, it would be worthwhile to explore how these impacts are moderated by consumer attributes such as their motivation to do upcycling, motivation to buy upcycled products, and dispositional creativity.

Third, future research is needed to investigate other actions through which consumers can actively participate in upcycling. The current thesis focused on consumer engagement in upcycling through consumer upcycling and consumption of upcycled products. These actions take place at product use and purchase stages. In addition to these two stages, a product lifecycle also includes product disposal, creation, and sale stages. At each of these stages, consumers can be incorporated into upcycling. For instance, at the stage of product disposal, consumers can participate in companies' or governments' take-back systems that support industrial upcycling. At the stage of product creation, consumers can participate in co-production-based business models that incorporate upcycling by submitting old objects, offering upcycling ideas, or co-creating products. At the stage of product sale, consumers can build their small upcycling businesses on e-commerce platforms or social communities. They can either sell upcycled products or provide upcycling services. Future research can investigate factors that facilitate or hinder consumers' willingness to engage in these upcycling related actions. Regarding facilitators, future research can explore what value or benefits consumers can derive from their engagement in these actions. In terms of barriers, future research can explore consumers' obstacles pertaining to spatial, temporal, exertional, and psychological dimensions when engaging in these actions.

Fourth, future research can examine the interplay among consumers' multiple roles in other circular approaches, such as access-based (delivering service/functionality rather than product ownership) and ecosystemic business models (collaborations among network members to circulate resources). This thesis demonstrated a positive relationship between consumer upcycling and purchase of upcycled products. These two behaviors involve consumers' different roles (i.e., creator and buyer) in upcycling. Similarly, in some other circular approaches,

consumers may also act in multiple roles. For instance, in access-based business models, consumers could assume the role of either buyer or the provider of service. In ecosystemic business models, consumers may interact with different network members in one eco-system, thus assuming multiple roles. Regarding this research direction, an example research question could be: which factors that influence the adoption of one role can facilitate consumers' transition to the other role?

To conclude, this thesis deepens our understanding of consumer behavior within the circular economy framework, with a specific focus on behaviors related to upcycling. Through an extensive and systematic literature review, it provides a broad picture of consumers' CE-oriented use behavior. Furthermore, through empirical studies, it demonstrates how one specific CE-oriented product use behavior, namely, consumer upcycling, is influenced by internal motivations. Extending this investigation, this thesis delves into the influence of these motivations on consumers' intention to purchase upcycled products. Additionally, the impact of a product feature, namely, visual past identity discernibility, is deeply explored, thereby enriching the insights on consumer evaluation of upcycled products from a product perspective.

Master references

Babin, B. J., Darden, W. R., & Griffin, M. (1994). Work and/or fun: measuring hedonic and utilitarian shopping value. *Journal of Consumer Research*, *20*(4), 644-656.

Camacho-Otero, J., Boks, C., & Pettersen, I. N. (2018). Consumption in the circular economy: A literature review. *Sustainability, 10*(8), 2758.

Coppola, C., Vollero, A., & Siano, A. (2021). Consumer upcycling as emancipated self-production: Understanding motivations and identifying upcycler types. *Journal of Cleaner Production, 285,* 124812.

Corvellec, H., Stowell, A. F., & Johansson, N. (2022). Critiques of the circular economy. *Journal of Industrial Ecology, 26*(2), 421-432.

De Groot, J. I., & Steg, L. (2009). Morality and prosocial behavior: The role of awareness, responsibility, and norms in the norm activation model. *The Journal of Social Psychology, 149*(4), 425-449.

Geissdoerfer, M., Morioka, S. N., de Carvalho, M. M., & Evans, S. (2018). Business models and supply chains for the circular economy. *Journal of Cleaner Production, 190*, 712-721., M., Morioka, S. N., de Carvalho, M. M., & Evans, S. (2018). Business models and supply chains for the circular economy. *Journal of Cleaner Production, 190,* 712-721.

Govindan, K., & Hasanagic, M. (2018). A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective. *International Journal of Production Research, 56*(1-2), 278-311.

Hobson, K., Holmes, H., Welch, D., Wheeler, K., & Wieser, H. (2021). Consumption Work in the circular economy: A research agenda. *Journal of Cleaner Production, 321*, 128969.

Hosta, M., & Zabkar, V. (2021). Antecedents of environmentally and socially responsible sustainable consumer behavior. *Journal of Business Ethics*, *171*(2), 273-293.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127,* 221-232.

Maki, A., Carrico, A. R., Raimi, K. T., Truelove, H. B., Araujo, B., & Yeung, K. L. (2019). Meta-analysis of pro-environmental behaviour spillover. *Nature Sustainability, 2*(4), 307-315.

Olsen, M. C., Slotegraaf, R. J., & Chandukala, S. R. (2014). Green claims and message frames: How green new products change brand attitude. *Journal of Marketing, 78*(5), 119-137.

Prothero, A., Dobscha, S., Freund, J., Kilbourne, W. E., Luchs, M. G., Ozanne, L. K., & Thøgersen, J. (2011). Sustainable consumption: Opportunities for consumer research and public policy. *Journal of Public Policy & Marketing, 30*(1), 31-38.

Singh, J., & Ordoñez, I. (2016). Resource recovery from post-consumer waste: important lessons for the upcoming circular economy. *Journal of Cleaner Production, 134,* 342-353.

Sung, K., Cooper, T., Kettley, S., 2014. Individual Upcycling Practice: Exploring the Possible Determinants of Upcycling Based on a Literature Review. Sustainable Innovation 2014, 19th International Conference, Copenhagen, Denmark.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: a social psychological perspective on mental health. *Psychological Bulletin*, *103*(2), 193.

Wasserbaur, R., Sakao, T., & Milios, L. (2022). Interactions of governmental policies and business models for a circular economy: A systematic literature review. *Journal of Cleaner Production*, *337*, 130329.

Wastling, T., Charnley, F., & Moreno, M. (2018). Design for circular behaviour: Considering users in a circular economy. *Sustainability, 10(*6), 1743.

White, K., Habib, R., & Hardisty, D. J. (2019). How to SHIFT consumer behaviors to be more sustainable: A literature review and guiding framework. *Journal of Marketing*, *83*(3), 22-49.

Wilson, M. (2016). When creative consumers go green: Understanding consumer upcycling. *Journal of Product & Brand Management*, *25*(4), 394-399.