

Article

Consumption in the Circular Economy: A Literature Review

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Abstract: A circular economy (CE) aims at decoupling value creation from waste generation and resource use by radically transforming production and consumption systems. Recent reviews on the topic of the circular economy have indicated that cultural barriers are a significant factor hindering the diffusion of so-called ‘circular’ business models, particularly the lack of consumer—or user—acceptance. However, none of them has provided an overview of the existing literature addressing such issues that can help academics and practitioners better understand consumption considerations when addressing the circular economy. Motivated by these observations, this paper presents the results of a literature review that summarises and discusses insights from 111 articles in terms of the problem area, theoretical approaches, methods, and tools that have been used to collect and analyse data, the main issues, and identified research gaps. The results show that most of the existing scientific work on the circular economy and circular solutions addressing consumption has focussed on identifying factors that drive or hinder the consumption of circular solutions. A smaller but expanding set of articles has focussed on offering insights into the nature, meaning, and dynamics of consumption in the context of the circular economy. According to this set of articles, consumption in the circular economy is anonymous, connected, political, uncertain, and based on multiple values, not only utility. A smaller set of papers has explored the integration of user and consumer perspectives into design processes. Although these contributions are relevant, opportunities for further research are still open, particularly regarding socio-material and cultural aspects of consumption in the context of the circular economy, and the role of digitalisation. In addition, more work could be done regarding strategies to foster not only acceptance but also the adoption and diffusion of the circular economy. Based on the findings of this literature review, some ideas for a research agenda on the issue of consumption in the circular economy are outlined.

Keywords: literature review; sustainable consumption; circular economy; product service systems; sharing economy; collaborative consumption; remanufacturing

1. Introduction

A circular economy (CE) aims at decoupling value creation from waste generation and resource use [1] by radically transforming production and consumption systems [2]. Most of the literature on the circular economy seems to focus on the production side, exploring circular business models [3], strategies to develop circular value propositions [4], and the benefits of such models [5]. Less attention seems to have been paid to how consumption and consumers would affect or be affected by the circular economy [2]. As suggested by Hobson et al. [6] the circular economy might translate into significant changes in people’s everyday lives, but there seems to be little understanding of such alterations in the scientific literature, and the policies promoting the circular economy [7]. Among such changes are the

need to give up the requirement for ownership and newness, and to engage in behaviours such as repairing and returning goods.

Due to such changes, consumption issues, particularly consumer and user acceptance, have been highlighted as a significant factor hindering the diffusion of 'so-called' circular business models. In a recent report, Kirchherr et al. [8] found that the lack of consumer interest and awareness is a "main impediment regarding a transition towards CE" (p. 7) after surveying businesses in Europe. Earlier, Rizos et al. [9] reported the same complaint from small and medium enterprises trying to move towards circular business models and solutions. They indicated that the "lack of support from demand networks" prevented the implementation of green innovations such as circular business models.

Despite the realisation that the circular economy translates into significant changes in consumption, recent reviews on the circular economy do not provide comprehensive accounts of such issues. For example, Kirchherr et al. [2] found that only 19% of the papers defining the circular economy considered consumption, and highlighted that not enough is known about why consumers would participate in the circular economy or not. Van Eijk's [10] review focussed on drivers and barriers to the circular economy, and although it included consumption and business/consumer acceptance as one of its thematic areas, the insights offered were rather general. Geissdoerfer et al. [11] investigated the relationship between the circular economy and sustainability, but did not make any significant reference regarding the consumer or consumption aspects. Finally, Ghisellini et al. [12] found that the existing literature on circular economy considers consumers to be passive and rational recipients that will follow labels and other production-side signals when making decisions.

Motivated by these observations, this paper aims at filling this gap by providing a review of the literature on the circular economy and specific circular solutions that address issues of consumption and consumer acceptance. To do so, it analyses articles in terms of research questions, theoretical approaches, methods, and tools used to collect and to analyse data, main issues addressed, and main research gaps identified in the studies. Based on the results, it suggests areas for further exploration on the topic of consumption and consumer acceptance in the circular economy to tackle concerns about the lack of understanding of such issues in the literature. The paper has five sections. After the introduction, Section 2 provides an overview of the circular economy, specific circular solutions, and consumption research in the context of sustainable development. Section 3 describes the method for performing this review. Section 4 presents a summary and discussion of the main findings. Section 5 discusses the main findings of the review. The final section presents the conclusions.

2. Background

Although the concept of the circular economy is widely used by academics and practitioners, there is little agreement regarding what it means. One of the most used definitions was coined by the Ellen Macarthur Foundation and is represented in the now-famous 'butterfly diagram' [1]. In this visualisation, the circular economy is divided into two cycles, a biological cycle and a technical cycle, both of which are comprised of actors and activities. At the centre of the diagram is the consumer for the biological cycle and the user for the technical cycle. Other stakeholders involved in this definition are the service provider, the product manufacturer, and the parts manufacturer. This diagram is accompanied by three principles that the foundation coined as the circular economy principles. First, the preservation and enhancement of natural capital, second, the longer circulation of products and materials in both cycles, and third, designing out waste.

More recently, Kirchherr et al. [2] offered a definition based on a systematic analysis of a significant number of publications in the scientific and grey literature that dealt with the circular economy. They suggested that a circular economy "is an economic system that replaces the "end-of-life" concept with reducing, alternatively reusing, recycling, and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks), and macro level (city, region, nation, and beyond), with the aim of accomplishing sustainable development, thus simultaneously creating environmental quality, economic prosperity

and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers.” (p. 229).

This last definition aimed at solving most of the shortcomings of the existing attempts to explain a circular economy. According to the authors, it provides a sense of hierarchy among the different activities that are part of this approach, prioritising reduction and reusing over recycling and recovering as expressed by Europe’s waste hierarchy. It makes explicit the multi-scale character of economic systems as well as the need to contribute to sustainable development rather than just resource efficiency bringing a triple-bottom perspective. Finally, it highlights the role of companies and consumers as enablers. Although this definition still has some shortcomings, such as for example, ignoring the role of other actors besides companies and consumers, or limiting the role of citizens to consumers or users as pointed out by Hobson and Lynch [6], it is deemed operational for the purpose of this review.

2.1. Circular Economy and Circular Solutions

Following Kirchherr et al., in a circular economy, materials and products should be reused, recycled, and recovered instead of discarded, if not reduced. Companies aiming at becoming circular should offer solutions based on such activities. In order to decide what solutions could be considered circular, we turned to the literature on circular business models. In 2014, Accenture [13] suggested five types of circular business models: circular supplies, resource recovery, product life extension, sharing platforms, and product as service. Later, Bocken et al. [14] suggested the access performance model, extending product value, classic long life, encouraging sufficiency, extending resource value, and industrial symbiosis as circular business model strategies. In a more systematic fashion, Lewandoski [4] presented over 25 different business models corresponding to the ReSOLVE (regenerate, share, optimise, loop, virtualise, and exchange) framework by the Ellen MacArthur Foundation [15]. Despite these efforts, clear definitions of circular business models and circular value propositions are still lacking

Drawing on these findings, this review focusses on the literature addressing three types of solutions, remanufactured products, product service systems (PSSs), the sharing economy, and collaborative consumption (these last two are counted as one). Remanufactured products are the result of a reuse process that repairs, replaces, or restores components of a product that is not useful anymore and aims at ensuring “operation comparable to a similar new product” [16]. A PSS is “a market proposition that extends the traditional functionality of a product by incorporating additional services. Here, the emphasis is on the ‘sale of use’ rather than the ‘sale of product’” [17] (p. 1543). Such a model enables the reuse of products by intensifying use. There are three types of PSS: product-oriented, results-oriented, and outcome-oriented [18], but only one could offer significant sustainability results according to Tukker and Tischner [19]. With an outcome-oriented PSS, the company has the incentive to reduce costs, including materials, thus creating the opportunity for increased efficiency and improving sustainability. In contrast to that, the two first groups still depend on the physical product to deliver value; therefore, the potential for material efficiency might not be as considerable. Companies have implemented PSSs as a strategy to commercialise remanufactured products and intensify the use of goods, thus making it a strategy for reuse, a key activity within the circular economy.

Finally, the sharing economy and collaborative consumption are both forms of consumption that aim at intensifying the use of otherwise underutilised assets, facilitating the reuse of products as in the case of PSSs [20]. According to the European Commission, the sharing economy refers to “companies that deploy accessibility-based business models for peer-to-peer markets and its user communities” [21] (p. 3). Schor [22] suggested four types of activities that are considered sharing: the recirculation of goods, an intensification of use of durable goods, an exchange of services, and the sharing of productive assets. Collaborative consumption as defined by Ertz [23] considers activities that involve consumers as both providers and “obtainers” of resources. It can be based on access and ownership transfer, either online or offline. In practice, sharing economy

solutions and collaborative consumption solutions aim at facilitating access to underused assets via marketplaces, platforms, or networks. They are not restricted to community initiatives; there are also companies that have developed solutions based on such premises. According to Accenture, technological developments have facilitated the proliferation of the sharing economy and collaborative consumption-based solutions, as they have allowed organisations and peers to access broader markets and populations [13]. However, and although their potential to contribute to sustainability has been an argument to promote them, there is no conclusive evidence that such a promise has been fulfilled; on the contrary, there appear to be indications that so-called sharing companies are increasing the demand for resources [22,24,25].

2.2. Sustainable Consumption Research

Since the circular economy should aim at achieving sustainable development as suggested by Kirchherr et al. [2], consumption in the context of the circular economy can be considered a form of sustainable consumption. Sustainable consumption as a field of research investigates the relationship between consumption and sustainable development, and the roles that consumers and other stakeholders play in that relationship [26]. It was born from a political concern about the environmental impacts of consumption patterns in affluent societies, as illustrated by Cohen [27]. This interest translated into a set of questions that have been at the core of the field, including what the consequences of consumption activities on the environment are, what the drivers of such forms of consumption are, what actions could reduce such impacts, and how to drive change [26]. Researchers from this field have investigated the environmental impacts of consumption [28] and the drivers of such forms of consumption including international trade [29] and societal conventions [30]. They have tried to conceptualise what makes consumption sustainable [27], and also offered insights about elements that can drive change, such as nudging [31], eco-labelling [32], marketing [33] and practice-oriented interventions [34].

To address the questions about what motivates consumer behaviour and how to foster sustainable consumption, researchers in this field have used different theoretical frameworks. In an early review, Jackson [35] offered a comprehensive account of models that had been used to understand consumer behaviour and change. He suggested four groups; one encompassed rational choice models such as rational choice theory, consumer preferences theory and Lancaster's model, all based on economic theory, the second one included the theory of reasoned action, the theory of planned behaviour, the means–end chain theory, and the simple expectancy–value theory. A third group referred to the theories offering a more cultural approach to understanding consumption, including consumer culture theories. The last group referred to models using a socio-material approach focussing on practices rather than behaviours.

The models in the first group, the rational choice theory group, suggested that people make decisions based on calculations regarding the costs and benefits of a given decision, such as purchasing a product or entering a marriage agreement. The option selected would be the one that maximises utility or minimises costs given different restrictions (income or tastes). Such an approach is based on the assumption that agents are perfectly rational, and that they have immense calculating abilities. It also assumes that individuals do not have morals or emotions, and therefore rely only on self-interest. All of these assumptions have resulted in strong criticism from different fields over the years.

The second set of models were considered by Jackson as an extension of rational choice theories and aimed at addressing previous criticism while keeping the assumption that decision making is based on a specific goal, an expected outcome, or reward. They detailed the factors that influence the intention of an individual regarding a particular behaviour. Such factors initially included attitudes, values, beliefs, and the individual's sense of their own capability to perform the behaviour. Later versions incorporated norms and habitual behaviour, and also considered situational factors and their influence in activating different norms (for a detailed discussion about the different models, see References [36,37]). Some of the criticism to this perspective as presented by Jackson and other

authors such as Sanne [38] referred to their reliance on the cognitive abilities of individuals even though emotional and moral aspects had been found to also be important, and the assumption that attitudes affect intention and behaviour, and not the other way around. In addition to these, Jackson also mentioned that critics highlighted the exogenous role given to social structures as another problematic assumption.

The third group of theories referenced in Jackson's review and in Halkier et al. [39] (a more recent overview of consumer research) focussed on the "dynamics of consumer actions, the marketplace, and cultural meanings" [40] (p. 868), and is more interested in consumers' lifestyles and identities. According to Jackson, such a set of models aimed at exploring the individual in her social context with the aim of understanding how consumption mediated such a relationship and how material goods help in the process of identity creation, because goods carry meanings. Consumer culture theories, which are part of this group, investigate the "consumption of market-made commodities and desire-inducing marketing symbols" [40] (p. 869) as vehicles of meaning. They are concerned with the entire consumption cycle, from acquisition to the possession and disposition of goods, and provide insights on the symbolism of consumption and its role in processes of identity creation and differentiation. Examples of research using this approach in the field of sustainable consumption include investigations into the meaning of anti-consumption [41], green consumerism, [42] or voluntary simplicity [43].

Transitioning from the theories that see individual consumption as embedded in social contexts, the fourth set of models emerged exploring consumption using practices as unit of analysis. Practices, as defined by Schatzki [44], are the "embodied, materially mediated arrays of human activity centrally organised around shared practical understandings" (p.11). According to Jackson, following Giddens, practices are "influenced on the one hand by social norms [and] lifestyle choices, and on the other by [the] institutions and structures of society" [35] (p. x). Examples of practices include food wasting [45] or laundering [46]. This approach aims at bridging approaches rooted in the individual and social structures by offering a middle point [47]. It also aims at bringing back ordinary consumption to the centre of attention after the consumer culture tradition relegated it to the side [48]. The application of practice theories in the field of sustainable consumption has gained traction in the last decades. Researchers such as Welch and Warde [49] offered an overview and presented two examples of how this has been done to illustrate the flexibility of the approach. They also argued that practice theories fit the research agenda of sustainable consumption, because besides considering acquisition as part of consumption, they also investigate subsequent phases such as use in the context of everyday life. In addition to this, they argue, practice theories also help address the "attitude-behaviour" gap, which is one of the main problems with psychological accounts of consumption.

3. Materials and Methods

In order to conduct the literature review, we followed the three steps suggested by Tranfield et al. [50] to perform systematic literature reviews. Stage I, the planning of the review, involved the definition of the key terms to be used for identifying relevant studies. Stage II, conducting the review, included the identification of relevant studies, as well as extraction and analysis of data. Finally, stage III, reporting and disseminating, involved the organisation and elaboration of this article. In this section, we describe each of these stages.

3.1. Stage I: Planning of the Review

Step 1. Definition of Keywords. During this stage, we defined a set of keywords and strings following the purpose and scope of this review, and the relevant literature on circular economy and consumption. Based on the discussions in Sections 2.1 and 2.2, we chose the search keywords and strings presented in Figure 1.

Topic	Search terms		Topic	Search terms
Circular Economy	"circulareconomy"			
Product Service Systems	"product service systems" OR "servitisation" OR "eco-efficient services"			
Remanufacturing	"remanufacturing" OR "remanufactured" OR "closed-loop supply chain"	AND	Consumption	"Consumption" OR "Consumer" OR "User"
Sharing economy	"sharing economy" OR "collaborative consumption" OR "product reuse"			

Figure 1. Search terms for web query.

3.2. Stage II: Conducting the Review

Step 2. Selection of Articles. Based on these search terms, we first identified existing relevant studies using Web of Science and Scopus. We only considered peer-reviewed journal articles published until February 2018. In order to guarantee the quality of the inputs, a minimum of five citations per paper was required for articles published before 2015, whereas papers published from 2015 onwards were included irrespective of their number of citations. A total of 1182 papers was identified.

To limit the publications for the review process, abstracts were screened using relevant keywords ("consumer" OR "user behaviour" OR "consumer and user acceptance" OR "adoption" OR "perceptions" OR "attitudes" OR "intentions" OR "willingness to pay"), which resulted in 178 papers addressing these issues. We are aware of the individualised theoretical orientation of these keywords, and tried to overcome such bias by complementing the literature using a snowballing approach.

After manual inspection, a significant number of these papers were excluded because they did not directly address issues of consumption or consumers. Instead, they dealt with other issues such as optimisation modelling, operations analysis, and environmental assessment. This resulted in a list of 95 papers. This group was complemented using a back and forth snowballing process, searching for articles that either used the selected studies as references or were referenced by them, mirroring the methodology used in Tukker [51]. The final list of articles to be reviewed included 111 publications.

Step 3. Data Extraction. Articles were organised in a spreadsheet. For each of the 111 papers, we identified general characteristics such as year of publication, geographical focus, and product category. Geographical focus shows where the empirical data were collected when this was available. Finally, product category or function included the type of product or practice, e.g., mobility, accommodation, heating, that was being analysed. Papers analysing different types of products or offerings were classified as multiple. Conceptual papers did not have a product or practice focus.

Each paper was then analysed in terms of five key dimensions as illustrated in Table 1. Each article was coded with Nvivo11 using the predefined categories: "definitions", "questions", "discipline", "methods", and "future research".

Step 4. Data Analysis. For each dimension, topics were identified following a double cycle coding technique, as defined by Saldaña [52]. During the first cycle, a descriptive coding strategy was used to understand the main issues the authors discussed, and in the second cycle, a pattern coding strategy was applied to similar group codes and identify categories.

Table 1. Dimensions for analysing existing literature on consumption and circular solutions.

Dimension	Description
Problem Addressed	The issue the study explores, the research questions posed by the article.
Theoretical Frameworks	The disciplines and theories used in the study to analyse the data collected.
Methods and Tools	Methodological approaches and tools used by the researchers to collect the data.
Issues	The answers the studies get to their research questions, including the list of factors explaining user and consumer acceptance, the nature, meaning, and dynamics of consumption, as well as the description of how design processes included consumption consideration
Research Gaps	The aspects that researchers suggest need further investigation.

3.3. Stage III: Reporting and Disseminating

Step 5. Organise Findings. The results of the review are presented in terms of the general features of the papers and the five dimensions selected and described in Table 1. For each dimension, the main themes are suggested based on the interpretative analysis of the content of the papers. The outline for a research agenda is based primarily on the future research suggested by the literature.

4. Results

4.1. General Characteristics

Most of the studies reviewed focussed on specific solutions such as the sharing economy and collaborative consumption (40%), PSS (24%), and remanufactured products (25%). Research addressing consumption in the context of the circular economy is scarce (10%). Although research focussing on consumers and specific solutions that contribute to closing material loops started in the mid-1990s, it has been on the rise ever since. At first, regarding consumption, researchers seem to have only worked with PSS, but remanufacturing and the sharing economy started to catch their attention after 2010. Studies investigating consumption in the specific context of the circular economy appeared for the first time in 2015.

In terms of geography, most of the studies were conducted in high-income countries in North America and Europe, with only a few located in countries classified as middle income such as China, India, Malaysia, and Brazil. Consumers from regions such as Latin America and Africa have not been included in existing studies, and Eastern European consumers are also underrepresented in the literature. Most of the studies explored the topic of the consumer acceptance of specific types of products or functions, with the majority of papers analysing several product categories and types of functions simultaneously. Consumer electronics and car sharing are the most popular categories among researchers, and both categories have been described as having the most potential for circularity. Accommodation and co-housing services follow these, with clothing as the third most popular product category to be used as a case study. Food, buildings, baby products, automotive parts, heating, waste collection, and packaging are included under the category “Others”.

4.1.1. Problem Addressed

The first dimension of our analysis is the problem area addressed by the circular economy and consumption literature, i.e., what questions researchers have focussed on. Based on our analysis, we found several themes of interest; these are presented in Table 2. Four major themes were identified: consumption drivers, consumption nature, meanings and dynamics, and user perspectives in design processes, including conceptual contributions.

Table 2. Main themes regarding the problem addressed in the publications.

Category	Theme	Description	Number of Papers	Examples
Consumption drivers	Factors (barriers, drivers, motivators)	Under this theme, we grouped articles that explored the antecedents of consumer acceptance as well as the barriers that prevent consumers from adopting the circular solutions included in this review.	72	[16,53–120]
	Consumer perceptions	Without specifically identifying antecedents or factors for acceptance, these papers focussed on consumers' attitudes towards circular solutions.	7	[121–127]
	Consumer typology	Under this theme, we classified articles that aimed at providing profiles or typologies of consumers in relation to the characteristics of circular solutions.	2	[128,129]
	Incentives for acceptance	This group includes studies that looked into external strategies that could help improve the acceptance and adoption of circular solutions.	2	[130,131]
Consumption nature, meanings, and dynamics	Consumption dynamics	This theme refers to the papers that aimed at explaining how the process of consumption changes in the context of circular solutions.	9	[132–140]
	Nature of consumption	These articles reflected on what makes the consumption of circular solutions different from the consumption of other types of offerings.	6	[7,24,141–144]
	Meaning of consumption	This theme groups papers that explored how consumers understood consumption in the context of specific circular offerings.	7	[145–149]
User perspectives in the design process	Design process	These papers investigated how the consumer or user was integrated into the design process of specific circular solutions.	6	[150–155]
	Theoretical inquiries	These papers provided frameworks to introduce the consumer perspective in the design process of circular offerings based on previous findings.	2	[156,157]

Most of the articles investigated the drivers of consumption of circular solutions. This included factors driving or hindering acceptance, consumer perceptions, consumer types and strategies, or incentives to improve acceptance. Authors approached this question from a variety of perspectives. For example, Armstrong et al. [124,125] investigated the reasons for the limited diffusion of particular solutions associated with positive or negative perceptions. Other questions addressed the level of public awareness of specific solutions [127], the role of specific features in forming such perceptions [126], consumer preferences [121], and how consumers construe the solution [122]. Besides perceptions, some of the literature has also tried to provide consumer typologies that have different answers to circular solutions [128,129], and the incentives to push for acceptance and adoption [130,131]. These contributions focussed mostly on solutions such as the sharing economy, remanufacturing, and PSS.

The other three themes have received considerably less attention. Of these, most of the articles addressed the nature, meanings, and dynamics of consumption. Studies offered new ways of understanding specific solutions [141]; they inquired about how everyday life would exist in a circular future [142], and what aspects defined consumption in this particular context [143,144]. Only two papers questioned the socio-political consequences of the circular economy and inquired about equity in this context [7,24]. The papers investigating meaning in the context of circular solutions, and explored notions of specific circular solutions [158], ideas, societal codes [149], shared and individual meanings, and understandings of the different solutions offered [148].

Papers have explored how the user has been included in the design of specific circular solutions, and discussed how user research was implemented, such as for instance during the development of a mobility solution based on PSS [150]. A similar approach was used with a housing development by Dewberry et al. [151]. More recently, studies on the design process of circular solutions focussed on how specific elements such as emotion were included in a PSS design in the health sector [154]. Such studies have also questioned how user-centred design was used to develop a sharing solution [152], or how design research infrastructures that integrate users can inform solutions development [153]. Gruen [155] explored how the design process can influence consumer decisions to participate in a circular solution. Finally, only two papers have focussed on summarising previous findings to make theoretical contributions regarding factors and motivators for acceptance, and how to include these in design processes [156,157].

4.1.2. Theoretical Frameworks

Half of the articles reviewed chose a theoretical approach coming from the fields of psychology or economics (50%). As Table 3 illustrates, within this group, the most popular theoretical framework is the theory of planned behaviour (TPB) developed by Ajzen [159], which suggests that intention is a good predictor of behaviour. It depended on three main components: attitudes, subjective norms and perceived behavioural control. According to this model, if interventions successfully address these elements, they will influence intention, and very likely affect behaviour. Although a few articles used the original version of the TPB, other studies included other approaches to overcome some of the criticism levelled at it.

Table 3. Theoretical approaches used in the publications.

Categories	Theories	No.	%	Examples	Articles
Utilitarian approaches	Theory of planned behaviour (TPB) and related theories	31	28%	TPB, extended TPB (combinations with norm activation theory, social practice theory, activity theory) and theory of reasoned action	[16,58,62,63,65–70,74,76,80,83,85,86,89,93,94,97,101,103,105,111,112,120,123–125,127,160]
	Other psychological theories	7	6%	Theory of psychological ownership, personal construct psychology	[75,122,154,161]
	Economic theories	18	16%	Risk theories, institutional economics, rational choice, prospect theories, Enkel-Kollat-Blackwell (EKB) model	[56,59,61,64,71,72,77–79,88,90,99,104,118,126,138,158]
Consumer culture approaches	Consumer culture	12	11%	Consumer culture theory (CCT), burdens of ownership, relational marketing	[55,57,87,91,114,140,141,143–146,149]
Institutional, socio-technical and socio-material theories	Practice theory	7	6%	Social practice theory, actor network theory	[132,134,136,137,142,148,153,155]
	Socio technical studies	4	4%	Diffusion of innovations, innovation studies	[121,134,135,162]
Other theoretical approaches	Design theories	3	3%	User-centred design	[53,150,152]
	Other theories	11	10%	Chaos and complexity theories, experiential learning, push–pull–mooring theory, Means–ends chain analysis	[60,95,106,129,139]

Such extensions include the norm activation theory that expands on what elements influence intention and behaviour in the context of moral situations [36] and activity theory, which explores how consequences in everyday life can affect the perception of a new offering [74]. Besides TPB, other psychological theories used to explain acceptance include personal construct psychology [122] and the theory of psychological ownership [161]. From economics, authors such as Kahneman and Tversky [163], have used theoretical approaches such as prospect theory decision-making theories under risk and uncertainty conditions, and institutional economics.

The second approach to consumer research comprises frameworks that look into the topic from a cultural perspective, focussing on the experience of consumption and its meaning for individuals, using consumer culture theory [40]. Only 11% of all the articles used theories that consider these aspects. Besides the specific framework of consumer culture theory, other authors explored the role of brand personality and involvement [91], semiotics [149], experiential learning, and grounded theory [57]. These theoretical approaches have been used mainly by authors working with PSS, remanufacturing, and the sharing economy, although not extensively. Studies that are more recent have not explored the topic using this stance.

An additional perspective used when studying consumption was grounded in more systemic theoretical approaches coming from institutional, socio-material, and socio-technical traditions. For example, Petersen and Riisberg [136] used actor network theory to describe how their phenomenon of interest, a PSS for baby clothes, evolved, and how human and non-human actors interacted to allow for adoption. Social practice theory (SPT) was used by Mylan [134] to understand how processes of appropriation influence the diffusion of PSS by investigating how the elements of a practice transform with the introduction of alternative solutions such as PSS, how the interlinkages among such elements change, as well as the links to and between other practices. Other authors used this theoretical framework as a model to understand how sharing economy solutions become normal [132]. Institutional economics were used by Mont [138] to explore the barriers to the normalisation of solutions such as PSS, and by Mohlmann [72] to identify the determinants of satisfaction regarding sharing solutions. Diffusion of innovations theory was used by Meijkamp [133], Borrello [162], and Guttentag [98] to explore the reasons why different solutions spread among consumers using the main drivers that this theory suggests. Some articles used other theoretical frameworks addressing issues such as governance [95], a sense of causality and hierarchy to the factors influencing consumers [106], complexity [110], and community [147].

4.1.3. Methods and Tools

From a methodological perspective, 46% of all of the studies used quantitative methods, 34% used qualitative methods, and 16% followed a mixed methodology. The literature using quantitative approaches focussed on sharing and collaborative consumption (19%) and remanufacturing (18%). Most of the research using qualitative methods investigated sharing and collaborative consumption (13%) and PSS (13%). Studies on the circular economy and consumption used both approaches equally. The three main data collection tools used were surveys (45%), semi-structured interviews (20%), and experiments (11%). Other data collection tools included focus groups, ethnography, and action research.

Most of the studies using a quantitative approach aimed at explaining the causality between a target variable such as willingness to pay or willingness to participate and some specific antecedents. Tools to analyse data quantitatively included structural equation modelling or regression analysis. Observation and action research have not been widely used in the literature due to the lack of real settings and logistical problems [143]. The digital transformation of businesses has also opened a new field for consumer research via the Internet, but only a few studies collected data using the Internet for answering their research questions [129,146].

4.2. Issues: Consumption Meanings, Drivers, and the User in the Design Process

As illustrated in Section 4.1.1, the literature reviewed discussed three questions. One addressed what drives the consumption of circular solutions, another explored the nature, meaning, and dynamics of consumption in the circular economy, and a third question explored how the consumer—or user—has been included in the design process of circular solutions. In this section, we present insights from the literature on these themes.

4.2.1. Factors Driving or Hindering Acceptance by Consumers

Most of the studies reviewed focussed on identifying factors that drive or prevent consumers from acquiring or participating in such solutions (see Figure 2). Such factors fall into one of seven major themes: personal characteristics, product and service offering, knowledge and understanding, experience and social aspects, risks and uncertainty, benefits, and other psychological factors.

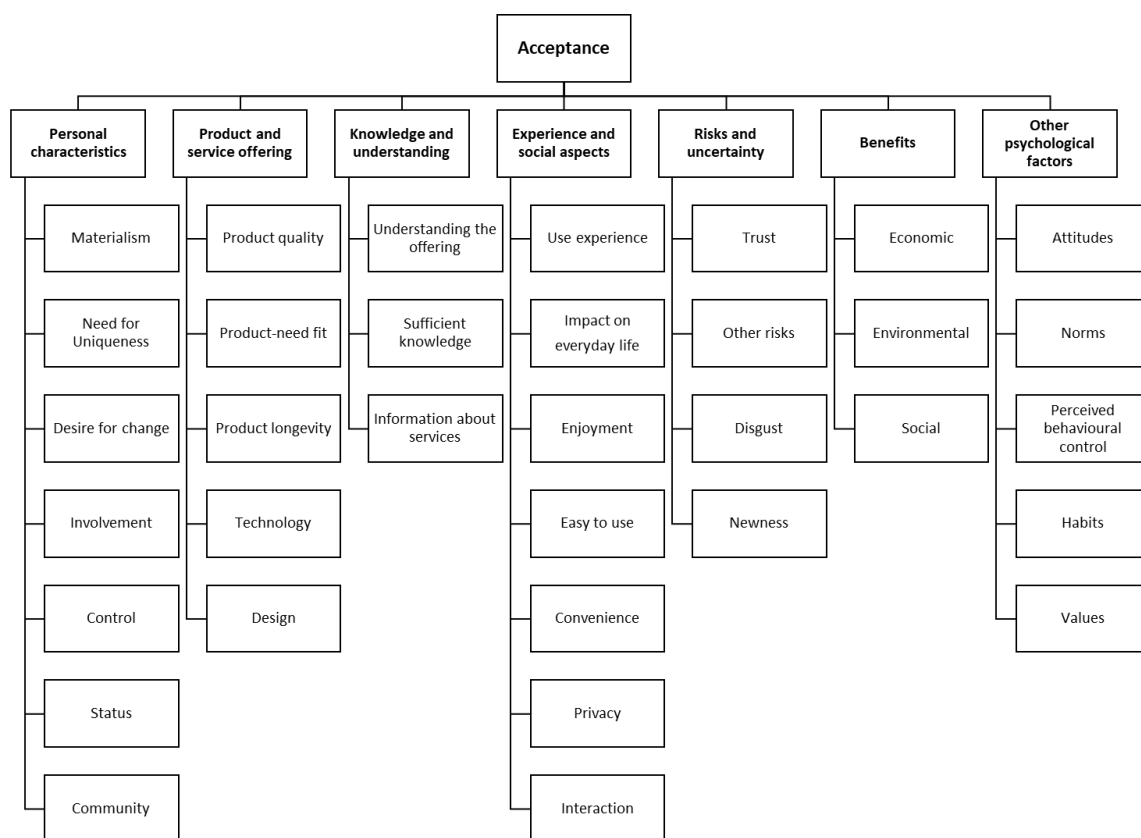


Figure 2. Main factors influencing the perception and acceptance of circular solutions, according to the literature.

Personal Characteristics

Recent research on the consumer acceptance of circular solutions has focussed primarily on aspects intrinsic to individuals. Materialism is one of the main features investigated by researchers [84,86,94,140,160]. Materialistic individuals attach high value to material possessions, and as such, it has been deemed problematic for access-based consumption. Other personal characteristics that have been explored in the literature include the need for uniqueness [93], desire for change [124], involvement [91,143,145], and the control or the ability of the consumer to effectively use the service [67,80,82,105,143,155]. Additional aspects investigated include the sense of status [55,84,107,122,138,140] and of community [72,137,147].

Product and Service Offering

Another aspect found by researchers influencing perceptions and attitudes towards circular solutions was the characteristics of the product or the service. For example, product quality [57] was one of the main reasons people gave regarding the decision to buy refurbished products over new ones. Product type and product-need fit were also relevant for consumers according to several authors [76,138,145]. Product longevity, the period of time in which a product is used before it reaches its end of life, was also relevant for consumers in their evaluation of circular solutions [82,157]. Besides the product, the technology that supports value delivery influenced perceptions and acceptance according to a study about circular solutions to reduce food waste [162]. This category also includes factors related to the design of the offering [65,83,102,124,125] and the brand [16,75,118].

Knowledge and Understanding

Researchers have considered understanding the offering, sufficient knowledge about the product [58,79,122], and information about the services as additional factors influencing the perceptions of different circular solutions. Understanding the offering refers to the ability of the consumer to assess what is needed from him or her in order to access the solution [83]. Public awareness has also been considered as an important indicator of understanding, and has been researched as an antecedent for acceptance [127]. Product knowledge refers to the information that the consumer has to assess the quality of the product and the potential benefits it would yield. It includes knowledge about the quality of the product, the environmental benefits, and the costs [79,100]. A lack of knowledge can lead to erroneous perceptions regarding the quality of remanufactured products or the hygiene of sharing schemes.

Experience and Social Aspects

This category includes aspects related to how consumers experienced the solutions and the impacts that such experiences have on their perception of the solutions [129] as well as the role of experiences in the past on such perceptions [66]. Besides experiences, it also considers the impact that such solutions have on the everyday life of the consumer [74]. The social characteristics of consumers are important when it comes to influencing their perception [68,77,97,120,160]. Emotional and affective aspects such as enjoyment and excitement are included here, as well as ease of use and convenience [54]. In addition to these, some authors also found that privacy [120] and interaction [98,100] are relevant for consumers.

Risks and Uncertainty

In this category, we included aspects such as trust, risks, disgust, and newness, as well as concerns about lack of ownership. Trust refers to the ability to be confident that the provider is offering a quality solution, and that in case of damage, they will solve any problem [54,55,72,97,126]. It also refers to trust in other customers, as some of the solutions require interaction between customers [95,120,130]. Quality risk includes problems regarding performance [78,87] as well as safety due to contamination [16,82,100]. Such interactions are connected with the concept of newness or lack thereof that is usually associated with circulated solutions [83,84].

Benefits

Another aspect that influences the perception of circular solutions is the different types of benefits the consumer derives from the offering. On the one hand, economic benefits such as cost savings resulting from discounted prices have a positive effect on consumer acceptance according to the literature reviewed [77,84,97]. On the other hand, several authors found that environmental benefits support positive perceptions [54,60,78], and social benefits have also been mentioned by authors as aspects relevant to the consumer [77,90,120].

Other Psychological Factors

As mentioned before, most of the studies conducted in this area focussed on psychological factors such as attitudes, subjective norms, perceived behavioural control, and intention [65–67]. Authors have explored both antecedents of such factors and their relationship with behaviour or constructs such as willingness to pay or participate.

These categories are presented separately for purposes of clarity; however, they are not entirely independent. For example, personal values such as materialism can affect a consumer's perception of risk, and this in turn could depend on what role psychological factors play. They might also influence what type of knowledge and information is more important for addressing such risks. Previous experiences can also affect perceptions of risks, uncertainty, or benefits, and several of the papers explore these relationships. Although this is a relevant aspect, it is beyond the scope of this review.

Besides the factors fostering or hindering the consumption of specific solutions, some authors have explored perceptions of different forms of circular solutions such as Armstrong et al. [124,125], who investigated what aspects influenced the positive or negative perceptions of hypothetical scenarios. Matsumoto [123] compared the perceptions of remanufactured products between United States (U.S.) and Japanese consumers regarding factors such as knowledge, price, and risks, among others. Other authors focussed on types of consumer and their acceptance of circular solutions. Decrop et al. [129] for example identified three types of users of accommodation sharing services, grouped according to how transformational the experience was. Finally, Mugge et al. [131] investigated the impact of different incentives (information, product, or service-based) on consumer groups when selling remanufactured/refurbished phones.

4.2.2. The Nature, Meaning, and Dynamics of Consumption

In the circular economy, consumption will most probably change in terms of what it means for consumers, how they perceive it, and how it evolves. The literature considers several aspects as relevant when exploring the new meaning of consumption in the context of the circular economy, as presented in Table 4.

Table 4. Meanings of consumption in the circular economy.

Aspect	Description	Authors
Anonymity	In the circular economy, consumption becomes anonymous because people do not own products, they merely use them. The identity potential offered by goods dissolves; people might not be able to define themselves by the products they have anymore.	[141,143,145]
Connected consumption	New relationships between consumers and companies develop, resulting in deeper forms of engagement and involvement. The idea of community is also relevant in the circular economy. Reciprocity, sociability, and interaction become key aspects that are realised through networks and sharing activities. Such settings facilitate the establishment of institutions that can enforce agreements and trigger commitment by participants. Usually, such characteristics arise from initiatives that come from the bottom-up, rather than top-down.	[132,136–139,142,143,145, 147,158,164]

Table 4. Cont.

Aspect	Description	Authors
Multiplicity of values	Although circularity is based on functionality, solutions cannot only rely on their utility value; they need to create symbolic value as well. Thus, consumption in the circular economy, as in the linear economy, needs to address several values at the same time. Two relevant aspects that become valuable in the circular economy are frugality and well-being. Circular solutions should also consider these aspects.	[134,137,142,144–146,149,164]
Political consumerism	Consumers perceive circular solutions as a form of rebellion against mainstream consumption, and engaging with them is expected to reflect a certain political stance. In the past, material consumption was perceived as a sign of status; however, dematerialised consumption becomes the norm in the circular economy.	[141,143]
Uncertainty	Since in the circular economy, products only move temporarily from producers to consumers and then return to continue their journey with other consumers, issues of trust, risk, and control arise. Thus, efforts to formalise such ‘liquid’ relationships are fundamental to reassure both parts in the transaction. Knowledge and information are also expected to address such concerns.	[139,141,143,144,158]

Beyond the nature and meanings of consumption in the circular economy, few authors have explored the dynamics of consumption in the context of the circular economy, i.e., the conditions by which circular solutions attract participants and retain them. Briceno and Stagl [139] focussed on how circular solutions such as PSS help build a sense of community and contribute to creating social capital. Huber [132] suggested a framework for exploring the processes by which different practices change and recruit or expel practitioners using practice theory as his framework. Earlier studies investigated how different forms of ownership and modes of transportation influenced the adoption of shared mobility [133] and the role of institutions facilitating the normalisation of access-based consumption [138]. More recently, Petersen and Riiseng [136] offered an illustration of how users and providers interacted to improve the adoption of innovative circular business models. Finally, Mylan [134,135] investigated how practices’ elements change, and their relationship transforms to allow for more participants to join.

4.2.3. The User Perspective in the Design Process for Circular Solutions

Only a few articles in the reviewed literature reflected on the consumer in the context of the design process of circular solutions. Dewberry et al. [151] indicated that solutions such as PSSs could not be thought of only in terms of the product, they must also consider systems of provision and how the consumer fits within such an ecosystem, as it is a product–service system. A similar suggestion was made by Knot and Luiten [150] when they analysed the process of creating a mobility-related PSS. A very important aspect highlighted by Stacey and Tether [154] was the consideration and integration of emotions and a sense of familiarity in successfully developing a circular solution in the health sector that users engage with and accept. An aspect highlighted by Knot and Luiten [150] that relates to these elements is the need to consider daily practices in the design process. Daily practices make up everyday lives, i.e., the routines that people perform in their day-to-day contexts can affect how they react to new solutions. The authors highlighted cost savings, income, and elements of efficiency as also being relevant for the consumer and user [151,152], and as important to incorporate into the

design process. Other aspects mentioned in the literature as increasing consumers' positive attitude towards circular solutions include control, knowledge, and creativity [155].

4.3. Research Gaps

The last dimension considered by this review were the gaps in the research identified by the authors. First, several authors indicated that more insights are needed regarding demographic and cultural factors and their role in affecting acceptance and adoption of circular solutions such as remanufactured products and the sharing economy [73,83,121]. This could be achieved for instance through geographical replicas of previous studies [121]. Authors also recognised the need for incorporating a gender perspective in the studies to clarify differences that might affect decisions [70,121]. Furthermore, some authors also suggested further investigating the intention–behaviour gap in the context of circular solutions by focussing on data collection on observed rather than reported behaviour [67]. Aspects related to the role of the brand in influencing behaviour were also mentioned as areas of interest for further investigation [16,75,91].

Changing perceptions of consumption was suggested as an area requiring more research, given the new notions of ownership [73,83] and new values in the context of collaborative consumption [62]. Additionally, Mylan [134] indicated that more work is needed on understanding the role of interlinkages between practices and how these affect the recruitment potential of a practice. In line with this integrative proposal, Möhlmann [72] indicated that studies should assess determinants of acceptance from a holistic perspective. Besides these, she also suggested including more sectors when investigating the sharing economy and the factors influencing acceptance. Some authors also suggested conducting more research on the type of individuals or groups that are more susceptible to accepting circular solutions [131,140], and exploring strategies to improve the acceptance of policy, design, and communication interventions [60,131].

Another proposed dimension for further research relates to methods and tools for collecting relevant data. Catulli et al. [55] suggested exploring ethnographic methods for understanding PSS better, whilst Santamaria et al. [149] indicated the need for tools to extract data from cultural codes that can be used to design circular offerings better. Finally, Dewberry et al. [151] suggested that participatory design could be important in developing PSS, given the need for more local and contextualised understandings.

5. Discussion

Based on this literature review, it was found that interest in the relationship between consumption and the circular economy is increasing. This is reflected in the growing number of studies conducted in recent years that explore the topic. However, most of such literature has focussed on specific circular solutions, rather than the general concept of the circular economy. Nonetheless, a few papers have investigated how the circular economy will affect consumers and how it will be affected by consumption, providing much-needed insights. In addition, most of the data used in the studies reviewed come from high-income economies, and only a few articles have explored consumption in the context of emerging economies. Although affluent economies are the leaders in resource consumption as highlighted by the United Nations [165], emerging economies seem to be following a similar development path, intensifying their resource use. In light of this, governments and other actors from these economies may want to leapfrog to a circular economy, demanding a better understanding of consumption aspects in this particular context.

This literature review indicated that three main questions had occupied researchers exploring consumption in the specific context of the circular economy and circular solutions. First, what factors, perceptions, typologies, and incentives drive the consumption of circular solutions. This question attempts to offer insight regarding the causes of the lack of consumer acceptance of circular solutions, which has been highlighted as an important barrier to moving towards a circular economy [51,166]. Most of the insights from this stream of literature referred to factors driving

or hindering the intention to buy or participate in such offerings. According to the authors addressing this issue, the acceptance of circular solutions depends on the personal characteristics of consumers, which include personality traits, values, and ideologies that may influence consumer perceptions. It also depends on the product and service offering, which refers to the characteristics of the solution offered by the company. The level of knowledge about and understanding of a specific offering also affects the intention to purchase it or participate in it. Moreover, the experience of using the offering, interacting with other consumers, and its impact on everyday life are also relevant. People also indicated that the risks and uncertainty associated with the circular solutions, i.e., reused products and access-based consumption, affect their perception and the intention to pay for them. The benefits of accessing the specific circular solution are also relevant when a person is deciding to participate or not. Other psychological factors such as attitudes and norms also influence such a decision, according to some of the papers reviewed here. These findings are in line with what Jackson [35] defined as the intrinsic and extrinsic factors influencing intention and behaviours.

The second question that the literature considered refers to the nature, meanings, and dynamics of consumption. Research addressing this area explored the symbolic and systemic aspects of consumption addressing the concerns about the relationship between the circular economy and consumption [8]. Findings by the studies suggest that the nature and meaning of consumption in the circular economy are characterised by five features, i.e., anonymity, connection, multiple values, political consumerism, and uncertainty. Regarding the dynamics of consumption, researchers have provided different accounts of how consumers move from a linear form of consumption to a circular one. According to studies investigating this question, practices that involve circularity were able to recruit participants due to the (re)configuration of the elements of practice, meanings, materiality, competencies, rules, and the opportunities for embodiment [132], or the linkages between elements and between practices, as suggested by Mylan [135]. Others explored how the interactions between actors (human and non-human) in a PSS resulted in different levels of adoption [136]. This set of papers is rather small compared to the contributions in the previous group, and is mostly about high-income economies. Thus, more work addressing these issues using data from middle and low-income economies could be beneficial.

The third question referred to the integration of users in the design process, and reflected on the operationalisation of a user-centred perspective in the developing process of circular solutions. The different answers to this question considered inputs from the studies in the other two groups. Some focussed on what factors should be integrated into the design process to attract consumers and users; others looked into infrastructures to facilitate understanding of complex relationships between consumers and circular solutions, and others explored how methods to integrate the consumer and the user in the design processes helped improve acceptance. By doing this, these studies exemplified how insights from different disciplines can be integrated and operationalised for developing solutions. Even fewer articles addressed this type of questions about strategies to develop solutions that are more acceptable to consumers. Considering that acceptance does not necessarily translate into adoption or diffusion, more research exploring how to develop interventions that not only are attractive to individuals but also help change trends is urgently required.

These contributions are in line with the development of research in the field of sustainable consumption. However, some areas of interest that have occupied researchers in this field seem to be missing in the literature on circular economy and circular solutions reviewed here. On the one hand, we did not find studies exploring the consequences of consumption in the circular economy on sustainability. On the other hand, only a handful of papers explored strategies to drive change and promote circular forms of consumption. The third stream of papers exploring design processes and the role of the designer could be considered as a contribution to answering this question about change. Nonetheless, change is not only about acceptance; it is also about actual adoption and diffusion, requiring research on not only products or services, but also on the system level.

Although this review aimed at being systematic, it has several shortcomings. On the one hand, it used a limited definition of circular solutions, restricting the search to three types that are based on the circulation of materials. Energy has not been considered here as a circular solution, although it has been included in some classifications of business models as energy recovery. Energy recovery operations are solutions at the 'end of the pipe', as illustrated in the butterfly diagram by the Ellen MacArthur Foundation [1]. The role of the consumer is limited to providing appropriate waste streams. Moreover, in presenting the findings of the existing literature, because of space limitations, we focussed on the factors, but not on the relationships among the factors. Although we tried to be exhaustive when selecting the papers to be reviewed, several were not included. Finally, we did not include conference papers; however, given the newness of the issue of the circular economy, they can provide important insights regarding what areas of interest are emerging.

6. Conclusions

This literature review has provided an overview and analysis of the existing literature focussing on the issue of consumption in the specific context of the circular economy. Based on its findings, it is possible to say that consumption in the context of the circular economy and circular solutions is becoming an area of increased interest for researchers. Although most of the existing contributions have been made regarding the factors driving and hindering the acceptance of circular solutions, some researchers have investigated the relationship between consumption and the circular economy by exploring the nature, meanings, and dynamics of consumption in this particular context. By doing so, these papers offered accounts of how consumers experience circular solutions and the elements and conditions that enable the recruitment and normalisation of practices that involve circularity. Less work has been done on how to trigger change both at the individual and collective levels to help the diffusion of circular solutions and the transition towards a circular economy.

Moreover, questions regarding equity and power in the circular economy are missing from the literature, as different authors have already pointed out [6,7,24,167]. Given the alterations in ownership, such topics raise interesting questions; for instance, how would the power balance between companies and consumers alter in a 100% access-based economy, or how willing would consumers be to give up privacy for the sake of comfort? What about the free labour that companies are getting by transferring assemblage or repair responsibilities to consumers? What is the role of media and other cultural actors in creating the conditions for a transition to a circular economy? These gaps, in addition to the ones highlighted in the literature, provide a picture of new avenues for research that can contribute to better understanding the conditions that facilitate the transition to a circular economy.

Finally, the digitalisation of the economy is suggested to be one of the main drivers of the circular economy, as e.g., pointed out by Accenture [13]. This opens up novel topics for consumer research, and offers new sources of data that can be used for future research. Although a few papers have used information from Internet communities, this limited practice needs to be further explored. Nonetheless, new legislation regarding the use of personal data online might create some barriers to accessing such sources.

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