



Circular supply chain management in post-pandemic context.

A qualitative study to explore how knowledge, environmental initiatives and economic viability affect sustainability.

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1 **Drivers and drawbacks in circular supply chain management: analysing the role of knowledge,**
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3 **environmental initiatives and economic viability in the food industry.**
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10 Purpose - Circular supply chain management (CSCM) is considered a promising solution to attain
11 sustainability in the current industrial system. Despite the exigency of this approach, its application in the food
12 industry is a challenge because of the nature of industry and CSCM being a novel approach. This research
13 fulfils the prerequisites of undertaking industry-based systematic analysis of CSCM by examining the
14 challenges for its application, exploring the effects of recognised challenges on various food supply chain
15 (FSC) stages, and investigating the business processes as drivers.
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23 Design/methodology/approach - Stakeholder theory guided the need to consider stakeholders' views in this
24 research and key stakeholders directly from the food circular supply chain were identified and interviewed
25 (n=36) following qualitative methods.
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30 Findings - Overall, the study reveals that knowledge, perception towards environmental initiatives and
31 economic viability are the major barriers for circular supply chain transition in the UK food supply chain.
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35 Originality - This research provides a holistic perspective analysing the loopholes in different stages of the
36 supply chain and investigating the way a particular circular supply chain stage is affected from recognised
37 challenges through stakeholder theory, which will be a contribution to designing management-level strategies.
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42 Reconceptualising this practice would be beneficial in bringing three-tier (economic, environmental, and
43 social) benefit and will be supportive to engage stakeholders in the sustainability agenda.
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49 **Keywords:** circular supply chain management (CSCM); knowledge management; stakeholder theory;
50 sustainability agenda; food industry; United Kingdom.
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1 Introduction

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3 Circular supply chain management (CSCM) is a novel concept which is still at an exceedingly early stage
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5 (Formentini, 2021). While academic interest in this topic has grown remarkably (Ünal et al., 2018; Tura et al.,
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7 2019), scientific research with practical implementation is lagging because business processes are currently
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9 linear (Tura et al., 2019). Due to the current resources crisis, policymakers need to design their supply chains
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11 based on circular economy (CE) concepts (Quarshie et al., 2016). However, the management directions of this
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13 concept have yet to be explored (De Angelis, 2021). Redesigning the supply chain according to the circular
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15 model requires systematic analysis of obstacles and the drivers (Erhun et al., 2021). It requires methods or
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17 tools for stakeholders of companies to recognise the capacity and possibility of product regeneration at each
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19 phase of CSCM. Its implementation varies according to the nature of the industry because of the involvement
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21 of different types of stakeholders and processes (Farooque et al., 2019). In essence, industry specific analysis
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23 is essential to overcome the obstacles. The need for applying a circular supply chain model in the food industry
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25 is a challenging task and seeks close analysis of all aspects which jointly can make it possible. Previous studies
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27 related to the CE have analysed the concept as a business model (Linder and Williander, 2017). The CE is
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29 studied as a two-dimensional chain: one is the value network, considering the management of supply chain by
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31 creating the value for its stakeholders i.e., suppliers, retailers, or manufacturers (Walker et al., 2021); and
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33 second is the value proposition and interface by managing the relationship with customers (Tukker, 2015). In
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35 fact, it provides multiple value creation methods which are decoupled from the consumption of finite resources
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37 (McKinsey and Company, 2015).
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39 Hence, it calls for systematic analysis from the stakeholder viewpoint to implement a circular approach into
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41 organisational process.
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49 Identification of circular supply chain deterrents is a difficult process due to its diversified nature and
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51 less awareness in the industries and societies (de Jesus and Mendonça, 2018). The hindrance and enabling of
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53 CSCM is explored in previous literature in general and different countries context (Mangla et al., 2018; Ranta
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et al., 2018). But it is important to explore it on the industry basis (Farooque et al., 2019) and there is no significant research done on the UK food industry for circular supply chain implementation. Thus, this research: (i) explores the CSCM approach from the food industry perspective; (ii) explores key barriers in CSCM in the food industry and drivers to those barriers; (iii) analyses the repercussions of those barriers for each stage (designing, manufacturing, retailing, consumption, upcycling, recycling and logistics) of CSCM.

This study offers a comprehensive outlook by examining the weaknesses present in various phases of the supply chain. It explores how a specific stage in the circular supply chain is impacted by acknowledged challenges through the lens of stakeholder theory. This exploration is intended to contribute to the formulation of management-level strategies. Rethinking and reshaping this approach could prove advantageous in generating three-fold benefits—economic, environmental, and social. Additionally, it can play a supportive role in involving stakeholders in the pursuit of sustainability goals.

In fact, investigating the obstacles in circular supply chain management is helpful for companies, researchers, and institutions. It further leads towards the drivers, methods, or tools for various stakeholders of companies to recognise the capacity and possibility of product regeneration in each phase of circular supply chain management. This study is also a helpful attempt to gain better understanding of circular supply chain management concept and potential to implement it in the food industry. Overall, this is a considerable contribution in the theoretical and management field.

The circular food supply chain is a new and propitious field in waste management that calls for zero waste strategies. It needs more contribution in total value recovery from all the actors of the supply chain by utilising waste in making something useful. Consequently, there is a broader scope for adding more research in the area (Farooque, 2019). Companies which decide to restructure their supply chain system to the circular economy, unlike the linear economy, will receive economical, environmental and social advantages. Reverse logistics and its configuration play a big role to develop circular supply chain framework, but major hurdles are expected to prevent the attainment of this transition on this phase as well (van Loon and Van Wassenhove,

2020). There are existing studies discussing quantity, quality, timing and capacity-related issues in the circular supply chain management (Linder and Williander, 2017), but a much more systematic analysis of challenges, faced at the time of redesigning a company's circular supply chain is needed, which would complement the initial research. Thus, an exploratory study is demanded (Sandvik and Wendy, 2019).

Literature says that consumer behaviour plays a significant role, therefore examining business to consumer (B2C) factors and rational/irrational motives of customers and methods to satisfy them play an instrumental role to support circular supply chain management practices.

Besides, considering economic, social, and environmental impacts, the food supply chain must be more sustainable and food waste should be planned, recorded, communicated, and organised carefully. The circular supply chain management is a dynamic approach and is not very easy to assess and monitor. For its successful implementation in industries, it is important to examine the threatening indicators it faces on all levels of the supply chain. Because its aspects are interconnected in this way, any variation at one end would affect the whole. Secondly, there is rarely a study regarding the circular supply chain which considers the customer perspective which is one of the most significant and inseparable aspects of the food supply chain (Kirchherr et al., 2018). Therefore, it is valuable to explore consumer's perspective for its effective implementation. Similarly, the other actors should equally be considered. There is a lack of exploring the list of barriers under theoretical lenses (Farooque et al., 2019). Thirdly, providing tools, methods and guidelines is required for adopting the circular practices. There follow the research gaps found in previous studies: (i) levers and challenges of the circular supply chain management can vary based on numerous factors i.e., industry, company size, role in supply chain and geography etc (Kirchherr et al., 2018; Tura et al., 2018; Hart et al., 2019); (ii) Tura et al.'s (2018) study on barriers in the circular economy does not address the effect of individual barriers on the whole supply chains so this research will acknowledge the repercussions of each barrier throughout the circular supply chain; (iii) furthermore, considering the consumer perspective has also been demanded (Kirchherr et al., 2018; Elzinga et al., 2020) in previous research; (iv) limited research is

1 performed on the conceptual studies for the circular business model to facilitate its practical and managerial
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3 implementation (De Angelis, 2021).
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5 This study provides a detailed understanding of circular supply chain management by exploring barriers and
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7 drivers from the perspective of stakeholders. Qualitative research offers flexible framework for this study
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9 because perspectives usually vary according to the experiences and positions of stakeholders. This flexible
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11 framework is needed to explore human perspective and opinion and to utilise the opinion as research. The
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13 theoretical aspect offers a contribution of theory extension by empirical exploration. This qualitative research
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15 gathers data which can be tested through preconceived theories and hypotheses in future research. In term of
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17 methodology, this research used a multi-disciplinary approach to the circular supply chain management
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19 concept as a main contribution of this study to provide a holistic perspective of the domain the circular
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24 economy literature.
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26 Literature review

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28 Batista et al. (2018) defined CSCM as: “The coordinated forward and reverse supply chains via purposeful
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30 business ecosystem integration for value creation from products/services, by-products and useful waste flows
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32 through prolonged lifecycles that improve the economic, social and environmental sustainability of
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34 organizations” (p. 446). CSCM being a collective process cannot be implemented effectively in isolation.
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36 (Batista et al., 2018). As the results stakeholder’s contribution is significant and can provide required
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38 framework for the successful implementation of this circular supply chain approach. It provides the structure
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40 for value creation based on the characteristics of stakeholder theory.
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44 The axis of stakeholder theory is “relationship management” of various parties involved to fulfil a common
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46 goal. Circular supply chain management being based upon three major dimensions (economic, social, and
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48 environmental), this theory explains how value can be created for these dimensions by management of the
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50 relationship of complex supply chains involving the circular economy concept. The reason for many supply
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52 chains’ success nowadays is relationship management. As circular supply chain management is still in its
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1 initial stage of development, it is important to drive insights from related concepts like sustainability, supply
2 chain management and green supply chain management (Batista et al., 2018). Management of stakeholder
3 relations is extensively studied in supply chain management (Mangla et al., 2018). It brings the ideas of co-
4 ordination, integration, competition, or collaboration to apply in supply chains for its efficient management
5 (Ranta et al., 2018). To reap the value of sustainability in supply chains, this approach demands taking into
6 consideration the idea of collaborative efforts of stakeholders including consumers (Gupta et al., 2019). Thus,
7 to maximise sustainability, the relationships of supply chain actors is fundamental.

8 Moreover, a summary table for the key authors used in this research highlighting the key gaps and key themes
9 have been mentioned in Tab. 1.

10 [INSERT TABLE 1 HERE]

11 A number of studies have identified drivers (Govindan and Hasanagic, 2018) and barriers (Ranta et al., 2018)
12 to CSCM development and implementation. Drivers and barriers will be analysed in the following sections.

13 *Technical barriers and drivers:* To increase the productivity, resource efficiency and to reduce the waste,
14 digitalization of processes and implementation of practices with smarter equipment are the critical success
15 factors (Mastos, 2021). “Manufacturing companies need to speed up in shifting the focus towards
16 sustainability and make use of technology like ‘Internet of Things’ (IoT) to meet the organization’s goal”
17 (Manavalan and Jayakrishna, 2019, p. 25). In the study by De Jesus and Mendonca (2018), technical factors
18 are considered harder barriers and are most discussed in the CE studies.

19 *Lack of specific technologies for the circular economy:* To create a business model for the circular economy,
20 absence of sharing waste information and technologies is a major barrier (Rademaekers et al., 2011). For better
21 management of the circular supply chain, information and technologies are required to establish a better link
22 between machines, production orders and to monitor the flow of resources (Tura et al., 2019). Overpowering
23 technical barriers will bring new business prospects in the CE (Preston, 2012). While highlighting

1 technological barriers in developing countries, Mangla et al. (2018) articulate that implementation of CE
2 practices needs new technologies and equipment which are not available.

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5 *Lack of knowledge, skills and expertise:* Inadequate knowledge (Shahbazi et al., 2016; Jimenez-Jimenez et al.,
6 2019) and technology methods compatible to the CE encumber the integration of supply chain management.
7 Existing literature (Shahbazi et al., 2016; Pheifer, 2017) has highlighted the requirement of significant state-
8 of-the-art in CSCM, with 35% of studies raising concern about it. However, this demand has not yet been
9 accomplished (Kirchherr et al., 2017). Today, firms require technical expertise which could assist to identify,
10 assess, and implement superior technologies for the CE (Rizos et al., 2017). Tura et al. (2018) accentuate that
11 there is lack of knowledge about transmuting companies' current methods of product manufacturing into using
12 recyclable materials.
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17 *Financial and economic barriers and drivers:* Financial risk in the circular business model is much higher
18 than in the linear model due to the complexities involved in remanufacturing and refurbishing in it (Linder and
19 Williander, 2017). Financial barriers are substantial factors (Farooque et al., 2019) and commonly discussed
20 barriers by academics. Farooque et al. (2019), who characterized all eight barriers found in their study under
21 various management theories as per their characteristics, have put financial barriers under the Resource based
22 View (RBV) perspective, which deals with organizations' inability to match the strategic resources needed.
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26 *High cost of products and raw material:* From the suppliers' side, companies have to pay the high cost of
27 virgin raw material which supports long-life and re-manufacturability of products, and they have less financial
28 support from government (Mangla et al., 2018). The time gap between cost and revenue flow should be taken
29 into account, while moving towards service selling business model (Barquet et al., 2013). It calls into question
30 the economic and financial viability of CE projects. In the product lifecycle, this challenge is faced by the
31 production, retailing and utilization stages. Similarly, manufacturers, distributors and service providers are
32 affected by these challenges.
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1 *Investments:* Financial investment is an initial step to facilitate the transformation from the linear to the CE
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3 and it can be expensive to implement (Govindan and Hasanagic, 2018). Govindan and Hasanagic (2018)
4
5 classified these barriers under economic issues which affect the CE framework internally and externally.
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7 Internally, organizations' perspective must bear high upfront costs (Tura et al., 2018). On the other hand, Hart
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9 et al. (2019) relate financial barriers to the market rather than fiscal issues for implementing the CE in the
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11 construction industry, where it can possibly be in the form of raw materials, property ownership and capital
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13 investments from which capital investments are prioritized and rapid returns are expected. This trend neglects
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15 social or environmental projects like the circular economy.
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19 *Profitability:* Environmental strategies have fewer financial gains (Lieder and Rashid, 2016) and have high
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21 production costs (Shahbazi et al., 2016). Investment in raw material and new technologies can be unprofitable,
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23 which is the one of the main objectives of any business (Tura et al., 2018). Finance and investment are
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25 obstacles for developing and poorer countries. Where developing countries are reluctant to invest due to
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27 unpredictable return on green technology, for poorer nations upfront cost and payback period are an even
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29 greater problem to consider (Li and Ma, 2015). Another factor recognized by scholars is financial and business
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31 management support.
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35 *Planning and management barriers and drivers:* Inefficient management of operational strategy, product
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37 design strategy, business model design and policies pose a problem for circular opportunities (Bonsu, 2020).
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39 Unclear business model and design strategies make it difficult for the industries to implement circular business
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41 model (Bocken et al., 2016; 2019; Mendoza et al., 2019). Management-related challenges are those obstacles
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43 in which there is a lack of planning, management of resources and procedures. Numerous barriers of this kind
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45 are recognized related to this category in literature.
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49 *Lack of management commitment:* Mangla et al. (2018) and Farooque et al. (2019) highlighted the need of
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51 upper- and lower-level management co-ordination and support, resistance to change, as well as all
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53 stakeholders' involvement in organizations to accept the circular model in supply chain management.
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1 Ecological improvements and transformation need a committed and dedicated managerial approach to attain
2 sustainability in practices which is lacking in real life scenarios (Lieder and Rashid, 2016). Effective and
3 efficient planning for the management of natural resources and their unprejudiced distribution is a challenge
4 for organizations (Miemczyk et al., 2016).
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10 *Inappropriate marketing strategies:* Marketing management is also a matter for circular supply chain
11 stakeholders to examine as there can be the chance of cannibalisation of a company's existing products by
12 circular ones and this can affect future revenue and sales of the company (Steenek and Sarin, 2018). Hence,
13 companies are reluctant to market CE-related products because it will possibly hamper sales of new products
14 (van Loon and Van Wassenhove, 2020). Additionally, the idea of long run products will also lose popularity
15 in the market because of less product substitution rate and loss of future sales (Lewandowski, 2016; Linder
16 and Williander, 2017). Similarly, advertising to make customers aware of circular products is also a challenge
17 for organizations.
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28 *Competition:* Managing competition, while attaining environmental benefits, needs an efficient strategic
29 planning (Ravi and Shankar, 2005). However, an adverse trend comes when businesses have to bear the
30 potential costs to stay in environmental-related competition (Wycherley, 1999). Supply chains are also
31 becoming more complex due to competition (Sheffi, 2018). Increase in global resource consumption is an
32 alarming situation and needs competitiveness for environmental initiatives (Jaeger and Upadhyay, 2020). Tura
33 et al. (2019) describe competitive pressure as more focussed to gain economic rather than environmental
34 benefits. Thus, the CE becomes less prioritized among government and industries at the expense of economic
35 growth.
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47 *Socio-cultural barriers:* This is one of the most significant subject areas that can be contested by social
48 scientists in environmental studies. It motivates to change attitudes and lifestyles (Redclift and Benton, 1994).
49 Lack of interest, knowledge and engagement during the supply chain is the crux of the problem and an
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1 imperative barrier in the implementation of the circular economy. Without developing interest and
2 participation of stakeholders in circularity, progress will be slow (Geng et al., 2009; Hart et al., 2019).

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5 *Lack of awareness and right information:* Adams et al. (2017) stated that the term CE is often confused with
6 the terms reuse and recycling, which prevent employees from understanding what the CE actually demands.
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8 So, there is a need for awareness and commitment from top to bottom management (Lakatos et al., 2018). It
9
10 is one of the most discussed barriers in the existing literature. The social awareness of the customer, being a
11
12 significant and integral part of the supply chain, is a crucial aspect for the success of the circular model. Raising
13
14 awareness requires alteration in people's behaviour (Lieder and Rashid, 2016). Behavioural challenges are
15
16 also discussed in upcoming sections of socio-cultural barriers.
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22 *Organisation culture:* Organization culture has an important role to promote the circular approach. "Disposing
23 is cheaper than using or re-using"; this employee attitude is one the biggest barriers to reducing food waste,
24 especially in western countries (FAO, 2016). Therefore, organizations hardly pay attention to investing in new
25
26 business models and technologies to bring circularity. Resistance to changing the traditional mindset and
27
28 structure of linear supplies has been seen as a hindrance to bringing sustainability. Companies are hesitant to
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30 accept environmental ventures like corporate social responsibility because of their hesitant culture. Thus, CE
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32 is a topic of limited discussion among managers (Kirchherr et al., 2018).
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38 *Perception, attitude, and behaviour:* Changing social behaviour, attitudes and mindset of people is another
39 major challenge discussed by circular supply chain studies. People are concerned about performance, product
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41 life, health, and safety regarding remanufactured products, which mean they are unwilling to spend on circular
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43 initiatives (Lieder and Rashid, 2016). Liu and Bai (2014) revealed that even though there is required awareness
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45 about the CE in China, people's behaviour still varies when it comes to practicality. Thus, struggles to convince
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47 consumers to accept the circular model further affects the whole supply chain because of its interdependency.
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52 *Structural barriers and drivers:* An efficient supply chain management requires an association of various
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54 actors involved in it (Kazancoglu et al., 2020). The difficulty occurs in the circular model when some
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1 companies deny adopting it while continuing ongoing linear practices (Narimissa et al., 2020). Less integrity
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3 in various levels, departments of organization and views of various departments and stakeholders lead to the
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5 failure of this change. This is also known as the “silo mentality” and is concerned with all areas of the
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7 organization working together and with transparency towards a mutual goal (Hart et al., 2019). There are
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9 studies understanding the prominence of vertical collaboration of CE participants, though lack of horizontal
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11 collaboration should also be overcome (Pomponi and Mocanter, 2018).
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14 *Complexity in nature:* The CE system is thought to be complex in industries where product lifecycles are long
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16 (Adams et al., 2017). There is less responsibility and accountability between actors i.e., product manufacturing,
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18 supply chain or administration related to certification (Ali et al., 2017). CE works on a broad scale potentially
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20 involving all key stakeholders. It makes processes more intricate to handle (Huamao and Fengqi, 2007).
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22 Complexity in the circular model is caused by the variety of processes from industries of a different nature
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24 joining together in one chain. Thus, the relationship between stakeholders and process should be managed
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26 wisely for the success of circular transition.
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30 *Lack of collaboration between supply chain actors:* Along with the complexity in functions and processes, the
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32 circular supply chain model can face less co-ordination from supply chain actors, which can be an alarming
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34 scenario. Farooque et al. (2019) explain that barriers arise when they do not support each other for the
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36 implementation of the CE because industry structure and policies are still co-ordinated around the linear model
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38 (Gumley, 2014). It is vital to understand the interrelationships of all stakeholders in the circular supply chain
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40 model, having extra layers of additional stages like upcycling and recycling (Mangla et al., 2018).
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44 *Lack of structure:* Physical infrastructure, such as utilities, buildings, and technology are essential components
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46 for application of circular business model implementation which motivates companies to utilise opportunities
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48 for competitive advantage (Russell et al., 2020). Infrastructure and technologies are needed for smooth flow
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50 of supply chain processes in industries for logistics and reverse logistics to be able to support waste
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52 management, upcycling, and recycling processes (Govindan and Hasanagic, 2018; Ritzen, 2018). Similarly
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1 convenient infrastructure also encourages consumers to accept circular process. Lack of infrastructure can lead
2 to failure of circular initiatives and prevent others from adopting it (Vadakkepatt et al., 2021).

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5 *Institutional and regulatory barriers and drivers:* National and international policies and regulations are
6 significant factors to apply CE business model (Wralsen et al., 2021). Institutional and regularity barriers are
7 deep-rooted into sustainable and green supply chain management transitions (Gumley, 2014). These barriers
8 prevent techniques and methods which are instrumental for sustainability related changes from development
9 (Li et al., 2015). The challenges are in terms of less government support and lack of suitable rules/regulations.

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17 *Lack of supportive law and regulation:* Unstable government policies and the absence of circular business
18 model-related regulations affect the formation of remanufacturing industries (Shao et al., 2020). It is explored
19 in the literature that government regulations are aligned in accordance with linear supply chains (Al Zaabi et
20 al., 2013), hence, do not support the circular model (Pheifer, 2017; Ranta et al., 2018). These regulations
21 include taxation policies (Mathiyazhagan et al., 2014), lack of smart regulations for waste prevention (Preston,
22 2012), or lack of policy framework (Rizos et al., 2017). de Jesus and Mondeca (2018) position the institutional
23 barriers as the second most pressing type of barriers.

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33 *Lack of government support:* This includes the lack of governmental support with supportive taxation policies,
34 funding, or royalty regimes (Gumley, 2014). Organizations are always reluctant to begin the CE transition due
35 to the financial risk associated with it. There are rare government policies to provide incentives to bear with
36 risks on investments related to innovative and sustainable businesses. Given the necessity to fulfil the
37 requirement of economic efficiency along with environmental benefits, public incentives are needed.
38 Providing financial incentives such as subsidies or lowering value added tax are also required to stimulate
39 circular initiatives (Stahel and Clift, 2016).

40 41 42 43 44 45 46 47 48 49 **Theoretical framework based on stakeholder theory.**

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51 Starting from the literature review, the paper presents a theoretical framework to CSCM considering its barriers
52 and drivers, and as a result to create value for stakeholders. The framework provides a foundation for analysing
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each phase of the circular supply chain and related barriers to it. In this framework, involved stakeholders are the managers from various the stages of circular supply chain i.e., designing, manufacturing, retailing, consuming, upcycling, recycling and logistics which work together to achieve the purpose of ‘closing the loops’; the value denoted for them is the critical factor which hinders the practical application of the circular model and how it can be overcome. Moreover, the framework also presents activities for value creation of stakeholders related to individual factors. Value creation extends three fundamental dimensions of circular supply chain management: economic, social, and environmental. Value for CSCM for the stakeholders can be best created through a close analysis of barriers the stakeholders face. Furthermore, to serve the purpose of this research, the barriers were re-examined and categorised according to appropriate categories. Some the themes were discarded i.e. “long product lifecycle” (Hart et al., 2019), because inappropriate to the UK FSC, and some of them which share the same idea were combined together, e.g. “Lack of preferential tax policies for promoting the circular models” and “Lack of environmental laws and regulations” (Mangla et al., 2018). The paper presents the inadequacy of government rules, regulation and policies as one theme: “lack of supportive law and regulation”. This model provided the foundation to recognise stakeholders of FSC and develop the questionnaire for qualitative data collection.

Methodology and research design.

Semi-structured interviews resulted as an appropriate method to meet the objectives of this research by providing better flexibility guarantee and ensuring interrelated levels of analysis. Interviews served the purpose of this research, to explore the topic to circular supply chain management, to investigate its barriers from stakeholders’ perspectives and to suggest the drivers.

Theoretical sampling was considered in this study rather than random sampling to “maximise opportunities for comparing concepts along their properties for the similarities and differences enabling researchers to define categories, to differentiate among them, and to specify their range of variability” (Strauss and Corbin, 1998, p. 149). The quality of the interview instrument also plays a significant role for passing the test of reliability.

1 A study is considered reliable when interview data is consistent without bias and serve the purpose (Sekaran
2 and Bougie, 2003). A pilot study was conducted prior to the actual interview. It helped to detect possible flaws
3 by recognizing potential issues or amendments. The researcher chose semi-structured interview method for
4 data collection, which made interviewees more flexible and allowed new questions to be added as per the flow
5 of conversation during the interview and increased the richness of information collected. Three pilot interviews
6 were conducted from the different stages of food supply chain and results obtained were used as foundation to
7 conduct actual interviews.

8 This study conducted 36 in-depth interviews, with various stakeholders of the circular supply chain of food
9 manufacturing industry, which allowed the researcher to gain individual subjective views and improve the
10 validity of results (Saunders et al., 2018). The participants are the managers from the different stages of circular
11 supply chain which starts from product design/development to recycling. Consumption stage is an integral part
12 of circular supply chain. To gain the perspective of whole supply chain this research has included consumer's
13 point view. In-depth interviews were the best way to address a complex process like circular supply chain
14 management because it provided depth of focus and prospects for explanation and understanding about the
15 topic (Ritchie, 2003). To recruit appropriate participants and justify the number of respondents, the researcher
16 contacted an employee of GI group (an employment agency) and a manager of a food manufacturing
17 organisation for approaching manufacturing companies. The researcher also contacted managers of insurance
18 broker companies requesting to refer participants like recycling or up-cycling companies which are insured
19 with them. and to approach the retailing companies and customers, retailers were directly contacted.

20 Contact details of 30 people from food manufacturing companies, 10 retailers, 4 upcycling, 5 recycling
21 including council representatives, 10 customers and 2 suppliers were provided. Research contacted all 61
22 people by email and telephone out of which 4 people from the designing stage, 13 from food manufacturing
23 and processing, 7 retailing managers, 4 from recycling (including 1 government representative council
24 worker), 1 from upcycling and 5 customers, 1 farmer and 1 manager from the logistics stage responded and

1 agreed to participate. Number of participants from a particular stage depends on the area in the industry for
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3 example, supplier stage: UK food manufactures mainly use suppliers from Europe and Asia; hence this
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5 research being limited to access to supplying stage was limited. Next, product designing and logistics stages
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7 which are always a part large manufacturing company. So, the participants are limited to 4 and 1 consequently.
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9 Product manufacturing and retailing are the larger unit with numerous departments, contribute to supply chain.
10
11 Hence, the participants on this stage were 10 and 7 consequently. Similarly, 4 participants from recycling and
12
13 5 consumers were included. Food upcycling is on very early stage at present, with very few companies (less
14
15 than 5) operating as business in the UK. Due to limited access of food products up-cyclers but to get the view
16
17 of complete supply chain, research included food manufacturing machines up-cycler.
18
19

20
21 Semi-structured technique was adopted for in-depth interviews which provided the uniformity and open-
22
23 ended/prompt discussion between interviewer and interviewee and provides freedom of expression (Kirchherr
24
25 et al., 2018; Sandvik and Wendy, 2019). Because of the absence of face-to-face interviews, research applied
26
27 some additional strategies for maintaining the interview quality and consistency i.e., sending introductory
28
29 emails, pre-preparation, and review of the procedure, cultivating rapport, acknowledging the content and
30
31 concerns of interviewee, and honouring their contribution (Drabble et al., 2016). Additionally, assuring
32
33 anonymity was also done by stating that the participant's identity will not be disclosed (Saunders et al., 2018).
34
35 In-depth interviews provided the flexibility and encouragement to the interviewee to talk freely on a variety
36
37 of topics. The researcher prepared an interview guide in which a brief description about circular supply chain
38
39 management and objectives of the study along with the consent form was emailed to the potential participants
40
41 for them to decide about the participation and get the confirmation. Due to the Covid-19 pandemic, it was not
42
43 possible to visit the sites and conduct interviews face to face. Therefore, phone calls, Skype and Zoom calls
44
45 method was chosen as per the convenience of participants (Ritchie et al., 2003). All the participants opted for
46
47 phone calls due to flexibility as there is less difference between face-to-face and telephone interviews (Drabble
48
49 et al., 2016), so this method was selected. An interview protocol was designed to confirm that all areas are
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covered. In the first part, seven sections of the interview protocol were to get the deep-insight and empirical views about the circular economy and sustainability and all internal/external hindrance factors which affect food supply chain to adopt it. The second part was area specific to know about the particular industry. Before starting the actual process, a pilot study was conducted to get the experience about interviews (Bryman, 2004; 2016) and a few questions were amended from the interview protocol after reviewing. Interviewees were encouraged to give detailed explanation about each subject so that themes and issues could emerge inductively (Saunders et al., 2018). The interviews lasted from 26 minutes to 1 hour and 29 minutes. All the interviews were conducted in English, recorded in more than one gadget and notes were taken side by side.

The researcher conducted 36 interviews, out of which 1 interview from a supplier and 1 from a consumer were discarded due to data quality issues. Another 25 people refused to take part due to their busy schedule. Although, there was access of more interviews, when themes stopped emerging and saturation was achieved, the interview process was stopped. Saturation decides the criteria of discontinuing data collection in qualitative research (Glaser, 1992). It means no further data is being found where researcher can develop the categories. But see similar instance over and over again and become confident that category is saturated (Saunders et al., 2018). Hence, during the data collection process in this research was closed when themes started repeating.

Data collection and data analysis.

The thematic analysis method has been applied to analyse the qualitative data, which involves generating analytical categories and theoretical dimensions guided by literature based on the theoretical framework and then the relationships between them are identified. The researchers' data analysis process started from becoming familiar with the data. Out of 36 recorded interviews, two were discarded due to data inappropriateness when listened to again, hence these were not transcribed. The remaining 34 interviews were transcribed into an MS Word document word for word. Some researchers see this as a key phase of qualitative data analysis process (Bird, 2005).

1 The next phase of analysis was open coding by building the codes and constructs extracted from the
2 literature review to explore the CSCM concept, its challenges, and barriers. A theoretical framework was
3 constructed by listing, describing, and categorising previously identified data into set of constructs and sub-
4 constructs which further can be used to index and sort the obtained facts (Chai et al., 2021). This advantages
5 the data by setting the directions and emerging the themes (Tesch, 2013). After transcribing the interviews,
6 researchers jotted down the points of the ideas emerging from each interview which helped to group the large
7 data into categories and to give the directions for further investigation. Themes which are observed frequently
8 and reflect the core data become core themes. Research used three-phase procedures for data analysis
9 recommended by Strauss and Corbin (1990): open coding, axial coding, and finally selective coding. In open-
10 coding, analyses merge and submerge in the data by line-to-line analysis, coding data in several possible ways
11 and remarking on the conceptual and theoretical ideas developing during the analysis process. This process of
12 data analysis is rigorous and brings simplification, verification, correction and finally saturation by itself
13 (Glaser, 1992). At the initial stage, only the core incidents and events are considered. The next stage of coding
14 is to place systematically analysed data together to show dynamic relationships among them. This led to four
15 analytical processes: a) rapidly relating sub-categories to a category, b) comparing categories with collected
16 data, c) escalating the properties and dimension of categories to expand the intensity, and d) discovering
17 variations in phenomena. All stages of coding process have been mentioned in Tab. 2.

18 [INSERT TABLE 2 HERE]

19 The final process is to re-read and selectively identify the themes and core themes of the same dimensions and
20 contents, which is called selective coding (Strauss and Corbin 1990). The researchers completed the final task
21 of coding process by relating the core category/themes with all other categories (Walker and Myrick, 2006).
22 After setting the categories into a series, researchers can start to cover broad range of consequences of variety
23 of situations (Brown et al., 2002). The outcome of this stage is a theoretical model, a theory or hypothesis.
24 Therefore, cuts among categories are not seen as a link or correspondence from the statistical viewpoint. Along

1 with the coding process, the researchers followed superfluous rule of disrupting the coding process over and
2 over and create the memos rapidly. Memos are distinct type of written ideas and thoughts that how researchers
3 arrived at the codes. It keeps track of the analytical process and enhances the audit trail. Hence, helped the
4 researchers to see it from the analytical perspective (Strauss and Corbin, 1990). Memos can also be in the form
5 of diagrams and assist to recognise the relationship between concepts from the data. When there was
6 satisfactory map with required themes, next step was of final analysis or discussing the findings. It was ensured
7 that each of the theme is optimally evidenced from the data. Furthermore, to ensure more efficiency in the
8 analysis process, the researchers used extra techniques: 1) Piloting: which means going backward and forward
9 in the collection and analysing process, reviewing and recuperating where necessary, 2) Co-coding: arranging
10 frequent meetings with the supervisor and experts, discussing the codes to confirm the consistent application,
11 fitness, and relationship of codes, and 3) Meta-narrative: to review research question to understand more about
12 it. This meant the researchers was able to delve into the CE and scrutinise challenges for the FSC to adopt the
13 circular approach. To manage and analyse the data in a more efficient way, the researchers used Computer-
14 Aided Qualitative Data Analysis Software. The researchers used NVivo version 12 to integrate coding with
15 qualitative linking, shaping, and modelling.

16 The investigator applied the “Triangulation” approach to escalate the validity of this study by merging the
17 information from various sources rather concentrating on one approach. Triangulation is application of more
18 than one method or sources to develop a broad understanding of phenomena. It is possible in four different
19 ways 1) method triangulation 2) investigator triangulation 3) data source triangulation 4) theory triangulation.
20 The researchers employed theory triangulation to analyse and interpret the data by applying thematic analysis
21 as analysis approach and stakeholder theory as theoretical lens. The researchers also involved diversity of
22 population, for data collection to gain manifold perspectives and validation of data. Besides this, multiple
23 methods of data collection were involved, which includes existing literature, interviews, and field notes
24 (Saunders et al., 2018). Interviewee details are illustrated in Table 3.

[INSERT TABLE 3 HERE]

Findings

Fig. 1 presents six main themes of the factors that impact CSCM, 21 subcategories that share the same features as those themes, classified under those six themes and including the drivers.

[INSERT FIGURE 1 HERE]

Technical barriers

New techniques are the major factor for any transition to become successful. Innovations are always encouraged by the organisations to acquire competitive advantage. The key factors leading towards the CE approaches are science and technology (Farooque et al., 2019; Tura et al., 2019). According to Preston, (2012, p. 10) “the [CE] opportunities are huge if technical barriers could be overcome.” The major technical challenges for CSCM are to incorporate it with existing FSC, limited technologies and lack of technical skills etc. (Shi and Xiao, 2008). This is stated by FSC stakeholders:

“It is the very spear target it should be a spear target; I wouldn’t say it is achievable in the current environment but may be in the future if the right technology, a new process, the future looks good but the zero waste is an aspiration to it.” (BK)

Shelf-life

In the food industry the connection between shelf-life and sustainability is very complex. A great amount of food is wasted due to biological properties (Guillard et al., 2018). Economic, environmental, and social characteristics of FSC are highly affected by the perishability factor, yet it is not considered as an important strategic decision of organisations (Esteso et al., 2021). The following quotes reflect the idea:

“I don’t know, with short shelf-life product, how that would work. I totally see [this working] with something like bread waste or pasta waste (...). When you get into the term short shelf-life into protein, you would have to be able to prove. Like that particular product came from this company for example where that company got the chicken from, the rice and the spices come from. Because there is food safety element to it. So, without

1 *technology (...), I don't think that can [be] used for human consumption unless that is vegetarian that can be*
2
3 *used for animal feed” (DE).*
4

5 **Lack of CE-specific technologies**

6
7 The findings from this study also emphasise looking into CE specific technologies. This can be in terms of
8
9 adding value to waste by-product durability, using by-products as input, waste reduction and management,
10
11 energy production, product take-back system machinery, increasing shelf-life and equipment renting, and
12
13 repair or information and communication technologies (Hull et al., 2021). Participants from all the stages of
14
15 the FSC stated that:
16
17

18
19 *“I think it is more to do with innovation from my department, like I said, you know, we need more development,*
20
21 *need product research [and] how we can stop the waste. Obviously, we have to make things and maintain food*
22
23 *safety, that's the key. Like I said, it is innovation, people need to think out of box, different ideas.” (BR)*
24
25

26 **Lack of knowledge, skills and expertise**

27
28 Knowledge and technical skills are significant factors, moving towards the new transition in any organisations
29
30 (de Jesus and Mendonça, 2018). “(...) what determines the “possibility” of reuse for a material is the extent of
31
32 knowledge that has led to technological innovation for reuse” (Park and Chertow, 2014, p. 47). Yet,
33
34 knowledge, skills and technical expertise specific to the CE transition are deficits in the existing industrial
35
36 system. The following comment supports the argument:
37
38

39
40 *“All the big business are on the way to work on their own agenda trying to make sure they are appearing to*
41
42 *be, green as possible to consumers. Not actually doing what is genuinely right. Like for example, I've just*
43
44 *completed a study of plastic trays that we use. The board tray and actually a plastic tray comes out on top on*
45
46 *17 environmental and the CE matrices. From all 17 matrices, it comes out on top, but we still got a perception*
47
48 *the consumers hold plastic and board is right”. (NR)*
49
50

51 **Orders and forecasting inaccuracy**

Another technical factor for the FSC that emerged during this research is fluctuation in forecasting and inaccuracy in orders. These factors prevent the supply chain actors, mainly manufacturers and retailers, controlling the huge amount of processed waste as well as waste ingredients. So, it is necessary for industries to have a more efficient demand-forecasting system. The following comment shows the concern from a manufacturing perspective:

“(...) We have to be so far ahead with our orders before they come through you know you could end up with so much [extra] rice that you don’t need, you don’t have orders for that. You have to play a gamble, is like you are in casino, you have to play gamble with how the orders were coming (...) obviously you can give it to charity”. (EGD)

Financial and economic barriers

Financial and economic factors have been extensively cited in studies for bringing circularity and sustainability in supply chain systems (Sillanpää and Ncibi, 2019). Companies are very much concerned about revenue generation strategies and return on investment and uncertainty about these factors makes companies reluctant to take sustainable decisions (Ritzén and Sandström, 2017). Financial and economic related barriers are predominantly discussed by interviewees from various standpoints such as *“Financially, it is very painful”*, *“Absolutely, that’s what it is at the end of the day that how business can make the money”*, *“I wouldn’t say that it can’t be done but finance side would be a real struggle to have that happen.”* Following are the various finance-related aspects to prevent the application of a circular model in the FSC.

Profitability

Profitability is a vital aspect to bring any types of changes in organisations and because ecological or sustainability initiatives are thought to be less attuned with the “raison d’être” of businesses (Ramus and Steter, 2000), industries find it critical to adopt them (Ünal et al., 2018). Similarly, the comment explains the vision of circular supply chain transition:

1 “[There] also has to be a kind of profit lens with it. Because you know, you have to make strict note in the
2
3 current climate that our margins are so small, in the food industry in particular. You have to have a
4
5 commercial advantage for doing anything. I am sure you can just do things because they’re nice to do, nothing
6
7 wrong (....). But it has to be commercial”. (HM)

10 **High cost of products and raw material**

11 Cost is an aspect that puts high impact on the profitability of the corporations. The CE solutions can be
12
13 expensive alternatives for stakeholders (Foroudi and Palazzo, 2021). This factor is a hurdle for stakeholders:

14
15
16
17 “It does [affect]. Difference in price, if people have got a lot of money, then they will go for it but if they
18
19 haven’t! Organic is a good example. Lots of organic curries carry different price tag[s] (...). You won’t sell
20
21 as much as organic material because of the price point. I think price is the king” (RJ)

22
23
24 “I see a lot of bamboo containers in my shop, people [should] use bamboo product instead of plastic, so
25
26 bamboo is a product, it can be reused again and again. the biggest barrier in those products is price” (PG)

28 **Minimum order quantities**

29
30 To cover the high set-up cost and other overheads, firms use economies of scale and minimum order quantities
31
32 approaches during the supply chain (Porrás and Dekker, 2006). The minimum order quantity is a standard
33
34 method applied by suppliers or retailers to sell their product in greater quantities, which also becomes cost
35
36 effective for buyers but becomes unsustainable by wasting the unrequired material. This fact has not been
37
38 studied in the existing research on CSCM. However, it has been referred to this matter by interviewed
39
40 stakeholders:
41
42
43

44
45 “Then buying team and all group[s] merge to decide if I need to buy a pot of sour cream, what is your MLOR,
46
47 (minimum life of receipt) and what is the quantities you can supply. The supplier would say I can only supply
48
49 500 kg pack. I can’t use 500 kg because this is a new product and the demand for new product is less and I
50
51 would only be using 200 kg per week. But the supplier says I have only 500kg packs or 20kg packs. But 500kg
52
53 packs are a lot cheaper. Then finance thing comes in and say we should go for 500kg packs which only cost
54
55

1 *us for example £1 kg. But practically this not the true picture, when it comes to manufacturing, I will be*
2
3 *wasting 300 kgs because my requirement is only 200kg so 300 kg is actually going to the bin and that is*
4
5 *creating hustle in the landfill. At the same time, we are losing our revenue.” (SKV)*
6
7

8 **Investment**

9
10 It is propounded that environmental investment (Geng et al., 2009; Shehbazi et al., 2016) and risk associated
11 with investment is a negation for existing businesses and new investors. Investment for research and
12 development and to update the technology and infrastructure are considered an additional cost (Hart et al.,
13
14 2019) and it is a challenge for companies operating in the current linear environment. In fact, interviews
15
16 highlight that:
17
18

19
20
21 *“I am working on a project on the packaging, that is, it is very new concept. It is fully biodegradable. (...) It*
22
23 *is really expensive, but somebody has to bite the bullet to start with. I mean we have all those things technology*
24
25 *is there, but it is who can actually invest in that technology and then keeping up with it is another challenge”*
26
27

28 (NB)
29

30 **Planning- and management-related barriers**

31
32 Positioning the resources along with their objectives is a significant role of management (Ünal et al., 2019).
33
34 In this study, management barriers are related to the deficiency of the supply chain actors to align the resources
35 and procedures or actions with the CE model. These actions can be marketing activities, competition or
36
37 management’s own actions for commitment. Management related barriers are substantially addressed in
38
39 existing literature by Govindan and Hasanagic (2018) and Ünal et al. (2019). CSCM practices aim to design
40
41 the scenario that ensures the optimum utility of resources (through reuse, repair, recycle and remanufacture).
42
43 Inappropriate planning and management in all these processes may mislead the practices (Nasir et al., 2017).
44
45
46 Three types of management-related barriers for the circular FSC are below, out of which the “lack of
47
48 management commitment” factor was frequently discussed.
49
50
51
52

53 **Lack of management commitment**

1 Stakeholders need management's complete support and dedication to employ the CSCM model, which seems
2
3 to be missing in the current industrial system (Mangla et al., 2018). Lacking management support limits the
4
5 development of dynamic capabilities to take revolutionary decisions like the circular supply chain (Farooque
6
7 et al., 2019). The following views co-relate with this indication:
8

9
10 *"There is partial blame on management side as well that how they deal with the situations, or they are more*
11
12 *about money making business by achieving the targets or achieving the goals."* (VS)

13
14 *"Companies do the talk about carbon footprint and all these things, but to be honest nobody is working*
15
16 *towards it. I mean they are, but whatever they're doing is not enough."* (PG)

17 18 19 **Inappropriate marketing strategies**

20
21 The circular economy provides us with effective solutions like upcycling to reduce the food waste, but
22
23 marketing strategies are not in place for those products to reach to the consumer's expectations (Zhang et al.,
24
25 2021) or to make them aware of them. A manufacturing manager from food manufacturing adds this:

26
27 *"You have the key, and you have right way of marketing through, then yes, the product will be successful. If*
28
29 *you don't market right, it through to right consumers, you don't market it to whoever it will be sold to or you*
30
31 *are generating it very extensive way, not generating enough revenue to sustain yourselves then it will not be*
32
33 *successful."* (BR)

34
35
36
37 The circular economy demands to ascertain market-based initiatives (Mangla et al., 2018). However, in the
38
39 current supply chain the policies are more profit driven and leads to unsustainable practices followed by the
40
41 supply chain actors. Project managers explain in the following quotation:

42
43 *"I have seen many times food restaurants and shops giving marketing deal like buy one get one free. People*
44
45 *only eat one and second one is dumped; they just bin it. So why to work on [these] deal, why can't they simply*
46
47 *give discount. It saves their gas, electricity, save on dough whatever, that all can be saved. Of course, it is*
48
49 *the people are in business are responsible for these strategies."* (NB)

50
51
52
53 A quotation floor manager from retailing also highlights the point:
54
55
56
57
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59
60

1 *“My store is doing a mistake with marketing strategies they are adopting like farmer’s milk. Straightway,*
2 *like you know you keep one flat price and why not just give the money direct into that farmer without*
3 *advertising it. Because they want to advertise it, there’s so much of wastage, just for their advertisement. There*
4 *is no scope for the circular economy or sustainability in this sort of environment.” (PG)*
5
6
7
8
9

10 The circular economy connected supply chains required a proactive marketing approach to influence the minds
11 of customers to adopt circular products or services. And at the same time, it needs a close analysis and control
12 over existing marketing strategies to reduce the waste and regenerate or recycle the products.
13
14
15

16 **Competition**

17
18
19 The economy cannot flourish in circular systems because the current market is more competition-oriented
20 rather than efficiency-based (Ghisellini et al., 2016). Competition is a well discussed factor in the supply chain
21 management and CE literature for being an obstacle for the effectiveness of sustainability (Gupta et al., 2019).
22
23
24

25 A participant from the consumer phase stated, *“Retailers are creating so much of waste, because they have to*
26 *face competition”*. A manager from a retailing company shares his understanding that for retailers to compete,
27 companies like Amazon need more and more flexible policies for customers by ignoring the environmental
28 impact:
29
30
31
32
33
34

35 *“Amazon is entering the retail sector. This has a huge effect on retailer like Asda, Morrison’s or Tesco.*
36 *Although they are big, but they’re not big enough like Amazon. (...) At the moment, the only way they can fight*
37 *Amazon is by becoming flexible” (PG)*
38
39
40
41

42 **Socio- cultural barriers**

43
44 CE is not an established model in industries as in societies (Ritzén and Sandström, 2017), which makes people
45 reluctant to accept it intentionally or unintentionally. Whether it is organisations or the general public, there is
46 very basic awareness about the CE practices (de Jesus and Mendonça, 2018), its need as well as its demand in
47 the current scenario. Likewise, the other main challenges to apply the circularity method at present are
48 organisation culture, lack of interest and preference in the CE resolutions (Ravi and Shankar, 2005; Tura et al,
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2019). Customer buying behaviour is an essential factor for implementation of the CE (Mostaghela and Chirumalla, 2020). Supported by authors Hart et al. (2019), de Jesus and Mendonça, (2018), Farooque et al. (2019), numerous cultural and social related barriers are discussed by the participants.

Lack of awareness and right information

Awareness is another prominent barrier that emerged during this research. Awareness about the CE is very minimal among customers and industries (Mangla et al., 2018; Tura et al., 2019). For instance, four of the participants mentioned, “you are the first person talking with me about this thing”. A participant also emphasised:

“Other than that, there is an element of educating the people as well. For example, in [the] business[es] we have seen all supermarkets are throwing the plastic out and using more of cardboard packing. But nobody realises this fact that if we compare with the model of the circular economy, plastic packaging seems to be much better. Now people have those things in mind that it’s only plastic [which is] destroying the climate. There is need to educate the people, need to educate our retailers, tell them that the carbon footprints, which are getting the card [boards] are much more than plastic trays” (VS)

Organisation culture

Companies’ traditional and rigid processes are major problems emphasised by authors Hartley et al. (2019), Mendoza et al. (2019), and Tura et al. (2019). In the following comment a manager pointed out that for employees in old organisations, where certain ways and processes to perform the tasks have been going on for a long time, it will be an arduous task to do things in a circular way until it becomes an integral part of the company.

“Unfortunately, part of the game is, there is bigger picture over there we still stay with the same mentality to do the things in a certain way. It will take a while to understand. For instance, if we cook the rice, we have to cook 400 kg rice, out of which we will use only 100 kg and 300 kg will go to the bin and the is purely for the factory trials. So, there is an element of educating the people, that 300 kg which you waste is a bigger picture

1 *not something very small thing. This is the example of only one trial. If I go with the numbers and calculate*
2
3 *the numbers for all through, the numbers are far, far bigger.” (VS)*
4

5 **Perception, attitude and behaviour**

6
7
8 Consumer perception has an imperative role to follow sustainability practices (Bovea et al., 2018). An
9
10 empirical study conducted in China among 157 firms reveals that despite having the awareness about the
11
12 circular economy, people’s actual behaviour in practice is still different due to cultural and contextual factors
13
14 (Liu and Bai, 2014). These contextual factors can be regional or from the level of awareness. In regard to
15
16 circular supply chain practice, these elements have an effect in two ways: firstly, following the right processes
17
18 to reduce waste, and secondly adoption of circular, regenerated, upcycled or recycled products. *“I think it is*
19
20 *what needs to change, people’s mindset”*, an operations manager describes. *“I think the most barriers that you*
21
22 *would be gonna come across is you know humans at the end of the day”*, a supply chain manager states:
23

24
25
26 *“I think consumer has big part to play in it. People are also key player in creating waste: they [should] only*
27
28 *buy what is actually need[ed], nothing more” (RJ)*
29

30
31 Therefore, consumer attitude becomes a challenge for other stakeholders to introduce upcycled products,
32
33 accepting circular procedures.
34

35 **Demographical factors**

36
37 Relatedly, demographical factors i.e., buying power of the consumer, are notable issues raised by the majority
38
39 of the participants. In developed countries where things are easily available, the consumer does not think hard
40
41 while buying extra items and wasting them. In the following statement, the participant agrees that consumers’
42
43 perception and attitude make a huge impact to bring positive circular changes in today’s system.
44
45

46
47 *“I could understand and relate to this concept to [name of a developing country], in this country, while*
48
49 *growing up, I saw many shops like TV repair, fridge repairs, etc. These shops made people aware of the lack*
50
51 *of natural resources. But with modern times, repairing is almost obsolete as everything is easily available and*
52
53 *not many professionals are interested in those tedious tasks (RM)*
54
55
56
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60

1 **Structural barriers**

2
3 There are blockages found in CSCM studies related to the way it is formed and the relation between its actors
4
5 from various stages. The need to introduce innovative technologies has been discussed by Rahman et al. (2019)
6
7 in relation to the application of the green supply chain. Due to the unconventional nature of the circular supply
8
9 chain model, there is an absence of appropriate hard and soft infrastructure. Correspondingly, the complexity
10
11 of its processes is blockers (Hart et al., 2019) which can further lead to less integration and less collaboration
12
13 between its actors (Pomponi and Mocanter, 2018). These challenges have been elaborated by participants in
14
15 the interviews below.
16
17

18 **Complexity in nature**

19
20 The ideal model of CSCM in the food industry is a combination of numerous organisations, processes and
21
22 stakeholders which work together to close the loops on each phase. So, its highly dynamic nature and
23
24 procedures are complicated to handle (Esteso et al., 2021). From the organisation perspective, complexities
25
26 can be from fragmented supply chains, administration, or production processes (Hart et al., 2019). So, applying
27
28 a circular model seems a challenging task.
29
30

31
32
33 *“I think it needs to be as easy as possible, (...) So may be the engagement can solve the problem. It [can] make*
34
35 *the complex supply chain easier” (DE)*
36

37 **Lack of collaboration between supply chain actors**

38
39 The next structural type of barrier found during this research is less collaboration of different actors. The
40
41 organisations are inter-reliant. The FSC is a group of numerous processes like designing, manufacturing,
42
43 packaging, retailing, procuring, etc., which are dependent on each other. Hence, it becomes compulsory to
44
45 involve more organisations and daring to make them follow the one mutual decision.
46
47

48
49 *“Thinking from sustainability point of view, industry will involve that all players in “the supply chain” [have]*
50
51 *to work together to sell the product[s] and I think that this perspective is the biggest thing.” (RJ)*
52

53 **Lack of structure**

To ensure the smooth flow of processes and material, structure plays an important part while applying the CE model (da Silva, 2018). This aspect has been given a significant importance in sustainability and CE studies (Govindan and Hasanagic, 2018). During the interviews from supply chain stakeholders, it was divulged that the current supply chain lags behind in soft as well as hard structure and can lead to the collapse of circularity implementation. The following quotation expresses the importance of structure in CE implementation:

“Structure is important because I need support to do this thing. Like I say if I don’t necessarily have the time or the knowledge. Without the company structure behind me and having experts in these areas I would not have plans to do that. Structure is vital. [...] but I don’t have the specialist knowledge to work further and deeper in the supply chain” (MC)

Institutional barriers

The next category of barriers instigated in this research relates to institutions and regulatory bodies. These challenges have been widely discussed in previous studies (Kirchherr et al., 2018; Hart et al., 2019). The following quotation from interviewees shows the prominence of government initiatives.

“Nothing is unachievable. But, to think to write and to implement there’s a big difference so if as I mentioned before sometimes that if there [are] rules regulations in place for other things why can’t they put rules and regulations for the circular economy. I’m not talking about rules and regulations but with the implications. With the reflection, with the penalty. because in the world or in corporate world I’m not sure there are any rules introduced which will regulate the management decisions or lead them to achieve their goals from waste management. But in other industries or other let’s say for example driving, if there are rules but if you break that rule then you will get the fine. Yes, and that’s why probably we have proper regulated traffic and all other things related to traffic. I think that kind of model will work in waste management as well” (AM)

Lack of supportive law and regulation

Hill (2015) states in his research that “largely ignored the upstream consequences of resource extraction (...) particularly if those are outside the UK border” and a similar concern was raised by Pheifer (2017). It also

1 involves insufficiency of global agreements for CSCM favoured policies, lack of laws for landfill diversion,
2 handling, and categorisation of waste (Hart et al., 2019), lack of smart regulations (Preston, 2012), and lack of
3 a supportive policy framework (Rizos et al., 2017). “Obstructing laws and regulations” are the most persistent
4 barrier in CE literature, ranking number seven from the main fifteen barriers (Kirchherr et al., 2018).
5 Undermentioned words of FSC stakeholders give a glimpse of this issue.
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11 *“It’s government policy, but we need to work on it rather than spoke about it. This is what happens with the*
12 *current ambition to bring carbon emission down. That process can be developed from the centre and could be*
13 *affecting all of us massively through the economy, but I don’t think it will succeed in educating all of us”.* (BK)

19 **Lack of government support**

20
21 Another barrier from government side recognised during the research is the non-existence of financial support
22 to existing businesses or innovators (Kirchherr et al., 2018). Experts think that there is no support from
23 government to create CSCM initiatives in the form of tax benefits, investment benefits or awareness campaign.

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28 *“When AD was a new technology, the government used to provide subsidies for it, basically they used to*
29 *incentivise the business which [would]go forward in it. So basically, what they are is all of the site that tied*
30 *into terms called feed-a terrace which basically you get an additional amount of money from the government*
31 *for every kilowatt of electricity which is fed back into the National Grid.”* (MP)

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37 Transitions like the CE need new interventions. Andrews (2015), and Kirchherr et al. (2018) suggest that
38 government has a central role to play in it. Government support from the awareness point of view is also
39 missing.
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44 **Post-Brexit trade**

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46 Another challenge that emerged during this research is the effect of Brexit, which can have an adverse effect
47 on circular supply chain proposals. Existing studies have no evidence about this factor, but it has been
48 discussed significantly by the participants in the following way:
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1 “The government of course plays a big role in any country’s economy, and they can bring a lot more changes
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3 at faster speed than anyone else. Recently I have come across in news that the UK government is looking to
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5 do a “Free-Trade” deal with Australia. On the one hand the deal shows a lot of advantages for the UK
6
7 economy, but some UK farmers have concerns there will be no meaningful safeguards in place to stop them
8
9 being undercut by cheap imports.” (RM)

12 Discussion

14 The study attempted to gain a holistic view from all the dimension of the circular supply chain. The outcomes
15
16 of this study present the model from the data extracted from literature combined with empirical substances
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18 from the managers from seven stages of food CSCM in the form of six categories of barriers. The first category
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20 of barrier instigated in this research was “technical barriers”. This category defined lack of techniques and
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22 technology which was further categorised into factors related to shelf-life, lack of technologies, lack of skill
23
24 and expertise and order and forecasting inaccuracy, out of which the most dominating theme was lack of
25
26 knowledge, skills, and expertise (Adams et al., 2017; Tura et al., 2019). It was ascertained from the interviews
27
28 that knowledge about the practices to follow to close the loops is at a very early stage among the stakeholders.
29
30 Life of products is the second most discussed technical challenge to attain circularity in the food industry “I
31
32 can’t see how the CE would work in a short shelf-life environment.”

33 The second construct, established in this research is “finance and economic related barriers”. The CE
34
35 transition required time, investment; the factor causing most panic for capitalist business is uncertainty about
36
37 financial outcomes and the return on investment for accepting the environmental innovations (Ritzén and
38
39 Sandström, 2017). As per the view from FSC managers, without the financial gain, circular transformation
40
41 will lose the interest of businesses. The most discussed financial and economic related challenges derived from
42
43 this study are high cost of sustainable solutions and products (Andrew, 2015; Li et al., 2015), followed by
44
45 profitability (Shi and Xiao, 2008), investment (Geng et al., 2009; Hart et al., 2019) and minimum order
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47 quantities respectively. Among these, the first three issues have been significantly stated in previous studies.
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1 The third group emerging in this research is “*planning and management*” and the hindrance factors
2 are lack of management commitment, inappropriate marketing activities, and competition in the market.
3 Commitment is a psychological condition to represent individuals’ interaction with an organisation’s
4 dimensions (Ünal, 2018); previous arguments from researchers signify management’s commitment is more
5 with profitable projects than sustainable solutions (Meyer et al., 2002; Mangla et al., 2018). In the same
6 instance, some participants did not agree that management is a barrier as they think that management is always
7 dedicated towards sustainable practices, but it is the rules and regulations or techniques where organisations
8 are lagging behind. The second element is companies’ marketing strategies, which are obstacles in two ways:
9 firstly, the existing marketing activities attract consumers’ attention and boost waste; and secondly,
10 sustainability or upcycling is not marketed on the required level (Mangla et al., 2018; Zhang et al., 2021).
11 Finally, this research reflects that the current market is competition-based, and competition promotes more
12 linear practices rather than circular.
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28 About “*Socio-cultural barriers*”, it was established that consumers as well as professionals are not yet
29 very aware of the circular approach (Ghisellini et al., 2016; Mondoza et al., 2019). Awareness is a fundamental
30 lever to bring circular change (Lieder and Rashid, 2016). There is discussion about public awareness in the
31 studies, in which the majority focus on China; this qualitative research established that awareness is a similar
32 level challenge in the UK. Above the awareness, the additional factors disturbing the application are consumer
33 behaviour, attitude, and perception (Hartley et al., 2019). Further aspects arising to prevent organisations and
34 societies to accept CSCM are “*Structural barriers*”. Circular supply chain is a combination of the 3Rs (reduce,
35 reuse, and recycle) (Zhu et al., 2010); intangible structure (responsible team, organisation structure, allocated
36 time) and tangible structure (deposing off facilities) do not exist to make these processes happen (Xi, 2011; da
37 Silva, 2018). The findings indicate that despite the emergence of the situation, circular initiatives are not an
38 integral segment of organisation structure, and as a result, it does not drive success. There is also a requirement
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1 to develop controlled infrastructure to segregate and dispose of the waste material in industries and for
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3 households (specifically high-rise flats).
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5 The sixth and last group of hindrance factors was classified as “*Institutional and regulatory barriers*”.
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7 Issues that came into existence under this category are lack of supportive law and regulation, lack of
8
9 government support and post-Brexit trade to make circular evolution less efficient. Scholars as well as
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11 interviewees believe that government is the most important driver to drive circular changes but at present it is
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13 more written propaganda rather than a practical approach. Government is lacking in aligning their policies
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15 apposite to the CE that can enforce the businesses and a common person to follow it as a rule.
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19 To sum up, despite the fact that sustainability is becoming a pillar in the food industry of the UK, findings
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21 demonstrate that challenges like perception, attitude and behaviour, lack of structure, high cost of products,
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23 raw material and solutions, lack of awareness, lack of supportive legislation and profitability etc. are
24
25 encountered as crucial barriers, putting high impact on stakeholders, and are consistent with the studies of
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27 Rizos et al., (2017), Kirchherr et al., (2018). There are five additional barriers originated from this research:
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29 shelf-life of food products, forecasting and ordering inaccuracy, minimum order quantities, post-Brexit trade
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31 and demographic factors which equivalently affect the implementation of circularity proposals in the FSC.
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33 The analysis suggested that organisations are still working in traditional/linear ways and have numerous
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35 challenges depending on the operations and duties multiple stakeholders perform. A theoretical framework
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37 was developed merging various concepts in Fig. 2.
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42 [INSERT FIGURE 2 HERE]
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45 **Theoretical contribution of study**

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47 This finding contributes to the CE literature and several other fields of academic research. This paper expands
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49 the CE literature by providing new theoretical findings through a new regional background, by exploring the
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51 potentials of implementing the CE model in the UK FSC, by critically assessing previously known and
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53 recognising new barriers, investigating, and exploring the repercussion at a stakeholder level and suggesting
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1 the drivers. The first contribution of this research shows that CSCM is a novel and demanding field in the UK
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3 food industry and the academic field. Current literature of the CE mainly focusses on China (Geng et al., 2009;
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5 Farooque et al., 2019), in a general context (Govindan and Hasanagic, 2018) and other contexts i.e.,
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7 construction or fashion industries or different countries (Mangla et al., 2018). Studying this concept from the
8
9 UK food industries gives more specific and deep insight into its application. The study is prerequisite because
10
11 of the difference in market and legal structures in different countries. China is the first county in the world to
12
13 execute the CE as legislation as the part of its national development strategy (Farooque et al., 2019). Whereas
14
15 there is no such imposing framework introduced in UK, on the contrary food health and safety regulation are
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17 more rigid than other countries. Subsequently, lack of supportive legislation is found as one of the most
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19 discussed barriers in the current study. Moreover, it is an attempt to address the gaps and calls from previous
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21 literature (Elzinga et al., 2020). As suggested by de Jesus and Mendonça (2018), an empirical and systematic
22
23 analysis is another major contribution of this study. Including relevant actors can offer more effectiveness to
24
25 bottom-up strategies for the CE by getting relevant feedback (Mendoza et al., 2019). Thus, this research on
26
27 stakeholder theory is the first empirical study to include relevant stakeholders (product designers,
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29 manufacturers, retailers' consumers, up-cyclers, recyclers, and logistics) the contribution of which is pertinent
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31 to create the value for this transition. Involvement of stakeholders in this research aided in offering more
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33 rational strategies as drivers to create value for stakeholders and the organisation while accepting
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35 environmental ventures in business.
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42 **Managerial contribution**

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44 To develop the understanding of managers, this study provides a comprehensive overview of different
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46 paradigms towards sustainability. Literature suggests the CE as most demanding and aspirational for current
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48 business scenarios while providing benefits on three main dimensions (social, environmental, and economic)
49
50 towards which managers must be inclined (Ayati et al., 2022; Elzinga et al., 2020). However, due to the nature
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52 of the food industry, the hindrances for business for not adopting it as a business model is a matter of
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1 discussion. Analysis of this study shows that managers are reluctant to accept this transition due to high
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3 investment requirements (Govindan and Hasanagic, 2018), their profitability approach (Shahbazi et al., 2016),
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5 longstanding organizational culture (Kirchher et al., 2018), less support from legislative bodies (Ranta et al.,
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7 2018a; b), the complex nature of the process (Adams et al., 2017), and some technical factors (Pheifer, 2017).
8
9 Managers also think that one of the reasons that this model is less favourable is unacceptability from end
10
11 consumers (Liu and Bai, 2014). By analysing the technical aspect, this study reveals that the food industries
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13 are lacking behind in terms of knowledge and skills of the practices to be followed, options and possibilities
14
15 to re-use the products (Ritzén and Sandström, 2017). Product life is the prime concern of managers to apply
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17 circularity strategies. Due to health and safety concerns, circular products are not acceptable to consumers.
18
19 For FSC, there is an incongruity in the demand and forecasting from retailers to manufacturers. That leads to
20
21 a huge amount of food waste and less possibility to apply real time approaches like closing the loops. This
22
23 study demands innovations regarding product life extension techniques or strategies for the products to be
24
25 used for an optimum time without affecting nutrition value, taste, texture, and the aesthetic appeal of the
26
27 product. It needs advances in the demand-forecasting system through techniques, strategies or through co-
28
29 ordination. Environmental transitions in the business should have financial property attached to them. It will
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31 not be acceptable until it is profitable for the business (Lieder and Rashid, 2016). For instance, sustainable
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33 solutions are an extra cost for business by the way of acquiring virgin material or investing in new technologies
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35 (Shahbazi et al., 2016).
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42 On the other hand, consumers are not ready to spend extra money for the sake of the environment only
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44 while having other priorities (Kiss et al., 2019; Li et al., 2021). Thus, the CE strategies do not fit with the need
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46 of the end consumer. An opposing factor discovered in this research, working against the CE is the rule set by
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48 businesses of a “buying limit”, buying more for less, which customers find economical, but which is consistent
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50 with the ideal picture of the circular supply chain. This research suggests that industries and government should
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52 start this initiative by educating and spreading awareness among societies by showing the results of accepting
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1 it and the consequences of carrying out linear processes (Sung et al., 2020). The most effective instrument
2 suggested is social media networks. Providing financial support to these endeavours can also lead to a change.
3 Environmental models are found to be less favourable by management because of lower financial gains
4 (Kirchherr et al., 2018). Literature shows that monetary benefits can be achieved for adopting CE as model by
5 reducing the waste, remanufacturing, and reusing are significant elements of the model and by getting
6 competitive advantage. Therefore, management should consider circular achievement as part of their
7 company's long-term plans and should design the strategies on that basis.

17 **Conclusions, limitations and future research**

19 This exploratory research is a preliminary step to gain deep insight into the CSCM topic, due to the
20 less availability of literature in the food industry in the UK, where application of such an approach is
21 demanding yet imminent from practical as well as theoretical perspectives. This study comes up with the
22 framework of implications incurring challenges and drivers for it. The findings of this study need interpretation
23 of limitations that are relevant for future research. The present research followed specific methods for sampling
24 and analysis, limitations related to which should be stated. This research is carried out in a specific setting
25 limited to the UK context and limited to the food industry. Application in the different settings may give
26 different results. Research is limited from the sampling size of 34 participants. Although it brought valuable
27 insights for the implementation of CE, large sampling including quantitative empirical studies is recommended
28 to validate the findings. Based on the stakeholder theory, this study is conducted involving the stakeholders
29 directly involved in the FSC. However, the supplier stage is first included then discarded due to data quality
30 and relevance issues. Similarly, there is only one participant involved from upcycling because of less
31 availability of food upcycling companies. Future studies can be performed by involving these stakeholders.
32 Furthermore, the participants involved in this research are directly related to FSC. But the context of
33 stakeholders who are indirectly related i.e., institutional bodies and academics, can be different and may be
34 worth exploring for the same settings. This study includes companies related to the food industry which are

1 involved and interested in sustainability practices, but the CE is not applied as a business model. Further
2
3 empirical study should be conducted from a comparative perspective with the findings of this study with the
4
5 companies where it is applied as a business strategy.
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8 Furthermore, the participants involved in this research are directly related to food supply chain. But context of
9
10 stakeholders who are indirectly related i.e., institutional bodies and academic, can be different and worth
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12 exploring for same settings. This study includes companies related to food industry which are involved and
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14 interested in sustainability practices, but the circular economy is not applied as business model. Further
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16 empirical study should be conducted from comparative perspective with the findings of this study with the
17
18 companies where it is applied as business strategy. Purely qualitative design is another limitation this research.
19
20 This study conducted semi-structured interviews with the stakeholders for exploring experience, feelings,
21
22 perceptions and understanding of the circular economy approach to develop the framework. In which
23
24 respondents bias could not be entirely limited. Future research should include quantitative methods to validate
25
26 qualitative the findings. This research presented challenges and explored their repercussions on various phases
27
28 of supply chain. The way they affect the stakeholders. To provide the additional understanding on the context
29
30 specificity of challenges to supply chain stages and to different industries and business environment can be
31
32 tested with quantitative methods. This research has taken stakeholder theory as a lens to create value for
33
34 stakeholders and is one of the few research studies of the circular economy from a management perspective.
35
36 Future research can be conducted through other management theories and model. Strategies are introduced to
37
38 overcome the barriers come on the way to accept the circular economy transition. i.e., traceability, big data,
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40 measurability. The findings are significance for the whole supply chain management. Further research can
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42 investigate the effectiveness of these strategies on different levels of supply chain. Due to Covid-19 restrictions
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44 data collection process was restricted to online (telephone interview) method. Which has disadvantages to
45
46 “lack of social cues” and “No view of the situation”, future research can be conducted involving face-to-face
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48 interviews and industry visits.
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1 This study has unlocked many doors for the possibilities of future research. The following are some
2 suggestions to extend the current body of knowledge in the circular supply chain literature and its business
3 and management context. This research has used stakeholder perspective as theoretical glance and propose
4 holistic framework for adopting circular supply chain approach considering challenges and barriers to its
5 different stages. A different theoretical approach can be perceived to analyses the concept. Further research
6 can be performed on various geographical locations and industries. A mixed method approach (qualitative and
7 quantitative) can be applied to test research objectives. Moreover, this study has explored the circular economy
8 from UK food supply chain settings. Researchers studying circular supply chain management can explore and
9 validate it in different settings. This paper is a first attempt to carry out systematic analysis of various
10 challenges from circular supply chain stakeholders' perspective who are directly related to its processes. It
11 should consider institutional and academic perspectives. In this respect future studies can integrate the views
12 of government representatives and academics. It could be interesting to study the different combinations such
13 as inter-organisational comparisons (different manufacturers, different retailers, or recyclers). It should also
14 be helpful to focus on one aspect of the supply chain such as designing and testing the findings of this research
15 using quantitative methods. Direct conceptual relationships of challenging factors and supply chain actors can
16 be explored, tested, and validated. Future studies can also explore how companies can implement suggested
17 strategies for value creation. There are new themes originated from this research related to the food industry
18 i.e., post-Brexit trade, minimum order quantities, shelf life of product and demographical factors. Further
19 research can explore and test these factors for validity and reliability in different settings.
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Table 1: Definitions of Constructs and Concepts

DEFINITIONS OF CONSTRUCTS AND CONCEPTS	
Circular Supply Chain Management	Circular Supply Chain Management is the co-ordination of forward and reverse supply chains (Batista et al., 2018a, p. 446) which systematically restore technical material and regenerate biological material towards a zero waste vision through system-wide innovation in business models and supply chain functions from product/service design to end-of-life and waste management, involving all stakeholders in a product/service lifecycle including parts/product manufacturers, service providers, consumers, and users (Farooque et al., 2019, p.884).
Circular economy	The circular economy is a restorative and regenerative production technique (EMP, 2012; 2013; 2014) which contributes in raising productivity (Linder and Williander, 2015; EEA, 2016; Souza-Zomer et al., 2018) and bringing economic and environmental benefits like increasing Gross Domestic Product, net material saving, employment growth (EMF, 2013a; Morgan and Mitchell, 2015) reducing carbon footprints (EMF and MCK, 2014; Pratt and Lenaghan, 2015) by keeping the product components, natural and human resources and material at highest utility and optimum level (Linder and Williander, 2017; EEA, 2016; Souza-Zomer et al., 2018).
Supply Chain Management	Supply Chain Management is systematic and strategic co-ordination of traditional business functions (Mentzer et al., 2001b, p. 22) that helps in management of relationships from upstream to downstream and from end user to original supplier to deliver superior customer value at less cost and to improve the long-term performance of individual companies and the supply chain as a whole (Christopher 1998; Cooper et al., 1997).
Upcycling	Upcycling is a green practice within the realm of product management (Griskevicius et al., 2010; Lin and Chang, 2012) which encourages the environmentally conscious entrepreneur to create and modify products from used material (Sung and Cooper, 2015) which is of higher quality or value than compositional elements (Sung et al., 2014; Sung, 2017), consumers to engage with alternatives (Albinsson and Yasanthi Perera, 2012) and environmentally sustainable products and facilitate economic diversification and employment opportunities (Khan and Tondon, 2018).
Recycling	Recycling is a critical part of the circular economy which ensures products are valued not wasted or left to pollute the environment (WRAP, 2019), by activities of reprocessing of recovered material at the end of the product life (Worrel and Reuter, 2014).
Logistics in circular supply chain management	Logistics in circular supply chain management is a combination of green and reverse logistics processes, which focus to change the environmental performance of supplier to customers (Oksana Seroka-Stolka and Ociepa-Kubicka, 2018) by combining the activities of recycling, reusing, and reducing (Carter and Ellram, 1998) and efficiently planning, implementing, and controlling the cost-effective flow of materials, from the point of consumption to the point of origin of the product (Rogers and Tibben-Lembke 1999, p. 2).

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Table 2: All stages of coding process

Memoing:	Stages in coding process of	Description
Take notes, capturing the thought process	Thematic analysis	
	Open coding	Identify concepts of interest in qualitative data; code them
	Axial coding	Identify relationships between concepts via inductive reasoning
	Selective coding	Choose a “core concept” for analysis

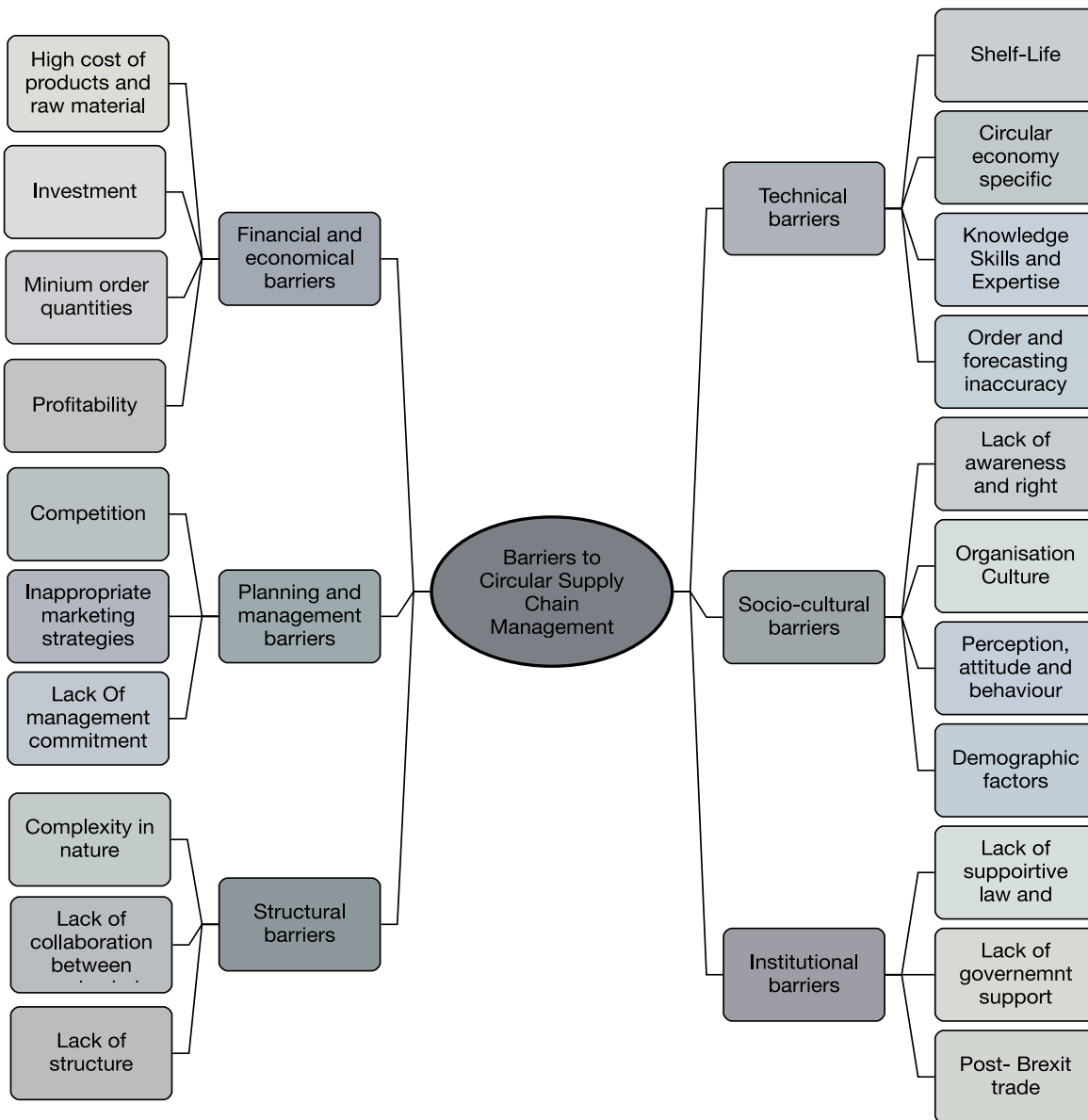
Source: Adapted from Dillon (2012)

Table 3: The details of in-depth interviews with key stakeholders of the circular supply chain

S. N.	Supply Chain Stage	Gender	Organisation	Position	No. yrs experience in the industry	No. yrs in the position	Interview duration
1	Supplier	Male	NSD	Farmer	11	11	20 mins
2	Designing	Male	Kerry	Technical Manager	11	4	52 mins
3	Designing	Male	Kerry	R & D Manager	20	3	1hr 5mins
4	Designing	Male	Kerry	Chef Manager	9	3	58 mins
5	Manufacturing	Male	Anonymous	Operations Manager	13	4	1hr
6	Manufacturing	Male	Nomad Foods	Operations Project Manager	26	1.5	1hr 10 mins
7	Manufacturing	Female	Kerry	Planning Manager	7	3.5	50 mins
8	Manufacturing	Female	Nomad Foods	Manufacturing Manager	10	1	38 mins
9	Manufacturing	Male	Kerry	Technical Manager	6	2	44 mins
10	Manufacturing	Male	Bakkavor	Operations Manager	10	4	48 mins
11	Manufacturing	Female	Kerry	Supply Chain Head	15	5.5	56 mins
12	Manufacturing	Male	Kerry	Demand Planner	6	2	1 hr
13	Manufacturing	Male	Kerry	Senior National Account Manager	1	3	35 mins
14	Logistics	Male	Bakkavor	Despatch Manager	17	4	1hr 25 mins
15	Retailing	Male	Anonymous	Floor Manager	20	1.5	30 mins
16	Retailing	Female	Greggs	Manager	8	2	31 mins
17	Retailing	Female	M&S	Head of International Supply Chain and Logistics	6	4	48 mins
18	Retailing	Male	Morrison's	Floor Manager	7	3.5	1hr 15 mins
19	Consumer	Male	Consumer	Consumer	-	-	55 mins
20	Consumer	Female	Consumer	Consumer	-	-	30 mins
21	Consumer	Male	Consumer	Consumer	-	-	40 mins
22	Upcycling	Male	Coffee Cup Ltd	Director	5	5	1 hr 29 mins
23	Recycling	Male	Cymru Lan holdings Ltd	Director	3	3	30 mins
24	Recycling	Male	Biogen (UK) Ltd	Business Development Manager	4	1	58 mins

25	Manufacturing	Male	Noon Products	Vice President	27	10	27 mins
26	Manufacturing	Male	Bakkavor	R&D Head	9	2	47 mins
27	Manufacturing	Male	Ginni Ent. Ltd	Director	29	29	30 mins
28	Designing	Male	Anonymous	R&D Packaging Lead	5	2	47 mins
29	Retailing	Male	Tesco	Supply Chain Manager	7	1	35 mins
30	Recycling	Female	Council	CSO	6	3	30 mins
31	Recycling	Male	Household recycling Ltd	Managing Director	13	13	45 mins
32	Consumer	Female	Consumer	Consumers	-	-	40 mins
33	Manufacturing	Male (Not included)	Anonymous	Health & Safety Manager	3	1	33 mins
34	Consumer	Female	Consumer	Consumer	-	-	30 mins
35	Retailing	Female	Morrison	Sales Manager	7	2.5	43 mins
36	Consumer	Male (Not included)	Consumer	Consumer	-	-	30 mins

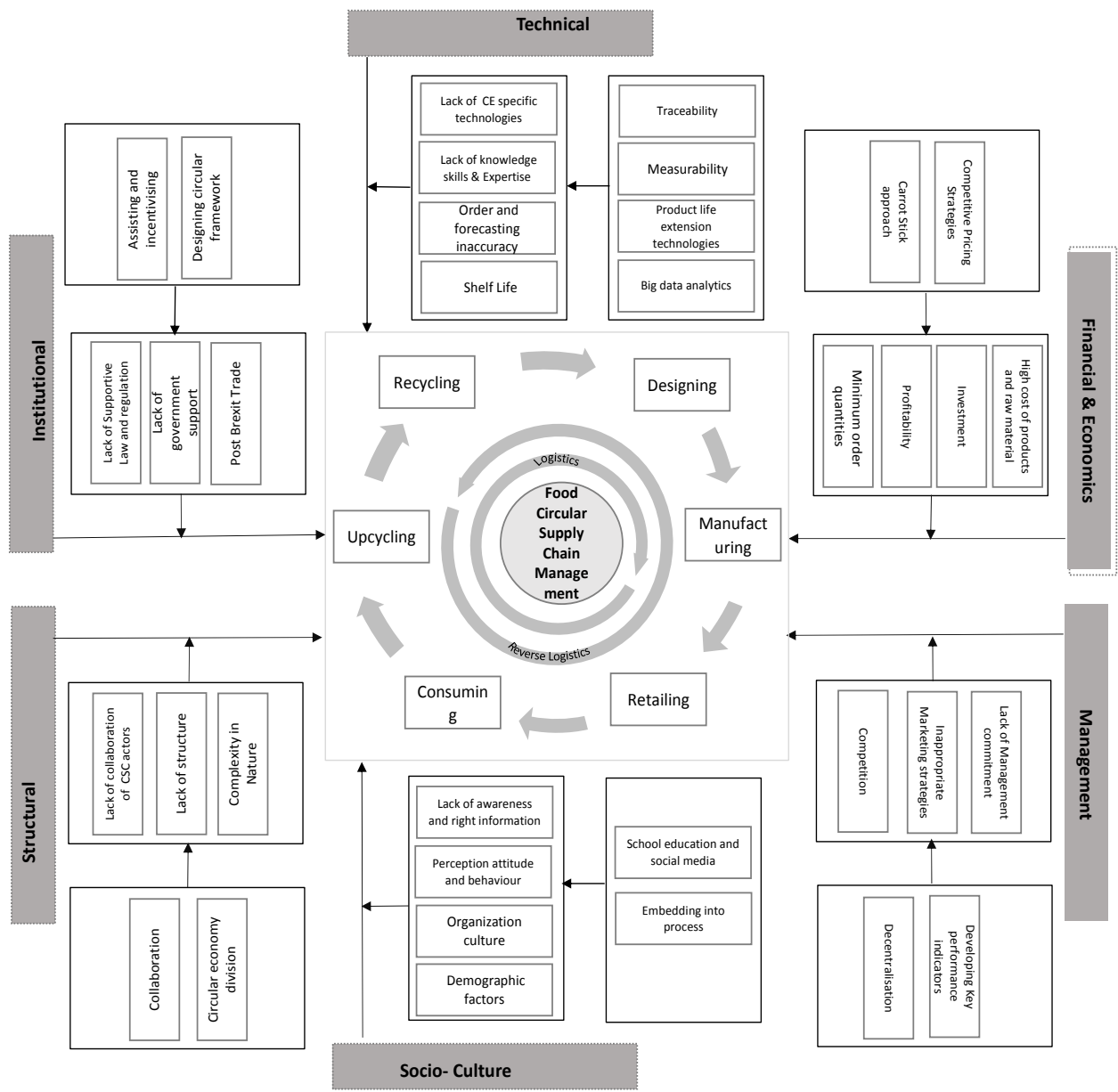
Figure 1: Graphical representation of themes and sub-themes



Source: NVivo 12 Mind map

search

Figure 2: Final theoretical model



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2 **Circular supply chain management in post-pandemic context.**

3 **A qualitative study to explore how knowledge, environmental initiatives and economic viability affect sustainability.**

4 **LETTER TO REVIEWERS**

5 Dear Reviewers,

6 We would like to kindly thank you for your evaluation and for the constructive and copious suggestions which have helped us to improve the draft significantly.
7 All your comments and suggestions have been taken into account in the revised paper, as described in the following table. We highlighted all the changes in the
8 revised manuscript.
9

Reviewer(s)' Comments to Author:	
Reviewer I	
Comments	Responses
<p>10 11 12 13 14 15 16 17 18 19 20 21 22</p> <p>Congratulations. The authors have tried to address the concerns and improve the manuscript. I believe that the manuscript can be conditionally accepted. The manuscript can be accepted for publication if the authors address the following issues: 1- In Table 3, the two interviewees that were not included in the analysis should be specified. Only No. 36 is specified. 2- In this revised version of the manuscript, we see many syntax-related errors, such as "Future research can should include quantitative methods...". Thus, the manuscript should be proofread carefully.</p>	<p>Thank you for your comments about the paper. All your suggestions have been taken into account in the revised paper with the aim of improving the understanding of the topic to the reader. 1- Table 3 has been revised 2- The manuscript was proofread carefully.</p>
<p>23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46</p> <p>1. Originality: Does the paper contain new and significant information adequate to justify publication?: Yes, the study contributes to circular economy literature by proposing a conceptual framework on circular supply chain management.</p> <p>2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Yes, the paper cites pertinent studies in the literature and the range of literature sources is acceptable.</p> <p>3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Yes, the study is grounded on the stakeholder theory and the applied methods are appropriate.</p> <p>4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Yes, the results are presented appropriately and in the discussion section, the authors summarize the study's results and findings.</p>	<p>Thank you for your enthusiasm and your positive view of the paper. All your comments and suggestions have been taken into account in the revised paper with the aim of improving the understanding of the topic to the reader.</p>

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5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: Yes, the paper provides theoretical and managerial implications.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: In the current version of the manuscript, we see many syntax-related errors and the quality of communication is not completely acceptable. The manuscript should be proofread carefully.

Reviewer II

Comments

The paper has demonstrated significant improvements in response to previous feedback, and it now stands as a well-structured and impactful contribution to the field. I recommend its acceptance for publication.

Additional Questions:

1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper demonstrates a commendable level of originality, presenting new and significant information that justifies its publication. The exploration of Circular Supply Chain Management in the post-pandemic context, particularly within the UK food industry, adds a fresh perspective to the existing literature.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The paper exhibits a thorough understanding of the relevant literature in the field, and the inclusion of additional references has significantly enriched the literature review. The authors have now appropriately cited a range of literature sources, strengthening the paper's theoretical foundation. No significant work appears to have been ignored, contributing to the paper's credibility.

Responses

Thank you for your enthusiasm and your positive view of the paper.

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3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: The paper's argument is built on a solid base of theory, concepts, and ideas, and the research design has been well thought out. The authors have responded to previous suggestions, incorporating a careful design that aligns with the study's objectives. The methods employed, particularly the use of semi-structured interviews, are appropriate for the research context.

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: The results are presented clearly, and the analysis is conducted appropriately. The conclusions effectively tie together the various elements of the paper, aligning with the research questions and hypotheses. The findings contribute to the overall coherence of the paper and enhance its scholarly merit.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The paper clearly identifies implications for research, practice, and society. The newly added sections on theoretical and managerial contributions provide a robust discussion of how the research impacts the Circular Economy literature and the practical considerations for managers in the UK food industry. The identified implications are consistent with the study's findings and conclusions, showcasing a thoughtful bridge between theory and practice.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The paper excels in terms of communication quality. It effectively expresses its case, employing technical language appropriate for the field and the expected knowledge of the journal's readership. Attention has been paid to clarity of expression and readability, ensuring the manuscript is accessible while maintaining a scholarly tone. Sentence structure, jargon use, and acronyms are well-managed, contributing to the overall clarity of the paper.

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Reviewer III	
Comments	Responses
<p>Thank you for granting me the opportunity to review the paper titled 'Drivers and Drawbacks in Circular Supply Chain Management: Analyzing the Role of Knowledge, Environmental Initiatives, and Economic Viability in the Food Industry.' I believe there are a couple of key points the authors should consider before finalizing the paper for publication.</p> <p>I highly recommend that the authors include industry reports from reputable sources like McKinsey or HBR that align with their study. This addition would underscore the significance of their research.</p> <p>Additionally, the contributions outlined in the introduction could benefit from further elaboration and discussion. The paragraph added seems insufficient in convincing the readers. Moreover, it would be valuable to explore the managerial and policy implications arising from their study</p>	<p>Thank you for your useful comments.</p> <p>We include industry reports from reputable sources like McKinsey or HBR that sustain the importance of developing our study.</p> <p>Additionally, we added more contributions in the introduction. Moreover, we explored the managerial and policy implications arising from the study.</p> <p>We stated that: “This study offers a comprehensive outlook by examining the weaknesses present in various phases of the supply chain. It explores how a specific stage in the circular supply chain is impacted by acknowledged challenges through the lens of stakeholder theory. This exploration is intended to contribute to the formulation of management-level strategies. Rethinking and reshaping this approach could prove advantageous in generating three-fold benefits—economic, environmental, and social. Additionally, it can play a supportive role in involving stakeholders in the pursuit of sustainability goals.</p> <p>In fact, investigating the obstacles in circular supply chain management is helpful for companies, researchers, and institutions. It further leads towards the drivers, methods, or tools for various stakeholders of companies to recognise the capacity and possibility of product regeneration in each phase of circular supply chain management. It is also a helpful attempt to gain better understanding of circular supply chain management concept and potential to implement it in the food industry. Overall, this is a considerable contribution in the theoretical and management field.</p> <p>The circular food supply chain is a new and propitious field in waste management that calls for zero waste strategies. It needs more contribution in total value recovery from all the actors of the supply chain by utilising waste in making something useful. Consequently, there is a broader scope for adding more research in the area (Farooque, 2019). Companies which decide to restructure their supply chain system to the circular economy, unlike the linear economy, will receive economical, environmental and social</p>

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advantages. Reverse logistics and its configuration play a big role to develop circular supply chain framework, but major hurdles are expected to prevent the attainment of this transition on this phase as well (van Loon and Van Wassenhove, 2020). There are existing studies discussing quantity, quality, timing and capacity-related issues in the circular supply chain management (Linder and Williander, 2017), but a much more systematic analysis of challenges, faced at the time of redesigning a company's circular supply chain is needed, which would complement the initial research. Thus, an exploratory study is demanded (Sandvik and Wendy, 2019). Literature says that consumer behaviour plays a significant role, therefore examining business to consumer (B2C) factors and rational/irrational motives of customers and methods to satisfy them play an instrumental role to support circular supply chain management practices.

Besides, considering economic, social, and environmental impacts, the food supply chain must be more sustainable and food waste should be planned, recorded, communicated, and organised carefully. The circular supply chain management is a dynamic approach and is not very easy to assess and monitor. For its successful implementation in industries, it is important to examine the threatening indicators it faces on all levels of the supply chain. Because its aspects are interconnected in this way, any variation at one end would affect the whole. Secondly, there is rarely a study regarding the circular supply chain which considers the customer perspective which is one of the most significant and inseparable aspects of the food supply chain (Kirchherr et al., 2018). Therefore, it is valuable to explore consumer's perspective for its effective implementation. Similarly, the other actors should equally be considered. There is a lack of exploring the list of barriers under theoretical lenses (Farooque et al., 2019). Thirdly, providing tools, methods and guidelines is required for adopting the circular practices. There follow the research gaps found in previous studies:

- i. Levers and challenges of the circular supply chain management can vary based on numerous factors i.e., industry, company size, role in supply chain and geography etc (Kirchherr et al., 2018; Tura et al., 2018; Hart et al., 2019). There has not been any

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	<p>previous research done on the UK food industry in the context of the circular supply chain.</p> <p>ii. Tura et al.'s (2018) study on barriers in the circular economy does not address the effect of individual barriers on the whole supply chains so this research will acknowledge the repercussions of each barrier throughout the circular supply chain.</p> <p>iii. Furthermore, considering the consumer perspective has also been demanded (Kirchherr et al., 2018; Elzinga et al., 2020) in previous research.</p> <p>iv. Limited research is performed on the conceptual studies for the circular business model to facilitate its practical and managerial implementation (De Angelis, 2021).</p> <p>This study provides a detailed understanding of circular supply chain management by exploring barriers and drivers from the perspective of stakeholders. Qualitative research offers flexible framework for this study because perspectives usually vary according to the experiences and positions of stakeholders. This flexible framework is needed to explore human perspective and opinion and to utilise the opinion as research. The theoretical aspect offers a contribution of theory extension by empirical exploration. This qualitative research gathers data which can be tested through preconceived theories and hypotheses in future research. In term of methodology, this research used a multi-disciplinary approach to the circular supply chain management concept as a main contribution of this study to provide a holistic perspective of the domain the circular economy literature”.</p>
<p>1. Originality: Does the paper contain new and significant information adequate to justify publication?: see below</p> <p>2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: see below</p> <p>3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: see below</p>	<p>Thank you for your enthusiasm and your positive view of the paper. All your comments and suggestions have been taken into account in the revised paper with the aim of improving the understanding of the topic to the reader.</p>

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4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: see below	
5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: see below	
6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: see below	