Creating sustainable value through food waste management: does retail customer value proposition matter?

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Abstract

Purpose – This research aims to explore retail managers' views on how food waste (FW) management activities contribute to sustainable value creation and how the customer value proposition (CVP) for a given food retailer interacts with their approaches to FW management.

Design/methodology/approach - A three-stage exploratory qualitative approach to data collection and analysis was adopted, involving in-depth interviews with retail managers, documentary analysis of multiple years of relevant corporate reports and email validation by seven major UK grocery retailers. Thematic content analysis supplemented by word similarity cluster analysis, two-step cluster analysis and crisp-set qualitative comparative analysis were undertaken.

Findings – FW management practices have been seen by retail managers to contribute to all forms of sustainable value creation as waste reduction minimises environmental impact, saves costs and/or serves social needs whilst economic value creation lies at the heart of retail FW management. However, retail operations are also framed by CVP and size of a retailer that enable or inhibit the adoption of certain FW management practices. Low-price retailers were more likely to adopt practices enabling them to save costs. Complicated cost-incurring solutions to FW were more likely to be adopted by retailers associated with larger size, high quality and a range of services.

Originality/value - This study is the first of its kind to empirically explore retail managers' perception of sustainable value creation through food waste management activities and to provide empirical evidence of the linkages between retail CVP and sustainable value creation in the context of retail FW management.

Keywords: retail sector, food waste, value creation, sustainable value, customer value proposition (CVP)

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1. Introduction

Food waste (FW) is a wicked problem with boundary spanning causes but no unified definition and solutions (Närvänen *et al.,* 2020). United Nations Environment Programme's (UNEP) most recent report estimates that a total of 931 million tonnes of food is wasted post farm gate each year, averaging 74 kg per capita globally (UNEP, 2021). FW in UNEP's report is defined as "food and the associated inedible parts removed from the human food supply chain" including food processing and manufacturing, food/grocery retail, food services and households (UNEP, 2021, p. 19). This study adopts Huang *et al.'s* (2021) definition which excludes inedible parts but includes "any food which has been produced for human consumption, but does not get consumed" (p.3). This includes FW that occurs at any stage in the process of food production, distribution and consumption. In this context, retailers can be viewed as critical intermediaries in the food supply chain (Närvänen *et al.,* 2020), playing a pivotal role in reducing FW farm-to-fork (de Moraes *et al.,* 2020).

Retail FW can arise from standards set by retailers, leading to rejection of food products that fail to meet quality requirements (Mena *et al.,* 2014); food safety concerns (Gruber *et al.,* 2016); the use of confusing date labelling (Aschemann-Witzel *et al.,* 2016); problems with in-store logistics and retailing format (Teller *et al.,* 2018), and a lack of staff training (Goodman-Smith *et al.,* 2020). There are multiple opportunities to reduce retail FW including improved efficiency and organisation (Teller *et al.,* 2018), use of modern technology to deliver better stock management; and adherence to customer quality expectations (Goodman-Smith *et al.,* 2020), and more autonomy for store managers (Rosenlund *et al.,* 2020) so they can provide reactive solutions to reduce FW (Hermsdorf *et al.,* 2017). Other options are take-back agreements with suppliers (Eriksson *et al.,* 2017); repurposing or redistributing food in donation-based supply chains, recycling through animal feed (Goodman-Smith *et al.,* 2020),

nutrient or calorie recovery processes (e.g. anaerobic digestion) or ultimately sending to landfill (Filimonau and Gherbin, 2017).

Managing FW has the potential to integrate the creation of environmental value (Scherhaufer *et al.,* 2018) and social value (Mirosa *et al.,* 2016) with existing organisational processes of economic value creation (de Moraes *et al.,* 2020) when considered against a backdrop of a growing global population, food poverty, food insecurity and climate change. However, most studies consider the retail waste management strategies adopted, via the waste hierarchy (Huang *et al.,* 2021), in isolation from sustainable value creation and the CVP adopted by each food retailer and the mechanisms of value delivery at retail and/or supply chain level. There is, as a result, a paucity of research on how a food retailer's CVP might interact with the value creation activities associated with managing FW.

Value is a term constructed by individuals and communities as a combination of factors that revolve around cost and reward/benefit (Manning, 2015). Value can be described as a combination of utility value i.e. customers' perceptions of the product value and exchange value i.e. the economic value derived from organisational activities (Bowman and Ambrosini, 2000). The value construct of profit maximisation and shareholder benefit has been extended over time to consider stakeholder value or shared value (Porter and Kramer, 2011), i.e. creating sustainable value for society as a whole. In the context of retail FW management, Huang *et al.* (2021) present a conceptual framework to demonstrate how sustainable value is created through FW management. They propose an "economic value plus" approach to sustainable value creation with a nuanced perspective on economic value which includes three forms: perceived surplus value, exchange value and mitigation value. The model shows that effective management of FW by retailers can create at least one form of economic value plus environmental value and/or social value. As the concept is still emergent, there are gaps in the identification of the antecedent conditions of sustainable value creation (Foss and Saebi, 2018),

and, in particular, a lack of understanding of how the organisation's existing CVP shapes and frames the way sustainable value is created (Evans *et al.*, 2017).

CVP is a poorly defined managerial concept which has often been used as an alternative for a business model (Payne *et al.,* 2017), a component of a business model (Haas *et al.,* 2019) or a retailing format (Yrjölä *et al.,* 2014). Based on a systematic review of literature on retail business models, Rintamäki and Kirves (2017) identify four types of CVP in the retail context: *economic value proposition* (low price), *emotional value proposition* (customer experience), *functional value proposition* (solutions) and *symbolic value proposition* (meanings). Retail CVP can alternatively be described in terms of the *offering* i.e. assortment or range of products, price and service), *customer experience* (atmosphere) and *shopping convenience* encompassing opening hours, location, amenities and availability (Yrjölä *et al.,* 2014; Haas, 2019). Retail CVP aligns with organisational capabilities and resources to promote competitive advantage (Rintamäki and Kirves, 2017) and the connection between value proposition and value creation and delivery is key in studies of business models. One common understanding is that value proposition reflects the target customer, their rationale for why they should purchase the organisational offering (product, service or combination of both) and an understanding of the interaction between price and perceived benefit (Payne *et al.,* 2017). Customer value can be created via operational efficiency, operational effectiveness and customer lock-in as well as value being captured by the business itself and its partners (Sorescu *et al.,* 2011).

However, a specific research gap exists in terms of how these interactions between business model components occurs (Wirtz, 2016; Haas, 2019), especially how retail CVP enables, or conversely hampers opportunities for sustainable value creation. Cognisant of this lack of empirical evidence and paucity of understanding of how the association between FW and sustainable value creation is perceived by retail managers, this paper aims to answer two interrelated central questions:

1. What is retail managers' understanding of how sustainable values can be created through FW management?
2. How does the CVP of a given retailer interact with sustainable value creation through their FW management activities?

The context of this study is FW management by United Kingdom (UK) food retailers. As it is a relatively concentrated sector dominated by nine big retailers, the UK food retail sector is ideal to explore the interaction between CVP and sustainable value creation. Studies in the UK have explored causes of retail FW (Mena *et al.*, 2014), reporting of FW in sustainability policies and reports (Bobe and Dragonmir, 2010; Jones *et al.*, 2015), and the role of the third sector in redistribution of retail food surplus (Alexander and Smaje, 2008). More recently, studies have examined managerial attitudes towards FW issues and mitigation practices reported by local store managers of the seven UK food retailers (Filimonau and Gherbin, 2017), channels used to communicate FW issues to consumers (Young *et al.*, 2018), adoption of best practice to influence household FW reduction (WRAP 2019), and motivations driving UK retailers' commitment to FW reduction (Swaffield *et al.*, 2018). However, the level of adoption of practices varies between retailers (Feedback, 2018). In the UK, a voluntary approach to FW management practices has been enactioned (apart from the Landfill Directive) and all UK retailers face nearly identical external pressures to manage FW. In such circumstances, different responses may be determined by internal institutional contexts (Souza-Monteiro and Hooker, 2017). The empirical research findings will enrich our understanding of the constraints and conduciveness of key retail contextual factors such as CVP and size in managing FW and creating value for shareholders and wider stakeholders.

2. Methodology

2.1 Research design

The association between CVP and sustainable value creation is a nascent area with limited empirical evidence (Haas, 2019). This study takes on an interpretive understanding of social action using a qualitative exploratory approach (Bazeley and Jackson, 2013) and triangulation with multiple data sources, a method commonly used in studies of challenging UK retail settings with a small number of large competitors (Filimonau and Gherbin, 2017; Rosenlund *et al.*, 2020).

2.2 Research context, sample selection and data collection

In the UK, there are 19 chain grocery retailers, nine of which are major players with market share ranging from 4% to 25.8% (Mintel, 2019). The sales of the nine major food retailers totalled 87% of the UK grocery market in 2019 (Mintel, 2019). Large retailers were chosen for this study due to their more consistent corporate responsibility reporting (Souza-Monteiro and Hooker, 2017), more clearly defined CVPs in terms of atmosphere, availability, price, quality, product range and service provision, and their associated power to influence both upstream and downstream FW practices.

The number of the food retailers in the UK is small and the challenges of obtaining responses from retail managers have been well documented (Filimonau and Gherbin, 2017). This study adopted a three-stage mixed method approach to data collection involving triangulation of data sources (stage 1 and 2) and checking for discrepancies and requesting clarification from retailers (stage 3) to ensure data validity. Similar approaches involving documentary analysis and interviews has been used by other studies on retailers' FW (e.g. Filimonau and Gherbin, 2017; Rosenlund *et al.*, 2020). This study builds on previous work by adding the third stage confirmation by retail managers of the data analysis results.

Stage-one of this study used individual face-to-face semi-structured interviews. Details of how the responses were obtained in this study can be found in Appendix 1. Altogether, five one-to-one interviews (representing four retailers) were conducted including three store

managers and two corporate sustainability directors, with each lasting around 1.5 hours. They were all recorded and fully transcribed.

Due to the challenges of gaining responses from all top nine retailers to discuss FW issues, also observed by Filimonau and Gherbin (2017), stage two of this study involved collection of corporate reports downloaded from the websites of all nine major retailers in the UK. These reports included sustainability reports, corporate social responsibility reports, annual reports and/or strategic reports between 2013 and 2018 if available online (see Appendix 1 for details). All reports were initially collated in 2018 and were subjected to iterative thematic content analysis.

To enhance the content validity, stage 3 involved asking all nine retailers to confirm the thematic content analysis coding of the documentary evidence. FW management practices were listed separately in an excel file for each of the top nine retailers. Each practice was defined to avoid any misunderstanding. Findings were provided for each practice as 'yes' or 'no' for each retailer. Respondents were asked to provide an example if a practice had to be changed from a 'no' to a 'yes' to make sure claims were evidenced. An open-ended question was added for the respondent to provide further comments and explanations regarding why 'yes' or why 'no' to each practice. This excel file was emailed to the CEO and corporate sustainability director (if available) of each of the top nine retailers. After two reminders, seven responses were received (see Appendix 1). The final analysis was therefore based on the data from those seven retailers comprising of two private, two partnerships/cooperatives and three public companies. Some retailers asked to be anonymised. Due to the small number of major retailers in the UK, it was decided to keep all retailers anonymous. Of the seven retailers, two were small-sized (M3, and P2), three were medium (D1, D2 and P1) and two were large (M1 and M2) based on their annual sales per store outlet times market share in 2019 (Mintel, 2019).

2.3 Data analysis and interpretation

All transcriptions and corporate documents were imported and coded in NVivo which allowed double checking and comparison. Thematic content analysis was carried out by at least two of the co-authors. This involved open coding of descriptive themes (read line by line), axial coding (categorising and recoding) and selective coding (refining on axial coding and identification of relationship) (Bazeley and Jackson, 2013). Each coder also checked their own reliability of coding by re-reading all data and recoding up to five times during the process. The validity of the coding of the FW management practices was also enhanced by the 3rd stage verification from the retail managers.

Three thematic frameworks were used for content analysis: retail managers' understanding of sustainable value creation through FW management practices (Huang *et al.,* 2021), the actual adoption of retail FW management practices (Huang *et al.,* 2021) by the seven retailers and CVP of the retailers (Rintamäki and Kirves, 2017).

The sustainable value creation framework conceptualised by Huang *et al.,* (2021) in the context of FW management was used to code sustainable value creation as perceived by retail managers. To understand how economic, environmental and social value creation interact with each other and with five FW management hierarchy elements, a coding word similarity cluster analysis was conducted in NVivo.

Twenty-seven FW management practices were coded using the 5-level FW management hierarchy (i.e. reduce/prevent, reuse, recycle, recover and dispose). Of the 27 practices, 15 were universally reported by all retailers and 12 were reported by some of the seven retailers. The latter 12 practices were then subjected to a two-step cluster analysis to identify potential grouping trends. This suggested a three-cluster division which seemed to be linked to the CVP of the retailers.

The CVP of the seven retailers are positioned based on the six key dimensions applied in Rintamäki and Kirves (2017): atmosphere, availability, price competitiveness, quality,

assortment/range, and services. Two retailers (D1 and D2) were coded as predominantly low-price based (discounters). Both stress low price being their core offering as one commented that "customers shop at our business because prices are low" (D1) and the other mentioned that "our main customer base is those who cannot afford to shop at other retailers" (D2). Two retailers (premium) were coded as high on atmosphere, quality and service (P1 and P2) as explained by one of the interviewees (P1) that "price is never far from customers minds. But I think they wouldn't shop with my shop or my company because of price. They would shop for other reasons. … service, food quality, atmosphere. Those are the things that I would hear about most" (P1). P2 stated in their report that they offer "special and different, … indulgent range, excitement and newness of products to delight customers". M1 and M2 were coded high on service, range and product availability as they aim for "ensuring customers can get what want, when they want it" (M1) and "a sustainable and secure supply of the everyday products our customers love (M2). M3 is a retailer which does not show very clear CVP, but coded high on service, a message repeated in their reports.

To identify the relationship between CVP and adoption of FW management practices, this study has taken a realist approach to understanding the causally relevant contexts (i.e. CVP and size) of retailers' FW management through identifying patterns and cross-case comparisons (Maxwell, 2012). The configurational method with crisp-set qualitative comparative analysis (QCA) populated by Ragin since 1987 was used (Ragin, 2014). All variables were coded as binary (1,0) and analysed with fsQCA 3.1 (Ragin and Davey, 2016). This method is particularly suitable for exploring causal configurations with small sample sizes.

A key feature of QCA is its ability to explore multiple causal pathways (equifinality) and causal asymmetry (Fiss, 2011), which means that causes for the presence of an outcome may be different from causes leading to the negated outcome. This study explored the casual conditions (i.e, CVP components and firm size) for both presence (indicated by "1") and absence (indicated by "0") of the outcomes (i.e, FW management practices excluding those

which were universally shared by all retailers). Absence in QCA of this study means 'low' in condition. Based on the coding presented in Table 2b and 2c, crisp-set QCA was conducted with CVP and size being used as contextual causal conditions for 24 outcomes (i.e. presence and negated of each of the 12 FW management practices). The analysis does not assume a linear and additive effect in QCA and does not show statistical significance as in conventional correlation-based statistical models.

3. Results and discussion

3.1 Perceived sustainable value creation through FW management by grocery retailers

Value creation and delivery ('how' value is created) can be broadly considered as activities in enhancing efficiency and customer effectiveness. As proposed by Huang *et al.* (2021), multiple values can be created through FW management by grocery retailers. Economic values can take the form of *exchange value* ("price paid for use value created"), *perceived surplus value* ("customer's perception of value for money") and *mitigation value* ("associated cost reduction, compliance and licence-to-operate"). In FW management activities, either or both of environmental value and social value may be created alongside any or all of the three dimensions of economic value. Data from the seven retailers seems to support this framework very well. Creating economic value is clearly perceived as the core business case. For some retailers, this was in terms of achieving *exchange value* by selling cosmetic imperfect produce and/or products near expiry date at reduced price. The business case was also about achieving cost efficiency by reducing loss as explained by three retailers:

> *there is a clear business case as well for reducing FW. …* FW is a cost to our business, is a cost to our suppliers. … It's about minimising that cost, but it's about growing top line sales, getting the mix right so the profitability of the company is good. *M1*

> *We are efficient in what we do, and FW plays a big part of that, that we do cut waste' D2.*

> *My stock loss has gone from 1.8% to .6%, that's a cool half a million. M2.*

Cost savings were also achieved via reduced cost for raw materials; 'we're paying less because it's class two [produce]' (D2) or through streamlining purchasing process:

> *So instead of a product being half a stage sitting in a Spanish pack case and sitting in a UK pack case and then goes to our DCs and stores, we've changed the way we work with suppliers so the products essentially go direct from Spain to our distribution centres and stores. And that cuts, two days, out of the journey from farm to store. M1*

Perceived surplus value creation was well recognised by retailers, in terms of *building consumer trust, improving goodwill* and *customer loyalty* through helping consumers to reduce FW and/or enhancing perceived value for money via price mark downs.

> *there's a huge opportunity if we can help customers reduce waste and save money. Research from WRAP shows, those customers, the current customer loyalty element there. And also again a financial-- a business case because according to WRAP's analysis half of that money saved is spent again in shops. And whether that's trading up or coming back to the same store, you know, there's a clear business case. M1.*

> *[FW campaigns] go on social media nowadays, ... So I'm sure it does bring a commercial benefit along the way somewhere ... We get loads of positive goodwill from doing this. M2.*

The retailers identified enhancing reputation as a significant source of value in FW management as shown below:

> *I'm saying that because of the heightened awareness and agenda of FW, there's additional value to be had by promoting what we're doing. ... because our customers want to see us doing it and we're doing it. So therefore we know from a reputational perspective there is value. D1*

The third dimension of economic value, *mitigation value creation,* involves reducing costs for FW disposal and ensuring compliance with the Landfill Directive. All but P1 saw FW management as an opportunity to reduce such costs. D2 commented that "We currently measure avoided disposal cost and have seen a good saving from redistributing food." This was echoed by M3 who commented that "It costs more to send to AD [anaerobic digestion] than to redistribute." More explanations were provided by another manager:

> *... So we have invested in terms of segregating our FW in stores, which allows us to send more to AD, and certainly as a requirement for sending it to animal feed. We receive money for sending the product to animal feed, and that's the bit that varies*

depending on the commodity price for wheat. Obviously there's a cost for waste disposal, be that incineration with energy recovery or AD. M1

Environmental value creation was achieved through waste reduction and diversion of FW from landfill. As put forward by Respondent 1 M1, "…anything that drives it up the waste hierarchy reduces environmental impact" suggesting that all practices directing food away from landfill would create environmental benefits and the higher up the hierarchy, the more environmental value is created. Buying up whole crop and selling 'wonky' fruits and vegetables, reducing price to facilitate produce sell out in store, streamlining operational processes and using technology to minimise FW all demonstrated quantifiable evidence of sustainable value creation in that they not only created exchange value for the retailers but also generated environmental benefits due to the food staying in the food system for human consumption, hence offsetting the resources and carbon emissions incurred for extra food production.

Social value creation was perceived via practices at the higher level of the FW hierarchy, namely reduce and reuse. Some respondents identified more long-term social value than simply feeding people in need:

Its things like it goes to a breakfast club in the morning and for kids, and they have seen in the last 6 months a direct improvement in the children's attendance, academic performance, because they're getting fed in the morning by our excess waste food. …we're directly affecting young children who perhaps weren't going to get a breakfast and they might end up having a better life because their academic performance is better. M2.

Thus, social value creation occurs through supporting individual farmers and the agri-food industry in general through whole or glut crop purchase practices, and supporting people in poverty through price reduction, or surplus food donation (Goodman-Smith *et al.,* 2020). More extensive exemplary quotes on how sustainable values can be created through the range of FW management practices by the retailers can be found from Table 1. The quotes were

315 colour coded to highlight the economic, environmental and social value as perceived by the
316 retail managers.

317 **Take in Table 1**

318 Cluster analysis based on word similarity of the top-level codes of the sustainable
319 values and the FW hierarchy was conducted in NVivo (Figure 1). The results showed that
320 economic value in the forms of 'perceived surplus value' and 'exchange value' were clustered
321 with 'reduce' whilst 'environmental value' and 'social value' with 'reuse'. 'Mitigation value'
322 was clustered with 'waste disposal', and 'recover' and 'recycle' were clustered together.
323 Details of the correlation coefficient*[1] of word similarity of the full range of codes can be found
324 in Appendix 2.

325 **Take in Figure 1**

326 This analysis provides strong evidence of the interactions between **perceived**
327 **environmental and/or social values creation** and economic value creation through managing
328 FW. The next section looks at the similarities and differences in adoption of FW management
329 practices by the retailers and whether a retailer's context such as CVP and size might explain
330 the different FW approaches adopted.

331 *3.2 FW management practices adopted by the UK retailers*

332 The results of the iterative analysis of the FW management practices by the seven retailers can
333 be found in Table 2. The categories used to organise the practices followed the waste hierarchy,
334 i.e. reduce, reuse, recycle, recover and dispose (Huang *et al.*, 2021).

335 **Take in Table 2**

[1] *This is generated in NVivo. No p value was generated unlike conventional statistical analysis.*

Unsurprisingly, due to the heavy promotion of the FW hierarchy by WRAP and FAO, there were far more practices reported by retailers to reduce/prevent FW. No activities were reported on disposal because landfill disposal has been discouraged as a result of the EU Landfill Directive introduced in 2009. Of the 27 items listed in Table 2, 15 FW management practices were commonly adopted, which fall into four categories: 1) reducing FW by making internal operational changes to achieve better cost efficiency, 2) undertaking activities to influence consumers to reduce FW, 3) surplus food redistribution by working with charities, and 4) recycling by sending FW for anaerobic digestion. It could be argued that these four categories of practices were low hanging fruits or easy wins for all retailers. Minimising/reducing FW through internal changes such as improving packaging, forecasting, temperature control, ordering or stock monitoring is closely related to cost reduction in a tight margin sector. These themes concur with the findings of Cicatiello *et al.* (2020). As one of the respondents commented:

> *It's such a huge, huge figure. If you think there's x number of shops and they're all potentially throwing away 10 grand a week. So if they* ***can turn the dial down by 5 or 6%*** *that just drops straight off M2.*

Alongside the economic outcome, FW has moved up the public agenda, particularly under food security and social equality headings. Although food donation has not been made a legal obligation in the UK, social pressures from charity organisations such as Fareshare have made food donation a must-do item for all retailers. Whilst this is a standing item in retail FW management practice, the amount of food donation could be improved (Goodman-Smith *et al.*, 2020). WRAP (2019) suggested that only 17,500 tonnes out of 300,000 tonnes of retail FW was redistributed to people in 2018. If surplus food can be collected by charities, this was seen as a cheaper way of dealing with FW before the "use-by" date: "It is more expensive to send food to anaerobic digestion than to redistribute" *M3.*

This was echoed by another retailer who confirmed that £37,000 was saved through redistribution of food compared to FW disposal. All major UK retailers have signed up to the Courtauld Commitments[2] 2025 instigated and delivered by WRAP (2019). Helping households to reduce FW through consumer food awareness campaigns, providing guidance on storage, freezing and meal planning and cooking have been heavily promoted by WRAP with retailers. Therefore, it is not unexpected to see that all retailers addressed this in their FW practices. Retailers see food donation and FW campaigns as a way to win public trust, and this may translate into customer loyalty or perceived surplus value, a form of economic value.

However, not all retailers are similar in their adoption of FW management practices. Twelve actions were not universally adopted. Details of each action by retailer are shown in Table 2b. Presence of the action is indicated by "1" and negated action indicated by "0". As explained previously, the seven retailers differ in size and CVP (Table 2b and 2c). An SPSS two-step cluster analysis of the 12 FW management practices generated three clusters with silhouette measure of cohesion and separation being just over .5, an indication of good cluster quality (Appendix 3). This analysis showed that D1 and D2 are in a distinct cluster, and M1 and M2 in cluster 2 and M3, P1 and P3 in cluster 3. Cluster 1 retailers (D1 and D2) are both medium-sized and have clearly adopted a low-cost low-price CVP with medium sized store outlets and limited product range and availability. Retailers in this cluster seemed to have focused on FW prevention and reduction through interrelated actions of selling cosmetically imperfect produce, relaxing cosmetic standards and whole crop purchasing. They also reported reviewing stock and cutting product range. Their low-cost, simplicity strategy also influenced their decision for not making BOGOF offers. Practices not adopted by this cluster included offering alternative packaging formats for small households, surplus food deposit banks for

[2] A series of voluntary agreements aiming to improve resource efficiency and reduce the carbon and wider environmental impact of the UK grocery sector, launched in 2005. For details, visit https://archive.wrap.org.uk/food-drink/business-food-waste/history-courtauld.

customers instore, in-store reprocessing, pre-processed surplus food and recycling surplus food for animal feed. Such non-adoptions were associated with their CVP of not focusing on providing additional services and very tight cost control which underpins their low-price offering as commented by one of the respondents.

In summary, the low-price low-cost based economic value proposition meant that in some ways this cluster's retail CVP was conducive to food waste control and was adaptive depending on the situation. They were able to prevent food waste effectively as part of their business model but also chose to ignore solutions which may increase their cost of operations.

Cluster two retailers (M1 and M2) were large scale retailers with CVP aiming to provide a one-stop food shopping experience with a wide range of customer offering including big product assortment and services such as fresh butcher counters and in-store cafes. They tried to compete on all fronts across the consumer base with multiple CVPs, but their offering cannot compete on price with cluster 1 and on quality with the premium retailers within cluster 3. The most distinct defining elements of CVP for this cluster were: range, availability, services. This cluster have adopted more FW management practices than the other two groups. It may be argued that there was a bigger scope and demand for actions to be taken as their CVPs may have led to a higher volume of FW generation, particularly due to bigger product range, availability and promotion activities. What distinguished this cluster most from cluster 1 retailers were embedded FW practices such as changing packaging to cater for small households, providing in-store surplus food deposit bank for customers, in-store redistribution (e.g. 'free fruits for kids'), in-store processing (especially if they had a customer or staff café) and processing surplus or wonky food. These activities were directly linked to either their service proposition or their offering of pre-processed food. This is also the only group recycling FW as animal feed. This could be linked to the scale of operation as the retailers could afford, and need, to sort FW in order to meet legal obligations.

Cluster three included M3, P1 and P2. Retailers in this cluster showed more differences within the group than the previous two groups. M3 seemed to be a 'drifter' with no clear CVP apart from service (convenience). This may be due to the regional structural nature of the retailer with the CVP being driven in a disseminated rather than centralised approach. P1 and P2 provide a quality-based offering associated with higher social status/identity with defining CVP elements offering service, quality, and atmosphere. P1 provided in-store surplus food deposit banks for their customers and in-store surplus food redistribution whilst P2 saw this as incompatible with their store atmosphere. In addition, P1 and P2 differed in that P1 offered an essential product line and operated in-store cafés. This meant that P1 were able to sell slightly imperfect produce in their essential product line and had the option to reuse surplus food in their store café. Both P1 and P2 provide high quality pre-prepared foods to their customers and therefore predominantly reprocess surplus or wonky food from their suppliers in their supply chain, rather than sell in-store. Relaxing cosmetic standards for the normal product line, whole crop purchasing and selling past "best before" products were seen as incompatible with their CVP of high quality by both P1 and P2 (see Goodman-Smith *et al.*, 2020). High quality offering to social status/identity focused customers affects both retailers in their promotion and product size offering as explained by the managers:

> *It matches with the demographics of not only my shop but also the changing demographics of customers. If they're aging and there's more single household[s], there was a bit of the packaging, but the biggest feeling I sensed from customers was about* ***quantity****. (P1)*

> *We work carefully on* ***portion control*** *and work to ensure that we sell equal amounts of* ***smaller size*** *options (P2)*

Regarding BOGOF, according to the P1 manager, this model was incompatible with their target customers. They have always used mix and match promotions to provide a distinct CVP. Addressing the impact of promotions on retail FW is an important reduction strategy (de Moraes *et al.*, 2020), but cutting product range was not seen as compatible with their current offering of a small range of premium stock-keeping units (SKUs). Despite some differences,

437 the results show that offering of premium pre-prepared food products, high level of services
438 and shopping atmosphere may have acted as barriers to adopting some FW management
439 practices, meaning the retailers has to focus strategically on others if they wanted to reduce
440 FW.

441 *3.3 Do a retailer's CVP and size matter in FW management?*

442 To understand how the above clustering of retailers based on their FW management
443 practices were linked to the causal context of CVP and size of the retailers, crisp-set QCA was
444 carried out. The causal pathways to the presence and negated FW management practice
445 outcomes are shown in Table 3. Only parsimonious[3] solutions are presented which shows the
446 core conditions in terms of retailer's size and CVP for each of the 12 FW management practices
447 (either presence or negated).

448 **Take in Table 3**

449 All but one retailer (P2) sell imperfect product (also known as 'wonky' fruit and
450 vegetables). Two core conditions led to this practice being not high on quality and atmosphere
451 (M3) or not high on quality and atmosphere and not small (D1, D2, M1, M2) or medium size
452 (P1). However, D1 and D2 marketed those products alongside their standard line as a Class 2
453 products whilst the others marketed them with labels of "perfectly imperfect" (M1) or "a little
454 less than perfect" (P1). P2 was the only retailer that did not sell imperfect produce with core
455 conditions being small and being high on atmosphere and quality in their CVP as commented
456 by a store manager from P1 that said selling 'wonky veg' does not align with their marketing
457 positioning of selling excellent produce. However, four retailers (D1, D2, M1, M2) showed a
458 coherent set of actions underpinning their ability to sell 'wonky F&V'. They were able to
459 broaden their specifications because quality attributes such as being visually perfect were not

3 Parsimonious solutions show conditions which are essential to distinguishing between adoption and non-adoption of FW practices. Consistency threshold was set at 0.9 in Truth Table. (See Ragin, 2014 for method).

460 a distinct CVP for those retailers. They also practiced whole crop purchase, underpinned by
461 the core condition of not being high on 'quality' and 'not being small' (P1). One of the retailers
462 explained that whole crop purchase enabled them to negotiate a low price with the suppliers.
463 M3, P1 and P2 did not practice whole crop purchase with the core condition being identified
464 as not competing on price and not being large retailers.

465 Five retailers (M1, M2, M3, P1 and P2) reported changing packaging for small
466 households, underpinned by their CVP of offering high level of service and not competing on
467 price. This is the opposite D1 and D2 which did not make this change for the reason that they
468 were competing on price but not on service. No consistent solutions were generated for selling
469 past 'best before' products for D1, D2, M1 and M2. M3 reported positively on this item, which
470 was explained by their position being small and not competing on quality. P1 and P2 reported
471 negatively on this because they compete on quality of products.

472 D1, D2 and M3 reported cutting product range so choice and guaranteed availability of
473 a given product were not part of the proposition. P1 and P2 have not cut product range as their
474 range is already more limited. No consistent solutions were generated for M1 which reported
475 cutting range and M2 which did not.

476 Regarding changing "buy-one-get-one-free" (BOGOF) offers, one of the main causes
477 for consumer FW in the home (Filimonau and Gherbin, 2017), no core CVP conditions were
478 identified for four retailers (M1, M2, M3, P2) who have removed BOGOF. But D1, D2 and P2
479 reported that BOGOF was never part of their offering for shared attributes, they do not normally
480 have high level of stocks for cost control (D1 and D2) or high quality sits within their CVP
481 (P2).

482 Turning to reuse/recycle of surplus food, five practices were reported by two to four
483 retailers each. Three retailers (M2, M3 and P1) reported having in-store surplus food deposit
484 bank for customers to donate. M2 and M3 shared core attributes of offering good service but

485 not competing on store atmosphere, whilst M2 and P1 shared the attributes of offering good
486 service and not being small. D1 and D2 did not provide this ‘ surplus food deposit’ with core
487 conditions being low on service and a low cost strategy. A D2 manager commented that “our
488 store format and procedures do not currently allow us to do this”. P2 also did not provide this
489 service for the core condition of being small and high on store atmosphere. M2 did not appear
490 in the solution. Another type of food donation was in-store redistribution to colleagues and
491 free food for customers. M1 and M2 both reported to have practiced this. Core conditions for
492 this shared practice were not competing on quality but on service and being large retailers as
493 explained by one of the managers that “food not taken by charities is offered to colleagues
494 through our ‘colleague shops’ which have been rolled out to all stores” (M1). The other five
495 retailers did not practice this form of donation. D2 explained “our focus is on redistributing to
496 charitable organisations”.
497 In terms of surplus food reprocessing in store, no consistent solutions were generated
498 for M1 and M2. P1 practiced this with the core condition being providing good service whilst,
499 not competing on range and not small. D1, D2, M3 and P2 did not practice this with core
500 condition being not competing on availability and product range. Not having staff canteens
501 was given as a main reason for nonadopting by D2. However, four retailers reported
502 reprocessing surplus or wonky food in their factories as pre-prepared food with M1 and M2
503 supported by the core condition of competing on availability and P1 and P2 with core condition
504 of high quality. This is particularly highlighted in P2’s report, perhaps to compensate for not
505 selling wonky veg in store. D1, D2 and M3, not competing on quality and range, confirmed
506 they did not practice this action. Finally, recycling surplus food as animal feed has been
507 reported by two retailers (M1 and M2) with core conditions of being large and competing on
508 range (which potentially could mean high stock and as a result higher waste warranting this
509 practice) as not being large was the core condition for the other five retailers who did not follow
510 the practice. One of the managers explained that size does matter and they “don't possess the

511 correct licence to supply animal feed in a commercial sense and currently this is cost-
512 prohibitive (D2)". D1 manager also commented about size and CVP related reasons that
513 "linking to our business model being a very efficient business, as soon as you bring [legal]
514 complexities into it, it makes it almost impossible for us to do".

515 **4. Conclusion and theoretical implications**

516 This research sought to address the current paucity of understanding of how sustainable
517 value creation is achieved via retail FW management and how different retail context such as
518 size and CVP might interact with sustainable value creation activities associated with FW
519 management practices in the context of increasing environmental regulations and stakeholder
520 pressures. There are three key findings in this study.

521 Firstly, it is clear from this study that FW management practices at all levels have been
522 seen by retailer managers to contribute to all forms of sustainable value creation as waste
523 reduction minimises environmental impact, saves costs and/or serves social needs. In
524 particular, 'reduce' has been strongly associated with the creation of two forms of economic
525 value: exchange value and perceived surplus value, 'reuse' more strongly associated with
526 creation of social value and environmental value, and 'waste disposal' with mitigation value.
527 Previously, only a conceptual framework of integration of FW management and sustainable
528 value creation has been proposed by Huang *et al.,* (2021). This finding provides the first
529 empirical evidence of retail managers' perception of sustainable value creation achieved by
530 FW management and the nuances of the three forms of economic value creation associated
531 with FW management activities.

532 Secondly, the findings confirmed previous evidence showing that UK retailers have
533 made great progress in minimising FW being sent for landfill (WRAP, 2019) and concurred
534 with previous studies that UK food retailers may be influenced by external societal pressures
535 to reduce FW and also to derive associated economic value (Filimonau and Gherbin, 2017;

Young *et al.*, 2018; Swaffield *et al.*, 2018) which are related to 25 commonly shared practices. FW management practices such as making changes to raise consumer awareness and help consumer to reduce waste have been a constant theme of WRAP's communication with retailers (WRAP, 2019). Recommendations by WRAP to make efficiency enhancing changes seemed to have been well received by the retailers too. Food donation via charities and sending food waste to AD rather than to landfill were universally practiced. However, this study has not explored the tensions between the third sector and the retailers as reported by Alexander and Smaje, 2008).

Thirdly, the causal paths generated by csQCA and the two-step cluster analysis showed that CVP and size of a given retailer do matter in explaining most of the differences and similarities of the seven retailers' adoption of specific FW management practices. Low-price retailers were more likely to adopt practices enabling them to save costs and reduce FW at the same time. Complicated cost-incurring solutions to FW (e.g reprocessing, adopting a range of SKUs) were more likely to be adopted by retailers associated with larger size, high quality and a range of services. This finding extends prior work on understanding retailers' CVP (Rintamäki and Kirva, 2017) and motivators of retail FW management (Swaffield *et al.*, 2018; Goodman-Smith *et al.*, 2020) by showing how the food retailers' current CVP frames and shapes different FW practices and drives sustainable value creation, providing insight into how businesses can create sustainable value through enhancing their operational efficiency and effectiveness.

5. Managerial implications and limitations

This research has implications for management practices in retail stores, and also gives insight into how business models may need to evolve in the future to meet societal, environmental and economic pressure to reduce FW. There are clear management trade-offs highlighted in the findings of this research for retailers offering more choices, wider services,

561 convenience and so forth. These business models are inherently more wasteful. This requires
562 food retailers to consider how they retain or restructure their CVP and associated business
563 models to assure their competitive positioning whilst also delivering to their customers' and
564 wider stakeholders' needs and aspirations.

565 Tackling FW is one of the effective ways of mitigating greenhouse gas (GHG)
566 emissions and supporting people in need (UNEP, 2021). For policy makers, two key issues
567 highlighted in this research are related to food donation and repurposing food waste for animal
568 feed. Surplus food donation is voluntary in the UK. Whilst there has been an increase of food
569 donated largely to charities, only 12.7% of retail edible food waste has been redistributed to
570 people and about 9% sent for animal feed (WRAP, 2021). The respondents of this study saw
571 both as a cost incurring operation rather than cost saving. To encourage retail business
572 behavioural change, more policy level incentives as those introduced in France could be
573 considered.

574 The limitations of this study are that firstly no direct observations were conducted. There
575 is the potential for inbuilt bias of self-reporting, however the three-stage approach has been
576 developed to seek to mitigate this. Secondly, only seven UK food retailers were included in
577 this study. Although three CVP cluster groups were identified, it would be ideal if this approach
578 could be widened to other countries, particularly in France and in Italy as noted by Filimonau
579 and Gherbin (2017) where food donation has been enforced. Thirdly, the interpretation of the
580 links between CVP, retailer size and FW management practices is not based on quantitative
581 causal inference. There are also many other firm-specific factors and decision-making
582 processes (e.g. leadership) which might help to explain the differences in value creation
583 activities. Fourthly, future research could extend this study to examine how the actual
584 measurable performance of FW reduction can be linked to the CVP of food retailers as more
585 and more retailers are pressured to report FW data. Finally, the linkage between CVP and

sustainable value creation is an emerging field of study and more research could be undertaken in other sectors.

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Table 1 Perceived sustainable value creation through food waste management practices

Food waste management practices	Exemplar quotes	Economic value creation			Environmental value creation	Social value creation
		Exchange value	Perceived surplus value	Mitigation value		
Selling cosmetic imperfect produce	We are now selling on average over 500 tonnes of 'Wonky Veg' to over 500,000 customers every week across all of our stores and online. Our Wonky Veg range helps to reduce unnecessary food waste on farm. M2	Ⓔ			ⓔ	Ⓢ
Reducing price for near expiry dates	My stock loss has gone from 1.8% to .6%, that's a cool half a million. M2. We reduce the amount of waste that we were producing. Again that fits into the food poverty by keeping cost down for our customers. D1	Ⓔ	Ⓔ	Ⓔ	ⓔ	Ⓢ
Making internal operational changes to minimise food waste	If you think there's *x* number of shops and they're all potentially throwing away 10 grand a week. So if they can turn the dial down by 5 or 6% that just drops straight off. .. To my mind, what will really help is the tie; that environmental or ethical concerns can be tied in with profitability. M2	Ⓔ		Ⓔ	ⓔ	Ⓢ
Whole crop purchase	We saved 70,000 kg of potatoes from waste by buying up the whole crop when the grower had a glut. D2 I think helping the farmers, the industry and the agriculture in the UK is important. Respondent 2 of M1	Ⓔ			ⓔ	Ⓢ
Helping suppliers to control food waste	Our suppliers have seen less waste and less associated environmental impacts, which has allowed them to control cost. D2 Food waste is a cost to our business, is a cost to our suppliers Respondent 1 of M1	Ⓔ		Ⓔ	ⓔ	Ⓢ
Helping consumers to reduce food waste	*There's a huge opportunity if we can help customers reduce waste and save money.* We have applied new food waste messaging on our entire fruit, veg and bakery lines. This messaging enforces the value of food and provide customers with tips to reduce food waste. D1 And because food waste is an issue that customers, colleagues really care about then it's a clear opportunity to build trust. Respondent 1 of M1.		Ⓔ		ⓔ	Ⓢ
Food donations	… you're reducing waste and helping people in need in this case so it's really positive and beneficial. Society feels very strongly about it. Respondent 1 of M1. *We currently measure avoided disposal cost and have seen a good saving from redistributing food (over £37,000 in 2018)." D2*		Ⓔ	Ⓔ	ⓔ	Ⓢ
Recycle for animal feeds	We receive money for sending the product to animal feed, and that's the bit that varies depending on the commodity price for wheat. Obviously there's a cost for waste disposal, be that incineration with energy recovery or AD. In terms of it staying in the food system and offsetting other feeds which have significant environmental impacts. … I think anything that drives it up the waste hierarchy reduces environmental impact. Respondent 1 of M1	Ⓔ	Ⓔ	Ⓔ	ⓔ	
Diverting food waste from landfill and other disposal	Food waste reduction results in lower disposal fees. It's cheaper for us to send to anaerobic digestion than it is to send to landfill. AD has reduced the cost of our waste. D1			Ⓔ	ⓔ	

Colour Notations: Ⓔ- Economic value; ⓔ – environmental value; Ⓢ – social value

Table 2. Food waste management practices reported by 7 UK large retailers

	Retailers						
2a. Practices universally adopted	D1	D2	M1	M2	M3	P1	P2
Reduce – Internal operations							
Reduce price for near expiry date food	✓	✓	✓	✓	✓	✓	✓
Improve packaging to extend shelf life	✓	✓	✓	✓	✓	✓	✓
Product display rotation and shelf life management	✓	✓	✓	✓	✓	✓	✓
Improve temperature control in store	✓	✓	✓	✓	✓	✓	✓
Improve forecasting	✓	✓	✓	✓	✓	✓	✓
Smart ordering and delivery	✓	✓	✓	✓	✓	✓	✓
Stock monitoring and rotation	✓	✓	✓	✓	✓	✓	✓
Keep record of food waste (Recording and reporting)	✓	✓	✓	✓	✓	✓	✓
Reduce – Influencing consumers							
Food waste awareness campaigns	✓	✓	✓	✓	✓	✓	✓
In-store demos & communication	✓	✓	✓	✓	✓	✓	✓
Online communication about food waste issues	✓	✓	✓	✓	✓	✓	✓
Guidance on cooking and meal planning (websites)	✓	✓	✓	✓	✓	✓	✓
Guidance on storage and freezing	✓	✓	✓	✓	✓	✓	✓
Reuse - Redistribute by working with charities	✓	✓	✓	✓	✓	✓	✓
Recycle - Unsold food sent to anaerobic digestion	✓	✓	✓	✓	✓	✓	✓
2b. Practices not universally adopted	D1	D2	M1	M2	M3	P1	P2
1) Reduce - Sell cosmetic imperfect produce	1*	1	1	1	1	1	0*
2) Reduce - Relax cosmetic standards	1	1	1	1	1	1	0
3) Reduce - Whole crop purchasing	1	1	1	1	0	0	0
4) Reduce – Change packaging for small households	0	0	1	1	1	1	1
5) Reduce - Sell past "best before" product	1	0	0	1	1	0	0
6) Reduce - Cut product range	1	1	1	0	1	0	0
7) Reduce - Removal of BOGOF	0	0	1	1	1	0	1
8) Reuse- Surplus food deposit bank for customers	0	0	0	1	1	1	0
9) Reuse- In-store redistribution or sold at nominal price to employees	0	0	1	1	0	0	0
10) Reuse- In-store reprocessing unsold food (staff canteen)	0	0	0	1	0	1	0
11) Reuse- Reprocess surplus or wonky food (not in-store)	0	0	1	1	0	1	1
12) Recycle - Repurpose as animal feed	0	0	1	1	0	0	0
2c. Size and Customer Value Proposition (CVP)	D1	D2	M1	M2	M3	P1	P2
Size – Small	0	0	0	0	1	0	1
Size – Medium	1	1	0	0	0	1	0
Size – Large	0	0	1	1	0	0	0
CVP – Atmosphere	0	0	0	0	0	1	1
CVP – Availability	0	0	1	1	0	0	0
CVP – Price advantage	1	1	0	0	0	0	0
CVP – Quality	0	0	0	0	0	1	1
CVP – Range	0	0	1	1	0	0	0
CVP – Service	0	0	1	1	1	1	1

**Notation: 1 = presence (or high); 0 = absence (or Low)*

Table 3. Configurations of different food waste management practiced by UK retailers on components of CVP and size of retailer

FW management practices	Solution coverage (solution consistency)	Cases	Causal conditions (CVP & Size)									Exemplary quotes
			Atmospher	Availability	Price	Quality	Range	Service	Small	Medium	Large	
Sell cosmetic imperfect produce (SCIP)	1 (1)	D1, D2 M1, M2	⊗			⊗			⊗			We have introduced **Class 2** products in a selection of our Everyday Essentials lines. It **runs alongside a standard pack** with Class 1 fruit(D2) we launched our Perfectly Imperfect range of 'wonky' fruit and vegetables, which …**maximise the amount of produce we can sell in store**, and **give our customers great products at low** prices. This enables us to take more of the crop than ever before and **reduce food waste on farms**. (M1)
		M3	⊗			⊗						No comments
		P1								●		so during the year we launched a new range of class two vegetables named 'a little less than perfect' where price per kilo is cheaper than our lowest essential range. (P1, corporate)
~SCIP	1 (1)	P2	●			●			●			No comments
Relax cosmetic standards (RCS)	1 (1)	D1, D2, M1, M2				⊗			⊗			Working with our suppliers we regularly review our standard product specifications to ensure they are realistic and fair. D1 … makes potato chips from those potatoes that fall outside of our specifications. And those are sold in our store. (M1)
		M3				⊗						No comments
		P1							⊗			No comments
~ RCS	1 (1)	P2				●			●			How can a retailer who wants to be known for selling fresh, excellent produce, how can it be selling wonky veg? (P1)
Whole crop purchase (WCP)	1 (1)	D1, D2, M1, M2				⊗			⊗			We've got arrangements with suppliers where we've formally contractually agreed to take the whole crop. (D1) Wonky pack supports whole crop procurement for our grower base. (D2) We buy direct from farmers and have the ability to process whole animals or crops, therefore we utilise more of what we buy with less wastage. (M2)
~ WCP	1 (1)	M3, P1, P2			⊗						⊗	We want to buy as much of our farmers' crop as possible. (P1)

~ = negated outcome; ● = Core presence of the causal condition; ⊗ = Core absence of the causal condition

Table 3. Configurations of different food waste management practiced by UK retailers on components of CVP and size of retailer (Continued)

Food waste management practices	Solution coverage (Solution consistency)	Cases	Causal conditions (CVP & Size)									Exemplary quotes
			Atmosphere	Availability	Price	Quality	Range	Service	Small	Medium	Large	
Change packaging for small households (CPSP)	1 (1)	M1, M2, M3, P1, P2			⊗			●				We have redeveloped our two portion chicken fillets packaging with a separate compartment for each fillet, so that customers can 'eat one and keep one'. (M1) We work carefully on portion control and work to ensure that we sell equal amounts of smaller size options (P2)
~ CPSP	1 (1)	D1, D2			●			⊗				No comments
Selling past "best before" products	0.333 (1)	M3				⊗			●			No comments
~ SPBBP	0.5 (1)	P1, P2				●						No comments
Cutting product range (CPR)	0.75 (1)	D1, D2, M3		⊗		⊗	⊗					Wastage on product lines is monitored daily by store teams and orders adjusted appropriately. (D1) We removed over 100,000 of these underperforming store/product combinations from the stores' ordering system in 2013, saving 1,093 tonnes of food waste, equating to £12.8m in cost savings. (M3)
~ CPR	0.6667 (1)	P1, P2	●			●						No comments
Removed BOGOF offers	1 (1)	M1, M2, M3, P2								⊗		That whole ethos of more is best isn't anymore. It's about understanding what actually when customers want to use them and -- I remember we did a promotion on iceberg lettuces, it was buy two, get two free. (M1)
~ BOGOF	1 (1)	D1, D2, P1		⊗			⊗			●		XX does not, and never has, offered BOGOFs. (D2) Never part of the offering (P1)

~ = negated outcome; ● = Core presence of the causal condition; ⊗ = Core absence of the causal condition

Table 3. Configurations of different food waste management practiced by UK retailers on components of CVP and size of retailer (Continued)

Food waste management practices	Solution coverage (Solution consistency)	Cases	Causal Conditions (CVP & Size)									Exemplary quotes
			Atmosphere	Availability	Price	Quality	Range	Service	Small	Medium	Large	
Surplus food deposit bank in store (SFBiS)	0.66667 (1)	M2, M3	⊗					●				Where possible, we allow space for front of store food banks so customers can donate goods. (M2)
		M2, P1						●	⊗			[We use]Trussell Trust donation banks (P1)
~ SFBiS	0.75 (1)	D1, D2			●			⊗				Our store format and procedures do not currently allow us to do this. (D2)
		P2	●						●			No comments
In-store redistribution (ISRD)	1 (1)	M1, M2				⊗		●			●	Food not taken by charities is offered to colleagues through our 'colleague shops' which have been rolled out to all stores. (M1)
~ ISRD	1 (1)	D1, D2, M3, P1, P2					⊗				⊗	Our focus is on redistributing to charitable organisations. (D2) Now even that will be replaced by ensuring it's all sold at markdown to customers or colleagues (P2)
In-store reprocessing (IR)	0.5 (1)	P1					⊗	●	⊗			No comments
~ IR	0.8 (1)	D1, D2, M3, P2		⊗			⊗				⊗	We don't have staff canteens. We don't have colleague shops. (D2)

~ = negated outcome; ● = Core presence of the causal condition; ⊗ = Core absence of the causal condition

Table 3. Configurations of different food waste management practiced by UK retailers on components of CVP and size of retailer (Continued)

Food waste management practices	Solution coverage (Solution consistency)	Cases	Causal conditions (CVP & Size)									Exemplary quotes
			Atmosphere	Availability	Price	Quality	Range	Service	Small	Medium	Large	
Reprocessing surplus food prior to store	1 (1)	M1, M2		●								Washed carrots and onions not used as Wonky Veg go into different streams such as our factories to be processed as pre-prepared food. (M2)
		P1, P2				●						We have worked with our suppliers to effectively use surplus e.g. wonky parsnips are used in our parsnip mash. This is at a factory levels where factories innovate using surplus food. (P2)
~ Reprocessing surplus food	1 (1)	D1, D2, M3				⊗	⊗					No comments
Repurpose as animal feed	1 (0.5)	M1, M2					●				●	So, we have invested in terms of segregating our food waste in stores. We receive money for sending the product to animal feed, and that's the bit that varies depending on the commodity price for wheat. Obviously, there's a cost for waste disposal, be that incineration with energy recovery or AD. (M1)
~ Repurpose as animal feed	0.8333 (1)	D1, D2, M3, P1, P2									⊗	We don't possess the correct licence to supply animal feed in a commercial sense and currently this is **cost-prohibitive**. (D2)

~ = negated outcome; ● = Core presence of the causal condition; ⊗ = Core absence of the causal condition

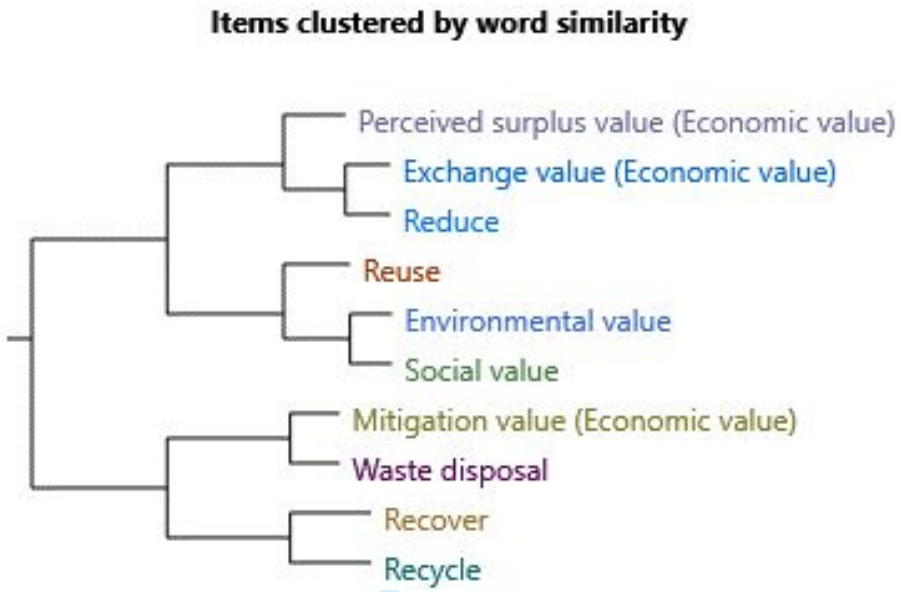


Figure 1 Clustering summary based on word similarity of codes of FW management and dimensions of sustainable value creation in NVivo

Creating sustainable value through food waste management: Does retail customer value proposition matter?

Supplementary material for review

Appendix 1. Retailer coding and grey literature analysed in the study associated with each retailer.

Retailer code	Stage 1*	Stage 2 – Reports analysed				Stage 3 email confirmation
	Interview	Annual report	Corporate Social Responsibility report	Sustainability report	Strategic Report	With further comments
D1	Corporate director		2016	2016		Yes
D2	No interview	2016	2015, 2016	2015, 2017		Yes
M1	Corporate director (Respondent 1) Store manager (Respondent 2)	2013-18	2015, 2016	2013, 2014	2015-18	No
M2	Store manager	2013-17	2013-17		2013-17	Yes
M3	No interview	2013-17		2013-17		Yes
P1	Store manager,	2013-18	2015, 2017	2013, 2014, 2016		Yes
P2	No interview	2014-18		2013-18		Yes

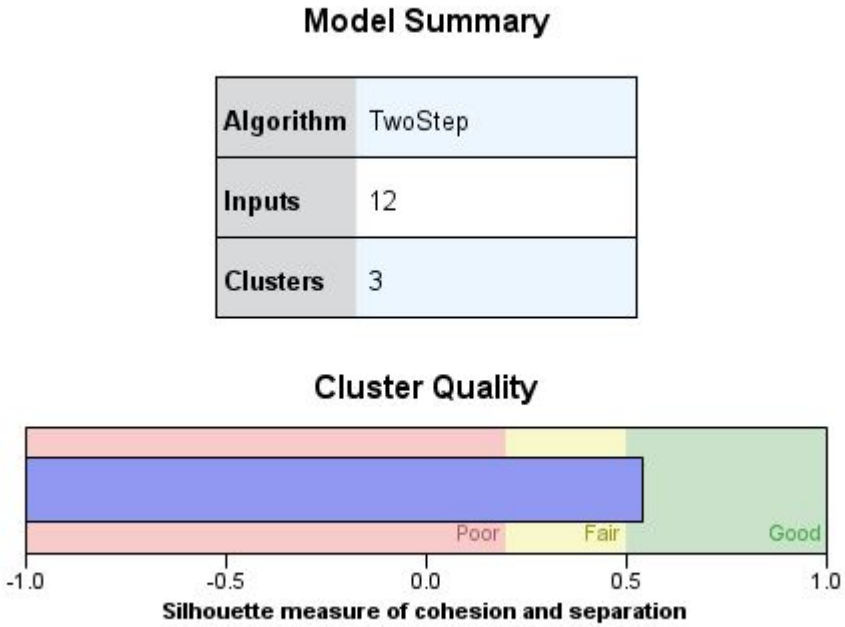
*For Stage 1, initial efforts were made in this study to contact both store managers and key contacts at retailer headquarters. Apart from the extremely busy work schedules of store managers, it soon became clear that store managers needed approval from their corporate headquarters to be interviewed and some deferred to the corporate sustainability director or equivalent. This prompted the researchers to contact the corporate sustainability director or CEOs directly. All top UK retailers (n=9) were contacted by both email and phone calls. Follow-up emails were also sent and four retailers agreed to be interviewed. The four retailers include one premium retailer (P1), two multi-orientated retailers (M1; M2) and one discounter (D1).

Appendix 2: Clustering summary based on word similarity of codes of FW management and dimensions of sustainable value creation in NVivo

Code A	Code B	Pearson correlation coefficient
Perceived surplus value (Economic value)*	**Exchange value (Economic value)**	0.707207
Mitigation value (Economic value)	Exchange value (Economic value)	0.483519
Perceived surplus value (Economic value)	Mitigation value (Economic value)	0.351939
Perceived surplus value (Economic value)*	**Reduce**	0.81049
Perceived surplus value (Economic value)	Recycle	0.46253
Perceived surplus value (Economic value)	Reuse	0.262532
Perceived surplus value (Economic value)	Recover	0.227927
Perceived surplus value (Economic value)	Waste disposal	0.20836
Exchange value (Economic value)*	**Reduce**	0.838087
Exchange value (Economic value)	Recycle	0.422829
Exchange value (Economic value)	Waste disposal	0.35798
Exchange value (Economic value)	Reuse	0.281913
Exchange value (Economic value)	Recover	0.249683
Reduce	Environmental value	0.820967
Reuse*	**Environmental value**	0.667556
Recycle	Environmental value	0.568493
Recover	Environmental value	0.439719
Waste disposal	Environmental value	0.351501
Reuse*	**Social value**	0.843101
Reduce	Social value	0.585784
Recycle	Social value	0.315402
Recover	Social value	0.240727
Waste disposal	Social value	0.209955
Social value*	**Environmental value**	0.863657
Waste disposal*	**Mitigation value (Economic value)**	0.803462
Recycle	Mitigation value (Economic value)	0.493932
Recover	Mitigation value (Economic value)	0.379119
Reduce	Mitigation value (Economic value)	0.344194
Reuse	Mitigation value (Economic value)	0.21431
Recycle*	**Recover**	**0.550581**
Exchange value (Economic value)	Environmental value	0.7888
Perceived surplus value (Economic value)	Environmental value	0.754003
Mitigation value (Economic value)	Environmental value	0.523968
Exchange value (Economic value)	Social value	0.569095
Perceived surplus value (Economic value)	Social value	0.551589
Mitigation value (Economic value)	Social value	0.336091

***shown in the cluster diagram in Figure 1.**

Appendix 3. Two-step cluster analysis based on the 12 FW practices not universally practiced



Cluster number	1	1	2	2	3	3	3
Cluster membership	D1	D2	M1	M2	M3	P1	P2