# Sustainable value co-creation at the Bottom of the Pyramid: Using Mobile Applications to Reduce Food Waste and Improve Food Security

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**Sustainable value co-creation at the Bottom of the Pyramid: Using Mobile Applications to Reduce Food Waste and Improve Food Security**

**Abstract:** Mobile apps redistributing surplus food are receiving increased attention for their sustainability benefits. Nevertheless, there is limited research on the opportunities created for businesses to penetrate the Bottom of the Pyramid (BoP) market. Drawing on Service-Dominant (S-D) logic, affordance and means-end theories, this study investigates how food waste mobile apps can support sustainable value co-creation at the BoP. Using a laddering approach, data were collected through semi-structured interviews in Sri Lanka. Despite similarities in respondents' perceptions of app functions, there are noticeable gaps in the perceived affordances and end goals, which may challenge the value co-creation process. Additionally, opportunism, stigma and goal misalignment may result in value co-destruction, i.e. the diminishment of value through stakeholder interactions. Our findings demonstrate that to develop technologies which enable value co-creation, an in-depth understanding of factors driving perceptions of value is essential.

**Summary statement of contribution:** Currently, there is very limited research exploring food waste mobile apps as BoP marketing tools, and their potential to support sustainable value co-creation to benefit businesses, BoP consumers and society.

To the best of our knowledge, this is the first study to combine Service-Dominant logic, affordance theory and means-end theory to explore mechanisms underlying digital value co-creation and co-destruction.

Our findings provide meaningful insights about the interpretation of technological functions into value.

**Keywords:** sustainable value co-creation, food waste, mobile apps, Bottom of the Pyramid, affordance theory, laddering

## 1. Introduction

Food waste within global supply chains, and its damage to the food sector's social, economic and environmental sustainability, is acknowledged within government reports (e.g. FAO, 2019; FAO, 2018), academic literature (e.g. Aschemann-Witzel et al., 2017; Garrone, Melacini, & Perego, 2014) and the media (e.g. BBC, 2019; CNN, 2018). This highlights the need to identify strategies to reduce avoidable food waste. The Food and Agriculture Organisation (FAO) defines food waste as "the discarding or alternative (non-food) use of food that was fit for human consumption by choice or after the food has been left to spoil or expire as a result of negligence" (FAO, 2015, p.1). It is generated throughout the food supply chain at the production, processing, packaging, retail and foodservice stages (Aschemann-Witzel et al., 2017; Corrado et al., 2019; Schanes & Stagl, 2019).

Food waste during the foodservice stage is worthy of exploration, as it constitutes a major source of food waste with a high percentage of avoidable loss which could be sold or redistributed by implementing appropriate strategies (Beretta et al., 2013; Papargyropoulou et al., 2016). Over the last two decades, practitioners have attempted numerous interventions to reduce avoidable food loss at the food business level, including awareness campaigns, customer reminders to avoid wasting food and donations to food banks and charities (FAO, 2019; Morone et al., 2019; Stöckli, Dorn & Liechti, 2018). However, these approaches have enjoyed mixed success due to ingrained consumer behaviours, social norms and market trends favouring overconsumption (Morone et al., 2019; Purdam, Garratt & Esmail, 2016; Stöckli, Dorn & Liechti, 2018).

Recently, advances in Information and Communication Technology (ICT) have placed mobile apps centrally to practitioner strategies for reaching and engaging consumers and businesses (Stocchi et al., 2018). This digital transformation has fuelled the development of digital solutions, supporting food waste reduction and generating a positive impact on the food sector sustainability (Michelini, Principato & Iasevoli, 2018; Schanes & Stagl, 2019). For instance, several Food Waste Mobile Applications (FWMAs) have been developed that enable food businesses to offer discounted food which would otherwise be wasted (e.g. surplus or food approaching its expiry date). These international apps include Too Good To Go, NoFoodWasted and YWaste, whilst several major restaurant chains and food retailers are developing in-house FWMAs (Mintel, 2020).

Unlike other measures such as food banks or charity donations, FWMAs enable businesses to distribute surplus food to needy consumers whilst simultaneously generating revenue from it. Therefore, FWMAs demonstrate how technology can enable food businesses to target the largely untapped 'low disposable income consumer' market, benefitting customers, the business, the environment and society. This view corresponds with the Bottom (or Base) of the Pyramid (BoP) concept, which considers the 4 billion global population enduring per capita incomes beneath US$2 per day (Prahalad, 2012). From this perspective, BoP consumers represent not only socially disadvantaged people requiring help, but also a potential mass market for which businesses could target profitably and with a positive social impact (Nagy, Bennett & Graham, 2019; Prahalad, 2012). Scholars have further developed the BoP concept, from viewing BoP merely as consumers in the value chain, to engaging them as partners in the co-creation of new products and services (BoP 2.0) and even collaborators in efforts to transform the market and alleviate poverty (BoP 3.0) (Chmielewski, Dembek & Beckett, 2020; Simanis & Hart, 2008). Therefore, by exploring the sustainable value co-creation opportunities offered by FWMAs, this study will unearth meaningful insights which are relevant to diverse BoP stakeholders.

According to existing studies, BoP consumers continue to deal with issues relating to food insecurity, high food prices, malnutrition and poor food quality (Chikweche, Stanton & Fletcher, 2012; Nagy, Bennett & Graham, 2019). Nevertheless, the increasing accessibility and adoption of digital platforms and mobile technology by BoP communities can enable BoP consumers to enhance their quality of life (Dey et al., 2013; Lappeman, Ransome & Louw, 2019). For instance, FWMAs may empower BoP consumers to improve their food security by purchasing good quality food at affordable prices.

Facilitating a BoP marketing approach, FWMAs may support food-insecure consumers whilst also benefitting foodservice businesses. Such benefits may constitute cost and waste reduction, and improvements to the bottom line, by selling food which may have otherwise remained unsold (Michelini, Principato & Iasevoli, 2018). Moreover, besides exploring the BoP market potential, businesses may enhance their corporate reputations by engaging with BoP stakeholders through societal marketing or CSR activities, which can help deliver long-term commercial sustainability (Holweg & Lienbacher, 2011). Furthermore, FWMAs may reduce the environmental impact of food waste, increase awareness of related issues, and support the diffusion of technologies to reduce food waste (Michelini, Principato & Iasevoli,

2018). Therefore, these apps can create value for multiple stakeholders, including BoP consumers, food businesses and governments, benefitting the environment and society - an approach defined as supporting the creation of 'sustainable' value (Lacoste, 2016; Lan et al., 2017).

Contrastingly, researchers warn that, by enabling food surplus redistribution alone, FWMAs may neglect larger issues which exacerbate food waste and may even perpetuate the problem by making food providers "feel good about themselves as they have distributed the food surplus" (Schanes & Stagl, 2019, p.1500) and abdicate responsibility to consumers for further initiatives. From a BoP perspective, market-based approaches targeting BoP markets, e.g. by incorporating social goals alongside traditional profit-maximizing objectives, might be unsustainable and mask unequal power relations (Ansari, Munir & Gregg, 2012). Scholars argue that a community-centric approach, focusing on building capabilities and social capital (i.e. the norms and networks enabling people within or across communities to act collectively), is more sustainable and enables BoP consumers to achieve their higher order needs such as self-esteem and self-actualization (Ansari, Munir & Gregg, 2012; Subrahmanyan & Gomez-Arias, 2008). Therefore, to capitalise on the aforementioned opportunities of FWMAs, merely redistributing part of the surplus food may be insufficient, as different stakeholders must interact meaningfully to enjoy the sustainable value offered by these apps. Nevertheless, there is limited research on FWMAs' potential use by businesses and consumers to create sustainable value (e.g. Di Talia, Simeone & Scarpato, 2019; Michelini, Principato & Iasevoli, 2018; Schanes & Stagl, 2019), a gap which this research aims to address.

South Asia presents an appropriate location in which to explore the potential of FWMAs. According to the FAO (2013), the region suffers amongst the highest food waste levels in the developing world, which is also environmentally problematic due to its substantial impacts upon carbon footprint, water and arable land. Moreover, Asia contains the largest concentration of BoP consumers, with 2.86 billion people across 19 countries (World Resource Institute, 2007). Sri Lanka is representative of a South Asian country with a large BoP market and many BoP households suffering malnutrition or food insufficiency (World Food Programme, 2017). At the same time, the FAO (2018) estimates food waste in Sri Lanka at 353 t/day, with the largest part of food waste attributable to foodservice businesses. These issues have driven interest by the government and non-government organisations in

initiatives supporting innovation to reduce food waste, improve food security and eradicate hunger and malnutrition in Sri Lanka (FAO, 2018; World Food Programme, 2017).

The use of FWMAs can be an effective approach to support these efforts. Nevertheless, although ICT developments in developing countries have enabled wider adoption and use of technology, FWMAs still face challenges which limit the opportunities for consumers, businesses and society. For example, Secondi, Principato and Mattia (2019) maintain that cultural expectations, social norms and personal and psychological characteristics influence the adoption of digital food waste reduction initiatives. Other studies suggest that technology adoption and use by BoP consumers differs greatly from higher income consumer markets due to financial constraints, lower technological literacy, infrastructural challenges, and their diverse needs (Dey et al., 2013; Hasan, Lowe & Rahman, 2017; Prahalad, 2012). Nevertheless, most research on FWMAs has focused on reducing food waste in Western, non-BoP markets (e.g. Almeida Oroski, 2020; Michelini, Principato & Iasevoli, 2018).

The above considerations demonstrate a considerable gap in the literature – a lack of studies focusing on FWMA usage in developing countries or the benefits that these technologies can create for BoP consumers. Several scholars have requested research contributing to the development of anti-food waste technologies, and to strategies delivering the greatest societal benefits. For instance, Filimonau and De Coteau (2018) argue that more research is required in consumer behaviour and knowledge in the case of food waste initiatives, particularly in non-Western contexts. Mu, Spaargaren and Lansink (2019) agree that further research is needed in mobile app usage to reduce food waste, considering the different practical and cultural contexts in different markets and the diverse expectations and motivations of different stakeholders (such as business and consumers) to engage with FWMAs and collaborate with each other. This reinforces the need for research linking the features and functions of apps with their value propositions, and with the goals which motivate stakeholder engagement with the apps.

By using information from BoP consumers and food businesses in Sri Lanka, and drawing on consumer behaviour and motivation theories, this study aims to explore how FWMAs can encourage and support sustainable value co-creation, by investigating: a) the features and functions of FWMAs which influence their value for food businesses and BoP consumers; b) the perceived affordances of these features/functions; and c) the end goals which businesses

and consumers aim to achieve through these apps. To achieve this, in-depth interviews using the laddering technique were conducted with BoP consumers and foodservice business representatives in the capital of Sri Lanka, Colombo. Building on this empirical research, and by drawing upon the affordance and means-end theories, we provide a better understanding of this emerging form of sustainable value co-creation through technology at the BoP.

## 2. Theoretical background and research context

In this section, we first discuss the findings and theoretical approaches employed by existing studies on the adoption of food mobile apps both from consumers and businesses. We then introduce a value-based perspective of technology usage, based on value co-creation and affordance and means-end theory, explaining how this can create meaningful insights in the adoption of FWMAs.

### 2.1 Factors influencing acceptance and use of food mobile apps

Recent research has explored the adoption and use of mobile apps in the food sector from several theoretical perspectives, using different regions and consumption occasions. For instance, Mu, Spaargaren and Lansink (2019) employ social practice theory to explore adoption of food apps by Chinese and Dutch consumers, arguing that food apps can "facilitate sustainability transitions in food consumption" (p.1275). Their findings suggest that consumers prefer food apps which are familiar, user-friendly, simple, trustworthy, flexible, and bestow on the user a reward. Similarly, Cho, Bonn and Li (2019) identify five salient attributes influencing the perceived value and intentions to use food delivery apps: convenience, design, trustworthiness, price, and variety of food choices. From a business perspective, Kimes and Laque (2011), surveying 326 top U.S. restaurants, identified their perceived benefits of mobile apps for food businesses, which include increased sales, automatic upselling, and storing order information to encourage repeat purchases. However, installation and operation costs, and the inadvertent exacerbation of excess peak-hours customer volume, have been identified as disadvantages of the use of food mobile apps by restaurants.

Several scholars have employed the Technology Acceptance Model and its derivative Unified Theory of Acceptance and Use of Technology, proposing a number of factors as key predictors of willingness to use food mobile apps. More specifically, perceived usefulness,

ease of use, hedonic motivation, personalisation, trust, enjoyment, peer-to-peer interactions, and links to social media have been identified as factors influencing consumer acceptance and use of food mobile apps (e.g. Alalwan, 2020; Kang & Namkung, 2019; Kapoor & Vij, 2018; Okumus, Bilgihan & Ozturk, 2016). Finally, the type and quality of information available on food mobile apps, both business-generated (e.g. text, menu, images) and user-generated (e.g. reviews, ratings), has been shown to influence satisfaction and intention to use apps (Alalwan, 2020; Kapoor & Vij, 2018; Xu & Huang, 2019).

Evidently, although several studies have examined the features and functions influencing the adoption of food mobile apps, scant research exists on how these features and functions can support the value creation process for consumers and businesses. Additionally, in their most common format, FMWAs are not simply food ordering apps, but can be considered as a 'sharing-for-money' platform, i.e. a for-profit, sharing economy model, as they allow businesses to 'share' surplus food with consumers affordably (Harvey et al., 2019; Michelini, Principato & Iasevoli, 2018). In the case of the sharing economy, it is important to explore the views of the different actors within the exchange process, as congruent perceptions regarding procedures, understandings and goals can produce meaningful interactions and value creation, preventing the diminishment or destruction of the value of the offering (Camilleri & Neuhofer, 2017; Echeverri & Skålén, 2011). Furthermore, engaging both businesses and consumers with technology-based services is crucial for successful adoption and value creation (Chan, Yim & Lam, 2010; Heidenreich & Handrich, 2015). However, extant studies have neglected the perceptions of businesses and BoP consumers surrounding the use of FWMAs, and particularly in terms of their features and the opportunities (or challenges) for sustainable value creation - a gap which this study aims to address.

### 2.2 Value co-creation and underlying constructs

Several researchers have used Service-Dominant (S-D) logic to explain the important role of both businesses and consumers in the value creation process, particularly within the adoption and use of new technologies (e.g. Lei, Wang & Law, 2019; Roy et al., 2019). In S-D logic, value is not created by providers and delivered to customers, but determined and created through usage, and therefore "intangibility, exchange processes, and relationships are central" (Vargo & Lusch, 2004, p. 2). From this perspective, although app developers can offer value propositions through their software design and development, the users decide how to use

these applications and whether to accept these value propositions, which results in ‘value-in-use’ (Akaka & Vargo, 2014; Vargo & Lusch, 2008).

Gebauer and Reynoso (2013) suggest that value co-creation and resource integration are increasingly relevant within the sharing economy and BoP markets, particularly because involving BoP consumers as value co-creators may contribute to the development of better services and the alleviation of poverty in the longer term. This view also highlights the relevance of the ‘value-in-use’ perspective as, for consumers to experience service benefits, they must engage meaningfully with the technology and capitalise on its value propositions. For example, while value propositions are embedded within the FWMA design (e.g. facilitating interactions between consumers/businesses to reduce food waste and/or provide affordable food), the way these apps are used during consumer-business interactions determines whether this value is materialised.

The value-in-use perspective, supported by S-D logic, is better understood by incorporating the fundamentals of affordance theory, according to which individuals perceive differently the possibilities for action their environment ‘affords’ them, depending on the goals which they strive to achieve(Gibson, 1979). This means that these perceived possibilities for action (or ‘affordances’) are subjective, and depend on the context, the individuals’ characteristics and their goals. In the context of technology adoption, affordance theory highlights the relationship between user intentions and technological capabilities which provide the potential for a particular action (Schrock, 2015). For instance, from a technology affordances perspective, mobile apps are not standalone technological objects with their own independent capacities, but can only perform a specific action when they are used (Lupton, 2018).

Several affordance-related concepts have been proposed to investigate the adoption and use of technology, such as functional affordances (i.e. the possibilities for action created by the technology), and perceived affordances (i.e. the possibilities for action perceived by users of the technology) (El Amri, 2019; Norman, 2008; Zhao et al., 2013). Lee (2010) attempts to clarify this distinction, distinguishing between core (primary) affordances and tangential (secondary) affordances. In this interpretation, core affordances are created deliberately by the designer of the technology, while tangential affordances may not be designed intentionally but rather perceived by the users. This has led to the further differentiation between positive affordances (which are desired or expected), and negative affordances

(which are undesired) as the afforded behaviour is unwanted and should be eliminated through design (El Amri, 2019).

In the context of this study, affordance theory can explain how the various functions and features of the apps can be utilised by consumer and business users to achieve their respective goals. This is extremely important, as differences in goals can lead to different perceptions of the value which a mobile app can offer, strongly influencing resource integration and the value co-creation process (Echeverri & Skålén, 2011; Jaakola et al., 2015; Lei, Wang & Law, 2019). Previous studies suggest that successful value co-creation strategies depend upon the alignment of the goals of consumers and businesses, as it is impossible to co-create value if the goals of participating parties are misaligned (D'Andrea et al., 2019; Möller et al., 2008).

### 2.3 Value co-destruction and diminishment of stakeholder wellbeing

A misalignment of goals may also lead to the destruction (instead of creation) of value, as the interactions diminish at least one of the actor's wellbeing (Plé & Cáceres, 2010). Scholars name this 'value co-destruction', attributing it to factors such as system failures, conflicting goals, lack of competency or motivation, and (intentional or unintentional) misuse of resources (Echeverri & Skålén, 2011; Findsrud, Tronvoll & Edvardsson, 2018; Groening, Sarkis & Zhu, 2018; Plé & Cáceres, 2010). For instance, limited technological literacy and lack of technical knowledge and skills may hinder the adoption of technology at the BoP, negatively impacting the value-in-use that technology can offer (Dey et al., 2013).

Nevertheless, some researchers argue that value co-destruction is an inevitable by-product, or even an integral part, of value co-creation (Rahman et al., 2019). As value is not objectively defined but varies according to the goals of different actors, value co-creation for some stakeholders may involve value co-destruction for others. For example, according to Schanes and Stagl (2019), motivations and goals behind the engagement with food sharing initiatives vary greatly (e.g. rewards, morality, social influence and sense of community). This misalignment of goals may generate different perceptions of value, creating tensions between participating parties which diminish the wellbeing of one or more stakeholders.

Therefore, to explore the impact of FWMAs on the sustainable value creation, both value co-creation and value co-destruction must be considered, and this research introduces 'positive' and 'negative' affordances as distinct concepts which can influence the value co-creation

process. Additionally, as goal misalignment may impact upon value co-creation (or co-destruction), we focus not only on perceptions of the various FWMA features and functions, but also on the underlying motivations and goals influencing business' and BoP consumers' adoption of these apps.

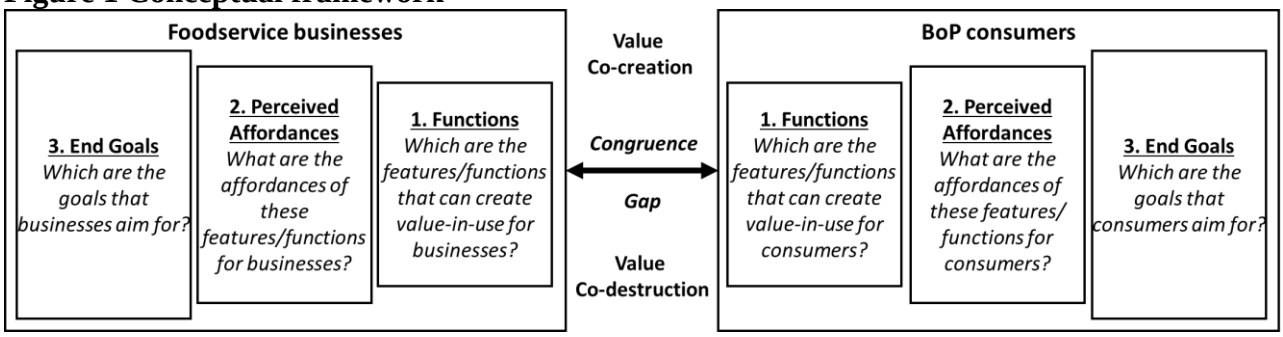
### 2.4 Understanding the underlying goals via means-end theory

To achieve the above, this study adopts the means–end theory (Gutman, 1982) to examine user perceptions of the attributes (FWMA features and functions), consequences (perceived affordances) and desired end states (goals) associated with FWMA adoption and usage. The means-end theory suggests that 'means' are the objects or attributes used to enable and facilitate actions in which people (or businesses) engage to achieve a specific outcome, and 'ends' are the end goals or states that they aim to achieve through these actions (Gutman, 1982). Research in marketing has used the means–end theory to explain the motivations and goals behind consumers' and businesses' adoption of technology (e.g. Pai & Arnott, 2013), but also in food-related marketing research (e.g. Apostolidis & McLeay, 2016).

As per Figure 1, in the context of this research, the desired goals influence the perceived affordances and use of the different features of FWMAs, as they are viewed as means to achieve a particular end. Therefore, goal alignment between consumers and businesses would suggest congruence in the perceived affordances of the different features and functions of FWMAs and the value-in-use they can create. This congruence can support sustainable value co-creation and encourage meaningful interactions between stakeholders. Nonetheless, as different goals may motivate the two actors to engage with food waste reduction initiatives (e.g. Schanes & Stagl, 2019), and FWMAs more specifically, this may create a gap in the perceptions of the app features and functions and how different actors may use them. This gap can precipitate the diminishment of the co-created value, or even cause value co-destruction, as different stakeholders try to achieve different and/or inconsistent goals.

By embracing S-D logic, affordance theory and means-end theory, this research aims to enhance the digital value co-creation debate, by exploring how FWMAs may enable interactions between businesses and BoP consumers and support sustainable value co-creation. Both BoP consumers' and food businesses' views are investigated to explore how FWMAs, as sharing-for-money platforms, can enable and motivate value co-creation and avoid value co-destruction in the interactions between these two parties.

**Figure 1 Conceptual framework**



## 3. Methodology

Understanding different actors' motivations and perceived affordances, and exploring how they can influence value co-creation, requires deep insights into consumer psychology. Hence, we adopt an interpretive research paradigm to explore the perceptions and underlying thought process of both BoP consumers and foodservice business representatives. Guided by the fundamentals of affordance and means-end theories, this study adopts a qualitative research design, incorporating a laddering approach to explore how FWMAs can enable and support sustainable value co-creation at the BoP.

Laddering is a marketing research technique, originally developed to explore the motivations and thought processes within consumer behaviour and decision-making (Reynolds & Gutman, 1988). It refers to an interviewing technique whereby the researcher explores the connections people make between attributes, the consequences or effects these attributes have for participants, and the end state or goals they associate with those consequences (Reynolds & Gutman, 1988). It has been applied to many research areas including use of mobile apps (e.g. Lei, Wang & Law, 2019), mobile purchases (Park, Yap & Makkar, 2019), ethical firm behaviour (Nguyen et al., 2015) and ethical consumption (Jägel et al., 2012). Furthermore, the laddering technique and in-depth interviews with key employees are recommended as reliable methods to identify the organisational goals and values which influence how the business operates (de Chernatony, Drury & Segal-Horn, 2004).

Laddering relies on the interpretation of qualitative, in-depth information and reflections to analyse the underlying motivations of a specific behaviour (Reynolds & Gutman, 1988). It may be both inductive and deductive, depending on the research objectives (McDonald, Thyne & McMorland, 2008; Watkins & Gnoth, 2011). Inductive laddering generally employs 'softer', less restrictive qualitative methods as it is concerned with obtaining insights into how motivations and end goals link to a particular behaviour. However, more deductive laddering approaches employ a more structured methodology as they focus on how behaviour-relevant knowledge is stored and organized in human memory (Watkins & Gnoth, 2011). Given our focus in revealing the underlying goals that motivate use of FWMAs, rather than defining the consumer's cognitive structure, the interpretivist/inductive laddering approach was adopted.

In our research, laddering was selected to uncover the perceived positive and negative affordances (i.e. consequences) which the various features and functions (i.e. attributes) of FWMAs offer to different stakeholders, and the end goals (i.e. end states) which these stakeholders try to achieve and are associated with these affordances. A 'soft' laddering approach is employed to collect information, in which qualitative interviews facilitate respondents' flow of speech and freedom of expression (Lundblad & Davies, 2016; Veludo-de-Oliviera, Ikeda & Campomar, 2006). This is opposed to 'hard' laddering techniques which use structured surveys and adopt a more objectivist epistemology (Jägel et al., 2012). Although hard laddering may be used to collect data from a larger number of respondents (Henneberg et al., 2009; Russell et al., 2004), soft laddering is most suited to in-depth, exploratory studies such as this one, albeit it demands of the researcher greater skill and time commitment.

### 3.1 Data collection

Interviews were conducted between September 2019 and February 2020, with participants selected from the BoP market and managers/representatives of foodservice businesses in Colombo, capital of Sri Lanka. Colombo was chosen primarily for its proliferation of foodservice businesses and comparatively high ICT accessibility. Recruitment used purposive and theoretical sampling methods. Purposive sampling follows an iterative process, moving back and forth between data collection and analysis, as the analysis of initial interviews guides selection of appropriate subsequent study participants to maximise or minimise differences between participants across specific dimensions (Lincoln & Guba, 1985). For this study, only participants meeting BoP criteria were selected for in-depth interviews, whilst all food business representatives held managerial roles or were involved in strategic decision making. Additionally, as data collection and analysis progressed, participant characteristics (e.g. gender, age) and business characteristics (e.g. size) were varied intentionally to ensure that opinions were not merely representative of a specific group or demographic segment.

Theoretical sampling informed the sample size, which was influenced more by the identification of incidents and concepts relating to the phenomenon, rather than attempting to collect data from a specific number of people (Corbin & Strauss, 1990; Martin & Woodside, 2012). Therefore, data collection ceased when few non-redundant data were being collected, as this suggested that saturation had been reached and we had the required information to

understand the phenomenon. This strategic selection of relevant participants also increased the validity and analytical generalization of the results (Stenbacka, 2001).

Interviews were conducted in the native language of the participant (Sinhala or Tamil), or English if they preferred. Soft laddering interviews allowed exploration of perceptions of the FWMAs, the features which create value-in-use, and the associated affordances and end goals. Based on prior laddering research (e.g. Jung & Kang, 2010), open-ended questions were used to explore respondents' thought process and the rationale behind their perceptions of the features and affordances of FWMAs. Therefore, respondents were asked about their perceptions of FWMAs, what features and functions would encourage them to use these apps, what purposes each feature or function of the FWMAs could help them achieve, and why each purpose is important to them. Accordingly, similar question were used to explore the negative affordances of the various features and functions of FWMAs by asking respondents to identify the features and functions which would discourage or limit their use of FWMAs, reasons to consider these features or functions as undesirable, and why these are important to them. An example interview guide used for collecting data from BoP consumers and businesses is provided in Table 1.

During this process, the features and functions of the FWMAs (desirable or undesirable) were identified first, whilst the second question corresponded to the affordances (positive or negative) and the third question explored the end goals which these affordances allow them (or do not allow them) to achieve. By asking the features and affordances questions first, we allowed respondents to discuss the links between attributes and main value-in-use and then associate them with the end goals which they are trying to achieve. This stepwise approach allowed more effective probing and collection of in-depth insights into the perceptions of FWMAs, and how they can enable value co-creation.

**Table 1 Example of interview guide and questions**

| |
|---|
| ***Background information*** |
| • Personal/business characteristics<br>• Personal/business access to mobile technology (mobile phones/smartphones)<br>• Experience of mobile applications |
| ***Presentation of scenario*** |
| ***Perceptions of FWMAs*** |
| • Would you use this app to purchase food/sell surplus food in your business?<br>• Can you please explain why/why not? |
| ***Features/functions of importance (positive)*** |
| • What are the features/functions of the app which would encourage you/your business to use this app, or to use this app more often? |
| ***Affordances (positive)*** |
| • Why would each of these features encourage you/your business to use the app? |
| ***End goals*** |
| • Why are they important to you/your business? |
| ***Features/functions of importance (negative)*** |
| • Are there any features/functions which would prohibit/limit your/your business' use of these apps? |
| ***Affordances (negative)*** |
| • Why would these features/functions limit your/your business' use of the app? |
| ***End goals*** |
| • Why are these important to you/your business? |
| ***Summarising/closing questions*** |
| • In general, do you think these mobile apps can help people/businesses/the community?<br>• Why do you think that? |

The laddering method enabled us to develop and enrich themes, identify relationships between them and eventually allowed the use of theoretical sampling and the identification of a data saturation point. Since many of our participants were unfamiliar with FWMAs, two separate scenarios were developed (one for consumers and one for businesses), based on common features and functions of existing FWMAs, explaining their use in detail. Since framing effects (i.e. bias due to the wording of the questions and descriptions of scenarios) may occur in research on sustainability and ethics (Bateman, Fraedrich & Iyer, 2002), both the interview questions and the FWMA scenarios were pilot-tested with potential participants (three participants from each group) to ensure comprehensiveness, clarity, applicability and accuracy. Additionally, the credibility and dependability of the scenarios were established by two additional, experienced researchers, familiar with the Sri Lankan market, who evaluated each scenario for relevance and objectivity (Lincoln & Guba, 1985). Minor changes in wording were made in the final versions of the scenarios and the interview questions based on the pilot tests.

Thirty-six participants (12 business representatives and 24 BoP consumers) were recruited in the Colombo area, until saturation had been reached and no new themes or connections between themes emerged from the analysis of the interviews (Corbin & Strauss, 2014). The sample size is smaller for business representatives due to the faster achievement of saturation, a common observation in laddering research including consumer and business participants (e.g. D'Andrea et al., 2019). Table 2 presents the socio-demographic information of the participants. Consumer respondents were predominantly male (75% of our sample) and were aged between 23 and 55 years, with a mean age of 35 years. Furthermore, they reported incomes below 14,000 Sri Lankan Rupees per month (US$2/day or less) which categorized them as BoP consumers. Business respondents were male and they owned or managed foodservice businesses of varying sizes and types, from smaller independent bakeries to large hotel restaurants. All business respondents, and the vast majority of consumer respondents (approximately 80%), reported having access to smartphone technology (their own device or a household/family member's). Additionally, all business respondents and over half of consumer respondents had experience of using mobile applications.

**Table 2 Characteristics of the sample**

| **BoP Consumers** | | | | | |
|---|---|---|---|---|---|
| **Nº** | **Code name** | **Gender** | **Age** | **Access to Smartphone technology** | **Experience with mobile apps** |
| 1 | C-1 | Male | 47 | No | No |
| 2 | C-2 | Male | 44 | Yes | Yes |
| 3 | C-3 | Male | 52 | No | No |
| 4 | C-4 | Female | 32 | Yes | No |
| 5 | C-5 | Female | 37 | Yes | Yes |
| 6 | C-6 | Male | 23 | Yes | Yes |
| 7 | C-7 | Male | 28 | Yes | Yes |
| 8 | C-8 | Female | 25 | Yes | Yes |
| 9 | C-9 | Male | 51 | No | No |
| 10 | C-10 | Male | 50 | Yes | No |
| 11 | C-11 | Male | 54 | No | No |
| 12 | C-12 | Female | 24 | Yes | Yes |
| 13 | C-13 | Male | 29 | Yes | Yes |
| 14 | C-14 | Female | 31 | Yes | No |
| 15 | C-15 | Male | 35 | Yes | Yes |
| 16 | C-16 | Female | 28 | Yes | No |
| 17 | C-17 | Male | 31 | Yes | Yes |
| 18 | C-18 | Male | 31 | Yes | No |
| 19 | C-19 | Male | 42 | No | No |
| 20 | C-20 | Male | 33 | Yes | Yes |
| 21 | C-21 | Male | 31 | Yes | No |
| 22 | C-22 | Male | 25 | Yes | Yes |
| 23 | C-23 | Male | 26 | Yes | Yes |
| 24 | C-24 | Male | 25 | Yes | Yes |
| **Food Businesses** | | | | | |
| **Nº** | **Code name** | **Gender** | **Business type/position** | **Access to Smartphone technology** | **Experience with mobile apps** |
| 1 | B-1 | Male | Hotel restaurant/manager | Yes | Yes |
| 2 | B-2 | Male | Restaurant/manager | Yes | Yes |
| 3 | B-3 | Male | Pizza restaurant/owner | Yes | Yes |
| 4 | B-4 | Male | Bakery/owner | Yes | Yes |
| 5 | B-5 | Male | Restaurant/manager | Yes | Yes |
| 6 | B-6 | Male | Hotel Restaurant/manager | Yes | Yes |
| 7 | B-7 | Male | Restaurant/owner | Yes | Yes |
| 8 | B-8 | Male | Café-Restaurant/Manager | Yes | Yes |
| 9 | B-9 | Male | Hotel Restaurant/manager | Yes | Yes |
| 10 | B-10 | Male | Restaurant/owner | Yes | Yes |
| 11 | B-11 | Male | Hotel restaurant/manager | Yes | Yes |
| 12 | B-12 | Male | Café-Restaurant/Manager | Yes | Yes |

### 3.2 Data analysis procedure

Each interview lasted approximately 60 minutes, and was recorded, transcribed and analysed with NVivo software. Codenames were assigned to each participant to preserve anonymity. Reynolds and Gutman (1988) suggest three steps to analyse laddering data. The first step is to perform a thematic analysis to identify the key elements (codes) in the interviews. This is achieved through initial qualitative coding of the transcripts. For the next step, a set of themes (i.e. summary codes) are produced, summarizing the key identified concepts. The process was inductive and data-driven, directed by interview content, however key phrases and concepts from the extant literature on technology affordances and personal/business goals were used to help create meaningful categories. These categories were broad enough to include points made by several respondents, yet representative enough to retain meaning. Codes were then categorized into features/functions, affordances and end goals.

The finalized codes are then used to construct an implications matrix and laddering map presenting key associations between concepts. The implications matrix demonstrates relationships between the different elements, such as the number of times each element (e.g. an affordance) leads to another element (e.g. a mobile app feature). In the next step, laddering maps are constructed, consisting of a visualisation of the more dominant themes and relationships derived from the implication matrix. LadderUX software was used to create the implication matrices and the laddering maps.

## 4. Findings

During analysis, data collected from foodservice business representatives and BoP consumers were analysed separately to create distinct implication matrices and ladders for each group. As inclusion of all themes and linkages would decrease a laddering map's usefulness and informativeness, the use of a cutoff level was employed (Gengler & Reynolds, 1995). Following the method recommended in existing research (e.g. Jung & Kang, 2010), the percentage of themes and active linkages above the different cutoff points was calculated to inform the choice of an appropriate cutoff level for the two ladders. Finally, a cutoff level of four was selected for both ladders, indicating that the included themes and relations are identified in the analysis at least four times. This cutoff level represented approximately 65% and the themes and linkages for consumers and approximately 80% of the themes and 75% of the linkages for business representatives. This is in line with the recommended threshold of

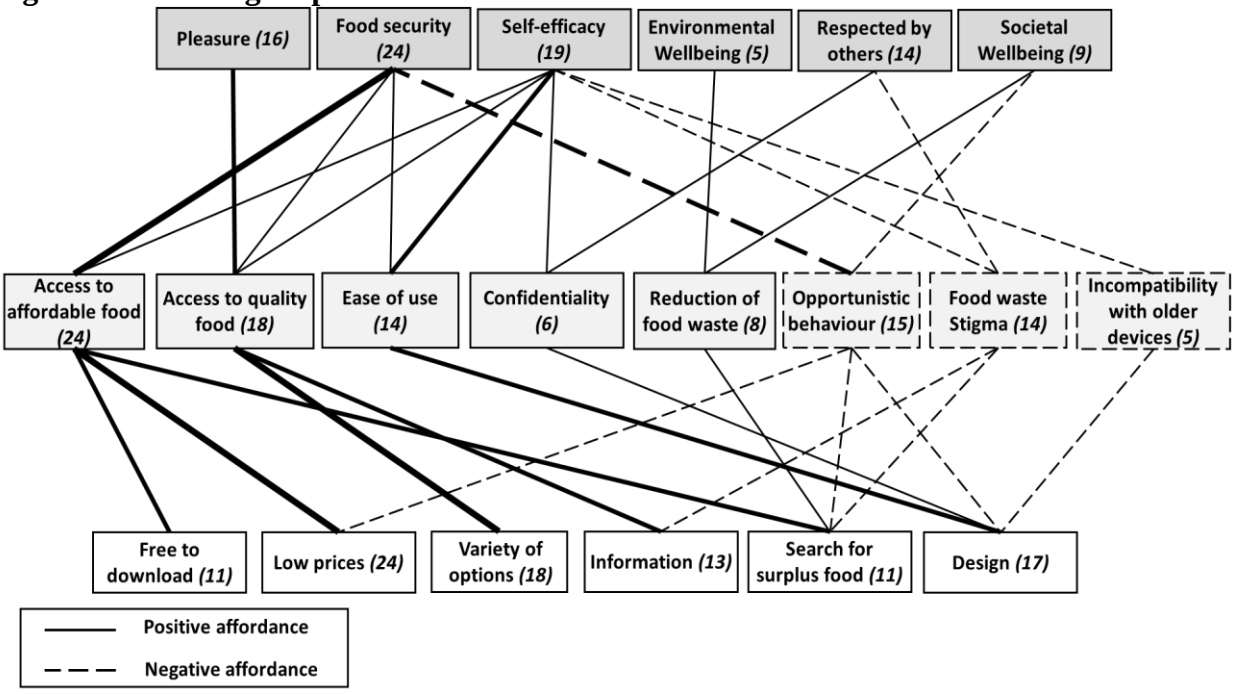
presenting approximately 70% of all linkages, while maintaining the accuracy and interpretability of the laddering maps (Gengler & Reynolds, 1995). Thus, a link between themes is added to the ladder only if at least four participants suggest that a relationship between the two concepts exists.

In this section, we present the results of the laddering analysis, first for BoP consumers and then for business representatives, and we provide some indicative quotes to support our findings. The presentation of the results follows the levels of abstraction, from lower to the higher abstraction levels, to create a logical flow of information from concrete (i.e. features and functions) to abstract (i.e. end goals).

### 4.1 BoP consumer analysis and laddering map

The analysis of the 24 consumer interviews revealed 31 themes: 8 attributes, 15 affordances and 8 values. All the connections retrieved from the interview analysis are demonstrated in the implication matrix (Appendix A). Following the construction of the implication matrix, laddering maps were created, using the cutoff point of four explained earlier, as a more clear and comprehensive way of examining and presenting the dominant themes and relationships than the matrices (Figure 2). In the laddering map, the number of respondents mentioning each concept in the ladder is presented in brackets next to the relevant concept, while the thickness of the lines connecting the concepts reflects the number of times the themes were linked in respondents' ladders.

**Figure 2 Laddering map for BoP consumers**



### 4.1.1 Features and functions (BoP consumers)

The themes at the base of the ladder (white colour) represent features/functions of the mobile apps which influence the value-in-use for BoP consumers. These include both generic technological features (e.g. app design) and functions relating to the food available on the FWMA. As presented in the laddering map, the two most cited features of FWMAs were access to 'Low priced food' (mentioned by all participants) and a 'Variety of food options' (mentioned by 18 participants), compared to other options such as charity organisations. These are followed by generic mobile app features linked to the overall 'Design' of the FWMA, the quantity and quality of 'Information' on the available food provided (e.g. clarity of information, wording used and how detailed the information is), and that the apps are 'Free-to-download', while the final theme relates to the apps' function of 'Search for surplus food'.

### 4.1.2 Perceived affordances (BoP consumers)

The next step of the ladder (light grey) indicates perceived affordances of the identified attributes. These include both functional and psycho-social affordances which respondents associated with FWMAs. For instance, participants associated app design with 'Ease of use' but also with the 'Confidentiality' it affords the users, in terms of safeguarding their public image and self-esteem, compared to other methods of accessing affordable food products such as food banks or charities:

> *I like how simple they are. You just press a few times. If someone shows you once, then you can use it to look for food every time you need it.* (C-2)

> *This is not a charity, is it? This is a real restaurant. It would be like picking food up from a restaurant, not like people from a charity knocking on your door or asking people that know you for food.* (C-16)

Furthermore, BoP consumers perceive the function of searching for surplus food, not only as a way to access affordable food, but also as an opportunity that they, as consumers, can help 'Reduce food waste' from restaurants and food businesses. Finally, the quantity and the quality of the information available on the apps, and the low prices of a variety of food

products, afford BoP customers access to ‘Affordable food’ and ‘Quality food’ (e.g. meets their palate requirements). For instance, one participant explains:

> *I believe it is important that you know that the food offered is of good quality and not expired or food that should have been thrown away. If I am to feed my family with that food, the quality needs to be good.* (C-4)

Contrastingly, in addition to the positive affordances (i.e. affordances contributing to the value-in-use), negative affordances were also identified, using the laddering process. Participants expressed concerns regarding how some of the FWMA features discussed earlier may cause the diminishment of the value-in-use which the FWMAs can offer. These negative affordances are mainly tangential (i.e. not designed as part of the app) and include the ‘Stigma’ associated with using FWMAs to purchase food labelled as “leftover food” or “food waste” (particularly associated with the wording used in the information on the apps), and the ‘Incompatibility’ of the majority of FWMAs with older devices, which limits many BoP consumers’ access to the value they can offer. For example:

> *It would be very embarrassing if people we know saw that we are trying to survive on leftovers* […] *I wouldn’t want to be seen as a beggar.* (C-16)

Finally, the opportunistic behaviours which the apps can afford, from businesses trying to sell lower quality food to increase their profit, and from other consumers (in both BoP and non-BoP markets) who may overuse the apps for their own personal and financial benefit, limiting the access of the wider BoP community to the finite quantities of affordable food, have been mentioned as negative affordances of FWMAs:

> *If you cannot see the food how do you know what you are buying? Maybe they* [businesses] *only want to get rid of it and they are only selling you rubbish and expired food.* (C-10)

### 4.1.3 End goals (BoP consumers)

At the top of the laddering map (dark grey), the end goals for which consumers strive, and which affect the perceived value-in-use and the value co-creation process, are presented with their links to the perceived affordances (positive and negative) with which they are

associated. The perceived affordances relating to access to affordable food which meets participants' quality requirements are driven by the end goals of personal and household 'Food security' and the more hedonic goal of 'Pleasure', as people feel they can improve their current diets (both in quantity and quality) while simultaneously helping businesses reduce food waste. Furthermore, participants argued that using an app which redistributes surplus food to the needy can reduce food waste, bringing benefits on an environmental ('Environmental wellbeing') and social ('Societal wellbeing') level. For instance:

> *It is sad to see good food being thrown away, it is disrespectful when there are families everywhere around us that need it* […] *If more people use these* [FWMA], *then maybe more businesses start using them as well, and there will be less food being wasted and less people hungry.* (C-12)

Finally, the perceived affordances of the FWMAs were linked to end goals relating to improving 'Self-efficacy' (i.e. sense of control over their behaviour and outcomes) and 'Respect from others'. Consumers suggested that the opportunity to access affordable, good quality food, coupled with the confidentiality which the apps afford them, will benefit the opinions of others but also make them feel more capable and in control of their diets.

Conversely, the important influence of the end goals on perceived affordances is also evident in their strong links to the negative affordances discussed during the interviews. More specifically, the perceived negative affordances of opportunistic behaviours and stigma are associated with their potential negative impact on end goals such as food security, societal wellbeing, self-efficacy and respect from others, demonstrating that the same end goals can influence the perceptions towards both positive and negative affordances and can influence, positively and negatively, the value-in-use:

> *If they are that easy* [to use], *I think many people that have better phones* [smartphones] *but do not need the food will use them* […] *They will just buy it because it is cheaper and that is bad for other people in the community that need it.* (C-2)

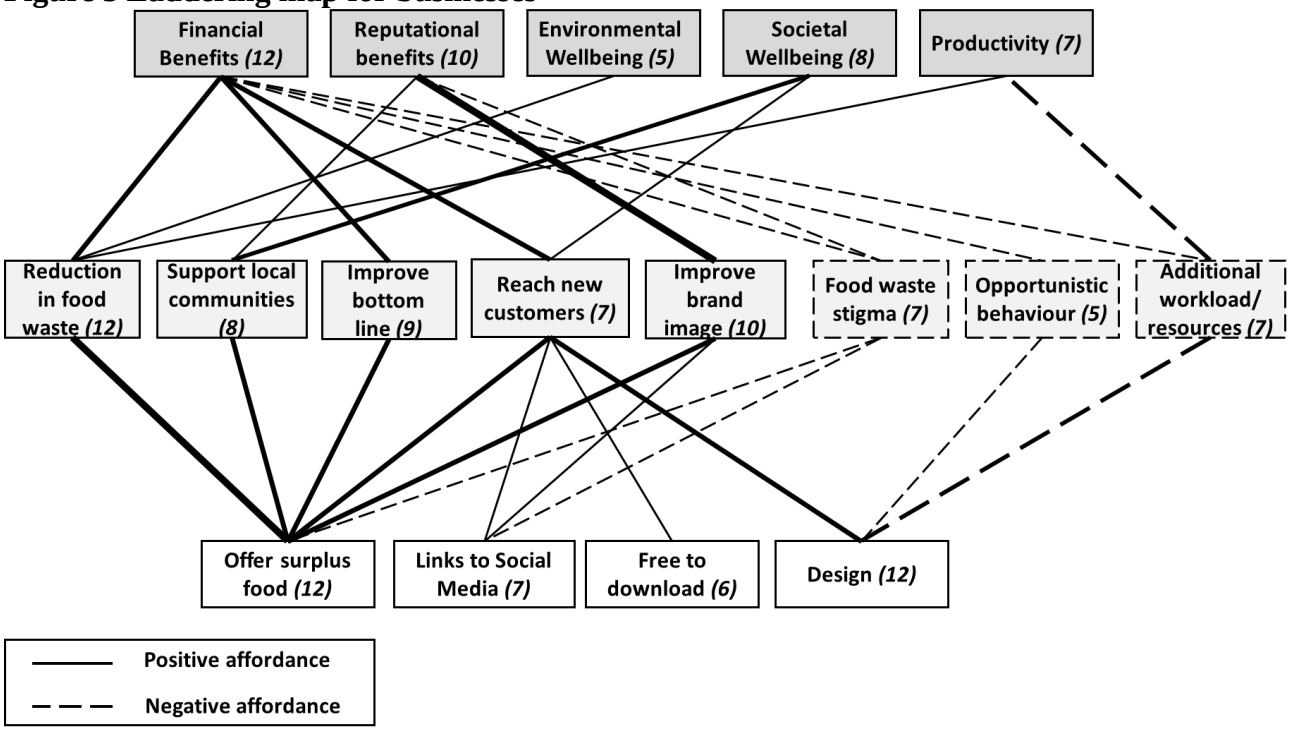
### 4.2 Business representative analysis and laddering map

Similar to the interviews with BoP consumers, the 12 business representative interviews also offered valuable insights on the features, positive and negative affordances, and end goals that businesses associate with FWMAs. This resulted in a second implication matrix consisting of 5 attributes, 10 affordances and 6 end goals (Appendix B) and a second laddering map presenting the most dominant features, affordances and goals (Figure 3).

#### 4.2.1 Features and functions (Business representatives)

Consistent with participants from the BoP consumer group, the business representatives also primarily focused on FWMA features relating to their function as platforms to ‘Offer surplus food’, but also the ‘Design’ of the app (both mentioned by all business participants), and the fact that the apps are ‘Free to download’ for businesses and consumers. The ‘Links to Social Media’ offered by some of the FWMAs is a feature which can contribute to their value-in-use for businesses according to the ‘business’ participants. However, this view is not shared by BoP consumer respondents.

**Figure 3 Laddering map for businesses**



### 4.2.2 Perceived affordances (Business representatives)

The above features and functions were linked to several different affordances. As possibly expected, ‘Reduction in food waste’, ‘Improve the bottom line’ and ‘Reach new customers’ were the most common positive affordances. These were followed by the potential to ‘Support local communities’ by offering leftover food at lower prices, and opportunities to ‘Improve brand image’ as businesses increasingly engage with these apps and capitalise on their links to social media through user-generated content and peer-to-peer communication. These perceived affordances create a strong link between FWMAs and BoP marketing as businesses clearly perceive that the apps afford them opportunities to enter the BoP market profitably whilst benefiting society and the environment. For example:

> *We need to make the most out of the food we make. We are always trying to find ways to use any food we have left or we give it to our staff for their families or people they know* […] *If this* [the app] *is a way not to throw away so much food, make some money, and help people in need then we will definitely use it.* (B-4)

> *If people share a picture of the food they buy from our restaurant every time they use it* [the app] *so many more will know who we are and the food we sell.* […] *Even those that don’t follow us* [on social media] *will hear about us and they might decide to visit our restaurant.* (B-3)

In addition to the positive affordances, however, several negative affordances were identified and associated with the FWMA features by business representatives. Similar to the information derived from interviews with consumers, one of the negative affordances of FWMAs was the potential ‘Stigma’ following the business’ decision to use a FWMA, as the restaurant may become associated with serving low-quality food or having insufficient customers willing to buy their food at full price. Moreover, ‘Adding to existing workload and resources needed’ by creating additional employee responsibilities, increasing traffic during busy times or extending opening times, was also associated with the way in which apps are designed to operate, making this a core, rather than tangential, affordance.

Finally, the fact that the FWMAs can encourage opportunistic behaviours was a negative affordance also mentioned by business representatives, as currently there is limited control over who uses the app, why and how often. Therefore, non-BoP consumers may also use the

app to access restaurant quality food at lower prices, limiting food availability for BoP consumers:

> *They* [FWMAs] *need to allow for more control over who is ordering and how often* […] *I would stop using it* [FWMA], *if we lose our customers because they find out they can buy our products cheaper or think we are trying to sell leftovers* […] *This means we lose money and there is less food available for poor people.* (B-7)

### 4.2.3 End goals (Business representatives)

The main goals associated with these perceived affordances were primarily related to 'Financial', 'Reputational' and 'Productivity' benefits. This means that business representatives are considering how FWMAs can help them profit from food waste by targeting a new customer segment (BoP customers), whilst simultaneously creating a more responsible brand image. Nevertheless, more altruistic goals such as 'Environmental wellbeing' and 'Societal wellbeing' were also mentioned as important goals which food businesses are pursuing, albeit they were less common in the discussions than the financial- and reputation-related goals.

Interestingly, the three dominant goals associated with the positive affordances were also those which drive the importance of negative perceived affordances, as concerns over stigma from selling food through FWMAs, opportunistic behaviours, and the need for additional resources, were also associated with financial, reputational and productivity threats:

> *My main concern is that if we start selling this extra food cheap, how will that change how our customers see us?* [Name of the restaurant] *is a very good restaurant and we only sell fresh, good quality food* […] *I do not want people to think that our food does not worth the price.* (B-1)

> *I am not saying we would not use it* [the apps], *but maybe not every day. We are generally quite busy here, and the way the app works means we will have to do more work or work for longer, but if the money is not enough, how will we pay for it* [additional work]*?* (B-11)

## 5. Discussion

Extant research suggests that to support value co-creation and avoid value co-destruction in interactions between businesses and customers, congruence between expectations, practices and goals is crucial (Baumann & Le Meunier-FitzHugh, 2015; Echeverri & Skålén, 2011; Plé & Cáceres, 2010). Therefore, by exploring the affordances and goals related to the features and functions of FWMAs, both from a BoP consumer and a business perspective, this study allows the comparison of the two perspectives and contributes to the identification of the similarities and gaps that can influence the co-creation of sustainable value in this context. For instance, the perceived value-in-use of the app designs, in terms of enabling BoP consumers an easy way to access affordable food, is shared by businesses, as the way in which apps are designed provides a user-friendly platform for a more organised redistribution of surplus food. This corresponds with existing literature claiming that user-friendly food apps offering a clear reward are perceived favourably by customers and businesses (Kapoor & Vij, 2018; Mu, Spaargaren & Lansink, 2019), and suggests that FWMAs may enable interactions between businesses and the BoP market which can nurture value co-creation.

Despite similarities in terms of the FWMA features and functions which create value-in-use for businesses and consumers, several differences emerged as we investigated in more detail how this value is perceived by exploring the underlying affordances and goals. Although our analysis indicates that features and functions - such as the design of the apps, the free download and the fact that they are used to offer surplus food - are perceived as useful by participants in both groups, the ladders indicate that perceptions of value of these features may be driven by conflicting affordances and goals. This means that, although these features can encourage use of FWMAs, the discrepancies between end goals for the different stakeholders may challenge sustainable value co-creation (Plé & Cáceres, 2010).

For instance, the most common affordances perceived by BoP customers (i.e. access to affordable and good quality food) are motivated strongly by goals relating to household food security, self-efficacy and pleasure. This is consistent with findings of earlier studies suggesting that consumer motivation in participating in food waste reduction and food sharing initiatives is mainly contingent upon personal and economic benefits (e.g. Barnes & Mattsson, 2016; Lazell, 2016; Schanes & Stagl, 2018). Nevertheless, our analysis indicates that the focus of businesses is on achieving financial, reputation and productivity goals, while

the more altruistic goals - such as environmental and societal wellbeing - have a less dominant presence within discussions.

This focus on individualistic and financial benefits, increases the probability of actors misusing (intentionally or accidentally) FWMAs to achieve their own goals, which can lead to value co-destruction, as the goals of stakeholders may be incompatible and thus the value-in-use of the apps will be diminished. For example, by prioritising their bottom line, food businesses might take advantage of the opportunity to redistribute surplus food to try to sell lower quality food, or by increasing the prices of the food they make available on the apps, making it unaffordable to BoP consumers. This finding helps justifying the argument of earlier studies which suggest that BoP marketing should move beyond merely incorporating social goals alongside financial objectives, as this approach might be ineffective due to consumer individualism, businesses' profit-maximization focus and unequal power relations (Ansari, Munir & Gregg, 2012; Subrahmanyan & Gomez-Arias, 2008). Instead, the adoption of a more holistic, community-centric approach will allow the building of capabilities, trust and social capital in the BoP market and will enable BoP consumers to achieve their higher order needs, such as self-esteem and self-efficacy.

The incongruent business and consumer goals may also explain why certain FWMA functions are perceived as creating value only for some of the stakeholders but not for others. This corroborates findings from previous research which suggested that, as perceptions of value-in-use are subjective and influenced by the stakeholders' interests and goals, value co-creation for one stakeholder might result in value co-destruction for another (Rahman et al., 2019). For instance, business representatives hold generally positive perceptions regarding the potential value-in-use of the links to social media offered by FWMAs, as positive word of mouth and peer-to-peer communication from users may help them achieve their reputational and financial goals. Nevertheless, BoP consumers do not consider the links to social media as a valuable feature of FWMAs, as evidenced by only infrequent mentions of social media-related features and functions during interviews. On the contrary, it is the confidentiality that the FWMAs afford consumers which they consider as contributing more to the value-in-use, and this may limit the engagement with social media which creates value for food businesses.

The above finding contradicts those of recent research, which suggest that peer-to-peer interaction and links to social media can positively influence acceptance of food mobile apps

(e.g. Okumus, Bilgihan & Ozturk, 2016). This difference in the willingness to engage with peers through social media, between FWMAs and other food apps, could be related to the stigma associated with using mobile apps to purchase leftover food and the fear of opportunistic behaviours from other consumers, both of which are perceived as important negative affordances, and might be unique in the context of FWMAs. Whilst purchasing food surplus is considered a cost-effective way to improve household food security, the stigma associated with FWMAs as they sell food labelled as "food waste" or "leftovers" (as it is often mentioned in the information available on the apps), has a negative impact on people's goals to improve self-efficacy and respect from others. This may lead to reluctance of consumers to spread the word and limit the value FWMAs can create for businesses, which want to improve their brand image through word of mouth and user generated content, as can be seen in the respective ladders.

Scholars argue that stigma, or even just the fear of stigmatisation, can undermine trust, reduce opportunities for meaningful interactions and exacerbate discrimination, which can interfere with the formation or maintenance of social capital within a community or among different communities (Chen et al., 2011). This, however, can be detrimental within BoP markets, since social capital can support community welfare by enabling people from the same or different groups to collaborate more effectively in pursuing joint objectives (Ansari, Munir & Gregg, 2012). For instance, fear of stigmatisation may make consumers reluctant to share information about FWMAs with their peers, limiting their potential for incremental value co-creation which would be essential to improve the sustainability of the food sector and support poverty alleviation in the longer term.

Sandikci, Özlem and Güliz Ger (2010) explain how a stigmatized behaviour can be gradually transformed into a common choice in the market once it is voluntarily adopted by a group of people. Nevertheless, the authors highlight that the efforts of different stakeholders are required to change the status of the stigmatised behaviour and create further opportunities for value co-creation. This is consistent with the multi-stakeholder view of value co-creation, which suggests that the engagement and interaction of multiple stakeholders at different levels can support value co-creation (Rahman et al., 2019). FWMAs can support efforts to remove the stigma associated with purchasing surplus food, by encouraging more people and businesses to participate through their ease of use, low prices and the opportunities they create for foodservice businesses to tap into the BoP market while reducing food waste.

Nevertheless, strategies may be required to encourage the initial adoption and further dissemination of FWMAs, since as more people and businesses engage with these apps, their use can become common practice, increasing the potential for sustainable value co-creation.

A second reason behind the unwillingness to engage with and promote these apps is related to the opportunistic behaviours which FWMAs may elicit amongst consumers and businesses, which may lead to misuse of resources and the co-destruction of value. Additionally, opportunistic behaviours might compromise social capital by negatively influencing trust and limiting meaningful interactions within the community, or between consumers and businesses. This is an important finding since, as discussed earlier, the formation and maintenance of social capital is important within BoP communities for sustainable value co-creation (Ansari, Munir & Gregg, 2012). Furthermore, according to Ertimur and Venkatesh (2010), opportunistic behaviours may cause a mismatch between the level of involvement of different parties within the value co-creation activities and lead to incongruent practices which result in value co-destruction.

In the case of FWMAs, respondents highlight that opportunistic behaviours may reduce the value which the apps can create and discourage people and businesses from participating. BoP consumers raise concerns regarding the quality of food offered by the businesses on the app, as they may try to maximise their profit, but also the use of FWMAs by consumers who are not necessarily food insecure, which can limit access to affordable food for people in need. This is consistent with the concerns raised from a business perspective, as the limited control in terms of who, why and how often they use FWMAs makes business representatives concerned about opportunistic behaviours in the market. According to our participants, opportunistic behaviours may have multiple negative effects on the value of the apps, as they will negatively impact the profits of the businesses and limit the value for BoP consumers. This means that use of FWMAs may actually result in value co-destruction as not only it does not support the co-creation of sustainable value, but the wellbeing of various stakeholders is actually diminished through the use of the apps.

This conflict due to opportunistic behaviours, however, is not inherently negative, as it can be considered a dynamic characteristic of human interactions, which if managed properly can lead to creativity, innovation and value co-creation (Laamanen & Skålén, 2015). For example, in line with the above discussion, participants in both groups have highlighted the

importance of having procedures in place to minimise cases of opportunism and improve trust in the system. This could mean the development of FWMAs specifically targeting BoP users (taking into consideration their limited technological and financial resources), restricting the amount of purchases per user, or working with local charities and organisations to inform and educate BoP consumers and improve trustworthiness and the effectiveness of digital platforms, suggesting a form of digitally-driven value co-creation supported by physical actors. This is in line with earlier research on "sharing-for-money" platforms which argues that improving trust between the different actors involved, but also towards the platforms supporting the interactions, can help reduce issues of opportunism and improve engagement in the sharing economy (e.g. ter Huurne et al., 2017).

## 6. Conclusions, contributions and limitations

Recently, opportunities created by digital technology and the emerging phenomenon of the sharing economy has led to the development of mobile applications aimed at reducing food waste and generating a positive environmental impact (Michelini, Principato & Iasevoli, 2018). This study contributes to this under-researched area by exploring how the FWMAs can encourage and support sustainable value co-creation by enabling the interaction of foodservice businesses with BoP consumers. To achieve that, instead of merely measuring customers' perceptions of mobile apps, the current study employed a laddering technique to identify and compare the key features and functions that influence the value-in-use of FWMAs for businesses and BoP consumers, and their links to the key affordances and the goals which they strive to achieve.

### 6.1 Contributions

Our findings offer important implications for academics exploring digital value co-creation at the BoP and practitioners interested in the sustainability of the food sector and the opportunities offered by the BoP market. By applying the laddering method, this study explores in depth the perceptions and thought process of both food business representatives and BoP consumers, which determines the value-in-use of FWMAs. Additionally, by combining affordance theory and means-end theory, the research uses an alternative theoretical and methodological approach to identify the features, affordances and goals which can influence the value co-creation process.

In our study we support that digital technologies are not a panacea for sustainable value co-creation, as their adoption might impact both positively and negatively on value co-creation, in some cases even leading to value co-destruction. Therefore, drawing on affordance theory in this study we introduce the distinction between positive and negative affordances and explore their impact on value co-creation and co-destruction. To the best of our knowledge, this is the first study to bring together these theoretical concepts in value co-creation research. By adopting this approach, we discover that although digital technologies (such as FWMAs) can offer useful capabilities to BoP consumers (e.g. accessing good quality and affordable food), negative affordances (such as stigmatisation and opportunistic behaviours) might compromise the value co-creation process and negatively impact the social capital within communities. As leveraging value co-creation and social capital can play an important role in empowering BoP communities and alleviating poverty, our research suggests that consideration should be given to the potentially negative impact digital technologies might have on these two areas.

In addition to the above, our research is novel in drawing upon means-end theory to provide a better understanding of the processes of both digital value co-creation and co-destruction. By exploring the underlying end goals that influence the perceived value-in-use of FWMAs for businesses and consumers, the findings unearth noticeable gaps between the two groups which influence the perceived affordances (positive and negative) and impact the value co-creation process. This gap implies that, although research in technologies (such as mobile apps) may indicate that their features and functions can facilitate interactions between businesses and the BoP market, this is not always enough for value co-creation. In the case of FWMAs, although this technology can enable access to the BoP market, the inconsistencies in the end goals that BoP consumers and businesses are trying to achieve through these apps lead to differences in the perceived affordances and may limit the co-created value or lead to value co-destruction for one or more of the stakeholders. This finding also supports the use of in-depth methodologies in research on digitally enabled value co-creation, due to the useful insights in perceptions and motivations they can provide.

From a practical perspective, as researchers highlight that designing affordances into a new technology requires a good understanding of the usage context (e.g. Lei, Wang & Law, 2019), the empirical evidence from this research contributes to the existing knowledge on how to develop more effective platforms to support sustainable value co-creation. First, app

developers need to narrow any significant gaps between business' and BoP consumers' perceptions to maximize the value co-creation potential of mobile apps. For example, offering more information and guidance when new technologies are introduced to the market can help educate users about sustainability-related issues, manage their expectations, and regulate more efficiently the interactions between the different actors. This is also supported by S-D logic literature, which highlights the importance of providing sufficient information and resources to enable meaningful interactions between customers and providers of a service to facilitate the value creation process (Prahalad & Ramaswamy, 2004; Vargo, Maglio, & Akaka, 2008).

Second, strategies are required to address concerns relating to the social stigma from a business and a consumer perspective, particularly when technologies are associated with a stigmatised behaviour. By improving the way in which features and affordances of 'stigmatised' mobile apps are communicated to the users (e.g. through information on the apps or relevant marketing material), initial adoption and further dissemination of these platforms might be encouraged, which can then lead to their anti-stigmatisation and wider acceptance by businesses and the BoP market. For instance, our research indicates that FWMAs have the opportunity to help overcome social stigmatisation issues through the confidentiality affordance they offer and the potential they have to help the diffusion of anti-food waste technologies, to create a trend that can reduce the stigma associated with selling or purchasing food surplus (Sandikci, Özlem & Güliz Ger, 2010).

Finally, as opportunistic behaviours by businesses and consumers may have a negative impact on value co-creation, particularly in the case of platforms related to the sharing economy, developing appropriate strategies and procedures that will improve trust and reduce the perceived risk during interactions may help avoid the diminishment of value-in-use and enable sustainable value co-creation. In the context of FWMAs, these strategies may include the development of applications specifically targeting the BoP market or incorporating systems that provide users with a stronger sense of control, such as channels to report opportunistic behaviours from consumers or businesses. Working with local charities and not-for-profit organisations which are supporting efforts to improve food security and/or reduce food waste can create benefits for multiple stakeholders, as it improves the trustworthiness of the FWMA, reduces cases of opportunism and provides the not-for-profit organisations with a tool that allows them to improve the efficiency of their operations and

raise awareness of the related issues which can create additional benefits from a social, environmental and economic perspective - which is the premise of sustainable value co-creation.

### 6.2 Limitations and further research

Despite its contributions, the paper also has certain limitations. The use of BoP consumers and businesses from one location (Colombo), and the comparatively larger number of male respondents with access to smartphone technology means that the findings should be interpreted with caution when trying to generalize the findings to the whole BoP market. Additionally, this study adopted an in-depth qualitative research approach, involving a small number of participants, which limits the generalization of its findings. However, as the objective of this study is to understand how mobile apps can support sustainable value co-creation at the BoP, this limitation does not weaken the study's contribution.

On the contrary, the paper offers significant opportunities for future research, as researchers may consider quantifying the findings from this study or conducting a similar study in different markets to gain further insights about the use of FWMAs and the opportunities they create for marketing at the BoP. Additionally, there is scope for exploration of the role of not-for-profit organisations and charities currently supporting food insecure households, and their potential to adopt or collaborate with technologies such as FWMAs to make the process easier, more trustworthy and potentially avoid stigma and opportunistic behaviours by businesses and customers.

### Disclosure statement

The authors confirm that there is no potential conflict of interest in this research.

## 7. References

Akaka, M. A., & Vargo, S. L. (2014). Technology as an operant resource in service (eco) systems. *Information Systems and e-Business Management*, *12*(3), 367-384.

Alalwan, A. A. (2020). Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse. *International Journal of Information Management*, *50*, 28-44.

Almeida Oroski, F. (2020). Exploring Food Waste Reducing Apps—A Business Model Lens. In *Food Waste Management* (pp. 367-387). Palgrave Macmillan, Cham.

Ansari, S., Munir, K., & Gregg, T. (2012). Impact at the 'bottom of the pyramid': The role of social capital in capability development and community empowerment. *Journal of Management Studies*, *49*(4), 813-842.

Apostolidis, C., & McLeay, F. (2016). It's not vegetarian, it's meat-free! Meat eaters, meat reducers and vegetarians and the case of Quorn in the UK. *Social Business*, *6*(3), 267-290.

Aschemann-Witzel, J., De Hooge, I. E., Rohm, H., Normann, A., Bossle, M. B., Grønhøj, A., & Oostindjer, M. (2017). Key characteristics and success factors of supply chain initiatives tackling consumer-related food waste–A multiple case study. *Journal of Cleaner Production*, *155*, 33-45.

Barnes, S. J., & Mattsson, J. (2016). Understanding current and future issues in collaborative consumption: A four-stage Delphi study. *Technological Forecasting and Social Change*, *104*, 200-211.

Bateman, C. R., Fraedrich, J. P., & Iyer, R. (2002). Framing effects within the ethical decision making process of consumers. *Journal of Business Ethics*, *36*(1-2), 119-140.

Baumann, J., & Le Meunier-FitzHugh, K. (2015). Making value co-creation a reality–exploring the co-creative value processes in customer–salesperson interaction. *Journal of Marketing Management*, *31*(3-4), 289-316.

Beretta, C., Stoessel, F., Baier, U., & Hellweg, S. (2013). Quantifying food losses and the potential for reduction in Switzerland. *Waste Management*, *33*(3), 764-773.

BBC (2019). *Scotland's food waste causing more greenhouse gas than plastic*. Accessed on May 28 2019 at https://www.bbc.co.uk/news/uk-scotland-48257019

Camilleri, J., & Neuhofer, B. (2017). Value co-creation and co-destruction in the Airbnb sharing economy. *International Journal of Contemporary Hospitality Management*, *29*(9), 2322-2340.

Chan, K. W., Yim, C. K., & Lam, S. S. (2010). Is customer participation in value creation a double-edged sword? Evidence from professional financial services across cultures. *Journal of Marketing*, *74*(3), 48-64.

Chen, X., Stanton, B., Kaljee, L., Fang, X., Xiong, Q., Lin, D., ... & Li, X. (2011). Social stigma, social capital reconstruction, and rural migrants in urban China: A population health perspective. *Human organization*, *70*(1), 22-32.

Chikweche, T., Stanton, J., & Fletcher, R. (2012). Family purchase decision making at the bottom of the pyramid. *Journal of Consumer Marketing*, *29*(3), 202-213.

Chmielewski, D. A., Dembek, K., & Beckett, J. R. (2020). 'Business Unusual': Building BoP 3.0. *Journal of Business Ethics*, *161*(1), 211-229.

Cho, M., Bonn, M. A., & Li, J. J. (2019). Differences in perceptions about food delivery apps between single-person and multi-person households. *International Journal of Hospitality Management*, *77*, 108-116.

CNN (2018). *Trash can to table: The rise of waste cafes.* Accessed on May 26 2019 at https://edition.cnn.com/2016/10/05/world/food-waste-cafes-rjfp/index.html

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, *13*(1), 3-21.

D'Andrea, F. A. M. C., Rigon, F., Almeida, A. C. L. D., Filomena, B. D. S., & Slongo, L. A. (2019). Co-creation: a B2C and B2B comparative analysis. *Marketing Intelligence & Planning*, *37*(6), 674-688.

De Chernatony, L., Drury, S., & Segal-Horn, S. (2004). Identifying and sustaining services brands' values. *Journal of Marketing Communications*, *10*(2), 73-93.

Dey, B. L., Binsardi, B., Prendergast, R., & Saren, M. (2013). A qualitative enquiry into the appropriation of mobile telephony at the bottom of the pyramid. *International Marketing Review*, *30*(4), 297-322.

Di Talia, E., Simeone, M., & Scarpato, D. (2019). Consumer behaviour types in household food waste. *Journal of Cleaner Production*, *214*, 166-172.

Echeverri, P., & Skålén, P. (2011). Co-creation and co-destruction: A practice-theory based study of interactive value formation. *Marketing theory*, *11*(3), 351-373.

El Amri, D. (2019). How do consumers categorize new hybrid products? *Psychology & Marketing*, *36*(5), 444-454.

Ertimur, B., & Venkatesh, A. (2010). Opportunism in co-production: Implications for value co-creation. *Australasian Marketing Journal*, *18*(4), 256-263.

Filimonau, V., & Delysia, A. (2019). Food waste management in hospitality operations: A critical review. *Tourism Management*, *71*, 234-245.

Findsrud, R., Tronvoll, B., & Edvardsson, B. (2018). Motivation: The missing driver for theorizing about resource integration. *Marketing Theory*, *18*(4), 493-519.

Food and Agriculture Organization of United Nations (FAO) (2019). *The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction*. UN Food and Agriculture Organization: Rome, Italy. Accessed on July 23 2020 at http://www.fao.org/3/ca6030en/ca6030en.pdf

Food and Agriculture Organization of United Nations (FAO) (2018). *Food Waste Management in City Region Food System - Colombo (Sri Lanka)*. UN Food and Agriculture

Organization: Rome, Italy. Accessed on August 20 2019 at http://www.fao.org/3/CA1110EN/ca1110en.pdf

Food and Agriculture Organization of United Nations (FAO) (2015). *Global Initiative on Food Losses and Waste Reduction.* UN Food and Agriculture Organization: Rome, Italy. Accessed on May 23 2019 at http://www.fao.org/3/a-i4068e.pdf

Food and Agriculture Organization of United Nations (FAO) (2013). *Foos wastage footprint-Impacts on natural resources*. UN Food and Agriculture Organization: Rome, Italy. Accessed on May 23 2019 at http://www.fao.org/3/i3347e/i3347e.pdf

Garrone, P., Melacini, M., & Perego, A. (2014). Opening the black box of food waste reduction. *Food Policy*, *46*, 129-139.

Gebauer, H., & Reynoso, J. (2013). An agenda for service research at the base of the pyramid. *Journal of Service Management*, *24*(5), 482-502.

Gengler, C. E., & Reynolds, T. J. (1995). Consumer understanding and advertising strategy: analysis and strategic translation of laddering data. *Journal of Advertising Research*, *35*(4), 19-34.

Gibson, J. J. (1979). *The theory of affordances. The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.

Groening, C., Sarkis, J., & Zhu, Q. (2018). Green marketing consumer-level theory review: A compendium of applied theories and further research directions. *Journal of Cleaner Production*, *172*, 1848-1866.

Gutman, J. (1982). A means-end chain model based on consumer categorization processes. *Journal of Marketing*, *46*(2), 60-72.

Harvey, J., Smith, A., Goulding, J., & Illodo, I. B. (2019). Food sharing, redistribution, and waste reduction via mobile applications: A social network analysis. *Industrial Marketing Management*, *88*, 437-448.

Hasan, M. R., Lowe, B., & Rahman, M. (2017). Visual cues and innovation adoption among bottom of the pyramid consumers. *Qualitative Market Research: An International Journal*, *20*(2), 147-157.

Heidenreich, S., & Handrich, M. (2015). Adoption of technology-based services: the role of customers' willingness to co-create. *Journal of Service Management*, *26*(1), 44-71.

Holweg, C., & Lienbacher, E. (2011). Social marketing innovation: New thinking in retailing. *Journal of Nonprofit & Public Sector Marketing*, *23*(4), 307-326.

Henneberg, S. C., Gruber, T., Reppel, A., Ashnai, B., & Naudé, P. (2009). Complaint management expectations: An online laddering analysis of small versus large firms. *Industrial Marketing Management*, *38*(6), 584-598.

Jaakkola, E., Helkkula, A., Aarikka-Stenroos, L., & Verleye, K. (2015). The co-creation experience from the customer perspective: its measurement and determinants. *Journal of Service Management*, *26*(2), 321-342.

Jägel, T., Keeling, K., Reppel, A., & Gruber, T. (2012). Individual values and motivational complexities in ethical clothing consumption: A means-end approach. *Journal of Marketing Management*, *28*(3-4), 373-396.

Jung, Y., & Kang, H. (2010). User goals in social virtual worlds: A means-end chain approach. *Computers in Human Behavior*, *26*(2), 218-225.

Kang, J. W., & Namkung, Y. (2019). The role of personalization on continuance intention in food service mobile apps. *International Journal of Contemporary Hospitality Management*, *31*(2), 734-752.

Kapoor, A. P., & Vij, M. (2018). Technology at the dinner table: Ordering food online through mobile apps. *Journal of Retailing and Consumer Services*, *43*, 342-351.

Kimes, S. E., & Laqué, P. (2011). Online, mobile, and text food ordering in the US restaurant industry. *Cornell Hospitality Report*, *11*(7), 6-15.

Laamanen, M., & Skålén, P. (2015). Collective–conflictual value co-creation: A strategic action field approach. *Marketing Theory*, *15*(3), 381-400.

Lacoste, S. (2016). Sustainable value co-creation in business networks. *Industrial Marketing Management*, *52*, 151-162.

Lan, J., Ma, Y., Zhu, D., Mangalagiu, D., & Thornton, T. (2017). Enabling value co-creation in the sharing economy: The case of mobike. *Sustainability*, *9*(9), 1504.

Lappeman, J., Ransome, K., & Louw, Z. (2019). Not one segment: Using global and local BoP characteristics to model country-specific consumer profiles. *European Business Review*, *31*(3), 317-336.

Lazell, J. (2016). Consumer food waste behaviour in universities: Sharing as a means of prevention. *Journal of Consumer Behaviour*, *15*(5), 430-439.

Lee, C. S. (2010). Managing perceived communication failures with affordances of ICTs. *Computers in Human Behavior*, *26*(4), 572-580.

Lei, S. I., Wang, D., & Law, R. (2019). Hoteliers' service design for mobile-based value co-creation. *International Journal of Contemporary Hospitality Management*, *31*(11), 4338-4356.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage.

Lundblad, L., & Davies, I. A. (2016). The values and motivations behind sustainable fashion consumption. *Journal of Consumer Behaviour*, *15*(2), 149-162.

Lupton, D. (2018). 'I just want it to be done, done, done!'Food tracking apps, affects, and agential capacities. *Multimodal Technologies and Interaction*, *2*(2), 29.

Martin, D., & Woodside, A. G. (2012). Structure and process modeling of seemingly unstructured leisure-travel decisions and behavior. *International Journal of Contemporary Hospitality Management*, *24*(6), 855-872.

McDonald, S., Thyne, M., & McMorland, L. A. (2008). Means-end theory in tourism research. *Annals of Tourism Research*, *35*(2), 596-599.

Michelini, L., Principato, L., & Iasevoli, G. (2018). Understanding food sharing models to tackle sustainability challenges. *Ecological Economics*, *145*, 205-217.

Mintel. (2020). *Jumbo terminates 'Too Good To Go' deal to tackle waste on its own* Accessed on February 14 2020 at https://reports.mintel.com/sinatra/oxygen/display/id=1000262?fromSearch=%3Ffreetext%3D%2522to%2520good%2520to%2520go%2522

Möller, K., Rajala, R., & Westerlund, M. (2008). Service innovation myopia? A new recipe for client-provider value creation. *California Management Review*, *50*(3), 31-48.

Morone, P., Koutinas, A., Gathergood, N., Arshadi, M., & Matharu, A. (2019). Food waste: challenges and opportunities for enhancing the emerging bio-economy. *Journal of Cleaner Production*, *221*, 10-16.

Mu, W., Spaargaren, G., & Oude Lansink, A. (2019). Mobile apps for green food practices and the role for consumers: a case study on dining out practices with Chinese and Dutch young consumers. *Sustainability*, *11*(5), 1275.

Nagy, M., Bennett, D., & Graham, C. (2019). Why include the BOP in your international marketing strategy. *International Marketing Review*, *37*(1), 76-97.

Nambisan, S., & Baron, R. A. (2009). Virtual customer environments: testing a model of voluntary participation in value co-creation activities. *Journal of Product Innovation management*, *26*(4), 388-406.

Nguyen, B., Simkin, L., Klaus, P., & Chen, J. (2015). Fairness quality: A conceptual model and multiple-item scale for assessing firms' fairness–An exploratory study. *Journal of Marketing Management*, *31*(11-12), 1181-1206.

Norman, D. A. (2008). The way I see IT signifiers, not affordances. *Interactions*, *15*(6), 18-19.

Okumus, B., Bilgihan, A., & Ozturk, A. B. (2016). Factors affecting the acceptance of smartphone diet applications. *Journal of Hospitality Marketing & Management*, *25*(6), 726-747.

Pai, P., & Arnott, D. C. (2013). User adoption of social networking sites: Eliciting uses and gratifications through a means–end approach. *Computers in Human Behavior*, *29*(3), 1039-1053.

Papargyropoulou, E., Wright, N., Lozano, R., Steinberger, J., Padfield, R., & Ujang, Z. (2016). Conceptual framework for the study of food waste generation and prevention in the hospitality sector. *Waste Management*, *49*, 326-336.

Park, H. E., Yap, S. F. C., & Makkar, M. (2019). A laddering study of motivational complexities in mobile shopping. *Marketing Intelligence & Planning*, *37*(2), 182-196.

Plé, L., & Chumpitaz Cáceres, R. (2010). Not always co-creation: introducing interactional co-destruction of value in service-dominant logic. *Journal of Services Marketing*, *24*(6), 430-437.

Prahalad, C. K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, *29*(1), 6-12.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, *18*(3), 5-14.

Purdam, K., Garratt, E. A., & Esmail, A. (2016). Hungry? Food insecurity, social stigma and embarrassment in the UK. *Sociology*, *50*(6), 1072-1088.

Rahman, M., Bose, S., Babu, M. M., Dey, B. L., Roy, S. K., & Binsardi, B. (2019). Value co-creation as a dialectical process: Study in Bangladesh and Indian Province of West Bengal. *Information Systems Frontiers*, *21*(3), 527-545.

Reynolds, T. J., & Gutman, J. (1988). Laddering theory, method, analysis, and interpretation. *Journal of Advertising Research*, *28*(1), 11-31.

Roy, S. K., Singh, G., Hope, M., Nguyen, B., & Harrigan, P. (2019). The rise of smart consumers: role of smart servicescape and smart consumer experience co-creation. *Journal of Marketing Management*, *35*(15-16), 1480-1513.

Russell, C. G., Flight, I., Leppard, P., Van Pabst, J. V. L., Syrette, J. A., & Cox, D. N. (2004). A comparison of paper-and-pencil and computerised methods of "hard" laddering. *Food Quality and Preference*, *15*(3), 279-291.

Sandikci, Özlem and Güliz Ger (2010), "Veiling in Style: How Does a Stigmatized Practice Become Fashionable?," *Journal of Consumer Research, 37*(1), 15–36

Schanes, K., & Stagl, S. (2019). Food waste fighters: What motivates people to engage in food sharing?. *Journal of Cleaner Production*, *211*, 1491-1501.

Schrock, A. R. (2015). Communicative affordances of mobile media: Portability, availability, locatability, and multimediality. *International Journal of Communication*, *9*, 1229–1246.

Secondi, L., Principato, L., & Mattia, G. (2019). Can digital solutions help in the minimization of out-of-home waste? An analysis from the client and business perspective. *British Food Journal*, *122*(5), 1341-1359.

Simanis, E., & Hart, S. L. (2008). *The base of the pyramid protocol: Toward next generation BoP strategy*. Ithaca, NY: Cornell University.

Stenbacka, C. (2001). Qualitative research requires quality concepts of its own. *Management Decision*. *39*(7), 551-556.

Corrado, S., Caldeira, C., Eriksson, M., Hanssen, O. J., Hauser, H. E., van Holsteijn, F., ... & Stenmarck, Å. (2019). Food waste accounting methodologies: Challenges, opportunities, and further advancements. *Global food security*, *20*, 93-100.

Stöckli, S., Dorn, M., & Liechti, S. (2018). Normative prompts reduce consumer food waste in restaurants. *Waste Management*, *77*, 532-536.

ter Huurne, M., Ronteltap, A., Corten, R., & Buskens, V. (2017). Antecedents of trust in the sharing economy: A systematic review. *Journal of Consumer Behaviour*, *16*(6), 485-498.

Vargo, S. L., & Lusch, R. F. (2008). From goods to service (s): Divergences and convergences of logics. *Industrial Marketing Management*, *37*(3), 254-259.

Vargo, S. L., & Lusch, R. F. (2004). The four service marketing myths: remnants of a goods-based, manufacturing model. *Journal of Service Research*, *6*(4), 324-335.

Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, *26*(3), 145-152.

Veludo-de-Oliveira, T. M., Ikeda, A. A., & Campomar, M. C. (2006). Discussing laddering application by the means-end chain theory. *The Qualitative Report*, *11*(4), 626-642.

Watkins, L. J., & Gnoth, J. (2011). Japanese tourism values: A means–end investigation. *Journal of Travel Research*, *50*(6), 654-668.

World Food Programme (2017). *Sri Lanka Country Strategic Plan (2018-2022)*. UN World Food Programme: Rome, Italy. Accessed on July 10 2019 https://www.wfp.org/operations/lk01-sri-lanka-country-strategic-plan-2018-2022

World Resources Institute. (2007). *The next 4 billion: Market size and business strategy at the base of the pyramid*. World Resources Institute, International Finance Corporation.

Xu, X., & Huang, Y. (2019). Restaurant information cues, Diners' expectations, and need for cognition: Experimental studies of online-to-offline mobile food ordering. *Journal of Retailing and Consumer Services*, *51*, 231-241.

Zhao, Y., Liu, J., Tang, J., & Zhu, Q. (2013). Conceptualizing perceived affordances in social media interaction design. *Aslib Proceedings*, *65*(3), 289-303

**Appendix A: Implication matrix for BoP consumers**

| | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 Specific pick-up time/location | | | 2 | | | 3 | | | | | | 3 | | | | | | | | | | | |
| 02 Low food prices | 24 | 3 | | | | | | | | 3 | | | | 8 | | | | | | | | | |
| 03 Design | | | | | 14 | | | | 6 | | | 3 | 5 | 9 | | | | | | | | | |
| 04 Variety of food options | | | | 18 | | | | | | | | | | | | | | | | | | | |
| 05 Free to download | 11 | | | | | | | | | | | | | | | | | | | | | | |
| 06 Search for surplus food | 11 | | | | | | 8 | | | | | | | 5 | 9 | | | | | | | | |
| 07 Social Media links | | | | | | | | 3 | | | 2 | | | | 3 | | | | | | | | |
| 08 Quantity/quality of | | | | 11 | | | | | | | 2 | | | | 7 | | | | | | | | |
| 09 Access to affordable food | | | | | | | | | | | | | | | | 24 | 10 | | | | | | |
| 10 Fun to use | | | | | | | | | | | | | | | | | | | | | | 3 | |
| 11 Saves time | | | | | | | | | | | | | | | | | 2 | | | | | | |
| 12 Access to quality food | | | | | | | | | | | | | | | | 9 | 6 | | | 16 | | | |
| 13 Ease of use | | | | | | | | | | | | | | | | 6 | 11 | | | | | | |
| 14 Convenience | | | | | | | | | | | | | | | | | 3 | | | | | | |
| 15 Reduction of food waste | | | | | | | | | | | | | | | | | | | 5 | 2 | 7 | | |
| 16 Supporting local businesses | | | | | | | | | | | | | | | | | | | | | 3 | | |
| 17 Confidentiality | | | | | | | | | | | | | | | | | 4 | 5 | | | | | |
| 18 Trying new food | | | | | | | | | | | | | | | | | | | | | | | 3 |
| 19 Promote food waste reduction | | | | | | | | | | | | | | | | | | | | | 2 | | |
| 20 Difficult to use | | | | | | | | | | | | | | | | | 3 | | | | | | |
| 21 Incompatibility with older | | | | | | | | | | | | | | | | | 5 | | | | | | |
| 22 Opportunistic behaviours | | | | | | | | | | | | | | | | 12 | | | | | 6 | | |
| 23 Food waste stigma | | | | | | | | | | | | | | | | | 5 | 10 | | | | | |
| 24 Food Security | | | | | | | | | | | | | | | | | | | | | | | |
| 25 Self-efficacy | | | | | | | | | | | | | | | | | | | | | | | |
| 26 Respect from others | | | | | | | | | | | | | | | | | | | | | | | |
| 27 Environmental wellbeing | | | | | | | | | | | | | | | | | | | | | | | |
| 28 Pleasure | | | | | | | | | | | | | | | | | | | | | | | |
| 29 Societal wellbeing | | | | | | | | | | | | | | | | | | | | | | | |
| 30 Amusement/ Enjoyment | | | | | | | | | | | | | | | | | | | | | | | |
| 31 Self-affirmation | | | | | | | | | | | | | | | | | | | | | | | |

**Appendix B: Implication matrix for foodservice businesses**

| | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 Offer surplus food | 10 | 8 | 9 | 8 | 7 | | | | 5 | | | | | | | |
| 02 Links to Social Media | | | | 4 | 5 | | | | 4 | | | | | | | |
| 03 Free to download | | | | 5 | | | | | | 3 | | | | | | |
| 04 Design | | | | 7 | | | 3 | 7 | | 5 | | | | | | |
| 05 Dashboard | | | | | | 3 | | | | | | | | | | |
| 06 Reduction in food waste | | | | | | | | | | | 8 | | 5 | | 5 | 2 |
| 07 Support local communities | | | | | | | | | | | | 5 | | 7 | | 3 |
| 08 Improve bottom line | | | | | | | | | | | 9 | | | | | |
| 09 Reach new customers | | | | | | | | | | | 7 | | | 6 | | |
| 10 Improve brand image | | | | | | | | | | | | 10 | | | | |
| 11 Tracking of surplus food sold | | | | | | | | | | | | | | | 3 | |
| 12 Operating outside working hours | | | | | | | | | | | 2 | | | | 2 | |
| 13 Adding to workload/resources | | | | | | | | | | | 4 | | | | 7 | |
| 14 Food waste stigma | | | | | | | | | | | 6 | 5 | | | | |
| 15 Opportunistic behaviour | | | | | | | | | | | 5 | | | | | |
| 16 Financial benefits | | | | | | | | | | | | | | | | |
| 17 Reputation benefits | | | | | | | | | | | | | | | | |
| 18 Environmental wellbeing | | | | | | | | | | | | | | | | |
| 19 Societal wellbeing | | | | | | | | | | | | | | | | |
| 20 Productivity | | | | | | | | | | | | | | | | |
| 21 Business Values | | | | | | | | | | | | | | | | |