Smart Packaging, Engagement, and Fast-Moving Consumer Goods

Obrien Sim

Thesis submitted to the University of Nottingham

for the degree of Doctor of Philosophy

April 2021

Abstract

Despite the growing prominence and rapid proliferation of smart packaging within the FMCG industry, academic work which looks at how consumers respond to their implementation has been minimal. It is this research gap that is addressed by this thesis through its investigation of how consumers interact, co-create value, and engage with smart packaging. A total of two studies were conducted to achieve the objectives of this research. The first explored consumer attitudes towards smart packaging using focus groups, during which participants were showcased storyboards which depict fictional but envisaged potential applications of smart packaging. This was then followed up by the second study which built and field-tested actual functional smart packaging prototypes (technology probes) over a four-week period within consumer homes, during which participants were given the opportunity to interact with a bespoke smart packaging experience designed around coffee. Collectively, these studies culminated in an informed empirical understanding of seven factors which influence the nature and likelihood of consumer interaction and subsequent value co-creation and engagement with smart packaging, alongside themes that characterise said phenomena. In addition to this empirical contribution, this research also yielded theoretical and methodological contributions. These took the form of a conceptualisation of smart packaging engagement and a methodological account of a novel interdisciplinary approach to smart packaging research, highlighting how the challenge of participant scarcity can be addressed through the use of technology probes, a method adopted from the field of computing which has yet to be embraced by the service and marketing literature. Finally, the implications of this research are relevant to both practical and academic work. For practitioners, this research provides design guidelines informed by qualitative insight on how different factors of smart packaging design can influence consumer interaction, value co-creation, and engagement with smart packaging, all of which can be utilised to improve the likelihood of a well-received implementation. For academics, as one of the earliest pieces of empirical and academic work on smart packaging, this research serves as a reference and starting point which sets out foundations that future work can build on.

Acknowledgements

I would first like to thank both of my supervisors Professor Sally Hibbert and Professor Christopher Greenhalgh for the tremendous amount of help they have provided me throughout my academic journey. Their guidance and support have been instrumental in shaping my work to its current form today.

I would also like to express my gratitude to others who have assisted me throughout my PhD, namely my sister Viola Sim who not only drew all the storyboards and artwork for the "Obrien's Coffee" app but also helped proofread this thesis, Michelle Coleman who taught me how to use the laser cutter required to build the encasing of my technology probes, Christopher Alexander who educated me on how load cells work, and Anthony Gunawan who assisted me with the assembly and calibration of the technology probes used for this research.

Finally, I would also like to thank Mairead Brady and Caroline Tynan for taking the time to examine this thesis, conduct my viva-voce, and advise me on how to improve this document.

This researcher is supported by the Horizon Centre for Doctoral Training at the University of Nottingham (RCUK Grant No. EP/L015463/1) and by the RCUK's Horizon Digital Economy Research Institute (RCUK Grant No. EP/G065802/1) and Unilever.

ABSTRACT **1**

ACKNOWLEDGEMENTS **2**

LIST OF FIGURES **9**

LIST OF TABLES **9**

CHAPTER 1: INTRODUCTION **11**

1.1 RESEARCH AIMS AND QUESTIONS 14

1.1.1 Research Aims *14*

1.1.2 Research Questions *14*

1.2 METHODOLOGY 14

1.3 STRUCTURE 14

CHAPTER 2: LITERATURE REVIEW **16**

2.1 SERVICE-DOMINANT LOGIC 17

2.1.1 Axioms and Foundational Premises of Service-Dominant Logic *18*

2.1.2 The Development of Service-Dominant Logic *25*

2.1.2.1 The Formative Period (2004 – 2008) 25

2.1.2.2 The Diversification Period (2009 – 2016) 28

2.1.2.3 The Present (2016 – present) 32

2.1.2.4 Why Service-Dominant Logic? 33

2.1.3 Summary *34*

2.2 ENGAGEMENT 35

2.2.1 Brodie et al.'s (2011) Conceptualisation of Engagement *38*

2.2.2 Summary *41*

2.3 VALUE 42

2.3.1 Summary *46*

2.4 PACKAGING 46

2.4.1 Smart Packaging *50*

2.4.1.1 Mobile Tags 51

2.4.1.2 Adaptive Packaging 55

2.4.1.3 Connected Packaging 56

2.4.2 Summary *58*

2.5 SMART TECHNOLOGIES 59

2.5.1 Smart Retailing *60*

2.5.1.1 NFC-enabled Mobile Payments 61

2.5.1.2 Augmented Reality 64

2.5.1.3 Data-Driven Personalisation 67

2.5.2 Smart Domestic Products *69*

2.5.3 Summary *72*

2.6 WORKING DEFINITION OF SMART PACKAGING ENGAGEMENT 73
2.6.1 Dimensions of Smart Packaging Engagement *74*
2.6.1.1 The Cognitive Dimension of Smart Packaging Engagement 74
2.6.1.2 The Emotional Dimension of Smart Packaging Engagement 76
2.6.1.3 The Behavioural Dimension of Smart Packaging Engagement 77
2.6.2 Dimensions of Value *79*
2.7 SUMMARY 82

CHAPTER 3: METHODOLOGY **84**

3.1 RESEARCH PARADIGMS 84
3.1.1 Positivism *85*
3.1.2 Constructivism *86*
3.1.3 Realism *86*
3.1.4 Pragmatism *88*
3.1.5 Rationale for Pragmatism *88*
3.2 METHODS 89
3.2.1 Quantitative Methods *89*
3.2.2 Qualitative Methods *90*
3.2.3 Mixed Methods *91*
3.2.4 Rationale for Qualitative Methods *93*
3.3 CONSUMER ATTITUDES TOWARDS SMART PACKAGING 93
3.3.1 Study Design and Conduct *94*
3.3.1.1 Focus Groups 94
3.3.1.2 Stimulus Material 96
3.3.1.3 Questioning Route 104
3.3.1.4 Sample Size 106
3.3.1.5 Focus Group Size 107
3.3.1.6 Homogeneity 109
3.3.1.7 Storyboard Coverage 110
3.3.1.8 Duration 111
3.3.1.9 Participant Demographic Profile 112
3.3.1.10 Procedure 113
3.3.1.11 Recruitment 114
3.3.1.12 Venue 115
3.3.1.13 Compensation 116
3.3.1.14 Data Collection 116
3.3.2 Analytical Approach *117*
3.3.2.1 Phase One: Data familiarisation and writing familiarisation notes 119
3.3.2.2 Phase Two: Systematic data coding 120
3.3.2.2.1 Coding Frame 121

3.3.2.3 Phase Three: Generating initial themes from coded and collated data 126
3.3.2.4 Phase Four: Developing and reviewing themes 127
3.3.2.5 Phase Five: Refining, defining, and naming themes 128
3.3.2.6 Phase Six: Writing the report 128
3.4 OBRIEN'S COFFEE 129
3.4.1 Study Design and Conduct *130*
3.4.1.1 Technology Probes 130
3.4.1.2 Procedure 132
3.4.1.3 FMCG Selection 135
3.4.1.4 Smart Packaging Experience 136
3.4.1.4.1 NFC tags 137
3.4.1.4.2 Consumption Tracking 138
3.4.1.4.3 Community 138
3.4.1.4.4 Ratings and Reviews 139
3.4.1.4.5 Logbook 139
3.4.1.5 Audio Diary Prompts 140
3.4.1.6 Logs 141
3.4.1.7 Interview Questioning Route 141
3.4.1.6 Sample Size 142
3.4.1.7 Duration 143
3.4.1.8 Participant Demographic Profile 144
3.4.1.9 Recruitment 146
3.4.1.10 Venue 147
3.4.1.11 Compensation 147
3.4.1.12 Technical Implementation 148
3.4.1.13 Possible Confounding Factors 148
3.4.2 Analytical Approach *151*
3.4.2.1 Phase One: Data familiarisation and writing familiarisation notes 151
3.4.2.2 Phase Two: Systematic data coding 151
3.4.2.3 Phase Three: Generating initial themes from coded and collated data 153
3.4.2.4 Phase Four: Developing and reviewing themes 157
3.4.2.5 Phase Five: Refining, defining, and naming themes 158
3.4.2.6 Phase Six: Writing the report 158
CHAPTER 4: FINDINGS **159**
4.1 STUDY 1: CONSUMER ATTITUDES TOWARDS SMART PACKAGING 160
4.1.1 Sustainability *160*
4.1.2 Communication *161*
4.1.3 Control *165*
4.1.4 Personal Data *167*
4.1.5 Scepticism *169*

4.1.6 Trade-off *171*
4.1.7 Habits and Characteristics *173*
4.1.8 Summary *175*
4.2 STUDY 2: OBRIEN'S COFFEE 175
4.2.1 Behavioural Engagement *176*
Routine Interaction 176
Discussion 177
Word of Mouth 178
Experimentation 179
Meticulous 182
Comparing Aroma Notes 182
Household Clarification 183
Miscellaneous 183
4.2.2 Cognitive Engagement *184*
Reflection 184
Awareness 185
Refinement 185
Thought Inducing 186
Miscellaneous 187
4.2.3 Emotional Engagement *187*
Intrusive 187
Intriguing 189
Novelty 190
Unnecessary 191
Need to catch up 192
Timesink 192
Miscellaneous 193
4.2.4 Utilitarian Value *194*
Blend Characteristics 194
Consumption Data 194
Purchase Decisions 195
Taste Profile 196
Accessibility 197
Brewing Notes 198
Miscellaneous 198
4.2.5 Hedonic Value *199*
Belonging 199
Enjoyment 200
Pleasant 201
Excitement 201
Frustration 202

Miscellaneous 202
4.2.6 Social Value *203*
4.2.7 Brand Trust *204*
Due Diligence 205
Lack of Transparency 205
Community Atmosphere 206
Miscellaneous 208
4.2.8 Brand Satisfaction *210*
Useful 210
Due Diligence 210
Positive Reinforcement 211
Novelty 211
Community Interaction 212
Ingenuity 213
Miscellaneous 213
4.2.9 Brand Attachment *217*
Belonging 217
Time Investment 217
Personal Record 218
Transparency 218
Miscellaneous 219
4.2.10 Supplementary Findings *220*

CHAPTER 5: DISCUSSION **221**

5.1 EXPANDING MARKETING'S VIEW OF PACKAGING 221
5.1.1 Sustainability *222*
5.1.2 Communication *224*
5.1.3 Control *225*
5.1.4 Personal Data *227*
5.1.5 Scepticism *230*
5.1.6 Trade-off *232*
5.1.7 Habits and Characteristics *233*
5.1.8 Summary *233*
5.2 PRACTICAL IMPLICATIONS 234
5.2.1 Sustainability *234*
5.2.2 Communication *235*
5.2.3 Control *236*
5.2.4 Personal Data *237*
5.2.5 Scepticism *238*
5.2.6 Trade-off *238*

5.2.7 Habits and Characteristics *239*
5.3 Revisiting Smart Packaging Engagement 240
5.3.1 Cognitive Dimension *241*
5.3.2 Emotional Dimension *242*
5.3.3 Behavioural Dimension *242*
5.3.4 Summary *243*
CHAPTER 6: CONCLUSIONS **244**
6.1 Contributions 244
6.1.1 Theoretical Contributions *244*
6.1.2 Empirical Contributions *244*
6.1.3 Methodological Contributions *244*
6.2 Limitations 245
6.2.1 Technical Limitations *245*
6.2.2 Study Period Synchronicity *246*
6.2.3 Absence of the Brand *246*
6.2.4 Diary Attrition *247*
6.3 Recommendations for Future Work 247
6.4 Closing Remarks 247
REFERENCES **248**
APPENDICES **284**
Appendix A: The Horizon Centre of Doctoral Training (CDT) 284
Appendix B: Storyboards 286
Appendix C: Study 1 Questioning Route 292
Appendix D: Transcript Excerpt 300
Appendix E: Coding Spreadsheet Extract 301
Appendix F: Theme Generation Example 302
Appendix G: Specifications of the "Obrien's Coffee" App 305
Appendix H: Audio Diary Prompts 315
Appendix I: Study 2 Questioning Route 317

List of Figures

Figure 1, The SD Logic Model of Value Co-Creation (B2C) 22

Figure 2. The Researcher's Representation of Brodie et al.'s (2011) Conceptualisation of Customer Engagement 40

Figure 3. A Conceptual Framework of the Working Definition of Smart Packaging Engagement 83

Figure 4. The Focus of "Consumer Attitudes Towards Smart Packaging" 94

Figure 5. The Focus of "Obrien's Coffee" 130

Figure 6 (left). Login Screen of the Obrien's Coffee app Figure 7 (right). Smart Scale and NFC Tag (prior to attachment to coffee packs) 132

Figure 8. The Active Study Period of Each Participant of the "Obrien's Coffee" Study 147

Figure 9. Excerpt of the Code Matrix of "Obrien's Coffee" 153

Figure 10. Average Feature Use of 12 Participants Over 4 Weeks 220

List of Tables

Table 1. Axioms and Foundational Premises of Service Dominant Logic Source: Vargo and Lusch (2016) . 18

Table 2, Changes Made in the First Major Revision of SD Logic. 26

Table 3, Changes made in the Second Major Revision of SD Logic . 31

Table 4. Number of Engagement-Related Academic Articles Published Between 2005 - 2015 . 36

Table 5. Core Conceptualisations of Engagement . 38

Table 6.Fundamental Propositions of Customer Engagement . 38

Table 7. The Proposed Dimensions of Value . 45

Table 8. Existing Applications of Mobile Tags . 54

Table 9. Existing Applications of Adaptive Packaging. 56

Table 10. Existing Applications of Connected Packaging . 58

Table 11. Similarities between Smart Packaging, Smart Retailing, and Smart Domestic Products. 60

Table 12. Existing Conceptualisations of the Cognitive Dimension of Engagement . 75

Table 13. Existing Conceptualisations of the Emotional Dimension of Engagement. 76

Table 14. Existing Conceptualisations of the Behavioural Dimension of Engagement . 79

Table 15. Conceptualisations of the Value and Engagement Dimensions of the Working Definition of Smart Packaging Engagement . 83

Table 16. Dominant Research Paradigms. 85

Table 17. Personal Involvement Inventory Scores . 98

Table 18. Smart Packaging Features Investigated in "Consumer Attitudes Towards Smart Packaging" .. 104

Table 19. Recommended Focus Group Sizes . 108

Table 20. Focus Group Storyboard Coverage . 111

Table 21. Recommended Focus Group Durations. 112

TABLE 22. "CONSUMER ATTITUDES TOWARDS SMART PACKAGING" PARTICIPANTS' DEMOGRAPHIC PROFILES 115
TABLE 23. BRAUN AND CLARKE'S SIX-PHASE APPROACH TO THEMATIC ANALYSIS 117
TABLE 24. CODING FRAME FOR THE THEMATIC ANALYSIS CONDUCTED FOR "CONSUMER ATTITUDES TOWARDS SMART PACKAGING" 123
TABLE 25. FILTER PARAMETERS FOR THE CODING MATRIX 126
TABLE 26. TARGETED VALUE PROPOSITIONS OF EACH SMART PACKAGING FEATURE 137
TABLE 27. SAMPLE SIZE OF TECHNOLOGY PROBE STUDIES IDENTIFIED FROM ACADEMIC LITERATURE 142
TABLE 28. STUDY DURATION OF TECHNOLOGY PROBE STUDIES IDENTIFIED FROM ACADEMIC LITERATURE 143
TABLE 29. AVERAGE CUPS OF COFFEE DRANK PER DAY IN THE UK. SOURCE: BRITISH COFFEE ASSOCIATION 146
TABLE 30. DEMOGRAPHIC PROFILE OF PARTICIPANTS RECRUITED FOR "OBRIEN'S COFFEE" 146
TABLE 31. POSSIBLE CONFOUNDING FACTORS OF "OBRIEN'S COFFEE" 151
TABLE 32. PROVISIONAL CODES OF "OBRIEN'S COFFEE" 152
TABLE 33. FROM CODES TO THEMES OF "OBRIEN'S COFFEE" 156
TABLE 34. PRESENTATION ORDER OF THE FINDINGS OF "OBRIEN'S COFFEE" 176
TABLE 35, CHANGES TO THE WORKING DEFINITION OF SMART PACKAGING ENGAGEMENT 243

Chapter 1: Introduction

The field of marketing has grown increasingly service-oriented throughout the last few decades. While this approach to marketing has been proposed by scholars as far back as three decades ago (Grönroos, 1990), it was not until Vargo and Lusch (2004) introduced service-dominant (SD) logic, a marketing perspective which views market exchange as an exchange of service instead of commodities that a service-oriented approach to marketing became increasingly adopted. Amidst this transition, marketers began to realise that it was no longer sufficient to simply focus on marketing the intrinsic qualities of a product without a greater consideration of its entire consumption lifecycle. This realisation, in conjunction with the rapidly growing number of Internet users and the steadily decreasing costs of data collection, storage, and processing facilitated by the Digital Revolution would later bring about the digitalisation of marketing into its current state today. Marketers quickly capitalised on the Internet's capacity to facilitate direct communication with their consumers and were eager to use this channel to expand their marketing communications. No longer was motivating consumer purchase their sole aim and their focus gradually shifted towards establishing and maintaining consumer relationships throughout the consumer lifecycle. This would later lead to the development of new marketing strategies centred around situational personalisation and real-time adaptation of value propositions (Huang and Rust, 2018; Rust and Huang, 2014), often based on predictions and analysis of consumer consumption behaviour (Hair and Sarstedt, 2021).

It is one of these marketing strategies that emerged as part of this movement that this thesis investigates: smart packaging. Defined as packaging that incorporates or is designed to interact with electronics, this thesis explores the effectiveness of smart packaging in terms of its potential to promote engagement, one of the newer indicators of relationship quality built on SD logic's value co-creation lens which has been deemed a research priority by the Marketing Science Institute (MSI) three times within the last decade. More specifically, this research investigated how consumers engage with smart packaging within the context of fast-moving consumer goods (FMCGs), relatively inexpensive items that are rapidly consumed and

frequently purchased with minimal cognitive effort (Dibb et al., 2005). Given the well-established nature of FMCGs as products that experience difficulties in establishing and maintaining consumer relationships (Javornik and Mandelli, 2012; Leahy, 2011), the FMCG industry is particularly keen on exploring the viability of smart packaging as a potential solution to this issue (Mahalik and Nambiar, 2010). This is not surprising given the elevated importance of packaging within the context of FMCGs as they are generally considered to be the primary cues that consumers rely on when forming product perceptions and making purchase decisions (Underwood and Klein, 2002). However, despite the significant number of smart packaging applications that has been trialled by the FMCG industry, very little academic work has been conducted within this research area. It is this research gap that is primarily addressed by this thesis in its investigation of how consumers engage with smart packaging.

Due to the lack of commercially available smart packaging and consequently, the lack of individuals who have had the opportunity to interact with them, recruiting participants experienced with smart packaging is a major challenge. Unlike how traditional packaging studies (Ampuero and Vila, 2006; Bettels et al., 2020; Maleki et al., 2020; Rundh, 2013; Simmonds et al., 2018; Vila and Ampuero, 2007) are able to feasibly use mock-ups to investigate how consumers respond towards physical changes (i.e. colour, shape, material) in packaging, the same approach is simply not viable for the study of smart packaging as due to their inherently technical nature, building mock-ups generally requires technical expertise that marketing researchers often do not have. To address this barrier, this research was conducted as an interdisciplinary PhD that bridges the fields of marketing and computing (refer to Appendix A). A substantial amount of technical work was invested into the development of functional smart packaging prototypes that participants were able to freely interact with, facilitating the use of technology probes (refer to Section 3.4), a method adopted from the field of computing that is commonly used to carry out user evaluation of prospective technologies within real-world settings (Crabtree et al., 2020; Huang et al., 2014; Hutchinson et al., 2003; O'Brien and Mueller, 2006) in carrying out this research. In doing so, this research highlighted how the adoption of

an interdisciplinary approach to smart packaging research can address its signature challenge of participant scarcity.

The findings of this research yielded both practical and academic contributions. Given the highly sensitive nature of FMCG purchase decisions towards changes in price and packaging design (Simms and Trott, 2014), business decisions regarding the implementation of smart packaging within this context warrant extreme caution. This is due to how the additional production costs incurred from implementation are likely to be passed on to consumers through higher prices, potentially reducing product demand and consequently, revenue if it results in consumer switching. Practitioners (i.e. smart packaging designers) can however utilise the findings of this research to partially mitigate this risk. The findings of this research provide qualitative insight on how consumers perceive and interact with various features and applications of smart packaging as well as the nature and valence of value co-creation and engagement they promote. This can be used as a reference to guide practitioners during the design process to increase the likelihood of a well-received implementation (e.g. avoiding features which were poorly received) and reduce the likelihood of consumer switching. For academics (i.e. marketing scholars), this research made theoretical, empirical, and methodological contributions. These took the form of a conceptualisation of smart packaging engagement, the identification of seven factors which influence the nature and likelihood of consumer interaction and subsequent value co-creation and engagement with smart packaging, themes that characterise said phenomena, and a methodological account of how the challenge of participant scarcity in smart packaging research can be addressed through the use of technology probes. Finally, readers should note that this research was supported by Unilever as an industrial partner and so, is shaped by their interest in FMCGs, the Internet of Things, and personal data (refer to Appendix A).

1.1 Research Aims and Questions

1.1.1 Research Aims

The primary goals of this research were to better understand how consumers engage with smart packaging of FMCGs and identify factors of smart packaging design which can influence the nature and likelihood of this phenomenon.

1.1.2 Research Questions

In order to fulfil the research aims, the following research questions were addressed:

- RQ1: What is the nature of consumer engagement with smart packaging of FMCGs?
- RQ2: What are factors which may encourage or discourage consumers to engage with smart packaging?

1.2 Methodology

This research adopted a pragmatic research paradigm and employed qualitative methods in its conduct. Two studies were carried out for this research. The first study was a focus group study which investigated consumer attitudes towards smart packaging, showcased to them through storyboards depicting fictional but envisaged potential applications of smart packaging designed for three types of FMCGs (sunscreen, alcohol, coffee). The second study was a technology probe study which deployed functional smart packaging prototypes into the homes of participants over a four-week period, during which they were given the opportunity to interact with a smart packaging experience designed around coffee. Data collected from both studies was analysed using thematic analysis.

1.3 Structure

This thesis is structured into six chapters:

Chapter 1 (Introduction) introduces the research and provides an overview of the background, motivation, and structure of this thesis.

Chapter 2 (Literature Review) reviews the five streams of literature relevant to this research: SD logic, engagement, value, packaging, and smart technologies. It concludes with a proposed working definition of smart packaging engagement.

Chapter 3 (Methodology) elaborates on the methodology of this research. It begins with a brief overview of the four dominant research paradigms (positivism, constructivism, realism, pragmatism) before justifying the research decision to adopt pragmatism. In a similar manner, it then proceeds to briefly review the three types of research methodologies (quantitative, qualitative, mixed) before justifying the research decision to employ a qualitative approach. A detailed description of the design, conduct, and analytical approach of each study alongside their rationale is then provided.

Chapter 4 (Findings) reports the findings of both studies. In this chapter, themes identified from the thematic analysis of each study are presented and explained in turn.

Chapter 5 (Discussion) discusses the implications of the findings of both studies. It is structured into three sections. In the first section, factors which influence consumer interaction and value co-creation with smart packaging identified from the first study are discussed. These are discussed in relation to the findings of the extant literature and those of the second study. The second section discusses the practical contributions of this research. In this section, practical guidelines for smart packaging design are discussed in relation to each of the factors discussed in the previous section. The final section revisits the conceptualisation of smart packaging engagement. In this section, the working definition of smart packaging engagement proposed at the end of Chapter 2 is revised according to the empirical findings of the second study.

Chapter 6 (Conclusion) provides a recap of the contributions made by this research and whether the research questions have been addressed. This is followed by a section reporting the limitations of this research before concluding with recommendations for future work.

Chapter 2: Literature Review

The literature review chapter introduces key streams of literature relevant to this research. Through critical literature review, this chapter identifies the research gaps addressed by this thesis, positions it within the field, and conceptualises the key constructs that inform its theoretical framework. There are five major sections to this chapter, each one dedicated to a different stream of literature. The first section explores SD logic, a view of marketing which scholars consider most dominant as of the time of writing. Given that this research adopts a conceptualisation of engagement built on the value co-creation lens introduced by SD logic, it is only appropriate that the backbone of this research's theoretical framework is first reviewed. The second section is dedicated to engagement. It provides a descriptive account of Brodie et al.'s (2011) conceptualisation of engagement which forms the foundation of the conceptualisation of smart packaging engagement adopted by this research. The third section covers value. As this research adopts Brodie et al.'s (2011) conceptualisation of engagement which posits it to be a product of value co-creation, exploration of the value literature is crucial for a better understanding of how it can be conceptualised within the context of this research. The fourth section is focused on packaging. Given that smart packaging prototypes were to be developed as part of this research, it was imperative that existing applications of smart packaging within the FMCG industry were first consulted to ensure that the designed prototypes would accurately reflect the current state of smart packaging (i.e. ecologically valid). Additionally, these also served as a reference on how smart packaging applications can be designed and the typical nature of the value propositions they offer, feeding into the discussion on how value could be best conceptualised in relation to smart packaging engagement. The fifth section reviews smart technologies. Due to the lack of real-world consumer research on smart packaging and given the numerous similarities shared between their technical features and use cases, much can still be learned from reviewing how users respond towards the application of smart technologies in domestic and retail settings. Finally, with the insight obtained from conducting the literature review, a working definition of smart packaging engagement is then conceptualised and presented.

2.1 Service-Dominant Logic

As previously mentioned, given how this research's adopted conceptualisation of engagement (Brodie et al., 2011) was built on the value co-creation lens inherent to SD logic, it stands to reason that SD logic is covered in the literature review as well. This section first begins with an elaboration on the underlying principles of SD logic. This is then followed by a review of the SD logic literature to critically evaluate the suitability and soundness of the value co-creation lens in forming the foundation of this research's conceptualisation of smart packaging engagement before concluding with a brief overview of the current SD logic research agenda and where this research is positioned to address it.

SD logic is a relatively new marketing paradigm that is currently dominating marketing thought. It was first conceptualised by Vargo and Lusch in 2004 in order to provide an alternative perspective of marketing that views all market exchange as an exchange of service, challenging the traditional distinction between goods and services practiced under the older goods-dominant (GD) logic. Under SD logic, goods are merely considered as wrappers or distributed mechanisms for service provision which are of no benefit to consumers prior to value co-creation, a process during which said 'wrapped' value propositions are actualised into real value by consumers through resource integration. By explicitly acknowledging the subjective nature of consumption, SD logic recognises the need for a greater consideration of the consumers' personal context when developing marketing strategy, advocating for the provision of more bespoke and personalised service which denotes the evolution from older 'make-and-sell' strategies into those that 'sense-and-respond' (Haeckel, 1999). These principles are succinctly captured in a set of axioms and foundational premises that are regularly updated to align with SD logic's development.

However, it should first be clarified that the SD logic discussed throughout this thesis is merely one variant of many. Although SD logic was initially intended for the marketing context, it has since its conception developed into a much more inclusive framework that now brands itself as a generic lens of viewing social and economic exchange (Vargo and Lusch, 2017). Hence, it should be noted that it is specifically the SD logic of marketing that all mentions of SD logic throughout this thesis refers to.

Additionally, while the conceptual development of SD logic has been extended to view exchange at three different levels of aggregation (micro, meso, macro), only the micro-level lens is discussed and adopted by this research given its primary interest in business-to-consumer (B2C) exchange. Having clarified the scope of SD logic relevant to this research, an elaboration of the latest revision of the axioms and foundational premises of SD logic (shown in Table 1 below) is now presented.

2.1.1 Axioms and Foundational Premises of Service-Dominant Logic

Axioms	Derived Foundational Premises
[AX1] Service is the fundamental basis of exchange	[DFP1] Indirect exchange masks the fundamental basis of exchange
	[DFP2] Goods are distributed mechanisms for service provision
	[DFP3] Operant resources are the fundamental source of strategic benefit
	[DFP4] All economies are service economies
[AX2] Value is co-created by multiple actors, always including the beneficiary	[DFP5] Actors cannot deliver value, but can participate in the creation and offering of value propositions
	[DFP6] The service-centred view is inherently beneficiary oriented and relational
[AX3] All social and economic actors are resource integrators	
[AX4] Value is always uniquely and phenomenologically determined by the beneficiary	
[AX5] Value co-creation is coordinated through actor-generated institutions and institutional arrangements	

Table 1. Axioms and Foundational Premises of Service Dominant Logic
Source: Vargo and Lusch (2016)

[AX1] Service is the fundamental basis of exchange

First of all, given the weight of the term service (distinguished by its singular form) throughout this section, it is important to distinguish it from the classical definition of services used to refer to intangible output (Rathmell, 1966), value-added service (i.e. product-enhancing offerings such as warranty), or activities within canonical service industries (e.g. hospitality, education, and banking). Under SD logic, service is defined as an "application of specialised competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (Vargo and Lusch, 2004, p. 2). This axiom challenges GD logic's established dichotomy of goods and services by framing all activities of market

exchange as service. It asserts that both goods and services play a fundamentally equal role in satisfying consumer desires and that market exchange can be better understood by studying how they facilitate the fulfilment of said desires without getting caught up in their distribution mechanisms. However, this axiom should not be misinterpreted to disregard the exchange of goods as they are still acknowledged under SD logic but are merely framed in a different manner, as per [DFP2].

[DFP1] Indirect exchange masks the fundamental basis of exchange

Although direct exchange in the form of bartering was commonplace in the past, it has been rendered close to obsolete due to the global implementation of the fiat monetary system. For instance, farmers who would previously trade crops (embodiment of farming skills) with hunters for game (embodiment of hunting skills) are now able to sell their crops to retailers for money instead, which they can then use to purchase game. However, regardless of how many times the farmers had to partake in exchange to procure game, they would ultimately still end up in the same net position of having given up their possession of crops for that of game. This example illustrates that while indirect exchange can mask the true skills-for-skills nature of exchange with that of skills-for-money, it does not replace it.

[DFP2] Goods are distributed mechanisms for service provision

Under SD logic, goods are defined as a distribution mechanism of competences. It adopts the perspective of Normann and Ramirez (1993) which views goods as embodied forms of knowledge and skills. While seemingly unconventional, this view is not entirely exclusive to SD logic and has actually been supported by other prominent scholars in the past, such as Prahalad and Hamel (1990) who refers to goods as “the physical embodiments of one or more competencies” (p. 85). This notion is extended even further by Hollander (1979) who claims that goods are capable of replacing traditional services, pointing out how everyday household items such as razors and washing machines have managed to replace barbers and launderers respectively. It is also complemented by the sentiments of Kotler (1997) and Gummesson (1995) who believes that it is ultimately the service rendered by goods which makes them valuable to consumers. Additionally, Rifkin (2001) also

points out that at times, consumers may purchase goods in order to satisfy higher-order needs which Gutman (1982) describes as "valued states of being, such as happiness, security, and accomplishment" (p. 60) rather than for the core functionality they provide. An example would be how consumer purchases of luxury branded goods such as Ferrari cars and Rolex watches are typically motivated by the social status associated with these brands rather than the need for transportation or indicator of time respectively. Collectively, these arguments strongly suggest that the traditional view of goods heavily oriented around their core functionality is not indicative of their true nature. On the other hand, by framing goods as a distributed mechanism for service provision, SD logic encourages marketers to better consider what consumers really want or need out of their consumption experience during new product development, potentially resulting in innovative designs less oriented around its core functionality.

[DFP3] Operant resources are the fundamental source of strategic benefit

There are two types of resources according to SD logic: operand and operant. While operand resources are raw tangible assets which require processing before they can induce an effect, operant resources refer to the know-how that can be performed on other operand and operant resources to amplify their effects (Constantin and Lusch, 1994). Unlike the older GD logic which prioritises operand over operant resources in view of the role they played as an indicator of wealth in the past, SD logic asserts otherwise. Consistent with the findings of Penrose (1995) and Zimmerman (1951), SD logic believes that operant resources such as technology, skills, and knowledge are much more beneficial for their ability to amplify, a line of thinking that is also aligned with the perspective of the modern industry which views technological progress and improved knowledge as key drivers to improving productivity and achieving competitive advantage (Capon and Glazer, 1987; Quinn et al., 1990). Essentially, [DFP3] emphasises that within the current marketing landscape, know-how is now viewed to be more favourable than raw resources as opposed to how it was in the past.

[DFP4] All economies are service economies

Marketers have traditionally perceived economic development in terms of eras, such as the hunter-gatherer, agricultural, and industrial era. Under GD logic, each one would typically be represented by its signature output (e.g. game, crops, and manufactured goods respectively for the eras mentioned above). On the other hand, SD logic views each era in terms of macrospecialisations which they define as the honing and refinement of a particular set of exchangeable skills. Viewed through this lens, the respective macrospecialisations of each era would be hunting and foraging, agricultural cultivation, and mass scale production. As all economies can be described in terms of macrospecialisations, SD logic argues that all economies are fundamentally service economies. This foundational premise points out that SD logic is not a framework that is compatible only with the modern economy that is becoming increasingly reliant on services but also with those of the past.

[AX2] Value is co-created by multiple actors, always including the beneficiary.

Before SD logic, value was conceptualised by GD logic with an exchange model inherited from economics. This model equated value to price, allowing it to be easily measured and used as a metric for profit maximisation which would later become what is now commonly referred to as value-for-exchange. Under this perspective, value is not created but determined based on a wide variety of economic factors such as supply and demand and delivered to consumers through transactions.

However, since the value-in-exchange concept does not align with [DFP2] which argues that goods have no value prior to their consumption, SD logic adopts a conceptualisation of value referred to as value-in-use. The value-in-use concept rejects the objective nature of value-in-exchange and instead, advocates for a more subjective nature of value that is primarily co-created by a beneficiary and other actors (generally assumed to be dyadic between the consumer and business within the context of this research). Hence, given that value co-creation simply cannot take place without a beneficiary's consumption, it must by definition always include the beneficiary as one of its actors. This axiom calls attention to the relational nature of

value co-creation, denoting how it is dependent on the presence and coordinated participation of both the consumer and the business for it to successfully take place.

[DFP5] Actors cannot deliver value but can participate in the creation and offering of value propositions

Under SD logic, value cannot be delivered, only co-created. This notion is supported by Gummesson (1998) who asserts that value co-creation is only possible through consumption as well as Grönroos (2000) who argues that the focus of marketing is on value co-creation rather than the distribution of ready-made value to consumers. When applied to the B2C context of this research, this foundational premise is taken to mean that the business cannot singlehandedly deliver value, further emphasising the relational nature of value co-creation by positing that it is not possible for it to take place without consumer participation. The business or enterprise's role instead, is to create and offer value propositions (potential value) that consumers can actualise into real or actual value through value co-creation (model shown in Figure 1 below).

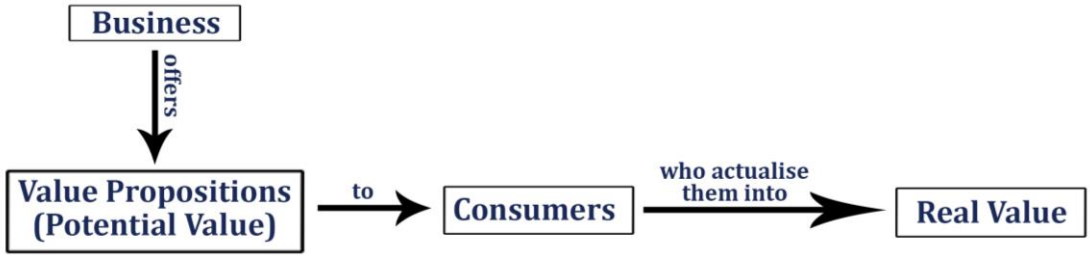


Figure 1, The SD Logic Model of Value Co-Creation (B2C)

For instance, for a female consumer (the beneficiary) purchasing a cup of coffee at a café (the business), while the café can offer her a value proposition in the form of a cup of coffee, it cannot deliver value as the cup of coffee can only be actualised into real value (e.g. the satisfaction of tasting it) once the consumer drinks it. Additionally, this foundational premise also distinguishes value co-creation from co-production that was often mistook for each other by implicitly defining co-production as the collaborative effort between a business and its consumers in creating value propositions. An example of co-production in this scenario would be the development of a new menu item based on the consumer's suggestions.

[DFP6] The service-centred view is inherently beneficiary oriented and relational

Given how service is by definition always beneficial for an actor, it is inherently beneficiary oriented. When this foundational premise is applied to the B2C context of this research, it implies that SD logic is inherently consumer oriented. Simultaneously, given the relational nature of the value co-creation model adopted by SD logic, it too is relational through transitivity.

[AX3] All social and economic actors are resource integrators

This purpose of this axiom is to elaborate on how service can be exchanged in its desired form. As previously highlighted, service defined under SD logic is the application of a specialised competence. Given that the demands of a typical modern consumer are very rarely met by a single specialisation, resource integration is how service can be effectively exchanged. For instance, referring back to the coffee example, the cup of coffee can be viewed as a culmination of various competences, such as that of agricultural cultivation and engineering required to harvest the coffee beans and develop the espresso machine respectively. While these might not be desirable to the consumer individually, the business's act of resource integration is what combines them into a value proposition which can then be offered to their consumers.

It should also be noted that this axiom asserts that it is not just the business who are resource integrators but consumers as well. For instance, the consumer would have also had to integrate their own resources (such as the time required to commute to the café and make the purchase) before being able to partake in value co-creation. This recognition of the need for resource integration can impact the development of marketing strategy in various ways. Marketers are now encouraged to pay closer attention to how resource integration can be made more convenient or enjoyable to improve the consumption experience of their consumers. For example, the café could add a drive-through counter to save their consumers some time if a significant portion of their sales are to consumers on their morning commute. Alternatively, by adopting a more modular view of the resources involved in the creation of value propositions, the marketable aspects of service can be made more apparent. For

instance, by viewing the cup of coffee as a combination of coffee beans, milk, and a paper cup rather than an entire product, marketers could be inspired to draft a green marketing strategy oriented around Fairtrade coffee, locally sourced milk, and recyclable packaging. Additionally, this axiom also illustrates how the market is disrupted and develops according to SD logic. As resource integration is fundamentally an act of combining resources to create new resources, through repeated instances, opportunities for innovative technological disruption and market development are revealed (Wieland et al., 2016).

[AX4] Value is always uniquely and phenomenologically determined by the beneficiary

This axiom highlights the highly subjective nature of value that is dependent on its beneficiary. Referring to the coffee scenario once again, the value co-created by the consumer (the beneficiary) with her cup of coffee is unique in the sense that it is dependent on her personal taste in coffee. Viewed through this perspective, value is subjective as a different consumer actualising the same value proposition (i.e. drinking the same beverage) will co-create value in a non-identical manner due to their difference in taste. By highlighting the significance of individual differences, this axiom advocates for a stronger consideration of the personal context of consumers throughout the development of marketing strategy, encouraging the provision of more personalised offerings over the adoption of older mass-marketing approaches.

[AX5] Value co-creation is coordinated through actor-generated institutions and institutional arrangements

Under SD logic, the term institution does not refer to organisations as used in everyday discourse but instead refers to the artificial rules, norms, and beliefs which enable and constrain action to make social life more predictable and meaningful (Vargo and Lusch, 2016). Given how SD logic models the market as a relatively chaotic system comprised of resource integrating actors all involved in value co-creation, this axiom was intended to explain how the market is coordinated to allow for effective service exchange. It posits that through the strategic enforcement of

time and cognitive constraints, the actions of actors are made predictable and rational in a way that enables their effective coordination with those of other actors.

2.1.2 The Development of Service-Dominant Logic

Following an elaboration of the underlying principles of SD logic, the soundness of its value co-creation lens that this research's adopted conceptualisation of engagement is built on is now examined through literature review. This review is structured into three sections, each one covering SD logic literature published within a specified time period between its conception and the present. It should however be noted that this review is not meant to comprehensively cover the entire body of SD logic literature and instead focuses primarily on work involving its conceptual development in response to its criticism and reception within the academic community.

2.1.2.1 The Formative Period (2004 – 2008)

The first period is commonly referred to as the formative period (Brodie et al., 2019; Wilden et al., 2017). Beginning from when Vargo and Lusch (2004) published their first article on SD logic, this period is characterised by the refinement of SD logic's foundational premises. Throughout this period, although academic opinion of SD logic was predominantly favourable, they were not entirely free of criticism. These issues were however largely addressed by Vargo and Lusch (2008) in their first major revision of SD logic that marked the end of this period. In this section, said issues and the role they played in refining the foundational premises of SD logic (shown in Table 2 below) are discussed.

FPs	Original Foundational Premises	Updated Foundational Premises
[FP1]	The application of specialised skill(s) and knowledge is the fundamental unit of exchange	Service is the fundamental basis of exchange
[FP2]	Indirect exchange masks the fundamental unit of exchange	Indirect exchange masks the fundamental basis of exchange
[FP3]	Goods are a distribution mechanism for service provision	Goods are a distribution mechanism for service provision
[FP4]	Knowledge is the fundamental source of competitive advantage	Operant resources are the fundamental source of competitive advantage
[FP5]	All economies are services economies	All economies are service economies
[FP6]	The customer is always a co-producer	The customer is always a co-creator of value
[FP7]	The enterprise can only make value propositions	The enterprise cannot deliver value, but only offer value propositions
[FP8]	A service-centred view is customer oriented and relational	A service-centred view is inherently customer oriented and relational
[FP9]	Organisations exist to integrate and transform microspecialised competences into complex services that are demanded in the marketplace*	All social and economic actors are resource integrators
[FP10]		Value is always uniquely and phenomenologically determined by the beneficiary

Table 2, Changes Made in the First Major Revision of SD Logic
****Added only in 2006***
NB: The distinction between axioms and derived foundational premises was only introduced by Lusch and Vargo in 2014. Prior to this change, all clauses shared an equal status as a foundational premise

The early criticisms of SD logic were mostly concerned with the excessive implicitness of its foundational premises. Most reflected a call for clarification rather than conceptual rejection and were able be addressed through more explicit phrasing. For instance, critics such as Ballantyne and Varey (2006) advised against the use of terms associated with the GD logic lexicon within the foundational premises of SD logic, noting the potential confusion that may arise due to their ingrained and pre-existing connotations. This was later addressed by making lexical replacements to [FP1], [FP2], and [FP5]. In [FP1] and [FP2], the term 'unit' was replaced with the more neutral 'basis' to avoid associating service with tangible output. While goods are still recognised under SD logic as a distribution mechanism of service, this change dispels the misunderstanding that the exchange of goods is still viewed by SD logic to form a majority of market activity. The changes to [FP5] were made for a similar purpose. In [FP5], the term 'services' was replaced with the singular 'service' to clarify that SD logic does not assert a view of the market dominated by traditional services either. Collectively, these changes explicitly

renounce the traditional dichotomy of the market as goods and services practiced under GD logic.

Besides the criticisms regarding the use GD lexicon in the foundational premises of SD logic, scholars (Grönroos, 2006; Gummesson, 2006) also noted that the relational nature of value co-creation was often misunderstood. These issues too were addressed through more explicit phrasing of the concerned foundational premises, namely [FP6] and [FP7]. The changes made to [FP6] clarified the role of the consumer throughout the value co-creation process. By replacing the term 'co-producer' that was often mistook as creators of value propositions with 'co-creator of value', the misunderstanding which falsely amplified the role of consumers throughout the value co-creation process was dispelled. With [FP7], the issue lied in its inadvertent restriction on the interaction between the enterprise (the business) and its consumers to a single instance (i.e. the moment at which value propositions are offered) throughout the value co-creation process. This was never the intended meaning of [FP7] as its authors acknowledged the possibility of there being instances of interaction beyond the moment of offering (e.g. after sales support). The changes to [FP7] were made to avoid this misinterpretation and to explicitly convey that although unilaterally the enterprise can only offer value propositions, it is still possible for there to be multiple instances of interaction between them and the consumers throughout the value co-creation process.

Finally, the last batch of criticism made of SD logic in this period concerned the subjective nature of value. Like those concerning the relational nature of value co-creation, these were not direct attacks on SD logic but rather took the form of work inspired or motivated by a misunderstanding or misinterpretation of the subjective nature of value. It was primarily the work of Schembri (2006) which misunderstood value determination to be a rationalistic practice as well as that of Peñaloza and Venkatesh (2006) which proposed an elaboration of value that included personalised meanings which prompted Vargo and Lusch to explicitly denote the subjective nature of value, resulting in the addition of [FP10].

By the end of this period, the goals of SD logic had also shifted. Having realised that the value co-creation lens is not only applicable to exchange between the enterprise

and consumers but the exchange between all the actors within a networked society characterised by [FP9] as well, the goal of SD logic broadened from becoming a paradigm solely designed for the marketing context towards becoming a more general lens of viewing social and economic exchange, one that can underpin not only a theory of the market but also a theory of society (Vargo and Lusch, 2008).

2.1.2.2 The Diversification Period (2009 – 2016)

Shortly after its first major revision, SD logic research diversified (Kryvinska et al., 2013; Olexova and Kubickova, 2014). Attention began to shift away from conceptual development towards application as scholars began to explore marketing issues through the value co-creation lens, some of which includes branding (Merz et al., 2009; Payne et al., 2008), brand community practices (Schau et al., 2009), joint problem solving (Aarikka-Stenroos and Jaakkola, 2012), as well as the engagement construct (Brodie et al., 2011) central to this thesis. Additionally, SD logic also began to diffuse into other disciplines such as healthcare (Hardyman et al., 2015; Rehman et al., 2012), education (Jarvis et al., 2014), and engineering (Isaksson et al., 2009). However, it was also during this period that critics became increasingly vocal in challenging SD logic's capacity to become a conceptual foundation for a theory of the market or society. Much like the previous section, this section discusses the prominent criticisms and conceptual development of SD logic up to its second major revision (Vargo and Lusch, 2016) that marks the end of this period.

Among the critics of SD logic, the most noteworthy yet arguably also most uninformed would be O'Shaughnessy and O'Shaughnessy (2009) who in their article titled "*The service-dominant perspective: a backward step?*" harshly criticised SD logic as "neither logically sound nor a perspective to displace others in marketing" (p. 784), triggering a heated debate between the pair and Vargo and Lusch that spanned across four articles. In this article, they rejected the notion of service as the main platform of consumer society, asserting that it was defined too broadly to have any operational meaning. Seemingly under the false impression that SD logic was promoting itself as the single best perspective of marketing, they also claimed that it was regressive to scholarly progress and emphasised the importance of multiple perspectives in the advancement of marketing thought.

It took two years before Lusch and Vargo (2011) finally responded. In their response, suspecting that the ambitions of SD logic were misunderstood or lost on O'Shaughnessy and O'Shaughnessy, they clarified that SD logic was never promoted as a singular perspective to marketing but as an alternative, inherently supporting the notion of multiple perspectives that O'Shaughnessy and O'Shaughnessy advocates. Besides pointing out this contradiction, Lusch and Vargo also criticised other elements of poor scholarship demonstrated by the opposing pair in the write-up of their critique, such as knowingly ignoring the entire body of SD logic literature that has addressed many of the issues they raised and evaluating SD logic solely based on its first article which had already been seven years old by then. This exchange continued across two more articles (O'Shaughnessy and O'Shaughnessy, 2011; Vargo and Lusch, 2011) before Vargo and Lusch announced their decision "to sidestep O'Shaughnessy and O'Shaughnessy's invective and to move on" (p. 1320) in their final rejoinder, attributed to their suspicions of vindictive and unconstructive intent to the debate.

Although support for O'Shaughnessy and O'Shaughnessy's critique was minimal given the strong academic support for SD logic that still persists today, they were not the only ones sceptical of a theory of the market built on SD logic. This view was later adopted by other critics (Hietanen et al., 2018; Wright and Russell, 2012) who would continue to identify the limitations of SD logic, albeit in a much more constructive manner which also discusses how they could be overcome. One such discussion can be found in Wright and Russell's (2012) article which argues that within certain contexts (i.e. less developed economies and industries), a theory of the market found on SD logic is very much likely to be inferior to that found on GD logic in providing practical marketing insight, echoing the earlier arguments of O'Shaughnessy and O'Shaughnessy's (2009) that highlighted how the broad definition of service can limit its operational meaning. To address this issue, Wright and Russell (2012) asserts that further conceptual development is required, namely in the identification of boundary conditions to indicate areas of the market where application of SD logic is favourable and acknowledging those where it is not.

However, despite the increasing amount of scrutiny that SD logic was under throughout this period, the same cannot be said for the value co-creation lens it introduced. The value co-creation lens was very well received by the academic community and it was during this period that it managed to decouple itself from SD logic and establish itself as an independent research area (Furrer et al., 2020). Three particularly prominent articles on the subject were published throughout this period (Grönroos, 2011; Grönroos and Voima, 2013; Payne et al., 2008) which elaborated on the roles played by consumers and the enterprise throughout the value co-creation process in much greater detail. Additionally, it was also during this period that discussions regarding value co-destruction began to take place. Recognising that there may be instances where value co-creation may backfire (e.g. resource misuse), scholars began to look into the contextual circumstances which facilitate this phenomenon, hoping to develop insight on how it could be prevented (Cova and Paranque, 2012; Echeverri and Skålén, 2011; Plé and Cáceres, 2010; Smith, 2013).

By the end of this period, SD logic had once again undergone another major revision (Vargo and Lusch, 2016). This revision was slightly more significant than the previous, with changes ranging from not only lexical replacements and conceptual extension but also a restructuring of how its foundational premises are presented. Having realised that the underlying principles of SD logic are still occasionally lost on scholars due to its sheer number (Williams, 2012), four foundational premises were promoted into axioms, with the hopeful intent of transforming it into a more parsimonious framework (Lusch and Vargo, 2014). Alongside this change, lexical replacements were also made to remove SD logic's existing connotations to the marketing context and reinforce its branding as a generic lens, resulting in the replacement of marketing-oriented terms such as 'enterprise', 'customers', and 'competitive advantage' with more generic ones such as 'actors', 'beneficiary', and 'strategic benefit' respectively. Finally, recognising that the generic-actor orientation implies a much more dynamic narrative which requires additional coordination, cooperation, and reconciliation of conflict in order for mutual exchange to remain feasible, the institutional perspective characterised by [AX5] was added as the glue that allows for a more complete and realistic portrayal of value co-creation,

completing its transition from a networked orientation into a systemic one. Collectively, these changes (shown in Table 3 below) culminated in the present revision of SD logic that was discussed in Section 2.1.1 and presented in Table 1 above.

AXs/FPs	2008 FPs	2015 AXs/FPs	Restructuring
[FP1]	Service is the fundamental basis of exchange	Service is the fundamental basis of exchange	Promoted to axiom status. Became [AX1]
[FP2]	Indirect exchange masks the fundamental unit of exchange.	Indirect exchange masks the fundamental unit of exchange.	Became [DFP1]
[FP3]	Goods are distribution mechanisms for service provision	Goods are distribution mechanisms for service provision	Became [DFP2]
[FP4]	Operant resources are the fundamental source of competitive advantage.	Operant answers are the fundamental source of strategic benefit	Became [DFP3]
[FP5]	All economies are service economies	All economies are services economies	Became [DFP4]
[FP6]	The customer is always a co-creator of value	Value is co-created by multiple actors, always including the beneficiary	Promoted to axiom status. Became [AX2]
[FP7]	The enterprise cannot deliver value, but only offer value propositions.	Actors cannot deliver value but can participate in the creation and offering of value propositions	Became [DFP5]
[FP8]	A service-centred view is inherently customer oriented and relational	A service-centred view is inherently beneficiary oriented and relational	Became [DFP6]
[FP9]	All social and economic actors are resource integrators	All social and economic actors are resource integrators	Promoted to axiom status. Became [AX3]
[FP10]	Value is always uniquely and phenomenologically determined by the beneficiary	Value is always uniquely and phenomenologically determined by the beneficiary	Promoted to axiom status. Became [AX4]
[AX5]		Value co-creation is coordinated through actor-generated institutions and institutional arrangements	Newly added as [AX5]

Table 3, Changes made in the Second Major Revision of SD Logic

2.1.2.3 The Present (2016 – present)

The third period begins from the second major revision of SD logic and extends to the present day. Given that this period is still ongoing, this section can only discuss the state of SD logic research to date. Arguably the biggest change in research direction throughout this period was the decision to formally announce SD logic's new goal of attaining theory-level status. Having achieved its initial goal of providing an alternative perspective to viewing social and economic exchange at the pre-theoretic level (Olexova and Kubickova, 2014), Vargo and Lusch (2017) explicitly announced that their next goal was to promote SD logic into a theory, beginning with a theory of the market. As a result, SD logic research is currently prioritising the reconciliation of knowledge and formation of research strategies which would allow them to achieve this goal (Brodie et al., 2019; Ekman and Röndell, 2019; Pohlmann and Kaartemo, 2017; Vargo and Lusch, 2017; Wilden et al., 2017). Scholars have generally agreed that given the metatheoretical nature of SD logic, the most effective way to prove itself would be through the development of supporting midrange theories alongside empirical and evidence-based research to prove the operationalisation of SD logic in practice. While this has already been ongoing prior to this development, this period saw work with more explicit links to the theorisation of SD logic begin to emerge (Jaakkola et al., 2019; Pels and Mele, 2019).

Besides this change in the research agenda, research trends remained relatively similar with those of the previous period. With the core conceptual or metatheoretical development of SD logic at a temporary hiatus, the research landscape continues to become increasingly dominated by the conceptual development of value co-creation through empirical exploration within both marketing and non-marketing contexts. Seemingly consistent with Storbacka et al.'s (2016) approach of using actor engagement (disposition and activities) as a microfoundation of value co-creation, scholars conceptualised value co-creation and co-destruction in terms of their specific interactional practices (Camilleri and Neuhofer, 2017; Järvi et al., 2018; Tommasetti et al., 2017) and developed scales to quantify them (McColl-Kennedy et al., 2017; Merz et al., 2018; Ranjan and Read, 2016; Sweeney et al., 2015). Additionally, as a result of SD logic's transition to a

systemic orientation, more holistic models of value co-creation unifying the role of distinct actor groups under a generic umbrella were also proposed (Wieland et al., 2016), extending the older models which were catered more specifically to the dyadic exchange between consumers and the enterprise (Grönroos, 2011; Grönroos and Voima, 2013; Payne et al., 2008).

On the other hand, critics who were concerned with SD logic's capability to underpin a theory of the market have been much less vocal throughout this period. This is speculated to be due to their satisfaction with Vargo and Lusch's (2017) acknowledgement of the current limitations of SD logic which they agreed to address in the future. SD logic's capacity to achieve its secondary goal of supporting a theory of society (Vargo and Lusch, 2008) also continues to be criticised (Hietanen et al., 2018). However, as this is not currently a research priority, it is unlikely to impact their research agenda that is currently focused on transcending SD logic towards a theory of the market.

2.1.2.4 Why Service-Dominant Logic?

Having critically reviewed the SD logic and value co-creation literature, a justification for the soundness of the value co-creation lens adopted by this research is now provided. First of all, given the synonymous-like relationship between SD logic and value co-creation due to the former's role in proliferating value co-creation as a research area within the field of marketing, the notion that the two is not equivalent needs to be emphasised. To recap, the primary interest of this research lies in exploring how consumers engage with smart packaging of FMCGs. In conceptualising engagement for the context of this research, Brodie et al.'s (2011) conceptualisation was selected as the foundation (refer to Section 2.2.1 for its justification) that would be built on and adapted to the smart packaging context (explained further in Section 2.6). This conceptualisation was built on the [AX2], [AX3], [AX4], and [DFP6] clauses of SD logic which they credited as the theoretical roots of their conceptualisation. Said clauses highlight the key aspects of the value co-creation process, more specifically the active role of the beneficiary as a resource integrator throughout the process and the subjectivity of value. It is this perspective of consumption that is modelled by value co-creation and referred to as the value co-creation lens. As a

research area, the alternative perspective provided by the value co-creation lens (Brodie et al., 2019) has been deemed critical in advancing marketing thought (Furrer et al., 2020). Besides, given that the major criticisms of SD logic largely concerned its ability to underpin theory, be it of the market (O'Shaughnessy and O'Shaughnessy, 2011, 2009; Wright and Russell, 2012) or of society (Hietanen et al., 2018) rather than the conceptual rejection of the value co-creation lens, it is argued that the value co-creation lens is sound and well-grounded.

Additionally, the value co-creation lens is particularly suitable for the context of this research: smart packaging of FMCGs. Smart packaging of FMCGs are not suitable to be modelled under the traditional GD logic as although they are generally considered to be a part of the product (Silayoi and Speece, 2004; Simms and Trott, 2010) and can technically be classified as goods, they can also play the role of traditional services (e.g. information provision), resulting in an awkward situation in which it does not solely fall under either. However, as smart products generally depend on other resources such as the availability of supporting infrastructure (e.g. Internet connectivity) and technical expertise for them to be able to be fully utilised for their intended purposes, the value co-creation lens that portrays consumers as active resource integrators was ultimately deemed more appropriate.

2.1.3 Summary

The influence of SD logic on the marketing discipline has been tremendous, to the extent that its signature articles (Vargo and Lusch, 2016, 2008, 2004) have been found to be among the most impactful and cited articles in marketing research within the last two decades (Furrer et al., 2020). It has diffused into virtually all the subdomains of marketing and is considered to be a major driving force behind the formation and proliferation of engagement research (Vargo and Lusch, 2017). This section began with an explanation of the underlying principles of SD logic, introducing the value co-creation lens that forms the conceptual foundation of engagement. This was then followed by a critical review of the SD logic literature which scoped out its academic reception and used it as an indicator of its validity. Based on this review, it was concluded that despite the current shortcomings of SD logic which renders it from attaining theory-level status, the value co-creation lens is

generally considered by scholars to be a well-grounded framework, justifying the research decision to adopt it as the foundation of the conceptualisation of smart packaging engagement adopted by this research.

2.2 Engagement

As marketing became increasingly service oriented, newer constructs that better characterise the interactive nature of consumer relationships were advocated to replace the older metrics of consumer satisfaction. Traditionally conceptualised as post-consumption cognitive processes (Bartikowski and Llosa, 2004; Parasuraman et al., 1988; Wirtz et al., 2000), these older metrics were often criticised for their inability to sufficiently capture the depth of consumer response to service performance (Giese and Cote, 2000; Oliver, 2014) and discriminate between true brand loyalty and inertia repeat purchasing (Amine, 1998). This critique was supported by a significant number of academics who consider research within the field to be plagued by imprecision and inconsistency, resulting in their claims of said measures to be a 'trap' best avoided (Anderson and Mittal, 2000; Giese and Cote, 2000). Collectively, this motivated the formation of a construct that many now considers to be a suitable replacement: engagement.

Within the marketing and service literature, engagement is still a relatively new construct. According to a literature review by Brodie et al. (2011), academic articles mentioning engagement only began to emerge in 2005. This was corroborated by a much more recent review conducted by Islam and Rahman (2016) which reported similar results. In conducting their review, Islam and Rahman (2016) scoured the Scopus, Emerald, EBSCOS, and Science Direct academic databases for articles mentioning the terms 'consumer engagement', 'customer engagement', 'consumer brand engagement', 'customer brand engagement', 'customer engagement behaviour', or 'brand community engagement' in its title, abstract, or keywords within the 'Business, Management, and Accounting', 'Social Sciences', and 'Psychology' disciplines. This number was then reduced through the elimination of duplicate entries and a full assessment of each article based on its relevance to engagement. Unfortunately, due to the lack of details on Brodie et al.'s (2011) selection criteria, it was not possible to deduce the reason for the discrepancy

between the numbers. Regardless, the findings of both reviews suggest that it was only in 2005 that the engagement construct began to be actively studied by marketing scholars. The number of engagement-related articles identified by each review can be found in Table 4 below

Year	Brodie et al. (2011)	Islam and Rahman (2016)
2005	9	1
2006	20	0
2007	18	0
2008	28	1
2009	61	4
2010	65	7
2011		6
2012		4
2013		7
2014		23
2015		13

Table 4. Number of Engagement-Related Academic Articles Published Between 2005 - 2015

Engagement quickly grew as a research area, rapidly gaining traction within both academic and industrial environments due to expectations that a better understanding of the construct can be utilised to benefit firms in the form of sales growth (Neff, 2007), higher consumer retention rates (Bowden, 2009), superior competitive advantage (Bijmolt et al., 2010; Sedley, 2010), increased consumer participation in new product development (Haumann et al., 2015; Hoyer et al., 2010), viral referral-based marketing (Chandler and Lusch, 2015), and profitability (Voyles, 2007). The construct was even selected as one of Marketing Science Institute's (MSI) Research Priorities (set biennially) three times within the last decade and became a subject of several special issues of various international academic journals (e.g. Journal of Service Research, 2010; Journal of Strategic Marketing, 2010; Journal of Product and Brand Management, 2014; Journal of Marketing Management, 2016). It was not long before the industry also developed an interest in the construct and major marketing consultants such as Nielsen, IAG, and Gallup began to provide consultation services on promoting engagement. This was accompanied by a significant number of business conferences, seminars, webinars, and round table discussions surrounding the topic (Brodie et al., 2011) which began to emerge.

Although a significant amount of academic effort has been dedicated to the study of engagement within the past decade, it is still widely considered by the academic community to be at its infancy (Hollebeek et al., 2019; Pansari and Kumar, 2017). Despite the numerous conceptualisations of engagement, the view of the construct remains relatively fragmented. This is partially attributed to the lack of agreement over the conceptual and contextual domain of engagement, resulting in conceptualisations that aim to capture engagement within different specific contexts rather than collectively focusing on a common one. This is evident from the various terms engagement has been framed as, including but not limited to 'customer engagement', 'consumer engagement', 'online brand engagement', 'customer engagement process', 'customer engagement behaviours', and 'customer brand engagement'. A brief overview of some said conceptualisations that are considered to be part of the core engagement literature is presented in Table 5 below.

Reference	Term	Definition
Patterson et al. (2006)	Customer Engagement	The level of a customer's physical, cognitive, and emotional presence in their relationship with a service organisation
Bowden (2009)	Customer Engagement Process	Psychological process that models the underlying mechanisms by which consumer loyalty forms for new customers of a service brand as well as the mechanism by which loyalty may be maintained for repeat purchase customers of a service brand
Sprott et al. (2009)	Brand Engagement in Self Concept (BESC)	An individual difference representing consumer's propensity to include important brands as part of how they view themselves
Doorn et al. (2010)	Customer Engagement Behaviours (CEB)	Customer engagement behaviours go beyond transactions, and may be specifically defined as a customer's behavioural manifestations that have a brand or firm focus, beyond purchase, resulting from motivational drivers
Mollen and Wilson (2010)	Online Engagement	A cognitive and affective commitment to an active relationship with the brand as personified by the website to other computer-mediated entities designed to communicate brand value. It is characterized by the dimensions of dynamic and sustained cognitive processing and satisficing of instrumental value (utility and relevance) and experiential value (emotional congruence with the narrative schema encountered in computer-mediated entities)
Brodie et al. (2011)	Customer Engagement	Customer Engagement reflects a psychological state, which occurs by virtue of interactive customer experiences with a focal agent/object within specific service relationships

Vivek et al. (2012)	Consumer Engagement	Intensity of an individual's participation and connection with the organisation's offerings and activities initiated by either the customer or the organisation
Hollebeek (2011)	Customer Brand Engagement	A consumer's positively valenced cognitive, emotional, and behavioural brand-related activity during, or related to, specific consumer/brand interactions

Table 5. Core Conceptualisations of Engagement

2.2.1 Brodie et al.'s (2011) Conceptualisation of Engagement

Among these conceptualisations, Brodie et al.'s (2011) is generally agreed upon to be the most well-accepted one. Framed as 'customer engagement', their conceptualisation has formed the foundation of a significant number of academic work within the engagement literature (Dessart et al., 2015; Hollebeek et al., 2019). The warm reception to their conceptualisation can be attributed to three reasons. First, it was conceptualised at a relatively high level of abstraction. This meant that it could be applied to a number of different contexts rather than just a specific one. Second, the conceptualisation was multidimensional. This gave it an advantage over other unidimensional conceptualisations that some argue to be inadequate in capturing the depth and richness of this construct. Third, this conceptualisation had received extensive feedback from thirteen academic experts on engagement research prior to publication. The approval from this panel is a convincing and reassuring indicator of its validity and acceptance within the engagement research community. The fundamental propositions (FPs) that make up this this conceptualisation can be found in Table 6 below.

FPs	Fundamental Proposition
[FP1]	CE reflects a psychological state, which occurs by virtue of interactive customer experiences with a focal agent/object within specific service relationships
[FP2]	CE states occur within a dynamic, iterative process of service relationships that co-creates value
[FP3]	CE plays a central role within a nomological network of service relationships
[FP4]	CE is a multidimensional concept subject to a context and/or stakeholder specific expression of relevant cognitive, emotional, and behavioural dimensions
[FP5]	CE occurs within a specific set of situational conditions generating differing CE levels

Table 6.Fundamental Propositions of Customer Engagement
Source: Brodie et al., 2011. CE = Customer Engagement

As this conceptualisation is the starting point of this research's conceptualisation of smart packaging engagement, these FPs are discussed in further detail in terms of what they imply about customer engagement. Prior to this conceptualisation, engagement has generally been defined as a phenomenon that could arise between

two specific parties. These parties would typically, but not necessarily, be indicated by how the engagement construct was framed (e.g. Hollebeek's (2011) 'customer brand engagement' would indicate that it denotes how engaged a customer is with a brand). [FP1] posits engagement as a phenomenon that could arise between a customer and another party without explicitly specifying what the latter is. By merely denoting it as a 'focal agent/object', this conceptualisation has the advantage of being context-free. Additionally, as this FP defines engagement as a psychological state that occurs through interactive experiences between the customer and a focal agent/object, it is implied that it would not be possible for a customer to become engaged with said focal agent/object without interaction. [FP2] implies that engagement results from value co-creation which takes place during consumption. This FP further solidifies the argument of there being a need for customers to interact with a focal agent/object before engagement could manifest. It is also important to note the use of the term 'iterative' in this FP to describe the cyclical relationship between value co-creation and engagement (i.e. value co-creation could drive customer engagement that may manifest in ways which then drives further value co-creation). It does not however define the dimensions and scope of value within this context, giving its adopters the freedom to define them as they see fit. [FP3] denotes how customer engagement has antecedents and consequences. While specific antecedents or consequences were not specified, some were suggested based on existing work (e.g. participation, involvement, flow, rapport, trust, commitment). Like [FP2], this FP also denotes the possibility of a cyclical relationship between said antecedents and consequences that can occur concurrently or coexist with customer engagement (e.g. trust and commitment may be consequences of customer engagement for some customers but could also be antecedents for others). [FP4] explicitly acknowledges customer engagement as a multidimensional construct with cognitive, emotional, and behavioural dimensions. However, it also does not specifically elaborate on how each of these dimensions are defined, as opposed to most conceptualisations preceding it such as those reviewed in Table 5. Once again, this contributes to this conceptualisation's advantage of a high level of abstraction and also functions as a mechanism to not blatantly reject existing conceptualisations which are inconsistent in terms of dimensionality (e.g. Doorn et al.'s (2010)

unidimensional conceptualisation of consumer engagement behaviours) to contribute to its understanding of customer engagement, akin to an umbrella which also covers other conceptualisations. Finally, [FP5] recognises the continuum of customer engagement. It acknowledges that customer engagement may not always manifest at the same level and that there are various degrees of magnitude to the phenomenon (e.g. fully engaged, partially engaged) that is influenced by specific conditions or circumstances during manifestation. The following general conceptual framework (Figure 2) depicts how customers engage according to this conceptualisation.

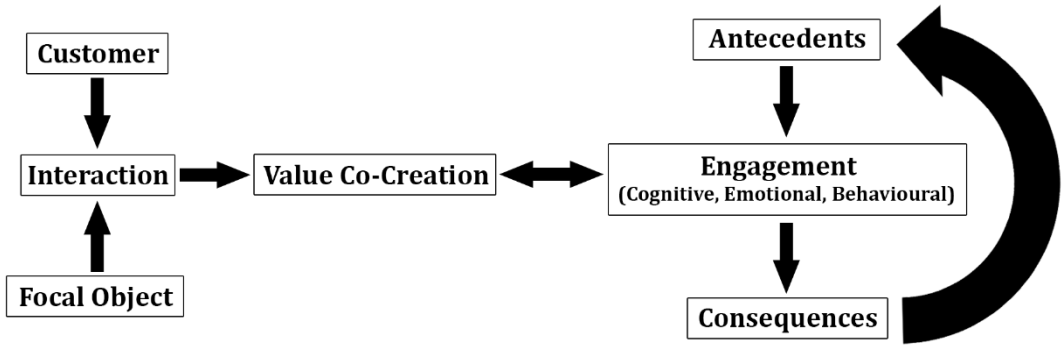


Figure 2. The Researcher's Representation of Brodie et al.'s (2011) Conceptualisation of Customer Engagement

The positive reception of Brodie et al.'s (2011) conceptualisation paved the way for an advancement of the engagement research agenda, progressing it from conceptual work towards empirical exploration (Islam and Rahman, 2016). It was during this phase that scholarly attention began to be drawn towards the empirical validation of the relationships between engagement and other conceptually related constructs, focusing on the initially theorised positive implications of engagement that were a major driving force behind the academic and practical exploration of the subject. Additionally, in hope of developing a better understanding of how engagement is induced, research on its antecedents was conducted as well (Chan et al., 2014). Scholars also began to acknowledge that there are settings in which consumers engage with various focal objects simultaneously, interconnected environments that Maslowska et al. (2016) coins as the 'engagement ecosystem', instigating research into the interplay and spill over effects between the various types of engagement that manifest simultaneously throughout the consumption process, a prime example

being the work of Bowden et al. (2017) which looked at how online brand community (OBC) engagement affects consumer brand engagement. Measurement scales began to be developed (Baldus et al., 2015; Hollebeek et al., 2014; Schivinski et al., 2016; So et al., 2014; Vivek et al., 2014), enabling quantitative empirical work to be carried out.

Although it is no longer as prominent, conceptual engagement research is still ongoing. Some of the more recent work includes the discovery of new facets of engagement such as negative valence and disengagement that was previously overlooked by early conceptual work (Bowden et al., 2017, 2015; Juric et al., 2016) and a proposed revision to Brodie et al.'s (2011) conceptualisation of customer engagement to better align it with SD logic (Hollebeek et al., 2019). Previous calls for conceptual engagement research within specific settings were also responded to, resulting in an increasing number of studies that examine engagement within specific contexts like social media (Dolan et al., 2016; Hollebeek et al., 2014), online brand communities (Dessart et al., 2015), mobile technologies (Viswanathan et al., 2017), and mobile applications (Fang, 2017). It is this call that this research partially answers to by investigating how consumers engage with a context that has yet to be explored within the field of engagement research: smart packaging.

2.2.2 Summary

This section discussed the chronological development of engagement research, highlighting the conceptual and empirical research gap that this research addresses amidst the current research agenda. It elaborated on Brodie et al.'s (2011) conceptualisation of customer engagement and provided a justification for the researcher's decision to adopt it as the foundation this research's conceptualisation of smart packaging engagement builds on, namely due to its favourable reception within the academic community and the flexibility and compatibility afforded by its context-free and multidimensional nature. While this section did not cover the other conceptualisations of engagement in much detail, they will be revisited in Section 2.6 where each one is broken down into its cognitive, emotional, and social dimensions to form a pool that this research's conceptualisation of smart packaging engagement then selects from.

2.3 Value

Given how value co-creation is inherent to Brodie et al's (2011) conceptualisation of customer engagement and how value has been stated as perhaps the most ill-defined and elusive concept within the marketing literature (Carù and Cova, 2003; Sánchez-Fernández and Iniesta-Bonillo, 2007; Woodall, 2003), a review of the value literature is crucial in order to be able to make an informed decision on how to best conceptualise it for the context of this research. This section reviews the literature on value, providing an overview of its development and dimensions within the academic literature.

Before proceeding, it should first be clarified that the notion of value being discussed throughout this thesis refers to consumer value. Consumer value refers to the value that consumers co-create throughout consumption rather than the financial value of consumers that is associated with the producer side of the value creation coin (Gupta and Lehmann, 2005). It should also be noted that throughout this thesis, consumption refers to the entire lifecycle of acquiring, using, and disposing of a product (Holbrook, 1987) as opposed to only the use phase like how the term is typically used within everyday discourse. This is an important distinction to keep in mind to avoid misunderstanding value-in-use to only refer to value derived during moments of use as it can also refer to value derived from simply owning a product (recall the Rolex and Ferrari example in Section 2.1.1) or disposal.

Despite its age as a construct, its recognition as a key marketing concept (Sheth and Uslay, 2007), and the significant amount of conceptual work that has been carried out surrounding value, scholars believe that our understanding of value is still lacking (Grönroos and Voima, 2013). The earliest conceptualisation of value in marketing was derived from economics, one which simply equates value to price. This concept of value-in-exchange was defined by Smith (1776) as the purchasing power bestowed by the possession of an object to purchase other goods. This definition of value implies that value is embedded within a product and that aside from influencing market demand (which affects prices) through their purchasing habits, consumers play a very limited role in determining value. Although the notion of value-in-exchange was later criticised for being too simplistic to capture the true

essence of value, this conceptualisation has actually been accepted by several scholars in the past (Bishop Jr, 1984; Hoffman, 1984; Schechter, 1984) and was the one adopted by the long-lasting GD logic paradigm before the conceptualisation of SD logic.

Subsequent conceptualisations of value later expanded on price by also considering the benefits a product provides. Empirical qualitative work conducted by Zeithaml (1988) later revealed that consumers define value based on four clauses: “low price”, “whatever I want in a product”, “what I get for what I give”, and “the quality I get for the price I pay”. Collectively, these clauses can be condensed to define value as an overall assessment of utility based on what is received and what is given. As the subjective nature of value began to emerge, marketers gradually shifted away from the concept of value-in-exchange and instead began conceptualising value in terms of utility, a subjective measure of usefulness or want satisfaction resulting from consumption which they borrowed from the field of economics. This batch of conceptualisations typically defined value as ratios, such as Sawyer and Dickson’s (1984) formula that calculates value to be the ratio of weighted attributes divided by weighted price and the ‘utility per dollar’ measure of value used in utility maximisation theory (Hauser and Shugan, 1983; Hauser and Simmie, 1981; Hauser and Urban, 1986). In everyday discourse, these ratios would be very much like what is often described as value-for-money. Representing value as an embodiment of trade-off was widely accepted by scholars as it gave a more complex insight on value rather than simply equating it to price and these conceptualisations were often adopted in price-quality research which aimed to predict factors that influence eventual product choice.

It was then proposed that a purely objective conceptualisation of value may perhaps be inadequate to capture the richness of the construct (Hirschman and Holbrook, 1982). In order to address this issue, value was later conceptualised by Holbrook and Corfman (1985) as an outcome of consumption experiences. This, in conjunction with work that found shopping (an activity that corresponds to the acquisition phase of consumption) to generate not only utilitarian value (Bloch and Richins, 1983) but also hedonic value (Bloch and Bruce, 1984) would later explicitly establish the

subjective nature and multidimensionality of value. It was at this point in time that research within this field became heavily oriented around the dimensionality of value. Scholars would later come to the agreement that value is no longer solely oriented around functional and economic benefits but also concerned emotional, social, ethical, and environmental dimensions (Barnes, 2003; Norman and MacDonald, 2004). Table 7 below depicts the various dimensions of value that has been proposed within the academic literature.

Dimension	Description	Reference(s)
Utilitarian Functional Instrumental	Value from the solution of consumption-related problems	Park et al. (1986)
	The perceived utility acquired from one's capacity for functional, utilitarian, or physical performance.	Sheth et al. (1991)
	Value derived from a product or service that helps consumers solve problems and accomplish tasks.	Babin et al. (1994)
	The utility derived from the perceived quality and expected performance of the product	Sweeney and Soutar (2001)
	Utilitarian value is defined as an overall assessment of functional benefits and sacrifices. Utilitarian value incorporates more cognitive aspects of attitude such as economic value-for-money and judgements of convenience and time savings.	Overby and Lee (2006)
	Functional/instrumental value is concerned with the extent to which a product (good or service) has desired characteristics, is useful, or performs a desired function	Smith and Colgate (2007)
Social Symbolic Expressive	Value from the fulfilment of internally generated needs for self-enhancement, role position, group membership, or ego identification.	Park et al. (1986)
	The perceived utility acquired from an alternative's association with one or more specific social groups. An alternative acquires social value through association with positively or negatively stereotyped demographic, socioeconomic, and cultural-ethnic groups. Measured on a profile of choice imagery	Sheth et al. (1991)
	Enhancement of social self-concept. The utility derived from the product's ability to enhance social self-concept	Sweeney and Soutar (2001)
	Symbolic/expressive value is concerned with the extent to which customers attach or associate psychological meanings to a product.	Smith and Colgate (2013)
Hedonic Experiential Emotional	Value from the fulfilment of desires that provide sensory pleasure, variety, or cognitive stimulation.	Park et al. (1986)
	The perceived utility acquired from an alternative's capacity to arouse feelings or affective states.	Sheth et al. (1991)
	Hedonic value is more subjective and personal than its utilitarian counterpart and results more from fun and playfulness than from task completion.	Babin et al. (1994)
	The utility derived from the feelings or affective states that a product generates	Sweeney and Soutar (2001)
	Hedonic value is defined as an overall assessment of experiential benefits and sacrifices, such as entertainment and escapism.	Overby and Lee (2006)
	Experiential/hedonic value is concerned with the extent to which a product creates appropriate experiences, feelings, and	Smith and Colgate

	emotions for the customer.	(2007)
Epistemic	The perceived utility acquired from an alternative's capacity to arouse curiosity, provide novelty, and/or satisfy a desire for knowledge. An alternative acquires epistemic knowledge value by questionnaire items referring to curiosity, novelty, and knowledge.	Sheth et al. (1991)
Conditional	The perceived utility acquired by an alternative as the result of the specific situation or set of circumstances facing the choice maker. An alternative acquires conditional value in the presence of antecedent physical or social contingencies that enhance its functional or social value. Conditional value is measured on a profile of choice contingencies.	Sheth et al. (1991)
Cost/Sacrifice	The utility derived from the product due to reduction of its perceived short term and longer term costs	Sweeney and Soutar (2001)
	Value concerned with transaction costs related to the purchase, ownership, and use of a product.	Smith and Colgate (2007)

Table 7. The Proposed Dimensions of Value

Following the general consensus on the multidimensionality of value, the value-in-use concept would later be reintroduced by Vargo and Lusch as a foundational premise of SD logic and the currently dominant conceptualisation of value. The term 'reintroduced' was specifically chosen because the value-in-use concept had actually been proposed and accepted in the past. Aristotle was one of the first to distinguish between value-in-use and value-in-exchange which back then were better known as use-value and exchange-value respectively (Fleetwood, 1997). This eventually led to the work of the Medieval Schoolmen who argued that the basis of exchange was the use-value found in consumer needs (Dixon, 1990), an argument that was widely accepted by scholars and philosophers with little debate. The proliferation of value-in-use was however held back by Smith's decision to conceptualise value as value-in-exchange, a decision he made primarily due to its compatibility with the field of economics which he would later find. Despite Smith's early works that discussed how 'real value' was found in the labour required to afford the necessities and pleasure in life as well as his explicit acknowledgement of the value-in-use concept that he defined as "the utility of some particular object" (1776, p. 42), he directed his work towards value-in-exchange due to its quantifiable nature which he felt was much easier to understand. Smith's model of embedded value distributed in tangible goods formed a large portion of the theoretical grounding of modern economics and

would later proliferate rapidly as part of the GD logic paradigm, driving the earlier dominance of value-in-exchange within the marketing literature.

Having acknowledged the multidimensionality and subjective nature of value inherent in the value-in-use concept, academic attention is now predominantly directed towards value co-creation (Grönroos, 2008; Holbrook, 1994; Prahalad and Ramaswamy, 2004; Vargo et al., 2008). The value research agenda is currently focused on identifying the circumstances and situations optimal for the phenomenon, emphasising on the subjective and experiential dimensions of value as opposed to the older objective and cognitive ones (Heinonen and Strandvik, 2009; Helkkula et al., 2012). Coincidentally, like engagement, the negative valence of value co-creation has also been recently acknowledged and termed value co-destruction (Camilleri and Neuhofer, 2017; Echeverri and Skålén, 2011; Plé and Cáceres, 2010; Smith, 2013)

2.3.1 Summary

This section provided a chronological development of how the conceptualisations of value evolved over time, elaborating on how marketers gradually shifted away from value-in-exchange towards value-for-money before finally embracing value-in-use. This was then followed by a brief overview of the different dimensions of value and current state of the research agenda within the field. In a pattern similar to that of the previous section, this section did not discuss the dimensions of value in great detail but will instead revisit them in Section 2.6 where some will be selected for the conceptualisation of value within the smart packaging context.

2.4 Packaging

This section provides a brief overview of the developments in packaging and smart packaging within the field of marketing. Given that the idea behind smart packaging is essentially packaging but better, it is beneficial to first develop an understanding of the role that packaging plays in marketing communications and its shortcomings that smart packaging aims to address. This is followed by a review of the smart packaging applications that have been trialled or announced within the FMCG industry which would later serve as reference material for the design of the smart

packaging applications featured in the two studies (refer to Section 3.3 and Section 3.4) conducted for this research.

Despite the importance of packaging in marketing communications, the subject has received relatively little academic attention when compared to the other dimensions of marketing like advertising and pricing (Rundh, 2005; Simms and Trott, 2010; Underwood and Klein, 2002). Scholars attribute this to how packaging has historically been viewed by marketers to simply be an unavoidable cost (Simms and Trott, 2010), significantly discounting their role in marketing communications. As a result, early work focused primarily on developing cost-saving designs (Ahmed et al., 2005) while largely neglecting the exploration of how packaging can be used as part of marketing strategy. However, interest in packaging's potential as a marketing tool has increased tremendously within the past two decades (Mahalik and Nambiar, 2010), an effect that marketers to be caused by the increasing amount of competition from retailer brands (Vazquez et al., 2003) and the environmental concerns associated with packaging.

Brands (especially those of FMCGs) are beginning to feel threatened by retailer brands due to their typically lower prices. This is not surprising given that the annual Brand Footprint Report by Kantar (2019) reported that in 2018, retailer branded products made up half of the total sales value in the UK for the first time in history, increasing by £3.3 billion from the previous year and over four times as much as the £0.8 billion increase in total sales value of non-retailer brands within the same period. As a result, firms have becoming increasingly desperate to raise their sales numbers which they hope to achieve by utilising packaging more effectively in their marketing strategies.

Additionally, brands are also becoming increasingly compelled to reduce the environmental impact of their product packaging. Packaging waste currently makes up for one of the highest proportions of global waste. According to a report by the Innovate UK Knowledge Transfer Network (2018), 11.5 million tonnes of packaging waste was produced in just the UK in 2015. Regulations and directives, such as the Packaging (Essential Requirements) Regulations 2015 enforced by the European Union (EU) in addition to the growing need to cater to consumers who lean towards

making sustainable purchases (i.e. ecological consumers) have spurred brands to design, develop and market more environmentally friendly packaging (Rundh, 2013; Vernuccio et al., 2010).

Collectively, this has instigated marketers to conduct an increasing amount of packaging research, consequently resulting in their acknowledgement of the critical roles that packaging plays in marketing communication which researchers have argued to be even more influential than commercials (Gelici-Zeko et al., 2013), earning them nicknames like the 'silent salesman' and the 'sales clincher' (Pildtich, 1972). Said roles include affecting consumer perception and product evaluation (Ampuero and Vila, 2006; Orth and Malkewitz, 2008; Rettie and Brewer, 2000; Sara, 1990; Wells et al., 2007), attracting attention (Underwood et al., 2001), protection and containment (Ampuero and Vila, 2006), and product differentiation (Wells et al., 2007). The influence of packaging is even stronger for products with low levels of involvement such as FMCGs as being the most readily available input that consumers can touch or see (Ryynänen and Rusko, 2015; Schafer, 2013), it is generally considered by consumers to be the primary cue they use to learn more about the product (Underwood and Klein, 2002). In some cases, consumers may even consider packaging to be part of the core product (Silayoi and Speece, 2004; Simms and Trott, 2010) itself and use them as an indicator of product quality (Venter et al., 2011) as many FMCGs tend to look immensely identical between brands and are often indistinguishable without packaging (e.g. sliced bread, butter). Hence, it should come to no surprise that well-received packaging has been found to be associated with product success within the FMCG industry (Wansink and Huffman, 2001).

Although the amount of research looking into the role of packaging in marketing communications has significantly risen, it is still predominantly focused on examining their influence on consumer purchase behaviour within commercial settings (Ampuero and Vila, 2006; Barber, 2010; Clement, 2007; Luis Méndez et al., 2011; Sehrawet and Kundu, 2007; Silayoi and Speece, 2007). Additionally, very little work has been done on improving or developing packaging that goes beyond making aesthetic changes concerning typography, colour, shape, and imagery (Ampuero and Vila, 2006; Gómez et al., 2015; Hess et al., 2014; Marlow and Jansson-Boyd, 2011;

Rokka and Uusitalo, 2008; Silayoi and Speece, 2007; Underwood et al., 2001; Underwood and Klein, 2002; Vila and Ampuero, 2007). This is posited by Simms and Trott (2014) to be due to the FMCG industry's orientation towards cost-minimisation which often discourages the adoption of new technologies in fear of the significant capital, development, or switching costs (Bunduchi and Smart, 2010) associated with them. Work that examines how consumers perceive packaging post-purchase has also been minimal and for the most part, theoretical (McNeal and Ji, 2003). Collectively, the lack of work in these areas has formed a research gap that this research addresses: a dearth in the exploration of consumer response towards changes in packaging beyond surface level aesthetics and how consumers interact with packaging post-purchase.

Before proceeding, it is first worth mentioning that the definition of smart packaging adopted by this research is not equivalent to the traditional one formally defined within the academic literature. Smart packaging was originally developed in order to reduce the food waste resulting from poor maintenance and storage. This meant that the research area initially focused on improving the logistical role of packaging as opposed to one of marketing (Ahvenainen and Hurme, 1997; Biji et al., 2015). Smart packaging is defined ambiguously by the academic literature as packaging that does more than simply protect, store, and give information about a product (Kerry and Butler, 2008) and can be classified as either active or intelligent packaging depending on their functionality. Deriving its name from constantly and actively protecting the product, active packaging refers to packaging which modifies the containment conditions of a product in order to extend its shelf-life or maintain food quality (Dainelli et al., 2008; Vermeiren et al., 1999). This is typically done through the use of scavengers and emitters to manipulate the levels of certain elements and compounds (e.g. oxygen, ethylene, carbon dioxide) within the packaging which in turn can slow down or speed up certain chemical or biological reactions (e.g. lipid oxidisation, respiration) to preserve the freshness of a product. While active packaging plays an active role in maintaining freshness, intelligent packaging can only passively monitor or give an indication of product's current state (Dainelli et al., 2008). Intelligent packaging is defined by Yam et al. (2005) as packaging that is able

to track a product, sense environmental conditions, and convey this information to its users. A commonly used and well-known application of intelligent packaging are time-temperature indicators (TTIs), labels that provide a visual indicator of changes in a product's temperature which are often attached to chilled and frozen food products that can spoil when exposed to higher temperatures for a prolonged period of time.

On the other hand, the definition of smart packaging adopted by this research is much more up to date with how the term is currently used within the industry. Within this research context, smart packaging or smart interactive packaging as it is more recently referred to as (Lydekaityte, 2019; Lydekaityte and Tambo, 2018) is defined as packaging that incorporates or is designed to interact with electronics. Much like other 'smart' terms such as the smartphone, smart home, and smart cities, the term smart packaging is a partial by-product of the 'smart' movement which associates the word 'smart' with connectivity. Seeing as this is generally what industrial practitioners refer to when they use the term (Baron and Dorfer, 2016; Donajgrodzki and Saven, 2013), it is this technologically framed definition of smart packaging that is adopted by this research.

Given that the global smart packaging market is expected grow at an annual growth rate of 6.4% and reach a value of $8.6 billion by 2025 (Cameron, 2020), it is surprising that there is still relatively little interest in conducting academic work on the subject despite its potential to revolutionise marketing. Due to the lack of academic literature, readers should note that a majority of the literature reviewed on smart packaging in this section is practitioner-oriented by nature (e.g. press releases, market reports, news articles). Having set the scene and background of smart packaging research, this section now proceeds to review the current state of smart packaging within the FMCG industry.

2.4.1 Smart Packaging

Based on a review of the existing applications of smart packaging within the FMCG industry, a loose typology of smart packaging composed of three categories (mobile tags, adaptive packaging, connected packaging) can be proposed. In this section,

each category is described alongside its different applications that have been or is expected to be trialled within the FMCG industry.

2.4.1.1 Mobile Tags

Mobile tags are codes attached to product packaging that are designed to be scanned by smart devices (predominantly smartphones) for content delivery. As of the time of writing, mobile tags can be considered to be most prominent and canonical form of smart packaging. Its ease and relatively low cost of implementation has made it accessible to many different brands and has resulted in a huge number of smart packaging experiences designed and implemented around them. Traditionally Quick Response (QR) codes were the most commonly found variant of mobile tags but with the rapid proliferation of Near Field Communication (NFC) technology that is now available on 80% of the entire smartphone market (Ewers, 2019), QR codes are expected to soon be replaced by NFC tags.

There are several practical advantages that NFC tags offer over QR codes but the most significant one would arguably be improved readability. This stems from the difference in the way that NFC tags and QR codes are scanned. Unlike QR codes that are scanned visually, NFC tags are scanned physically. To scan NFC tags, users are not required to align the cameras of their smart devices to the tag in a well-lit environment but simply have to hover their NFC-enabled devices at a suitable distance (1-5cm) from the tag. Additionally, NFC tags are able to be assigned clone-resistant and globally unique identifiers, enabling them to be used as a cost-effective approach for authentication and counterfeit prevention. Another advantage that NFC tags has over QR codes is their appearance. As NFC tags can be made transparent, they are much easier to aesthetically integrate with existing product packaging. The use of NFC tags allows packaging designers to work with a wider surface area as they no longer need to allocate space for QR codes, effectively providing them with more artistic freedom in their designs. They are also much easier to physically incorporate into product packaging as they are modular and can be simply attached through the use of adhesives. Finally, users do not have to install an additional app on their smart devices in order to be able to scan an NFC tag. NFC scanning functionality is generally built into the operating system of NFC-enabled

devices, making it much more accessible to consumers who consider app installation as a barrier to interaction. It should however be noted that while no apps are required to scan the NFC tag itself, one may still be required to fully participate in the smart packaging experience designed around it.

Although NFC tags and QR codes play a highly similar role in marketing (i.e. signposts which direct consumers to informational or entertaining content), studies have shown that NFC tags are much better received (NFC Forum, 2015). As of the time of writing, NFC tags are widely considered by the industry to be one of the most promising applications of smart packaging. This has resulted in the formation of an active movement that aims to remove its remaining barriers to market penetration, them primarily being cost and sustainability. A number of initiatives that address these issues are already currently underway. One such initiative is SCOPE, a program led by the Centre for Process Innovation (CPI) which aims to reduce the production costs of NFC tags to less than £0.01 per tag (Montgomery, 2016). Another would be the research into the development of more sustainable NFC tags. As NFC tags have been criticised for being difficult to recycle due to the use of polyethylene terephthalate (PET) and metal materials in traditional NFC inlays, work is also being carried out to try and replace said materials with a recyclable paper-based substrate (GoToTags, 2018).

Aside from QR codes and NFC tags, there is also another category of mobile tags which although may not be as well-known, is still fairly used within the industry. These are augmented reality (AR) codes, mobile tags which like QR codes are scanned visually but can only be detected by apps specifically designed for the smart packaging experience (unlike QR codes which can be scanned by any app capable of decoding them). AR codes are typically placed on product packaging in a way that part of the actual physical packaging becomes a backdrop for the digital content displayed on the scanning device. This allows for more creative avenues in visual delivery and is the unique selling point of AR codes compared to QR codes and NFC tags which displays purely digital content. Unfortunately, this application of real time image processing is much more computationally intensive and may not run smoothly on lower-end devices which forms a significant proportion of the smartphone and

tablet market (the two main type of smart devices that mobile tags are usually scanned with), drastically reducing their accessibility. Additionally, as a visual code, AR codes also suffer from many of the same drawbacks of QR codes. Collectively, these have been reported to be a major deterrent to consumer participation in AR experiences (Engine Creative, 2014) that is likely to be why the industry has relatively lower expectations of the technology. Shown below in Table 8 are various examples of how mobile tags have been used within the FMCG industry.

Brand	Product Category	Technology	Description
Malibu	Alcohol (Rum)	NFC Tags	Scanning the NFC tag found on the bottle directs consumers to exclusive cocktail recipes and an interactive mobile game which they can play for a chance to win Malibu branded prizes
Ferngrove Wine Group	Alcohol (Wine)	NFC Tags	Scanning the NFC tag found on the bottle reveals whether the bottle has been opened.
Bodegas Barbadillo	Alcohol (Wine)	NFC Tags	Scanning the NFC tag found on the bottle redirects consumers to a customised brand landing page. Consumers can then input a code found underneath the cork for a chance to win 1,000 euros
Kilchoman	Alcohol (Whisky)	NFC Tags	Scanning the NFC tag found on the bottle launches a digital experience that provides information about the product, the distillery it was brewed in, and its brand.
Hopsy	Alcohol (Craft Beer)	NFC Tags	Scanning the NFC tag found on the bottle reveals exclusive information and notes from the brewer
Böen	Alcohol (Wine)	NFC Tags	Scanning the NFC tag found on the bottle directs consumers to a digital experience where they can access a digital tour of the Böen farmhouse, discover and share food pairings, find out more about the winemaking process, build a virtual wine cellar, and upload images to share their experience
Remy Martin	Alcohol (Cognac)	NFC Tags	Scanning the NFC tag found on the bottle reveals whether the bottle has been opened.
Johnnie Walker	Alcohol (Whisky)	NFC Tags	Scanning the NFC tag found on the bottle reveals whether the bottle has been opened.
iOlive	Condiments (Extra Virgin Olive Oil)	NFC Tags	Scanning the NFC tag found on the bottle reveals whether the bottle is authentic
Jameson	Alcohol (Whiskey)	NFC Tags	Scanning the NFC tag found on the bottle provides consumers with suggestions on how to celebrate St. Patricks Day
Jack Daniels	Alcohol (Whisky)	AR Codes	Scanning the AR code found on the bottle using the Jack Daniels AR Experience app directs consumers to content about its founder, brewing process, and distillery
Heinz	Condiments (Ketchup)	AR Codes	Scanning the AR code found on the product using the Blippar app reveals an interactive recipe book
Jeri's Farm	Recreational Drugs (Cannabis)	AR Codes	Scanning the AR code found on the product reveals informational content about the product and allows consumers to select and share their favourite variety

			with a restricted circle of testers
Glenlivet	Alcohol (Whiskey)	AR Codes	Scanning an AR code found on the product using the Shazam app plays a video of the master distiller Alan Winchester explaining the story behind Glenlivet's distinctive taste. Consumers can then guess the ingredients of the whiskey by guessing four aromas and flavours which are then scored and can be shared on social media
W-in-a-Box	Bottled Water	AR Codes	Scanning an AR code found on the product using the Zappar apps plays a video that tells a story about the health benefits of water and the eco-credentials of the product
Bulmers	Alcohol (Cider)	AR Codes	Scanning an AR code found on the product using the Shazam app launches a "keepie-uppie" game and link to a campaign microsite
Bombay Sapphire	Alcohol (Gin)	AR Codes	Scanning an AR code found on the product using the Shazam app reveals an animation that represents the essence and character of the product in AR. Consumers can then watch exclusive videos on how to make various Bombay Sapphire cocktail recipes
Francesco Rinaldi	Condiments (Pasta Sauce)	AR Codes	Scanning an AR code found on the product using the Francesco Rinaldi AR app brings the character depicted on the packaging to life who then elaborates on the different sauces and sustainability of their packaging
Shackleton	Alcohol (Whiskey)	AR Codes	Scanning an AR code found on the product using the Shazam app shows the history of how the whiskey was developed
Patron	Alcohol (Tequila)	AR Codes	Scanning an AR code found on the product using The Patron Experience app prompts consumers to plant an agave plant which then flourishes into a model of the distillery, providing a guided explanation of its tasting notes and brewing process
PEZ	Confectionary (Candy)	AR Codes	Scanning an AR code found on the product using the PEZ Play app unlocks one of the six games and characters playable on the app
Fanta	Soft Drinks	AR Codes	Scanning an AR code found on the product using the Shazam app provides consumers with the chance to win prizes. It would also unlock 12 face filters that they could use to take a selfie and share on social media, with selected selfies being displayed in a follow up out of home campaign.
Tesco	Ready Made Meals	AR Codes	Scanning an AR code found on the product using the Tesco Discover app launches an interactive family quiz game.
Haagen-Dazs	Dairy (Ice-cream)	AR Codes	Scanning an AR code found on the product using the Haagen-Dazs Concerto Timer app launches an ethereal violinist to play Bach Inventions No. 14 that lasts for two minutes, just the right amount of time to wait before consuming ice cream right out of the freezer.

Table 8. Existing Applications of Mobile Tags

2.4.1.2 Adaptive Packaging

Adaptive smart packaging refers to applications of smart packaging that are able to change their appearance or functionality based on environmental stimuli (e.g. motion, temperature, sound, pressure). They typically make use of sensors to detect environmental stimuli which then triggers sensory effects delivered through other connected devices or components that also integrated into the packaging. While not always the case, the functionality of adaptive packaging is generally not dependent on the availability of other supplementary devices (e.g. smartphones). This does however mean that their implementation costs tends to be higher than those of mobile tags, simply due to the cost of components (i.e. batteries, sensors) and engineering required to make this possible. As they are generally not cost-effective to make commercially available, adaptive packaging is often trialled solely during small-scale events. It is perhaps for this reason that most existing applications of adaptive packaging were designed to be more of a novelty and hedonic experience rather than serve utilitarian purposes as they were not designed with scalability and long-term functionality in mind. Shown below in Table 9 are various examples of how adaptive packaging has been used within the FMCG industry.

Brand	Product Category	Technology	Description
Heineken	Alcohol (Beer)	LEDs that react to sound and movement	The bottle lights up when clinked with another or detects a sip. It can also be programmed to light up in synchronisation with music
Strongbow	Alcohol (Cider)	RFID Chip	An RFID chip is embedded in the bottle cap which sends signals to connected surrounding RFID scanners when opened, triggering pre-programmed events like shooting confetti or launching fireworks
GH Mumm	Alcohol (Champagne)	RFID Chip	An RFID chip is embedded in the bottle cap which sends signals to connected receivers in a venue's audio and visual system when opened, allowing bars and clubs to shine a spotlight where it is opened
Oculto	Alcohol (beer)	Pressure sensitive labels, printed electronic pathways, paper batteries, micro switches, LED lights	A pressure switch is placed where the thumb naturally falls when holding the bottle, triggering the LED lights under the brand logo to illuminate
Tostitos	Snack (Crisps)	LEDs, breathalyser, internal power strip and NFC tags	Consumers activate an alcohol sensor by pressing a button on the packaging. LED lights indicate when the sensor is ready for reading. Consumers can then blow on the

	sensor to see if they are fit to drive. If they are, a green circle appears, otherwise, a red steering wheel shows up with the words "Don't Drink and Drive". Scanning the NFC tag will then prompt the consumer to book an Uber ride

Table 9. Existing Applications of Adaptive Packaging

2.4.1.3 Connected Packaging

The final category of smart packaging applications is referred to as connected packaging. Connected packaging is arguably the category which consists of the costliest and most cutting edge applications of smart packaging, embodying what many considers to be the 'ideal' form of smart packaging. Unlike the previous two categories which typically have to rely on novelty or sensory stimulus to prompt consumer interaction, connected packaging is designed to provide regular long-term functionality to consumers (e.g. expiry notifications, reordering assistance) through constant connectivity and monitoring of itself, allowing it to report and communicate to users at all times. According to the findings of the Everyday Connects research project conducted by Mindshare (2016), this is the type of smart packaging that consumers find most appealing. Unfortunately, it is also the least likely to be available in the near future.

As of the time of writing, there are two challenges that needs to be addressed in order for connected packaging to made commercially available, the first being production costs. Due to how connected packaging is designed to communicate with other smart devices, their technical complexity is relatively higher than other types of smart packaging. This effectively translates to higher production costs that are simply not viable to pass on to consumers given the high price elasticity of demand FMCGs. Hence, until production can be made more cost-effective, it is unlikely that connected packaging will be made commercially available. The second challenge relates to the lack of a uniform or standardised communication protocol. Given the wide range of smart devices that connected packaging can possibly communicate to, firms need more reassurance that the connected packaging they launch will be able to communicate with the smart devices owned by a significant proportion of the market. As it is not technically feasible to 'hard-code' connected packaging to be able to communicate with each device on the market, a likely solution would be for

manufacturers to agree on a standardised communication protocol that both connected packaging and these devices could adopt. Doing so would reassure packaging designers that consumers with devices supporting this protocol will be able to access the services they design. However, no such agreement has been made and until one is in place, it is unlikely that firms will be willing to make the jump towards connected packaging.

While production is expected to naturally become more cost-effective alongside technological progress, explicit effort will need to be exerted by the industry to agree on a standardised technical infrastructure that connected packaging adheres to. Based on the findings of Mindshare (2016), personal home assistants such as Amazon Alexa are promising starting points given their relatively low cost and fairly successful penetration into domestic environments. Their capacity to function as a centralised hub could potentially be used by consumers to manage all of their connected packaging applications as opposed to having to use a variety of different platforms for each individual one. Given that Mindshare (2016) also claims that consumers will need to be able to establish connectivity between their connected packaging and other devices in a quickly and easily in order to better encourage uptake, utilising existing technical infrastructure that consumers are already familiar with (e.g. Alexa Skills) would be more convenient for consumers.

Despite the challenges of a successful implementation, practitioners strongly believe that connected packaging will be much more effective than mobile tags and adaptive packaging in establishing and maintaining long term consumer brand relationships. This largely stems from the continuous stream of value propositions they offer as opposed to the 'disposable' value propositions (i.e. loses novelty, information needs only to be learned once) that are offered by most of the applications in Table 8 and 9. Shown below in Table 10 are various examples of how connected packaging has been used within the FMCG industry.

Brand	Product Category	Technology	Description
Absolut	Alcohol (Vodka)	Wireless connectivity, quantity sensing	The bottle is able to detect when its quantity is below a certain threshold and automatically reorder from the nearest delivery service

"Mindshare"	Seasoning (Stockpot)	Wireless connectivity, date and time sensing	Consumers are alerted through their smartphone to use the product a few days before its expiration date. A few recipes using the product are also provided.
"Mindshare"	**Skincare (Moisturiser)**	**Wireless connectivity, temperature sensing**	**Consumers are suggested through their smartphones to use the product when temperature below a certain threshold is detected**
"Mindshare"	Condiments (Yeast Extract Spread)	Wireless connectivity, quantity sensing	Consumers are alerted through their smartphones to restock at a suggested nearby retailer when quantity of the product is detected to be below a certain threshold
"Mindshare"	Teabags	Wireless connectivity, Bluetooth button	Consumers can press a button on the product to add it to their online shopping basket which then needs to be confirmed or cancelled on their smartphone
"Mindshare"	Laundry Detergent	Wireless connectivity, Bluetooth button	Consumers can press a button on the product to add it to their online shopping basket which then needs to be confirmed or cancelled on their smartphone

Table 10. Existing Applications of Connected Packaging

2.4.2 Summary

Three key observations were made based on the scoping of the existing smart packaging applications within the FMCG industry. The first was how aside from applications of smart packaging that were exclusively tailored for use in promotional events, most applications of smart packaging which were commercially available were not designed to be used at the point of sale. Reasons for this include lengthy interaction times (rendering it unsuitable for the acquisition phase of consumption) as well as features that are designed to be used only once the product has been used (e.g. sharing usage experiences) or opened (i.e. the smart packaging element is designed to be inaccessible prior to unboxing). The second observation was how smart packaging is rarely designed to be stand-alone or used in isolation. Most applications of smart packaging (e.g. mobile tags) depend on the availability of a smart device such as a smart phone or tablets and even those which do not, typically requires connectivity with other smart devices in order to be able to function as

intended (e.g. the Strongbow and GH Mumm examples in Table 9 and the Absolut example in Table 10). The final observation relates to the nature of the value propositions offered by the reviewed applications of smart packaging. It is evident that most can be identified as utilitarian, hedonic, or social in nature. A majority of the reviewed applications were designed to provide utilitarian guidance (e.g. usage instructions, expiry notifications, restocking alerts) and hedonic content (e.g. sensory stimulation, sweepstake entries) or influence one's social image (e.g. sharing selfies or quiz results on social media, 'feel-good' effect from supporting sustainable brands). These observations are later taken into consideration when conceptualising value within the smart packaging engagement context and designing the smart packaging applications featured in the two studies conducted for this research.

2.5 Smart Technologies

As previously mentioned in the introduction to this chapter, due to the lack of real-world consumer studies on smart packaging, a supplementary literature review on smart technologies was conducted. In determining the specific fields of the literature said review should cover, a higher-level perspective of smart packaging which viewed it as a subclass of smart technologies was first adopted. As of the time of writing, while there have been many proposed definitions of smart technologies, none has yet to be universally agreed upon. It is however generally accepted by both academics and practitioners to be an umbrella term for technologies that are able to be used interactively or connect to the Internet (Foroudi et al., 2018). Consequently, for ease of reference, given the vast scope encompassed by the term, smart technologies have been classified into various subclasses based on similar characteristics such as use settings and technical functionality. These subclasses can typically be identified by the 'smart' prefix, such as smartphones, smart cities, smart homes, and smart packaging.

While there has been relatively little work that has been done on smart packaging, there is much that can be learned from reviewing the literature on other subclasses of smart technologies. In this section, the literature on smart retailing technologies and smart domestic products are reviewed. More specifically, this review was conducted to identify features or aspects of said technologies more likely to yield

pragmatic findings when built into the applications of smart packaging used in the two studies conducted for this research. These two subclasses were selected for the similarities they shared with smart packaging in terms of the technology they utilise and the setting of their use (depicted in Table 11 below).

	Typical Use Setting	Similarities in technology used
Smart Packaging	Generally designed to be used within the home but may extend to physical retail environments	Near Field Communication, augmented reality, data-driven personalisation
Smart Retailing	Generally designed to be used within physical retail environments but may also extend to digital retail channels	Near Field Communication, augmented reality, data-driven personalisation
Smart Domestic Products	Generally designed to be used within home	Data-driven personalisation

Table 11. Similarities between Smart Packaging, Smart Retailing, and Smart Domestic Products

2.5.1 Smart Retailing

Given how both smart retailing and packaging utilise similar technologies (even if applied in a different manner), reviewing consumer studies that looked into the acceptance and use of these technologies can be beneficial in building up a better understanding of the implications of their implementation in smart packaging. In this section, the findings of said studies and their relevance to this research are discussed. It does not however thoroughly cover the entire scope of smart retailing technologies, focusing only on the prominent technologies also evident in smart packaging.

Much like other terms preceded by the term 'smart', numerous definitions of smart retailing have been proposed and although none has been universally accepted due to the growing breadth of technologies it can be characterised by, they do share the common theme of enhancing the consumption experience (Priporas et al., 2017). This is evident from the definitions proposed by Roy et al. (2017) as well as Pantano and Timmermans' (2014) which defined it as "an interactive and connected retail system which supports the seamless management of different customer touchpoints to personalise the customer experience across different touchpoints and optimise performance over these touchpoints" (p. 259) and "a particular idea of retailing, where firms and consumers use technology to reinvent and reinforce their role in the new service economy, by improving the quality of their shopping experiences" (p.

102) respectively. Like engagement, the study of smart retailing is highly motivated by the benefits it is expected to deliver, some of which includes lower labour costs, increased retailer efficiency, and greater consumer convenience and accessibility (Roy et al., 2017; Wünderlich et al., 2013).

Although smart retailing is not a particularly new field within the research landscape, empirical work is still at a relatively early stage due to the fragmentation resulting from not only the wide range of technologies being studied but also the various retail settings (i.e. brick-and-mortar, mobile, and online) they can be applied to (Inman and Nikolova, 2017; Priporas et al., 2017). In this section, consumer studies surrounding various smart retailing technologies are reviewed, focusing primarily on technologies commonly used in applications of smart packaging: NFC, AR, and data driven personalisation.

2.5.1.1 NFC-enabled Mobile Payments

While applications of smart packaging that make use of NFC technology has traditionally used them to redirect consumers to content through NFC tags, smart retailing technologies utilise this technology in a slightly different manner. Under this umbrella, NFC technology is typically used to facilitate mobile payments, payments made through the use of smart devices (e.g. smart tablets, smartphones) which eliminate the need for consumers to carry cash or card (Kim et al., 2010). In response to the successful global penetration of the smartphone, an increasing number of retailers have also begun to accept mobile payments, a trend that is expected to continue as more devices (e.g. smart watches) begin to support this functionality (Pham and Ho, 2015; Tan et al., 2014). There are various different ways mobile payments can be implemented but Apple and Google Pay which are built into the two leading smartphone operating systems: iOS and Android are most common. Using this functionality, consumers can emulate their contactless debit or credits cards using their smart devices and make payments simply by hovering their NFC-enabled device near most modern card machines (technically termed POS or EFTPOS terminals). Unlike how this technology is utilised in smart packaging, the smart device in this context does not play the role of the scanner but is what is being scanned instead. However, given that both use cases are highly dependent on

consumers conducting a successful NFC scan, the literature on how consumers react to making NFC-enabled mobile payments could still provide a better understanding of consumer sentiment towards this technology.

Based on the conducted literature review, consumer studies on NFC-enabled mobile payments can be classified into two groups. The first group focuses on comparing the speed at which transactions can be completed using NFC-enabled mobile payments. Given that it is generally accepted that both consumers and retailers can benefit from faster transaction times (Brits and Winder, 2005), this body of work aims to verify whether NFC-enabled mobile payments are truly faster than traditional means through empirical work (Polasik et al., 2013; Wiechert et al., 2009). However, as the scanning speed of NFC tags is posited to be much less influential in affecting the consumption experience within the smart packaging context than a transactional one given the lack of time pressure throughout the interaction (i.e. not holding up a queue), this body of work does not align itself closely with the interests of this research. On the other hand, it is actually the second group of work which focuses on investigating consumer acceptance of this technology that is much more relevant.

In studying consumer response towards NFC-enabled mobile payments, researchers typically investigate the potential factors that may affect consumer intention in adopting or using this technology. These studies (Liébana-Cabanillas et al., 2017; Pham and Ho, 2015; Ramos-de-Luna et al., 2019, 2017, 2016; Shin and Lee, 2014; Tan et al., 2014) are typically grounded on variations of Davis' (1989) Technology Acceptance Model (TAM), a widely applied generic model that posits the acceptance of a technology to be determined by its perceived usefulness and ease of use. While a majority of the studies report that the perceived usefulness of NFC-enabled mobile payments (i.e. faster transactions) does influence consumer intention of using the feature, the same cannot be said for its perceived ease of use (Liébana-Cabanillas et al., 2017; Pham and Ho, 2015; Ramos-de-Luna et al., 2017; Shin and Lee, 2014). While this may initially suggest that consumers feel the same way about NFC tags in smart packaging (i.e. do not consider their ease of use to be important), it should be noted that the perceived ease of use of NFC-enabled mobile payments is relative to

the perceived ease of use of its alternatives. Given that the improvements in the usability of NFC tags over its older predecessors (i.e. QR codes) are much more significant than those of NFC-enabled mobile payments over cash or card, it can be argued that the influence of perceived ease of use on consumer intention to use NFC tags could still be significant.

Aside from the more generic factors (i.e. perceived usefulness and perceived ease of use) commonly found in the adapted variations of the TAM, there were also three other factors which recurred relatively frequently across the reviewed conceptual models. Listed in descending order of recurrence, these were namely subjective norms, personal innovativeness in information technology (PIIT), and perceived risk or security. Subjective norms refer to society's view of the technology. While this has been shown to significantly influence consumer intention of adopting NFC-enabled mobile payments, it is unlikely to be as relevant within the smart packaging context given the domestic settings they are primarily designed for. Given that the home is generally considered to be a private place, societal views are less likely to influence activities conducted within the space. This is then followed by PIIT, a consumer's willingness to adopt new technology (Agarwal and Prasad, 1998). Like subjective norms, PIIT has also been found to significantly influence consumer intention of adopting NFC-enabled mobile payments (Pham and Ho, 2015; Ramos-de-Luna et al., 2016; Tan et al., 2014). This is consistent with the findings of various other consumer studies that identified PIIT's capacity to significantly influence one's intention to adopt new technology (Crespo and Rodríguez, 2008; Liu et al., 2010). This was not surprising as NFC technology, while fairly dated can still be argued to be relatively new given the relatively low number of smartphones which currently supports this functionality. Surprisingly, perceived risk and security recurred least frequently out of the three. This was unexpected as given the sensitivity of payment card information that is transmitted when making NFC-enabled mobile payments, one would have expected the security of this feature to strongly influence consumer intention of adopting this technology. Yet, studies suggest that consumer sentiment regarding the influence of this factor on their intention to adopt NFC-enabled mobile payments has been mixed. For instance, while one found its lack of security (i.e.

lacking authentication and verification prompts) to be positively associated with its perceived ease of use (Shin and Lee, 2014) and indirectly affects its likelihood of adoption, another contradicts it by reporting it to be the most influential factor (Doan, 2014). This is also evident from the number of studies that reports it to be a significant factor (Liébana-Cabanillas et al., 2017, 2017; Pham and Ho, 2015; Ramos-de-Luna et al., 2019) alongside those that report otherwise (Tan et al., 2014). Regardless, it is posited that security will have even less of an influence within the context of NFC tags as no transmission of payment card information will be involved throughout the interaction.

2.5.1.2 Augmented Reality

Unlike NFC technology, augmented reality (AR) is utilised by smart retailing and smart packaging in a fairly similar manner. As previously described in Section 2.4.1.1, AR is a technology that overlays digital or virtual elements (i.e. computer graphics) onto real world images (e.g. photographs). Given its unique approach to visualisation, marketers have been investigating its potential to enhance the retail experience of shopping for aesthetically oriented products such as clothing (Szymczyk, 2018, 2014), makeup (Rayome, 2018; Scholz and Duffy, 2018), paint (Dacko, 2017), and furniture (Baier et al., 2015). Within the industry, this concept has been trialled and showcased by brands such as Ted Baker and Golfino which made use of dynamic image capture, processing, and analysis to simulate virtual fitting rooms by overlaying images of their products (e.g. clothing) on that of their consumers (Szymczyk, 2018, 2014). However, as these installations require expensive equipment (e.g. interactive displays, motion capture cameras, computers), they are relatively limited in number and generally only available in exclusive offline settings. This posed a challenge for academics who wanted to conduct empirical work within the context and would later cause the gradual shift in their attention towards AR technologies accessible on mobile apps and websites instead. Consequently, work looking into online implementations of this approach was then carried out. Notable examples include the case studies on IKEA (Baier et al., 2015; Rauschnabel et al., 2019) and Dulux (Dacko, 2017) which both launched a mobile app that allows consumers to upload images of their home to visualise how furniture and wall paint

colours would look like in their household respectively. Another would be the case study on Sephora which undertook a similar approach by launching a website where consumers could upload images of themselves through a webcam or smartphone camera to visualise how they look with various makeup products (Rayome, 2018; Scholz and Duffy, 2018).

Based on the conducted empirical work in the investigation of consumer response to applications of AR within the retail sector, AR seems to be generally well accepted as a technological feature that enhances the shopping experience (Bonetti et al., 2019; Dacko, 2017; Hilken et al., 2017; Huang and Hsu Liu, 2014). Tested within the context of the product categories mentioned above (i.e. clothing, paint, furniture, makeup), studies show that consumers perceived this technology to not only offer more utilitarian value propositions through the provision of more complete information that reduces uncertainty when making personal purchases (Dacko, 2017) but also offer hedonic value propositions that makes the shopping experience more immersive and enjoyable (Bonetti et al., 2019; Hilken et al., 2017; Huang and Hsu Liu, 2014). Additionally, they have also been found to positively influence consumer satisfaction and willingness to purchase (Poushneh and Vasquez-Parraga, 2017) as well as inspire, which may in turn positively influence consumer brand attitudes (Rauschnabel et al., 2019).

However, when translating these findings to the context of smart packaging of FMCGs, it should be noted that the nature of the products that have been studied are very different to most FMCGs. Compared to most FMCGs, clothes, furniture, paint, and makeup are products with persisting effects or used over a relatively longer period. For instance, the potentially undesirable effects (financially or otherwise) of painting an entire house in an unappealing colour, ordering clothes or furniture which does not fit, or purchasing makeup not suitable for one's skin are arguably much more severe and long lasting than if one were to say buy a wrong pack of ground coffee. For this reason, it is not surprising that consumers are willing to invest more time and effort into utilising the AR experience to gain a better understanding of what they are purchasing. However, FMCGs which are purchased with minimal cognitive effort are unlikely to be viewed the same way. This can be

inferred from how the AR experiences reviewed in Section 2.4.1.1 were designed to be used post-purchase, as opposed to those discussed in this section that were designed to be used pre-purchase, suggesting that consumers are likely to be much more involved with the purchase of these products than those of FMCGs.

Another notable and surprising observation made from this literature review was how consumers seem to be more concerned with the security and privacy of applications utilising AR than those of NFC-enabled mobile payments, a technology that involves transmission of actual payment card information. This was theorised to be due to how jaded consumers have become when it comes to issues pertaining to digital transactions, possibly resulting from their acclimatisation to online shopping or simply because they place a higher level of trust in the institutions behind the infrastructure (i.e. Mastercard, Visa, Google, Apple) than they do in branded app developers. Given that smart packaging is also expected to be backed by corporations of that magnitude (i.e. capable of standardising the industry), it may be worthwhile to look into whether consumer reluctance to share personal information would still apply within the context of smart packaging.

Finally, it is also important to note that while numerous studies have found that an AR experience can positively influence a consumer's consumption experience, one should be aware of their nuances. While these may paint AR technology in a positive light, studies that have directly compared an AR shopping experience to a non-AR one are few and limited (Brengman et al., 2019). Furthermore, among those that do, most generally compares them to arguably dated platforms such as print magazine ads (Mauroner et al., 2016) rather than contemporary and more competitive ones like websites and apps. Some even excludes data from consumers who experienced technical difficulties (Hilken et al., 2017) which unfortunately is not uncommon given the high computational demands of AR technologies. Despite the advancements in the field of computer vision that is primarily responsible for blending the digital images with the physical overlay, running AR applications smoothly is still very computationally taxing, even on relatively recent flagship smart devices (Javornik, 2016; Rese et al., 2017). It was primarily for this reason that the decision to rule out

AR oriented smart packaging features from this context of this research would later be made.

2.5.1.3 Data-Driven Personalisation

The final category of smart retailing applications discussed in this section is data-driven personalisation. Perhaps better known as machine learning, data-driven personalisation is generally used within the smart retailing context to develop and improve the accuracy of personalised recommender systems, systems that allow retailers to make recommendations based on the personal data of their consumers (Pathak et al., 2010; Yang and Gao, 2017). While there are a multitude of different ways to implement them, Chatzidimitris et al. (2020) notes that the two most common approaches are based on consumer demographics and item similarity. Data is typically collected through loyalty cards and online shopping accounts, allowing retailers to map the shopping behaviour of their consumers which are then used to train and build models that make personalised recommendations based on actual historical data. Recommendations can then be delivered through various means such as personalised communication (e.g. email, post, SMS, push notifications), coupons, or simply as a list of products on their online shopping platforms. Following the global penetration of the smartphone, these also became possible to localise. Through the use mobile apps, retailers are now able to detect consumer location and provide localised recommendations (Yang et al., 2008; Yuan and Tsao, 2003). Given that research on personalised recommender systems is generally focused on making technical improvements by optimising data processing and model structure (Chatzidimitris et al., 2020; Hwangbo et al., 2018), it should first be clarified that it is not this body of work that this thesis discusses in this section. Rather, It is actually the often overlooked body of work which explores consumer sentiment towards these systems (Ozok et al., 2010) that this thesis is much more interested in given their similarities with smart packaging in their use of personal data.

As data collection, storage, and processing became more cost effective, personalised recommender systems were able to be built with increased computational capacity and trained with much larger datasets. While this significantly improved their accuracy, they also became increasingly viewed by consumers as intrusive (Raber et

al., 2018). These concerns are amplified even further by the mainstream media's constant exposure of Big Data Disasters, events which highlights the potentially unwanted consequences that could arise from use of this technology. One such example was how Target managed to correctly predict a teenager was pregnant even before she realised it herself (Corrigan et al., 2014; Hill, 2012), denoting just how much consumer personal data retailers must have in order to be able to develop models that are accurate to this extent. Additionally, due to scandals like Cambridge Analytica's (Cadwalladr and Graham-Harrison, 2018), consumers have also become increasingly wary of how much personal data they are giving out to corporations like Google and Facebook in exchange for using their services and consequently, gradually growing more resistant towards the practice of personal data collection. It is for this reason that work is currently dedicated to building less intrusive recommender systems (Brack et al., 2019; Friedman et al., 2016, 2015; Martin et al., 2020) which unfortunately, have yet to perform as well as the traditional ones.

Despite the increasing consumer sentiment against personal data collection, research does suggest that consumers can warm up to the notion provided they benefit from the exchange, a theory that academics refer to as the privacy calculus (Dinev and Hart, 2006). In fact, although the mainstream media has been very vocal in portraying consumer perception of personal data collection as a violation of privacy, numerous studies have actually reported the contrary, reflecting a phenomenon termed the privacy paradox (Norberg et al., 2007). For instance, Barth and de Jong (2017) reported that whilst consumers generally do express concerns about privacy, they do very little to actually protect their data and can be very easily swayed by benefits they could receive for them in exchange. As this has also been observed in several other studies (Gutierrez et al., 2019; Keith et al., 2013; Xu et al., 2011), these findings collectively suggest that despite being aware of the intrusive nature of data-driven personalisation, consumers can still willingly accept them, even more so if firms are transparent (e.g. explain the types of data they collect and what it is being used for) in their conduct (Gu et al., 2017). Another observation made from this review was how aside from location data, personal data is often

bundled together and treated as collective entity. Very few studies have looked into specific types of personal data and not much is known about whether different types (e.g. shopping patterns, demographic) of personal data influence a consumer's position on the privacy calculus differently, revealing a research gap which this thesis helps address through its investigation of smart packaging features that make use of different types of personal data.

2.5.2 Smart Domestic Products

Having reviewed smart retailing technologies, it was observed that although empirical studies have been carried out to investigate consumer sentiment towards the use of smart technologies within a retail setting, not much is known about how these technologies can influence consumption behaviours post-purchase. The decision to review smart domestic products was made due to their use of personal data within the home. Given that smart packaging is expected to provide data-driven personalisation using consumer personal data collected within the home in the near future, smart domestic products can be considered to be fairly similar to them in terms of technology and use context.

Smart domestic products are defined by Woodall et al. (2018) as appliances within domestic environments (i.e. households) that functions as a technological interface which provides or supports domestic routines (e.g. cooking, cleaning, energy usage management). While a lot of these are designed to encourage material consumption, many are also designed to enhance personal wellbeing by supporting, assisting, or imposing behavioural regimes, facilitating what Garcia et al. (2015) refers to as 'ambient assisted living'. It is also these products that function as building blocks of what the industry refers to as a smart home ecosystem. Examples include thermostats (Google, 2020), light bulbs (Philips, 2020), doorbells (Ring, 2020), speakers (Amazon, 2020), pod coffee machines (Nespresso, 2020), robot vacuum cleaners (Roomba, 2020), and many more. However, despite the commercial availability of smart domestic products, there has been relatively little market research conducted around them as scholarly attention has primarily been directed at their engineering instead (Wilson et al., 2015). In this section, current state of consumer-oriented academic literature on smart domestic products is reviewed.

Although the smart home is a fairly aged concept, Weinreich (2017) contends that it was not until the launch of the Nest Thermostat in 2011 that interest in the smart home movement resurged. The Nest Thermostat, an energy-saving thermostat that allows users to remotely detect and automatically set the temperature of rooms they are monitoring through the Internet was one of the earliest modern smart domestic products that many consider to be a catalyst to their development. While other smart domestic products prior to the Nest Thermostat did exist (such as those which enabled remote operation of locks and light switches), they needed to be connected to a stand-alone device within the home (termed a bridge) and communicated solely using vendor specific protocols like the Z-Wave and Zigbee. This not only limited the operational area to within the confines of the home (i.e. smart domestic products can only be controlled through the bridge as opposed to any device that is able to connect to the Internet) but also made integration of smart domestic products from different vendors into the smart home ecosystem logistically challenging as multiple bridges would be required if a user wanted to use smart domestic products from different vendors (Guhr et al., 2020).

Given the variety of smart domestic products that are currently available on the market, It should first be clarified that this review does not comprehensively cover the entire range, focusing solely on devices that are able to offer data-driven personalisation instead. Within the smart home context, these are typically devices which can automatically adapt their functionality to better suit their user's consumption habits without needing manual user intervention. The Nest Thermostat (Google, 2020) is an example of such a product as it is able to detect when rooms are empty and automatically adjust the household temperature once it has been trained, saving its users money by reducing their energy consumption. This is as opposed to smart domestic products like the Phillips Hue light bulbs (Philips, 2020) which although can be controlled remotely through the Internet ultimately still requires user input to modify its behaviour. While this focus was initially chosen due to the more intrusive nature of data collection required to train said devices, the literature review has revealed that this does not necessarily need to be the case in order to prompt privacy related concerns. Studies show that simply having smart domestic

products with the technical capacity to do so within consumer homes are sufficient to prompt privacy related concerns, even if these devices are not actually collecting personal data (Winder, 2020). This is most likely due to how sceptical consumers have become of vendors actually taking into account their privacy related concerns given the number of occasions they have been caught out by agreeing to complex and lengthy terms and conditions that are simply not feasible to be read thoroughly (BBC, 2015)

Despite having acknowledged the privacy concerns prompted by smart domestic products, academic work looking into their influence on the adoption of smart domestic products has been minimal with as focus has been primarily allocated towards their engineering instead (Guhr et al., 2020; Wilson et al., 2015). While several studies have been conducted which looked into the factors that influence the acceptability and adoption of smart domestic products (Ahn et al., 2016; Caivano et al., 2018; Hubert et al., 2019; Kim et al., 2017; Paetz et al., 2012; Shih, 2013; Yang and Newman, 2013) and many have actually found privacy risks to be a factor that is holding back adoption (Balta-Ozkan et al., 2013; Brush et al., 2011; Chan et al., 2009; Kim et al., 2017; Kotz et al., 2009; Mani and Chouk, 2017), work investigating the influence of privacy-related factors on smart domestic product adoption has been minimal (Birchley et al., 2017; Guhr et al., 2020; Zheng et al., 2018), even amidst the ongoing development of less intrusive and more transparent smart domestic products (Crabtree et al., 2016; McKenna et al., 2012; Mortier et al., 2016; Perera et al., 2017). Additionally, it was also observed from the literature review that the privacy calculus theory also applies within the context of smart domestic products. For instance, Zheng et al.'s (2018) work corroborates how consumers are willing to accept the loss of privacy in exchange for the convenience of living with sensory technologies (Demiris et al., 2008; Townsend et al., 2011) and that they weight benefits much heavier than privacy risks when contemplating whether they would like to adopt a smart domestic product. It is however worth noting that smart domestic products are able to offer value propositions typically perceived to be much more valuable (e.g. regular cost-saving optimisation) than those offered by smart retailing technologies (e.g. saving a few seconds during checkout, a novel

experience unlikely to be revisited). Hence, it is not actually surprising that consumers are more willing to share their personal data in exchange for said benefits. Nonetheless, these findings provide further evidence that despite being aware of the privacy risks, consumers can be convinced to share their personal data. Consequently, this also makes a stronger case for researchers to address the research gap identified earlier in Section 2.5.1.3 regarding the investigation of the influence of personal data on smart technology adoption at a more granular level which once addressed can be used by practitioners to adapt their designs of smart technologies to better meet the privacy needs of their consumers and could potentially lead to higher rates of adoption.

2.5.3 Summary

Based on the literature review that was conducted around smart retailing and smart domestic products, it is apparent that despite the concerns consumers have expressed over the privacy-related risks of using smart technologies in both retail and domestic settings, they are often willing to undertake these risks in exchange for the convenience and benefits they provide. Furthermore, although privacy has been identified as an influential factor in determining a consumer's likelihood to adopt smart technologies, it is often treated as a collective component and not sufficiently broken down, limiting the investigation on how different types of personal data influence user perception. Collectively, this review provided guidance in directing the design of the smart packaging prototypes towards targeting research gaps concerning how consumers react to the use of different types of personal data for personalisation.

Additionally, it was also observed that marketing's use of the TAM as the go-to model in exploring consumer sentiment towards physical technology is likely to be outdated. Consistent with the early criticisms that have been made of the model (Bagozzi, 2007), the TAM neglects the social and emotional aspects of technology use such as the hedonic satisfaction from AR-driven shopping (Bonetti et al., 2019; Hilken et al., 2017; Huang and Hsu Liu, 2014) through their inherent assumption of users as rational and goal-driven individuals. While attempts have been made to address this weakness (e.g. introducing trust-related factors), the literature review

reveals that this gap has yet to be sufficiently filled and is partially addressed by this research through its use of an alternative multidimensional perspective (i.e. the engagement construct) in gauging consumer sentiment towards technology.

Finally, given the hypothetical (i.e. participants are not given the chance to interact with the actual technologies) and controlled (i.e. laboratory setting) nature of a lot of the empirical work that had been carried out on this subject, this review further clarifies the novelty of the contribution that this research made through its use of technology probes as a method to collect real world interactional data within the field of marketing.

2.6 Working Definition of Smart Packaging Engagement

Having reviewed the various conceptualisations of engagement, the current state of smart packaging within the FMCG industry, consumer sentiment towards smart technologies, as well as the value literature, the researcher is now ready to propose a working definition of smart packaging engagement. As previously mentioned in Section 2.2.1, this working definition uses Brodie et al.'s (2011) widely accepted conceptualisation of customer engagement as a starting point. This decision was primarily made for two reasons. The first was the conceptualisation's acceptance within the academic community. Not only did it underwent a rigorous panel review prior to its publication but the three-dimensional perspective (cognitive, emotional, behavioural) of engagement it introduced has also been adopted by several academics in their conceptualisations of various engagement-oriented constructs (Brodie et al., 2011; Calder et al., 2009; Dessart et al., 2015; Hollebeek, 2011; Hollebeek et al., 2014; Patterson et al., 2006; Vivek et al., 2012), indicating its acceptance within the academic community. The second was its context free nature. The conceptualisation is not tied down to a specific focal object (such as social media or brand), allowing it to be adapted for the smart packaging context with relative ease.

In adapting Brodie et al.'s (2011) conceptualisation of engagement for the smart packaging context, it was also decided that the working definition would take into account the negative valence of engagement, a facet that has been predominantly

overlooked by most conceptualisations and only acknowledged by few (Bowden et al., 2017; Doorn et al., 2010; Hollebeek et al., 2014; Juric et al., 2016). Given the amount of privacy related concerns surrounding smart technologies, smart packaging is also expected to face similar issues and the researcher believes that this should be captured by the construct as a better understanding of why people do not engage with smart packaging can contribute towards an understanding of how to design engaging smart packaging. Following that, the individual dimensions of smart packaging engagement then had to be defined. This was carried out by first reviewing how each dimension was defined in existing engagement-oriented constructs and then selecting the most appropriate one for the context of smart packaging. As the working definition aims to define each dimension separately, only engagement-oriented constructs that adopt a similar approach were reviewed. This does not however exclude unidimensional conceptualisations which are limited to a single dimension like Doorn et al.'s (2010) conceptualisation of consumer engagement behaviours that is limited to the behavioural dimension. The following sections elaborate on the selection of constructs that were selected to capture the cognitive, emotional, and behavioural dimensions of smart packaging engagement for the purpose of this study.

2.6.1 Dimensions of Smart Packaging Engagement

2.6.1.1 The Cognitive Dimension of Smart Packaging Engagement

Reference	Context	Conceptualisation
Patterson et al. (2006)	Customer Engagement	Absorption – The state of a customer being fully concentrated, happy, and deeply engrossed while playing his role. They feel time passes quickly while interacting with the service employees, the firm, the brand, or the other customers. Customer might find it difficult of detaching themselves from the brand.
Higgins and Scholer (2009)	Engagement	Sustained Attention – A state of being involved, occupied, fully absorbed, or engrossed in something
Mollen and Wilson (2010)	Online Brand Engagement	Cognitive commitment to an active relationship with the brand as personified by the website or other computer-mediated entities designed to communicate brand value characterised by the satisficing of instrumental value (utility and relevance).
Hollebeek and Chen (2014)	Brand Engagement	Immersion – The level of a consumer's positive/negatively valenced brand related thoughts, concentration, and reflection in specific brand interactions

Hollebeek et al. (2014)	**Customer Brand Engagement in Social Media**	**Cognitive Processing – A consumer's level of brand-related thought processing and elaboration in a particular consumer-brand interaction**
Vivek et al. (2014)	Customer Engagement	Conscious Attention – The degree of interest the person has or wishes to have in interacting with the focus of their engagement
So et al. (2014)	Customer engagement	Absorption – A pleasant state which describes the customer as being fully concentrated, happy, and deeply engrossed while playing the role as a consumer of the brand Enthusiasm – The degree of excitement and interest that a customer has in the brand Attention – The degree of attentiveness, focus, and connection that a consumer has with a brand
Dwivedi (2015)	Consumer Brand Engagement	Absorption – Sense of being fully concentrated and happily engrossed in brand interactions and in which time passes quickly
Dessart et al. (2016)	Online Brand Community	Attention – Cognitive availability and amount of time spent thinking about, and being attentive to, the engagement partner Absorption – Level of consumer's concentration and immersion with an engagement partner

Table 12. Existing Conceptualisations of the Cognitive Dimension of Engagement

After taking into consideration the existing conceptualisations of the cognitive dimension of engagement-oriented constructs (refer to Table 12 above) the researcher asserts that Hollebeek et al.'s (2014) construct of 'cognitive processing' is what best captures the cognitive dimension of smart packaging engagement. However, as this construct was originally intended to capture the cognitive dimension of customer brand engagement in social media, changes had to be made to adapt the construct towards the context of smart packaging, culminating in an adapted definition of 'cognitive processing' as "the level or amount of cognitive thought about a smart packaged product prompted by a consumer's interaction with smart packaging". This decision was made based on the lack of bias towards the positive valence of this construct compared to others that are described using terms such as such as 'degree of excitement and interest' and 'happy' that does not acknowledge the negative valence of cognitive engagement which although was not observed from the findings of this study, has been in others (Bowden et al., 2017; D. Hollebeek and Chen, 2014)

2.6.1.2 The Emotional Dimension of Smart Packaging Engagement

Reference	Context	Conceptualisation
Patterson et al. (2006)	Customer Engagement	Dedication – Customer's sense of belonging as a customer
Mollen and Wilson (2010)	Online Brand Engagement	Affective commitment to an active relationship with the brand as personified by the website or other computer-mediated entities designed to communicate brand value characterised by the satisficing of experiential value (emotional congruence with the narrative schema encountered in computer-mediated entities).
Hollebeek and Chen (2014)	Brand Engagement	Passion – The degree of a consumer's positively/negatively valenced brand related affect exhibited in particular brand interactions
Hollebeek et al. (2014)	Customer Brand Engagement in Social Media	Affection – A consumer's degree of positive brand-related affect in a particular consumer/brand interaction
Vivek et al. (2014)	Customer Engagement	Enthused Participation – The zealous reactions and feeling of a person related to using or interacting with the focus of their engagement
So et al. (2014)	Customer engagement	Identification – The degree of a consumer's perceived oneness with or belongingness to the brand
Dwivedi (2015)	Consumer Brand Engagement	Dedication – Sense of significance, enthusiasm, inspiration, pride, and challenge
Dessart et al. (2016)	Online Brand Community	Enthusiasm – Intrinsic level of excitement and interest regarding the engagement partner Enjoyment – Pleasure and happiness derived from interactions with the engagement partner

Table 13. Existing Conceptualisations of the Emotional Dimension of Engagement

Existing conceptualisations of the emotional dimension of engagement-oriented constructs (refer to Table 13 above) are typically characterised by feelings of pride, sense of belonging, and psychological closeness (Dwivedi, 2015; Mollen and Wilson, 2010; Patterson et al., 2006). While this may have been deemed relevant to the context these engagement constructs were conceptualised for (e.g. customer brand engagement), the researcher argues that it is unsuitable for the context of smart packaging engagement due to high likelihood that the infrastructure supporting smart packaging experiences is not limited to a single brand or organisation (i.e. the smart packaging experience makes use of sensors manufactured by brand X for products branded Y using apps developed by Z), greatly diminishing and fragmenting said feelings. Instead, the researcher would like to base the conceptualisation of this dimension on Vivek et al.'s (2014) construct of enthused participation which they

defined as “the zealous reactions and feelings of a person related to using or interacting with the focus of their engagement”. Similar to what was done during the conceptualisation of the cognitive dimension, this definition was adapted for the smart packaging context by replacing “the focus of their engagement” with “smart packaging”. The bias towards the positive valence was once again also observed in this conceptualisation through the use of terms such as ‘enthused’ and ‘zealous’ that neglects or disregards negatively valenced emotional engagement and mitigated, resulting in the proposed conceptualisation of “emotions aroused in a consumer as a result of their interaction with smart packaging” for this dimension.

2.6.1.3 The Behavioural Dimension of Smart Packaging Engagement

Reference	Context	Conceptualisation
Patterson et al. (2006)	Customer Engagement	Vigour – Customer’s level of energy and mental resilience while interacting with the service employees, the organisation, the brand, or with other customers Interaction – Various interactions between the customer and service employees, between the customer and the organisation, between the customer and the brand, and among the customers themselves
Brodie et al. (2013)	Consumer Engagement in a Virtual Brand Community	Sharing – Sharing personal relevant information, knowledge, and experiences through the process of active contributions to the co-creation of knowledge within the online community Learning – Vicarious acquisition of cognitive competencies that consumers apply to purchase and consumption decision-making Advocating – Actively recommending specific brands, products/services, organisations, and/or ways of using products or brands Socialising – Two-way, non-functional interactions through which consumers acquire and/or develop attitudes, norms, and/or community language Co-developing – Process where consumers contribute to organisations and/or organisational performance by assisting in the development of new products, services, brands, or brand meanings
Hollebeek et al. (2014)	Customer Brand Engagement in Social Media	Activation – A consumer’s level of energy, effort, and time spent on a brand in a particular consumer brand/interaction

Vivek et al. (2014)	Customer Engagement	Social Connection – Enhancement of the interaction based on the inclusion of others with the focus of engagement, indicating mutual or reciprocal action in the presence of others
So et al. (2014)	Customer Engagement	Interaction – Various participation (both online and offline) that a customer has with a brand organisation or other customers outside of purchase
Dwivedi (2015)	Consumer Brand Engagement	Vigour – High levels of energy and mental resilience when interacting with a brand, and the consumer willingness and the ability to invest effort in such interactions
Dessart et al. (2016)	Online Brand Community Engagement	Sharing - The act of providing content, information, experiences, ideas or other resources to the engagement partner Learning – The act of seeking content, information, experiences, ideas or other resources from the engagement partner Endorsing – The act of sanctioning, showing support, referring resources shared by the engagement partner
Dolan et al. (2016)	Social Media Engagement Behaviour (SMEB)	Co-creation – Highest possible level of positive, active SMEB whereby users initiate unprompted, positive, and active contributions to social media communities Positive Contribution – Moderate level of positive, active SMEB whereby users make positive and active contributions to existing content on social media brand pages Consumption – The minimum level of positive, passive SMEB whereby users consume content without any form of active reciprocation or contribution Dormancy – Temporary state of inactive, passive SMEB by users who have previously interacted with the social media community Detachment – Minimum level of negative, active SMEB whereby users temporarily or permanently conclude their membership Negative Contribution – A moderate level of negative, active SMEB whereby users make negative contributions to existing content within the social media community Co-destruction – The highest possible level of negative, active, SMEB whereby users initiate unprompted, negative contributions to the social media community

Doorn et al. (2010)	**Consumer Engagement Behaviours**	**Customer engagement behaviours go beyond transactions, and may be specifically defined as a customer's behavioural manifestations that have a brand or firm focus, beyond purchase, resulting from motivational drivers**
Hollebeek and Chen (2014)	Brand Engagement	Activation – A consumer's positively/negatively valenced energy, effort, and time spent on a brand in particular brand interactions

Table 14. Existing Conceptualisations of the Behavioural Dimension of Engagement

Upon review of the existing conceptualisations of the behavioural dimension of engagement-oriented constructs (refer to Table 14 above), the researcher observed that they could be loosely categorised into two groups: general and specific. As it names implies, conceptualisations that fall into the general category typically defines the behavioural dimension merely as interactions (or the resources exerted into them) with their engagement partners (D. Hollebeek and Chen, 2014; Dwivedi, 2015; Hollebeek, 2011; Hollebeek et al., 2014; Patterson et al., 2006; So et al., 2014; Vivek et al., 2014) whereas conceptualisations that fall into the specific category defines it as context-specific actions like sharing and endorsing on social media (Dessart et al., 2016; Dolan et al., 2016; Hollebeek et al., 2014). The researcher decides that at this stage, a loose definition is more suitable as unlike social media which is a well-established context (i.e. one can expect a common baseline level of functionality such as a form of posting, liking, commenting, and sharing to be available to users of social media), the same cannot be said for smart packaging in its current state which is still growing and highly experimental. This approach to conceptualisation would restrict its applicability to only other smart packaging experiences designed in a similar manner. As the researcher would like to avoid conceptualisations that are too restrictive at this stage, the decision was finally made to define the behavioural dimensions using an adapted conceptualisation of Doorn et al.'s (2010) that was adapted to "a consumer's behavioural manifestations focused around smart packaging".

2.6.2 Dimensions of Value

Like engagement, although value is generally agreed upon to be a multidimensional construct (Babin et al., 1994; Overby and Lee, 2006; Park et al., 1986; Sheth et al., 1991; Smith and Colgate, 2007; Sweeney and Soutar, 2001), there is still a lack of consensus on what these dimensions are. To address this issue, the researcher

rhetorically posed the question of "what types of value are likely to be co-created by consumers from their interaction with smart packaging throughout their consumption of FMCGs?". The various proposed dimensions of value (Table 7) as well as the existing applications of smart packaging (Table 8, 9, and 10) were consulted in making this decision.

This ultimately led to his decision of conceptualising value as a three-dimensional construct with utilitarian, hedonic, and social dimensions that is defined as follows. Utilitarian value is value co-created from interactions with smart packaging that provides functional benefits throughout the consumption experience. It combines the essence of Park et al.'s (1986) definition of utilitarian value but is amended in such a way that it does not necessarily have to solve consumption-related problems but can positively or negatively affect how consumers can acquire (e.g. make purchase decisions), use (e.g. provide usage instructions), and dispose (e.g. recycling guidance) in functional ways. Utilitarian value is defined as "value co-created or co-destroyed from interactions with smart packaging that affects how consumers acquire, use, and dispose of a smart packaged product". Hedonic value is defined based on Smith and Colgate's (2007) definition and simply given a focal object, resulting in it being defined as "value co-created or co-destroyed from interactions with smart packaging that arouses feelings, and emotions" within the research context. Finally, social value is defined based on Sweeney and Soutar's (2001) notion of self-concept enhancement. It is defined as "value co-created or co-destroyed from interactions with smart packaging that affects one's self-concept". Like engagement, this conceptualisation would also acknowledge the negative valence of value and subsequently, value co-destruction. Examples of negative value would be how interactions with smart packaging make the consumption experience more troublesome, arouses negative feelings or emotions, or make consumers feel worse about themselves in utilitarian, hedonic, and social dimensions respectively.

These dimensions were selected for a number of reasons. First, the review of the conceptual value literature strongly indicates that the utilitarian and hedonic dimension were very prominent and recurred frequently (Holbrook and Hirschman, 1982). Given that these dimensions were historical pillars that represent the major

turning points in the value research agenda, they are supported by a highly cited body of literature (Babin et al., 1994; Overby and Lee, 2006; Park et al., 1986; Sánchez-Fernández and Iniesta-Bonillo, 2007; Sandström et al., 2008; Sheth et al., 1991; Smith and Colgate, 2007; Sweeney and Soutar, 2001). Second, the utilitarian and hedonic dimensions are also recognised in the FMCG consumption literature, particularly in work that classifies consumption motives to be either utilitarian or hedonic (Adams, 2016; do Vale and Duarte, 2013; Suresh, 2018). As these collectively strongly suggest that utilitarian and hedonic value is co-created from an individual's consumption of FMCGs, these two dimensions were selected as dimensions of value under the smart packaging engagement context. The inclusion of social value into the conceptualisation was driven by the increasing attention that consumers are placing on the provenance of products they consume (Maguire, 2010; Reid and Rout, 2016). Due to how consumers incorporate the brands of products they consume into their self-identity (Escalas, 2004; Sprott et al., 2009), what they consume effectively affects how they perceive themselves. For instance, positive and negative connotations associated with practices exhibited or supported by brands like sustainable production and unlawful working conditions can be 'injected' by the consumer into their self-identity if they consume products of that particular brand. As the social aspects of consumption are also well grounded (Belk, 2010; Carrier and Luetchford, 2012; Fitzmaurice and Comegys, 2006; Holbrook and Hirschman, 1982), there is sufficient support to include the social dimension of value as part of the working definition of smart packaging engagement.

Besides, the review of the existing applications of smart packaging is also supportive of this tripartite conceptualisation. It was observed from the review that a significant proportion of smart packaging applications were designed to provide detailed instructions on how to use the product (e.g. Heinz, Hopsy), deliver a novel entertaining hedonic experience (e.g. Heineken, Strongbow, Occulto), provide information relating to the provenance of a product (e.g. Francesco Rinaldi), deliver content meant to be shared by the consumers within their social circle (e.g. Fanta, Böen), and make consumers feel special (e.g. GH Mumm, Glenlivet, Kilchoman), all of which offers utilitarian, hedonic, and social value propositions.

Finally, the researcher would also like to explain why the remaining three dimensions of value depicted in Table 7 were 'rejected' or not included in his conceptualisation of value under the smart packaging engagement context. According to the researcher, cost/sacrifice value can be framed or 'merged' into the utilitarian dimension as definitions which considers efficiency already take into account the costs and risks of consumption (Overby and Lee, 2006). As for conditional value, while it is only possible to be co-created under certain conditions, the researcher asserts that it is still either utilitarian or social value at its most basic level. A similar case is then made for epistemic value which the researcher argues is already covered by the utilitarian, hedonic, and social dimensions. Epistemic value co-created when consumers perceive novelty is argued to be hedonic as novel experiences have been shown to be associated with hedonic value (Fiore et al., 2005) whereas epistemic value co-created from learning and curiosity is argued to be fundamentally utilitarian or social.

2.7 Summary

To recap, this chapter has accomplished the following. First, it elaborated on SD logic due to its status as the theoretical foundation of Brodie et al.'s (2011) conceptualisation of engagement that was selected as the starting point for this research's conceptualisation of smart packaging engagement, also justifying the soundness of the value co-creation lens both conceptualisations were built on. Second, it described Brodie et al.'s (2011) conceptualisation of engagement and explained the rationale behind the researcher's decision to select it as the base his conceptualisation of smart packaging engagement was built on. Third, it scoped out the existing applications of smart packaging to not only use as reference material for smart packaging design but also synergized with a review of the existing conceptualisations of value and engagement dimensions to identify those most suitable for the working definition of smart packaging engagement adopted by this research (refer to Figure 3 and Table 15 below). Lastly, this chapter reviewed the existing literature on consumer sentiment towards smart technologies, identifying research gaps within the smart technology field that is addressed by this research (namely the influence of sharing different types of personal data on the privacy

calculus of consumers), further guiding the design of the smart packaging applications that were trialled as part of this research to tackle them.

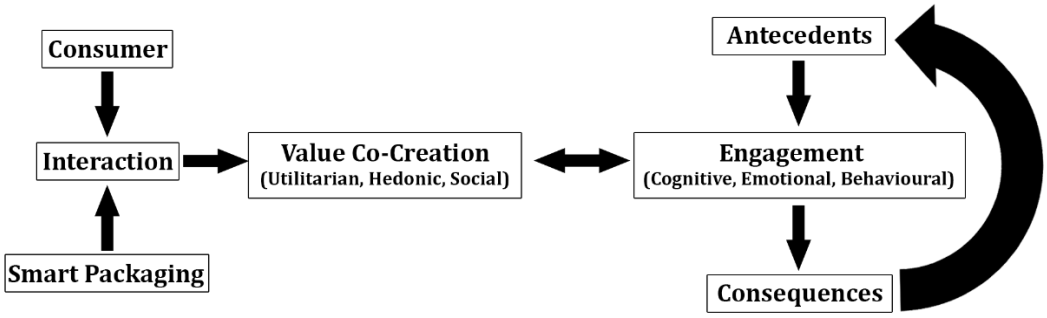


Figure 3. A Conceptual Framework of the Working Definition of Smart Packaging Engagement

Construct	Dimension	Description	Reference
Smart Packaging Engagement	Cognitive	The level or amount of thought about a smart packaged product prompted by a consumer's interaction with smart packaging	Hollebeek at al. (2014)
Smart Packaging Engagement	Emotional	Emotions aroused in a consumer resulting from interaction with smart packaging	Vivek et al. (2014)
Smart Packaging Engagement	Behavioural	A consumer's behavioural manifestations focused around smart packaging	Doorn et al. (2010)
Value	Utilitarian	Value co-created or co-destroyed from interactions with smart packaging that affects how consumers acquire, use, and dispose of a smart packaged product	Park et al. (1986)
Value	Hedonic	Value co-created or co-destroyed from interactions with smart packaging that arouses feelings and emotions	Smith and Colgate (2007)
Value	Social	Value co-created or co-destroyed from interactions with smart packaging that affects one's self-concept	Sweeney and Soutar (2001)

Table 15. Conceptualisations of the Value and Engagement Dimensions of the Working Definition of Smart Packaging Engagement

Chapter 3: Methodology

This chapter describes the methodological approach and methods adopted by this research. It begins with an explanation of the rationale behind its framing as a pragmatic investigation and why a qualitative approach was undertaken in its conduct. This is then followed by two sections, each one elaborating on the design, conduct, and analytical approach for each of the two studies that were carried out for this research.

3.1 Research Paradigms

Before deciding on the methodological approach this research was to adopt, a research paradigm had to be selected in order to establish a foundation that subsequent research decisions can be grounded on (Mackenzie and Knipe, 2006). Research paradigms are defined by Kuhn (1962) as a set of common beliefs and agreements shared between scientists regarding how problems should be addressed and understood and are generally characterised (Guba, 1990) based on their view of reality (ontology), knowledge (epistemology), and nature of pursuit (methodology). In this section, a detailed perspective of the researcher's disposition to research is provided so that readers can better comprehend the rationale behind his selected methodological approach. A concise overview of four of the most dominant research paradigms (presented in Table 16 below) and a brief discussion of each in social inquiry is first presented before a justification for the research decision to adopt pragmatism is provided.

Paradigm	Ontology	Epistemology	Methodology
Positivism	The notion of a single objective reality exists.	'Absolute' knowledge already exists within the realm of a single reality and simply needs to be measured.	Leans towards traditional quantitative methods due to its need of objectivity.
Constructionism	The notion of a single reality cannot exist as different individuals define reality in different ways (relativism).	Knowledge is the understanding of how individuals construct their view of reality.	Leans towards traditional qualitative methods due to its inherently subjective nature.

Realism	**The notion of a single reality exists, but it is constantly changing and unlikely to be discovered.**	**Knowledge is society's understanding of the world. Yet due to society's dynamic nature, social phenomenon can never be completely understood.**	**Leans towards mixed methods research.**
Pragmatism	Reality is both objective and subjective. It is objective due to it being constrained by the natural order of the world but also subjective in a sense that it is constantly redefined by individuals based on their experiences.	Knowledge consists of warranted assertions that result from taking action and experiencing their outcomes.	Leans towards mixed methods research.

Table 16. Dominant Research Paradigms

3.1.1 Positivism

Positivists embrace the notion of a single objective reality. Stemming from their assertions that postulate the impartiality or indifference of research subjects towards the research itself (Healy and Perry, 2000), their view of reality as an independent entity free of external influence is often described as "through a one way mirror" (Guba and Lincoln, 1994, p. 110). According to positivists, knowledge comprises of facts concerning reality that are waiting to be discovered (Neuman, 2013), gathered, and validated through quantitative methods similar to those of natural science based on the underlying assumption that "the social world can be studied in the same way as the natural" (Mertens, 2005, p. 2). Grounded in their objective view of reality, positivists believe that knowledge too can be identified and measured objectively (Guba and Lincoln, 1994; Schrag, 1992; Tsoukas, 1989) and hence, is capable of supporting time and context-free generalisations (Nagel, 1989). Because of this predisposition, positivism also mandates that distance is maintained between researchers and their participants in order to avoid potentially inducing bias (Johnson and Onwuegbuzie, 2004). Their pursuit of knowledge is fuelled by their desire to be able to predict and control surrounding forces (O'Leary, 2004), reflecting a deterministic philosophy which believes that causes determine outcomes (Creswell, 2003). Consequently, positivism is generally considered unsuitable for fields within social science such as marketing in which data is often a collection of subjective experiences and insights. Marketing scholars argue that the treatment of participants as independent and static subjects is unrealistic as it effectively ignores

their “ability to reflect on problem situations, and act on these in an interdependent way” (Robson, 1993, p. 60), implying that inquiry into the social and natural facet of reality is likely to require different approaches due to their inability to be studied in the same way. Furthermore, it is also common in marketing research for researchers to directly interact with research participants to build up rapport in hope of collective a richer dataset, voiding a fundamental aspect of positivism (i.e. objective measuring) by involving the subjectivity of the researchers. Hence, while positivism may be suitable for fields with ‘hard truths’, it is generally considered to be unsuitable for the field of research that this thesis sits in.

3.1.2 Constructivism

As the second of the two traditionally dominant research paradigms, constructivism is generally considered to be the polar opposite of positivism. Constructivism rejects the notion of there being a single objective reality and instead claims that there are as many realities as individuals, each one representing an individual’s unique view of reality that is constructed based on their social understanding of the world (Denzin and Lincoln, 2011; Healy and Perry, 2000; Mertens, 2005). Its epistemological stance considers knowledge to be a contribution towards the development of an understanding of how and why individuals construct reality the way they do. In aiming to understand the ‘human experience’ (Cohen et al., 2017), constructivists rely on qualitative methods which explores the participants’ perspectives of the studied phenomenon (Creswell, 2003). Rather than focusing on proving or disproving theories as positivists do, constructivists inductively construct non-deterministic theory, acknowledging the limitations imposed by their subjectivity (Guba, 1990). While constructivism is widely preferred over positivism in social science research due to its recognition of individual differences and irrational construction of reality, it is not appropriate for this research due to its exclusion of concerns regarding the objective dimensions (e.g. economic, technological) of the studied phenomenon (Hunt, 1991), dimensions which are integral to this research.

3.1.3 Realism

Realism, also commonly known as post-positivism is one of the hybrid paradigms that lie in between the positivism and constructivism continuum. The ontology of

realism is critical realism which although acknowledges the existence of a singular objective reality, also believes its discovery to be imperfect and probabilistic (Godfrey and Hill, 1995; Guba and Lincoln, 1994; Merriam, 1988; Tashakkori and Teddlie, 2010; Tsoukas, 1989). Realists view reality as an independent or external world that is influenced by a reflective and active society (Pawson and Tilley, 1997), rejecting the deterministic, mechanical, and absolute 'cause and effect' perspective of societal behaviour that positivists have. Their epistemological stance defines knowledge as an understanding of society's interpretation of the world (Danermark et al., 2019) and asserts that due to their dynamic nature, it is impossible to completely understand any social phenomenon, consequently rejecting universal claims to truth such as time and context-free generalisations. Instead, realists contend that causal impacts are not fixed but are dependent on their environment (Healy and Perry, 2000), aiming to provide a "family of answers that cover several contingent contexts and different reflective participants, albeit imperfectly" (Pawson and Tilley, 1997, p. 152), rendering knowledge obtained through realist research to be "real but fallible" (Wollin, 1995, p. 80). Similar to constructivism, realism focuses on inductive theory building but is slightly different in the sense that it does not completely rule out hypothesis testing and may carry them out once theory has been sufficiently built (Healy and Perry, 2000). With regards to methodology, realists advocate mixed methods. They acknowledge the respective strengths and weaknesses of both quantitative and qualitative methods and believe that a combined interdependent approach will be most effective in formulating an explanation of the studied social phenomenon. Due to their mixed approach, realists are also inherently transparent. They openly acknowledge and address the imperfection of their methods through triangulation and recognise that although the subjective influence of a researcher's values or beliefs is unable to be completely neutralised, it can to a certain extent remain under control (Easton, 2010). Renowned for its flexible nature, realism is generally considered to be an appropriate paradigm for social science research (Perry et al., 1999).

3.1.4 Pragmatism

Unlike the paradigms which have been discussed, pragmatism does not adhere to any philosophical principles. Pragmatists do not have a default ontology, epistemology, and methodology to fall back on and instead, endorse a flexible approach that allows researchers to freely adapt to what is required of the research problem (Creswell, 2003), making it suitable for research in almost all disciplines. A pragmatist's view of reality is not limited to a single perspective but often a combination of multiple coexisting realities that is dependent on their personal value systems (Tashakkori and Teddlie, 2010). Knowledge is generally considered to be a solution or answer to the research problem being addressed and discovered through methods selected purely based on their suitability for the research without any inclination towards their qualitative or quantitative affinities. Due to their predisposition to problem solving, research is often empirical to provide an indicator of the solution's viability within the real world (Diggins, 1995). Consequently, this has led pragmatism to be widely considered as a paradigm suitable for the exploration of new and complex phenomena (Salehi and Golafshani, 2010). As a paradigm also positioned between the positivism and constructivism continuum, pragmatism shares many similarities to realism and is often identified as its looser counterpart. Both paradigms acknowledge the existence of subjective and objective realities (Teddlie and Tashakkori, 2009), the inevitable influence of a researcher's personal value system onto their research, and the difficulty of completely understanding social phenomena due to the constant flux of society. The key difference between the two however lies in the degree of confidence that pragmatists and realists have in their work as compared to realists who view their results as a fallible but imperfect explanation of social phenomena, pragmatists assert their's to be empirically tested working solutions (Johnson and Onwuegbuzie, 2004).

3.1.5 Rationale for Pragmatism

Having reviewed the four research paradigms discussed above, the research decision to adopt pragmatism was made. In making this decision, the researcher began by deliberating between realism and pragmatism, the two paradigms which support the critical realism ontology he is personally inclined towards. Much like how the

spiciness of a chilli pepper can be perceived differently by different people despite it having the same objective rating on the Scoville scale, the researcher believes that the ontology of pragmatism in which an objective reality is subjectively defined by individuals is what best matches his view of reality. While this was a fairly difficult decision to make as both paradigms are generally considered to be suitable for social science research and is compatible with all research methodologies, pragmatism was ultimately selected for its stronger alignment with the goals of this research. Given that the primary objective of this research was to investigate how consumers engage with smart packaging of FMCGs and generate theory on effective smart packaging design, the empirical nature associated with pragmatism (Diggins, 1995) was deemed to be more suitable than the weak beliefs perspective implicit in realism (Pawson and Tilley, 1997; Wollin, 1995). Finally, as society's exposure to smart packaging has been extremely limited due to their lack of commercial availability, smart packaging can be classified as a relatively new social phenomenon that a pragmatic investigation is especially apt for (Salehi and Golafshani, 2010).

3.2 Methods

Having chosen a research paradigm, a methodological approach then needed to be selected. Due to the flexibility afforded by pragmatism, the researcher was able to pick from all three types of research methodologies (quantitative, qualitative, mixed). In this section, each type of research methodology is described in turn before the justification for the research decision to adopt a qualitative research methodology is provided.

3.2.1 Quantitative Methods

Quantitative methods are methods which seek to make generalisations about social phenomena through deductive logic (May and Williams, 2002; Neuman, 2013; Rocco et al., 2003; Salehi and Golafshani, 2010). They typically involve collecting numerical data which are then analysed and interpreted according to well-established mathematical rules. Grounded in mathematics and statistics, quantitative methods are objective based on the underlying assumption that 'numbers do not lie'. The large number of samples required by quantitative methods allows them to not only effectively discover relationships between variables (Williams, 2007) but also prove

and disprove theories (Lincoln et al., 2011) which can be generalised if sufficiently tested on different populations (Malhotra, 2019). Consequently, quantitative methods has been generally considered to be suitable for exploring or confirming the 'working mechanisms' of social phenomena (Elliot, 1995) which are not too nuanced. Due to their inherently objective nature, the findings of quantitative methods are likely to be replicated when carried out by other researchers applying a similar approach to data collection and analysis, earning the favour of positivists who considers this to be evidence of impartial research. This is unlike the findings of qualitative methods which tends to differ based on the researcher due to the influence of the researcher's personal values on data analysis and interpretation (Mauthner and Doucet, 2003). While the findings of quantitative methods are generally considered to be more scientifically valid and straightforward than those of qualitative methods, they lack the depth and complexity evident in qualitative research (Elliott et al., 1999), often providing a shallow view of the participants' experience in social settings (Denzin and Lincoln, 2011; Parkhe, 1993). Additionally, their emphasis on hypothesis testing can also potentially encourage their adopters to develop tunnel vision (i.e. confirmation bias) that limits their capability to identify phenomena and generate theory (Johnson and Onwuegbuzie, 2004).

3.2.2 Qualitative Methods

Renowned for their potency in exploring personal experiences or new and complex phenomena (Gummesson, 2011; Polit et al., 2006; Yin, 2009), qualitative methods are methods which seek to develop descriptive and comprehensive accounts of studied phenomena by exploring the who, what, why, how, and when (Gephart, 2004). They are primarily used to expand the knowledge base and discover unexpected variables concerning the studied phenomenon (Denzin and Lincoln, 2011). Unlike quantitative methods which are heavily inclined towards deductive hypothesis testing, qualitative methods generate theories or hypotheses inductively in order to provide a better understanding of the studied phenomenon (Jogulu and Pansiri, 2011; Salehi and Golafshani, 2010). Qualitative data is typically collected using methods such as ethnography, interviews, focus groups, and case studies (Bryman, 2016) as a narrative in textual (e.g. transcriptions) or audio-visual (i.e.

video recordings) form. Compared to its quantitative counterpart, the procedure of conducting qualitative analysis is also much less clear-cut. While its lack of structure facilitates various different ways to which analysis can be done, it is also the primary reason for the struggle that reviewers experience when trying to determine the reliability and validity of qualitative work. Additionally, due to the nature of its analysis, qualitative research is also much more time consuming than quantitative work. As a result, sample sizes are generally quite small (Maanen, 1998) and insufficient to support generalisations that represent an entire population. This, in conjunction with their lack of attention towards the quantitative aspects of studied phenomena renders qualitative methods unsuitable for studying causal relationships or quantifying phenomena under focus.

Another key difference between quantitative and qualitative research lies in their perception of subjectivity. Unlike quantitative researchers who advocate for minimal contact with participants to avoid compromising research objectivity, qualitative researchers typically immerse themselves in fieldwork and are keen to build a rapport with their participants as it allows them to capture data in greater detail. Although they acknowledge the potential bias this may generate (Gephart, 2004), they also believe that the benefits of having researchers interacting directly with their participants generally outweigh its risks. Rather than avoid subjectivity, qualitative researchers argue that to a certain degree, subjectivity is inevitable (e.g. consulting personal value systems when interpreting research findings) and should instead be viewed as a potential asset that should be wielded cautiously (Miles et al., 2018).

3.2.3 Mixed Methods

Mixed methods, also known as the 'third methodology' (Jogulu and Pansiri, 2011) or the 'third methodological movement' is a research methodology that combines quantitative and qualitative methods to address the shortcomings of each (Johnson and Onwuegbuzie, 2004; Tashakkori and Teddlie, 2010). It is a class of research in which the researcher combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study (Johnson and Onwuegbuzie, 2004). Given that methodological eclecticism has been shown to

result in findings that are of greater depth and breadth as well as improve the accuracy and credibility of inferences (Andrew and Halcomb, 2009; Begley, 1996; Creswell and Miller, 2000; Foss and Ellefsen, 2002; Hanson et al., 2005; Jogulu and Pansiri, 2011; Risjord et al., 2002), this research methodology was conceptualised with the underlying principle that a combination of quantitative and qualitative elements would result in a stronger approach that brings out the complementary strengths of each (Brewer and Hunter, 1989; Creswell and Clark, 2017). As a research methodology, mixed methods are renowned for their flexibility which allows researchers to make use of both inductive and deductive logic within a single study (De Waal, 2001), facilitating the simultaneous generation and reaffirmation of theory without having to compromise one for the other (Jogulu and Pansiri, 2011). On the other hand, they have also been criticised for the very same thing as critiques claim that this ignores the conflicting ontological, epistemological, and methodological assumptions of qualitative and quantitative research (Berríos and Lucca, 2006; Guba, 1987; Lincoln and Guba, 1985; Smith, 1983). This argument that is termed the incompatibility thesis (Howe, 1988) has however been rebutted by methodologists who invalidate this claim by asserting that mixed methods merely combine different methods and not research paradigms (Hesse-Biber, 2010; Teddlie and Tashakkori, 2009).

While a mixed methods approach to research can be advantageous, it should be noted that it does introduce additional logistical challenges due to its need for a research team well-versed in both qualitative and quantitative approaches (Andrew and Halcomb, 2009; Bazeley, 2003), potentially increasing the time (Anaf and Sheppard, 2007; Connelly et al., 1997) and financial resources (Duffy, 1987; Redfern and Norman, 1994) required to carry out the work. Despite these challenges, they are however becoming increasingly used. This is particularly evident within social science disciplines such as marketing and management (Azorín and Cameron, 2010; Bryman, 2016; Greene et al., 1989; Schifferdecker and Reed, 2009) in which researchers are often not particularly sure of what they seek (Salehi and Golafshani, 2010) due to the infancy or complexity of the studied phenomenon.

3.2.4 Rationale for Qualitative Methods

After extensive deliberation, the research decision to adopt a qualitative research methodology for this investigation was made. This decision was primarily attributed to the infancy of smart packaging as a research area. As previously mentioned, academic work on smart packaging is still minimal. With limited work to reference, the viability of quantitative methods is heavily reduced as relatively little had been done in the conceptualisation and validation of instrumental measures that facilitate hypothesis testing. Furthermore, given the exploratory nature of this research (i.e. aiming to understand how and why consumers engage with smart packaging rather than reaffirming theories or relationships), there simply was not a convincing argument for the adoption of a quantitative approach. This however was not the case for the adoption of a qualitative approach. Qualitative methods are much more well-attuned with the goals of this research as not only are they suitable for exploratory work (Husén, 1988) but they have also been found to be superior to quantitative methods in their ability to gain a deeper insight and discover unexpected variables concerning the studied phenomenon (Denzin and Lincoln, 2011; Silverman and Marvasti, 2008). Supported by the increasing amount of use within the field of marketing that this research sits in (Brown, 2003; Brownlie, 1994; Burton, 2001; Goulding, 2005), a qualitative approach was ultimately deemed to be the more suitable option. It should however be noted that the decision to adopt a qualitative approach does not completely discount the notion of collecting quantitative data. This was done during the second study where it played a supplementary role in gaining a more in-depth qualitative account of participant interaction with smart packaging as opposed to forming the basis of objective generalisations that quantitative methods typically make. Having covered the methodological approach adopted by this research, the next section will now proceed to elaborate on the design, conduct, and analytical approach of the focus group and technology probe studies carried out for this research.

3.3 Consumer Attitudes Towards Smart Packaging

"Consumer attitudes towards smart packaging" was the first study that was conducted for this research. This was a focus group study which involved five focus

group discussions concerning fictional but envisaged potential applications of smart packaging. These applications were designed around three types of FMCGs (sunscreen, alcohol, ground coffee) and showcased to participants through the use of storyboards. The goals of this study were to:

1. Identify factors which encourage and discourage the likelihood of consumer interaction with smart packaging
2. Better understand how consumers perceive smart packaging and its potential to facilitate value co-creation and co-destruction.

Before investigating how consumers engage with smart packaging, it is crucial to first identify factors which affect their likelihood of interacting (i.e. use) and consequently, co-create value with smart packaging. It is this that is what this study focuses on (depicted by the segment enclosed by the red dotted lines in Figure 4 below) given that the first fundamental proposition of Brodie et al.'s (2011) conceptualisation of engagement posits that without interaction and value co-creation, engagement would simply not be possible. There are two parts to this section. The first part elaborates on the rationale behind the decisions made regarding the design and conduct of this study, while the second covers its analytical approach.

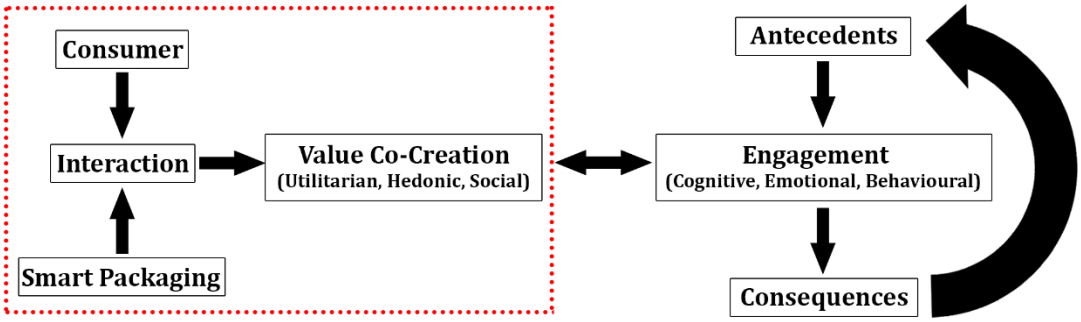


Figure 4. The Focus of "Consumer Attitudes Towards Smart Packaging"

3.3.1 Study Design and Conduct

3.3.1.1 Focus Groups

The decision to employ focus groups was made after reviewing the methods (i.e. individual interviews, ethnography, observation, focus groups) commonly used in exploratory consumer research (Carson et al., 2001). At this stage, it is important to

note that the research was not yet tied to a specific type of FMCG or smart packaging application and aimed to explore how consumers respond to a broader range of smart packaging use cases instead. This eliminated ethnography and observation as viable options due to their dependency on the availability of actual naturalistic participant interaction with smart packaging which would not only restrict the scope of the study to smart packaging applications participants were already using (if any) but also be extremely difficult to recruit for given their lack of commercial availability. It was at this point that it became apparent that this study could only feasibly investigate consumer sentiment towards hypothetical applications (e.g. storyboards) of smart packaging as it would simply be an inefficient use of resources to develop various actual smart packaging prototypes for participants to interact with at such an early stage of the research. Having eliminated ethnography and observation as options, a choice then had to be made between individual interviews and focus groups.

Focus groups were ultimately selected for their naturalistic setting that better reflects the social structure of society (Krueger and Casey, 2014). Unlike the one-on-one setting of individual interviews, focus groups facilitate an environment where the views of a participant are influenced by those of others, potentially giving rise to ideas that could otherwise remain undiscovered. Given that this study not only aimed to explore consumer attitudes towards smart packaging but also generate ideas from participants in the form of suggestions and feedback, group dynamics which facilitate a continuous refinement of the participants' own views that could result in deeper and more meaningful responses (Ritchie et al., 2013) are especially advantageous. This is even more so in study this where baseline responses are likely to be of a lower quality given the lack of knowledge or pre-existing sentiments that participants have around smart packaging due to their lack of commercial availability. Additionally, as participants may feel reluctant or intimidated to discuss a topic they are not well versed in, the use of focus groups allows the researcher to quickly address participant inquiries and make detailed clarifications to ensure that participants understand the technology correctly. They are also much more resilient than individual interviews in dealing with laconic participants. Compared to

individual interviews where the conversation might run into a 'dead-end' (Grønkjær et al., 2011) when conducted with a laconic participant, the size of focus groups not only inherently reduces the influence of an inactive participant but also provides a setting where participants find it easier to contribute (Kitzinger, 1995).

As a method, focus groups are well-accepted within both industrial (Folch-Lyon and Trost, 1981) and academic (Calder, 1977; Fern, 1982) environments. Since first introduced as the 'focussed interview' by Merton and Kendall (1946), focus groups have grown to become one of the most widely used methods in market research due to their relatively low cost and high speed of delivery (Fern, 1982; Folch-Lyon and Trost, 1981; Stewart and Shamdasani, 2014). They have also been extensively used within the FMCG industry, with survey results indicating them to be the industry with the highest proportion of companies (81%) that uses them regularly in conducting market research (Greenberg et al., 1977), a trend that has persisted to the present day. Typically used to explore the attitudes and opinions of consumers towards new products, brand image, advertising campaigns, promotions, and packaging design (Barwise and Strong, 2002; Fern, 1982; Kohli, 1997; Ritchie et al., 2013; Roberts et al., 2005; Silayoi and Speece, 2004; Woodside and Summers, 2008), focus groups have been described as particularly useful for exploratory research that elicits issues participants find relevant which can then be used to inform the design of further research (Vaughn et al., 1996). It is frequently used by both practicing and academic marketers for purposes similar to what this study aims to accomplish and is acknowledged as a well-established method (Barbour and Morgan, 2017; Bloor et al., 2001; Greenbaum, 1998; Ritchie et al., 2013).

3.3.1.2 Stimulus Material

During the focus group discussions, participants were provided with stimulus material in the form of storyboards (refer to Appendix B) which showcase the potential applications of smart packaging. These storyboards drew upon existing smart packaging applications (i.e. those reviewed in Section 2.4.1) for ecological validity and were written following Truong et al.'s (2006) storyboard guidelines for eliciting participant response towards interactional experiences (i.e. limiting the number of frames per scenario to no more than five, including human characters,

explicitly indicating the passage of time when relevant, and adding simple accompanied text).

As previously mentioned, due to the infancy of smart packaging and the exploratory nature of this study, this study strived to explore consumer response towards a diverse set of scenarios. As such, storyboards were written to cover a wide range of smart packaging applications (i.e. mobile tags, adaptive packaging, connected packaging) which differ in their expected frequency of interaction and longevity of use in order to explore their respective capabilities in facilitating utilitarian, hedonic, and social value co-creation required for smart packaging engagement based on the working definition adopted by this research. In deciding the product categories the storyboards were to be written for, the researcher used the product involvement construct as a metric. Generally defined as the perceived personal relevance of a product based on the individual consumer's needs, interests, and values (Park et al., 2007; Zaichkowsky, 1985), the involvement construct was used as a metric due to its association with a product's frequency and variety of use (Ram and Jung, 1994, 1989; Samson, 2010) as well as its proposed relationship with engagement as an antecedent (Harrigan et al., 2018; Hollebeek et al., 2014; Naumann et al., 2020). Building on these findings, the research decision to write storyboards for products with varying levels of involvement was made in hope of the study yielding a richer dataset.

Although it is generally agreed upon by academics and practitioners that the majority of the FMCG market is dominated by low involvement purchases (Grossman and Wisenblit, 1999; Javornik and Mandelli, 2012; Silayoi and Speece, 2004) due to their inherently low-risk nature and weak brand loyalty (Chaudhuri, 2000; Mitchell, 1999), it needs to be emphasised that not all FMCGs share the same level of involvement. FMCGs have an implicit hierarchy of products with varied levels of involvement, affected by factors such as the potential negative consequences of making a poor purchase of the product, the likelihood of making a poor purchase of the product, the pleasure that may arise from consumption of the product, and the perceived ability of the product to express status, personality, and identity (Laurent and Kapferer, 1985; Zaichkowsky, 1985). Unfortunately, while there has been some

work done quantifying involvement (e.g. the Personal Involvement Inventory (PII) scores shown in Table 17 below), there has yet to be any comprehensive academically-backed rankings or classification of FMCGs based on their levels of involvement, leaving only the loose indicators of involvement mentioned above for the researcher to work with.

Product	Mean PII Score
Instant Coffee	66
Bubble Bath	69
Breakfast Cereal	69
Mouthwash	74
Red Wine	82
Red Wine	84
Facial Tissues	87
Headache Remedy	91
35mm Camera	96
Colour TV	97
Jeans	99
Laundry Detergent	103
Calculator	112
Automobile	122

Table 17. Personal Involvement Inventory Scores. Source: Zaichkowsky (1985)
Theoretical Mean = 80. Actual Mean Based on Above Products = 90

Based on these considerations, it was then decided that storyboards were to be written for sunscreen, alcohol, and ground coffee, collectively forming a range of products with a low, medium, and high level of involvement. Sunscreen was framed as the FMCG with a low level of involvement due to there being relatively little pleasure associated with its consumption. As an FMCG that is typically not consumed regularly (generally only during vacations), consumers often find it difficult to remember how to apply them correctly. This is evident from studies conducted by the British Association of Dermatologists (2013) which show that the majority of consumers do not apply sunscreen correctly (i.e. applying too thinly, at insufficient intervals, and missing sections of difficult to reach areas such as the back), risking their health and appearance by increasing the likelihood of getting sunburnt and undesirable tanning. Considered as an FMCG generally consumed for functional (i.e. protection from the sun) and minor social (e.g. consumers would not like to look too tanned) purposes, the storyboards written around it focused on how smart packaging can offer utilitarian and social value propositions. Additionally, the context of its consumption that depends on the individual consumer (i.e. skin type) as well as

the environment (i.e. ultraviolet levels) made it a suitable opportunity for the researcher to explore how consumers perceive adaptive packaging. In a nutshell, this storyboard illustrates how smart packaging could potentially personalise a consumption experience based on a consumer's biometric and environmental data to enhance consumer wellbeing.

The second set of storyboards were written for ground coffee. This set had an underlying theme of improving or optimising consumer consumption habits through information provision and convenience. Ground coffee was framed as the FMCG with a medium level of involvement as although its consumption is considered by many to be a pleasurable experience, it is viewed by some to be simply a necessity which helps them function throughout the day. As a beverage, coffee can be brewed in various different ways and it is not uncommon for laymen consumers (i.e. those not so interested or knowledgeable about coffee) to brew them in non-optimal ways (e.g. wrong dose, wrong brewing techniques), negatively influencing their taste. It also comes in a huge number of 'flavours' or variants dependent on the combination of many different characteristics (e.g. the region where it was grown, type of coffee plants it was harvested from, its washing procedure) that consumers are often keen to learn more about (Reid and Rout, 2016). Additionally, coffee has been reported by consumers to not only be an expression of their identity (Verma, 2013) but also (due to it being a harvested product) a reflection of their views on ecologic sustainability (Hughes, 2009). Hence, there is a significant pool of information relating to the product and its use which consumers are interested in that can be delivered through smart packaging. Like in most of the examples reviewed in Table 8, mobile tags were selected as the delivery mechanism for this information with NFC tags being chosen for their prominence within the industry.

Given the immense amount of coffee consumed daily within the UK (95 million cups according to the British Coffee Association in 2018), a smart packaging feature that would assist consumers with replenishment was also written in. This was written with the intent to investigate consumer attitudes towards connected packaging that facilitates consumption tracking, a form of personal data collection that is becoming increasingly common within the industry. As previously mentioned, due to

technological progress, firms are now able to collect, store, and process consumer personal data much in a much more cost-effective manner. Consequently, marketers are now offering an increasing amount of personalised service within the industry, believing them to be prime opportunities to augment value co-creation. Therefore, it was imperative for the storyboards to include elements of personal data collection and processing which has become a core and integral value proposition in many of the smart packaging applications reviewed in Section 2.4.1.2 in order to authentically portray the current state of smart packaging within the industry. On the other hand, personal data collection has also prompted negative consumer response due to the media coverage on its potential to facilitate an Orwellian society (e.g. China's social credit scoring system) as well as 'Big Data Disasters' such as those of Target (Hill, 2012) and Cambridge Analytica (Cadwalladr and Graham-Harrison, 2018). Hence, given the collective amount of industrial activity and societal interest around this feature, it was written into the storyboards in hopes of improving this study's prospects of yielding practical findings.

The reordering mechanism was largely inspired by Amazon Dash (Rubin, 2019) and was augmented with predictive analytics to explicitly convey its consumption tracking feature to participants. It was designed with the intent to stimulate discussion on how they feel about having their consumption habits monitored. This was then emphasised even further through the addition of a screen on the tin that constantly displays its remaining quantity, a recommender system capable of learning its user's preferences, and a warning system which alerts users when excessive caffeine consumption is detected (adapted from the Tostitos example in Table 9). Finally, cohesive supplementary features were then written in to 'round off' the smart packaging experience. These were designed to only make use of the technology already required to implement the features discussed above in order to avoid 'overcrowding' the tin with an excessive amount of technical components. Said supplementary features include displaying the date the coffee is opened on the screen of the tin (as coffee loses flavour over time) and providing incentives for purchase (adapted from the PEZ and Bodegas Barbadillo examples in Table 8).

The final set of storyboards were written for alcohol. These were written with the intention to appeal to the more hedonic wants and needs of consumers. Within the context of this study, alcohol was framed as the FMCG with a high level of involvement. This was not only due to the escapism and pleasure facilitated by its consumption but also its influence on the social identity of its consumers, affecting how they perceive themselves based on what they have tasted or enjoy drinking (e.g. whiskey connoisseur, IPA expert). Another reason to explore the potential smart packaging applications of alcohol was the alcohol industry's investment in smart packaging. Based on the literature review conducted in Section 2.4.1, the alcohol industry is arguably one of the largest investors in smart packaging. Hence, for reasons similar to why elements of personal data were written into the storyboards concerning coffee, storyboards concerning alcohol are expected to be more likely to yield findings with practical implications due to their prominence within the industry.

One of the major issues which the alcohol industry hopes could be addressed through the implementation of smart packaging are counterfeits. Based on the reports from the European Union's Intellectual Property Office (EUIPO), approximately £220 million is lost from the UK economy each year as a result of counterfeit wines and spirits entering the market (Hancock, 2019). As a result, the alcohol industry has been increasingly keen to provide consumers with features that enable them to verify the authenticity of alcohol products they consume. Evident from many of the examples reviewed earlier in Table 8, one approach that has been trialled quite extensively within the industry capable of providing this functionality is smart packaging. As a widely implemented feature, this feature was written into the storyboards to investigate whether or not consumers would actually find this feature valuable. Like most existing implementations, this too was written in the storyboards as an implementation that makes use of NFC tags.

According to the Wine and Spirit Trade Association, consumers are also generally interested in the provenance of the alcohol they consume (Wallace, 2018). This is not surprising given that the alcohol market is fairly similar to that of coffee, both being markets which are abundant with choices and revolves around naturally derived products. It was for this reason that a feature which enables consumers to

find out more about a product and provide other additional content like cocktail recipes, ongoing promotions, and drinking games through subsequent scans of the same NFC tags (similar to those of existing applications) used for authenticity verification was written into the storyboards. Additionally, as an FMCG that comes in 'sets', a digital collection feature that helps consumers keep track of the various drinks they have tried and rewards them for 'unlocking' more drinks by scanning the NFC tags of different drinks was also written in. As this is something that consumers are already doing 'manually' (i.e. collecting craft beer bottle caps) as well as a feature that has been trialled in the past (refer to the Böen example in Table 8), it is argued to be one worth exploring.

The next feature written in concerned social media. It is well established that consumers occasionally share their consumption experiences within their social circles (Dolan et al., 2016; Hollebeek et al., 2014) and alcohol is no exception. On social media, alcoholic consumption experiences are routinely shared by young adults in the form of posts, images, and videos (McCreanor et al., 2013), often stemming from their desire to incorporate their drinking habits into their social identity as they believe that it would make them more socially desirable (Ridout et al., 2012). Given that features which facilitate the sharing of consumption experiences on social media have been trialled in the past (e.g. Böen, Glenlivet, Jeri's Farm, and Fanta in Table 8), the 'link to social media' feature was also written in to investigate how a smart packaging feature of this nature would be perceived by consumers.

The last feature to be written in was the functionality to connect with other smart devices. This was added to encourage participants to think about how smart packaging could potentially communicate with other smart devices within the home. As previously mentioned, trials involving connected packaging are still lacking due to the costs associated with their implementation. Hence, it would be wasteful to pass up the opportunity to investigate how consumers would react to the notion, even if it is under hypothetical circumstances. Among the FMCGs selected for this study, alcohol was selected as the avenue to investigate this due to its relatively higher prices and lower price elasticity of demand (i.e. consumers are still willing to

purchase alcohol at marked up prices at venues such as pubs, restaurants, and night clubs) which allows it to feasibly pass on a higher proportion of additional implementation costs to its consumers without significantly affecting demand. Additionally, seeing as how this functionality has also been trialled within the alcohol sector (i.e. the Absolut example in Table 10), it is argued that alcohol is a suitable FMCG for the exploration of consumer sentiment towards connected packaging.

Having explained the rationale for the smart packaging features written into the storyboards (a summary of them is presented in Table 18 below), the storyboards are then grouped into three scenarios (one for each FMCG) which are then broken down into several stages (except for the sunscreen which only has one) to avoid overloading participants with too much information at any given time. A stage is generally represented by a coloured-4 panel storyboard accompanied by a short paragraph of text (roughly 150 words) that is meant to help participants visualise the smart packaging features. Two stages were not explicitly represented: the smart home stage pertaining to alcohol scenario and the final stage pertaining to coffee. The smart home scenario was not represented with a storyboard due to the difficulty in visualising connectivity with other smart objects and devices without constraining or tunnelling the participants' views to specific use cases which could potentially induce bias into their responses. As for the final stage of coffee scenario, a storyboard was deemed unnecessary due to its simplicity. Unlike the uncommon and cutting-edge technologies depicted in the other storyboards, use of personal recommender systems are readily found in our daily lives (i.e. used by a variety of retailers and shopping platforms such as Tesco and Amazon). Besides, the caffeine consumption monitoring feature simply carries out basic subtraction between the daily logged data points of remaining coffee quantity shown on the tin which has already been depicted in the coffee scenario's first storyboard.

FMCG	*Level of Involvement*	*Smart Packaging Utilised*	*Implemented Features*
Sunscreen	Low	Adaptive (Sensors)	Personalisation Consumption Reminders
Ground Coffee	Medium	Mobile Tags (NFC Tags) Connected (Connectivity)	Provenance Additional Content Consumption Tracking Replenishment Personalisation State Detection Incentives
Alcohol	High	Mobile Tags (NFC Tags) Adaptive (Sensors) Connected (Connectivity)	Authenticity Verification Provenance Digital Collection Incentives Social Media Sharing Connectivity

Table 18. Smart Packaging Features Investigated in "Consumer Attitudes Towards Smart Packaging"

Finally, besides the storyboards, off-the-shelf and traditionally packaged versions of the FMCGs depicted in the storyboards and smart packaging components such as small screens and buttons were also placed at the centre of the table at the venue. These were provided for participants to freely fiddle during the session as it could potentially stimulate the formation of additional insight and ideas.

3.3.1.3 Questioning Route

The questioning route (Appendix C) was developed in the image of a funnel, an approach that has been acknowledged by methodologists to be effective. Questioning routes adopting the funnel pattern begin by asking generic questions that gradually becomes more and more specific as the discussion progresses (Krueger and Casey, 2014; Morgan, 1996a, 1996b). Questioning routes used for each scenario were roughly identical aside from the minor changes required to adapt them to the different smart packaging features. For each stage of a scenario, the first question asks the participants for their initial thoughts on the corresponding smart packaging feature. This plays the role of the 'opening question' (Krueger and Casey, 2014) that is meant to encourage participants to quickly initiate conversation. Next, participants were asked a closed-ended question (i.e. "Would you use it?") but requested to elaborate on their answer. This question serves as a transition between questions which are easier to answer (e.g. the first thing that comes to mind) and those that require further thought. This is then followed by the two key questions (i.e. "How would this change the way you use this product?" and "What do you think

are some of the benefits and risks of using this feature?") designed to explore how smart packaging could affect the way participants might use the product and its potential to facilitate value co-creation or co-destruction, also further probing on how they feel about said changes. The questioning route for each stage finally ends with two questions that elicits suggestions from participants on how to improve the smart packaging applications discussed and other products they might be suitable for. These questions are designed to be 'imagination questions' which engage participants and retain their interest in the discussion while also serving the purpose of an 'all-things considered ending question' (Krueger and Casey, 2014) that aims to identify the most concerning aspects of the smart packaging applications (i.e. those that participants would like 'fixed'). The entire questioning route was then repeated for each stage in each scenario covered in the focus group discussion before moving on to the final stage.

Unlike the questions asked during the previous stages, the questions asked during the final (wrap up) stage of the discussion concerns smart packaging in general rather than its specific applications. These questions were asked only after participants have been exposed to various applications of smart packaging in order to first provide them with a better understanding of their capabilities. This stage begins by asking participants about their thoughts on whether the implementation of smart packaging in branded products could affect their perspective of the brand and if so, whether it would be in a positive or negative manner. The questioning then becomes more explicit as participants are asked to name certain features they believe to have influenced their answer to the previous question so that a better understanding of the characteristics that make one's perception of smart packaging desirable and undesirable can be attained. This is focused down even further by the next question which asks participants to name certain characteristics or traits of smart packaging applications that would encourage or discourage their use. While this has most likely been touched on during the 'benefits and risks' questions in the previous stages, this one emphasises on whether said benefits and risks are significant enough to affect their likelihood of use. The study ends with another 'imagination question' where participants were asked to freely design a smart

packaged product under the assumption that anything is possible in order to elicit further suggestions on smart packaging applications that goes beyond the scope of the products discussed. As “imagination questions” have also been said to be fun to think about, this helps end the discussion with a more positive note.

Both questioning routes (scenarios and wrap up) adopted the funnel approach. The transition between the first questioning route into the second is a ‘specific to general’ movement as the final stage discusses smart packaging in general rather than its specific applications. This was designed to be in line with the guidelines recommended by Payne (1976) and Axelrod (1975) who argued that participant exposure to more specific stimulus (i.e. the text-accompanied storyboards) would allow for the collection of fresher and more spontaneous response than if the underlying general concept is presented first.

3.3.1.4 Sample Size

Despite the increasing use of focus groups in both industrial and academic marketing environments, very little has been done in refining focus groups as a method. Researchers still struggle in determining whether or not their sample size is adequate and the golden standard has become to rely on Glaser and Strauss’s (1967) concept of saturation which they define as the point at which “no additional data are being found whereby the [researcher] can develop properties of the category” (p. 61) as the key determinant in deciding whether or not sufficient data has been collected (Guest et al., 2006; Guest and MacQueen, 2008). Unfortunately, the major drawback of this approach lies in its inability to determine the saturation point prior to data analysis. As this approach was originally intended for studies adopting a grounded theory perspective (in which data collection and analysis alternates iteratively), it is not viable for research that requires an estimate of the sample size before commencing data collection (Charmaz, 2014). Alternatively, researchers could follow unreliable numeric recommendations with no empirical backing that ranges from as few as two to as many as forty groups (Fern, 1982; Greenbaum, 1998; Kitzinger and Barbour, 1999; Krueger and Casey, 2014; Morgan, 1996b; Powell and Single, 1996; Vaughn et al., 1996).

It was not until relatively recently that academics began attempts to empirically identify the sample size required to reach the saturation point of qualitative research. Early work which addressed this issue focused on the saturation point of individual interviews rather than that of focus groups. One of the first was Morgan et al.'s (2002) which discovered that 80 – 92% of all encountered concepts can be identified from just the first 10 interviews, with a majority of them from the first 5 – 6 interviews alone. These findings were consistent with those of Guest et al.'s (2006) which revealed that 70% and 92% of all the identified themes could have been generated from just six and twelve interviews respectively. Although extremely limited in number, similar studies concerning focus groups were then also conducted. Two of them in particular (Coenen et al., 2012; Kirchberger et al., 2009) adopted a slightly different definition of saturation, defining it to be the point at which linking concepts from two consecutive focus groups or individual interviews reveals no additional second level categories. The saturation point of these studies were found to be five and eight focus groups respectively, at most merely a fifth of the highest number of focus groups (i.e. 40) recommended by the literature (Vaughn et al., 1996). The most eye-opening finding was however the recent one by Guest et al. (2017) who discovered that out of all the codes generated from a thematic analysis conducted on forty focus groups, almost two thirds could be generated from the first focus group alone, with 80% and 90% of them being able to be generated from 2.7 and 4.3 focus groups respectively based on an average of 11 orders of analysis (10 randomised and 1 chronological). As findings from two of the three studies suggest that five focus groups would be sufficient to identify 90% of the themes, the decision to run a total of five focus groups was made on the basis that the resources required to run additional ones would not yield favourable marginal returns.

3.3.1.5 Focus Group Size

The methods literature on focus groups was consulted in deciding its size. While the vast number of proposed group sizes (as shown in Table 19 below) suggests that the notion of a single optimal group size does not exist, this does not necessarily mean that there are no well-established guidelines which researchers follow when determining the size of their focus groups.

Suggested Group Size	Reference(s)
4 – 6 (minigroups), 8-10	Greenbaum, 1998
4 – 8	Kitzinger, 1995
4 – 10	Morgan and Spanish, 1984
6 – 8	Gill et al., 2008; Ritchie and Lewis, 2003
6 – 9	Nielsen, 1997
6 - 10	MacIntosh, 1993; Morgan, 1996a; Powell and Single, 1996
6 – 10	Litosseliti, 2003
6 – 12	Folch-Lyon and Trost, 1981
8 – 10	Calder, 1977; Greenbaum, 1998
8 – 12	Stewart and Shamdasani, 2014; Tynan and Drayton, 1988

Table 19. Recommended Focus Group Sizes

It is generally agreed upon that the size of the group is inversely correlated with individual participation (Morgan, 1993). The need for an experienced moderator increases in conjunction with the size of the group as a higher level of moderator involvement is usually required to ensure that each participant is given sufficient time to speak or voice out their opinions in a larger group (Folch-Lyon and Trost, 1981; Levy, 1979; Litosseliti, 2003). Additionally, a group that is too large risks affecting the group dynamics in a negative manner as participants who would like to but are unable to share their insights may talk to their neighbours, splitting up the group into smaller conversations and resulting in data loss due to recording difficulties (Krueger and Casey, 2014; Levy, 1979; Morgan, 1996b; Tynan and Drayton, 1988). While relatively more challenging, well-moderated larger groups can actually generate more ideas than smaller ones due to the greater collective pool of insights and experiences that participants can draw upon (Fern, 1982; Krueger and Casey, 2014). It is because of these challenges that smaller groups or minigroups that consist of 4 – 6 participants compared to the 6 – 10 participants that full groups are usually composed of are becoming increasingly common. The reduced number of participants makes it easier for the moderator to control the flow of the discussion and the extended amount of time each participant gets to contribute to the discussion allows for more in-depth information to be collected (Greenbaum, 1998; Litosseliti, 2003; Morgan, 1996b).

After taking into account these considerations, a decision was then made to conduct the focus groups in groups of five. This decision was made for two main reasons. First, it is essential that participants are conveyed sufficient technical knowledge regarding the functionality of the smart packaging applications discussed in order to

ensure that their insights are captured accurately. Due to the complexity of the discussion topic, this was deemed to likely require additional delivery time for which a smaller group was desirable. Second, a smaller group provides the moderator with more time to probe deeper into the response of each participant. Seeing as the aims of this study leaned heavier towards understanding why consumers feel the way they do about smart packaging rather than idea generation, the potential benefits of running larger groups simply did not outweigh the risks.

3.3.1.6 Homogeneity

Although homogeneous focus groups have traditionally been preferred over heterogeneous ones for their superior group dynamics, there is sufficient literature to suggest that heterogeneous groups are more appropriate for this study. Heterogeneous groups have been known to reveal a wider range of opinions and experiences that makes it particularly well-suited for exploratory research (Calder, 1977; Kitzinger, 1994; Levy, 1979) due to its better reflection of societal structure which allows researchers to learn about the social differences and relationships within the community (Goss and Leinbach, 1996). Although heterogeneous groups are often criticised for the reduced willingness of its participants in expressing themselves for reasons such as status distinction or fear of conflict (Freeman, 2006; Levy, 1979; Morgan and Krueger, 1993), these are risks that can be mitigated by the topic and structure of the group. For instance, due to the lack of commercial availability and infancy of smart packaging, it can be argued that it is extremely unlikely for participants to have had any experience with the topic being discussed, effectively 'levelling the playing field' for participants and severely reducing the likelihood of status distinction based on levels of expertise to arise. Participants are also at no point in time during the discussion expected to collectively come to a decision or agreement on a subject, allowing them to speak freely without having to be concerned with issues that may arise from a difference in opinion.

The distinguishing factor of the homogeneity of the focus groups was gender. Heterogeneous groups were composed of both male and female participants whereas homogeneous ones were composed of either all male or all female participants. This decision was made because gender is generally a well-accepted

segmentation criteria of homogeneity (Krueger and Casey, 2014; Morgan, 1996a; Smithson, 2000; Stewart and Shamdasani, 2014). Given the differences in the consumption behaviour of sunscreen (Rothman et al., 1993), alcohol (Rosenquist et al., 2010), and coffee (Tifferet et al., 2013) between men and women, the status distinctions that may arise from the underrepresentation of women in science technology, engineering, and mathematics (Beede et al., 2011), and the reported differences between single-gender and mixed-gender focus groups (Folch-Lyon and Trost, 1981; Krueger and Casey, 2014; Morgan, 1989), there was sufficient evidence to suggest that running both heterogeneous and homogeneous focus groups would yield a richer dataset.

While there were no issues that arose during the first three heterogeneous focus group discussions, the researcher would later decide to run the remaining two groups as homogeneous groups. Seeing as how there are findings which indicate that returns from running focus groups beyond the first three were minimal (Guest et al., 2017), the researcher believed that it may be more fruitful to run the final two groups as homogeneous focus groups. Given that the superior group dynamics of homogeneous groups has the potential to reveal a facet of views that were not brought up during the heterogeneous ones and that they have also been found to be more effective in developing an atmosphere that facilitates a relaxed, comfortable, and natural discussion (Goldman, 1962) which could spark conversations on the shared experiences or perspectives of the group (Kitzinger, 1994), the research decision to run the remaining two focus groups as homogeneous ones was made.

3.3.1.7 Storyboard Coverage

After the first focus group, it was evident that it would be extremely difficult for the discussion to cover the storyboards for all three FMCGs at a reasonable level of depth within the allotted time. This was largely due to the participants speaking more than the amount expected from the pilot session. As a result, the number of FMCGs discussed in each focus group was reduced to two to avoid the rushed atmosphere the session would otherwise have. The FMCGs to be discussed in each group were decided based on what has been covered during the previous groups to provide a balanced coverage of each FMCG. A summary of the FMCGs covered in

each focus group is shown below in Table 20. A "Y" indicates that the FMCG was discussed at a reasonable level of depth, a "y" (lower case) indicates a discussion not as in-depth as those indicated by a "Y", while an "N" indicates that the FMCG was not discussed in that particular session.

	Smart Sunscreen	Smart Coffee	Smart Alcohol
Group 1 (Heterogeneous)	Y	y	Y
Group 2 (Heterogeneous)	N	Y	Y
Group 3 (Heterogeneous)	Y	Y	N
Group 4 (Homogeneous)	Y	N	Y
Group 5 (Homogeneous)	Y	Y	N

Table 20. Focus Group Storyboard Coverage

For the first three (heterogeneous) groups, each FMCG was discussed in at least two focus groups (coffee was discussed three times but the first was fairly rushed). For the remaining two (homogeneous) groups, the researcher decided to choose the smart sunscreen as the common FMCG to cover in both groups due to its effectiveness during the previous groups as an introductory scenario (i.e. standalone packaging) to get participants accustomed to the concept of smart packaging.

3.3.1.8 Duration

As of the time of writing, there has yet to be a consensus on the recommended duration of a focus group (refer to Table 21 below for an overview of the various recommended focus group durations). Some methodologists recommend a duration of 90 – 120 minutes (Fern, 1982; Flores and Alonso, 1995; Folch-Lyon and Trost, 1981; Litosseliti, 2003; Morgan and Spanish, 1984; Nielsen, 1997; Powell and Single, 1996; Ritchie et al., 2013) while others consider 60 minutes to be sufficient (Kitzinger, 1994; Tynan and Drayton, 1988). However, despite the lack of agreement, it is generally agreed upon that focus groups should run no longer than two hours to avoid mentally exhausting participants which often leads to low quality responses (Krueger and Casey, 2014; Payne, 1976). In particular, focus groups which involve technical or emotional discussions have been associated with a faster build-up of cognitive fatigue and should ideally be conducted in a time-efficient manner (Stewart and Shamdasani, 2014). Given the technical and complex nature of smart packaging, each focus group was scheduled to run for 90 minutes. This was taken as the middle ground between 60 minutes which was likely to be too short to cover the

discussion topic at a reasonable level of depth and 120 minutes which poses the risk of burning participants out.

Recommended Group Duration (minutes)	Reference (s)
60 – 120	Kitzinger, 1995; Tynan and Drayton, 1988
90 – 120	Greenbaum, 1998; Litosseliti, 2003; Powell and Single, 1996; Ritchie and Lewis, 2003
120	Folch-Lyon and Trost, 1981; Krueger and Casey, 2014; Nielsen, 1997
< 120	Morgan and Spanish, 1984

Table 21. Recommended Focus Group Durations

3.3.1.9 Participant Demographic Profile

The demographic profile for participants recruited for this study were individuals aged between 25 and 34. This age group was selected for their experience in growing up during the Digital Revolution, a period when digital technology began to replace older analogue electronic and mechanical devices. It marked the beginning of the Information Age (Castells, 1996) and is canonically represented by the proliferation of computers, mobile phones, and Internet access that many now consider aspects of everyday life. Based on the *Golden Age of Youth* study conducted by Viacom Brand Solutions International in 2008, individuals in this age group have been characterised with not only a better understanding of newer technology than those in older age groups but also more likely to be more receptive due to their experience in growing up during this period. More specifically, the study reported that a third of this age group were exceptionally interested in new technology with two thirds also expressing a willingness to learn in greater detail how they function in order to be able to derive its full benefits (MarketingCharts, 2008).

Another reason this age group was suitable for this study lies in its composition. This age group consists of individuals at many different stages of life (e.g. a student living in a house share, a married parent, cohabiting with a partner). Given that consumption behaviour is subject to influence from one's living circumstances, this age group was ideal to capture the various perspectives of participants comfortable with technology. The *Golden Age of Youth* study also found that this age group was more likely to gravitate towards premium, understated and often luxurious brands and experiences to affirm their identity (Bergh and Behrer, 2016). This was a suitable match for this study as the smart packaging market within the FMCG industry (refer

to Section 2.4.1) is currently dominated by premium brands (mostly alcohol) seeking to further enhance their brand image through the provision of a fresh and innovative consumption experience. As such, participants from this age group are more likely to find it easier to relate to the smart packaging concepts and features discussed during the focus groups and consequently, improve the quality of responses generated during the discussions.

3.3.1.10 Procedure

A day before the session, participants are sent an email or text message to remind them of the date, time, and venue of the focus group. At this time, participants unfamiliar with the venue could also arrange to be personally led into the venue by the researcher. Half an hour prior to the session, the venue is then prepared. This involves setting up the video camera and placing the physical props (product samples and smart packaging components) and documentation onto each participant's allocated tablespace. Upon arrival, participants are seated around the table and asked to read and fill out the documentation (i.e. participant information sheet, informed consent form, pre-study questionnaire) placed in front of them. Completed forms are then collected although participants may take a copy of the information sheet if they wish to do so. Once this has been completed, participants are notified that recording will soon begin, providing them with some time to settle down before the session commences.

The researcher begins by thanking all the participants for their willingness to participate in the focus group. This is followed by a brief explanation of the discussion outline to notify participants of the staged approach to the discussion. The discussion is broken down into several stages, with each stage corresponding to a smart packaging application. At the beginning of each stage, only the corresponding stimulus material for that stage is distributed to participants to reduce the likelihood of them getting distracted or biased by those of the next stages (e.g. distributing only the stimulus material for "Information Display" stage when discussing ground coffee rather than all the storyboards simultaneously). Participants are then given approximately 1 – 2 minutes to read through before the discussion commences. Once all the stages scheduled for the session has been

covered, the researcher wraps up the session and if necessary, requests the participants for the details required to send out their compensation.

3.3.1.11 Recruitment

In a student city like Nottingham, measures had to be taken to ensure that the quality of data collected was not compromised by a sample pool dominated by students. To address this issue, purposive sampling was used in recruiting participants for this study. Purposive sampling is a sampling method in which participants are recruited for their ability to provide insights that may be valuable despite the fact that they may not necessarily represent the frequencies of the different types of people in the whole population (Carson et al., 2001). More precisely, this study used maximum variation sampling (also known as heterogeneous sampling) in which cases are specifically picked to get a variation on the dimensions of interest in the subject (Patton, 2005). This was reflected by the explicit recruitment of non-student participants for the formation of the last two focus groups.

Participants were recruited through a variety of digital and physical channels. Recruitment flyers were put up on noticeboards at locations with high foot traffic such as the post office, churches, community centres, supermarkets, primary schools, and apartment complexes. Since the focus groups were conducted at the University of Nottingham due to its free availability of meeting rooms, the sites selected as recruitment spots were located around the Beeston and Nottingham city centre areas to target locals who are much more likely to be willing and able to attend a session due to their proximity to the venue. Flyers were also put up around the University of Nottingham, including libraries, student service centres, graduate centres, and the international office. Digitally, the flyer was shared on social media amongst the researcher's social network and emailed out to several mailing lists the researcher belonged to on the University of Nottingham domain. While this recruitment strategy was highly effective in recruiting students, it was unable to recruit a sufficient number of non-student participants, prompting additional methods of recruitment.

Emails were then sent out to recruit staff from the Estates, Catering, and Admissions department at the University of Nottingham and flyers directly distributed to staff groups such as the administration staff for the School of Computer Science and the sports centre to propagate amongst themselves. When it became apparent that these too were not effective, a local qualitative research agency (i.e. Considered Response) was hired to recruit 9 non-student participants (10 was requested but 1 dropped out at the last minute) which formed the last two focus groups. The final number of participants recruited for this study was 23 and their demographic profiles are shown in Table 22 below.

Occupation	Gender	Age	Living (with)
Student	Female	28	Partner (1)
Student	Male	34	Family (2)
Student	Male	26	Friends (3)
Student	Female	26	Friend (1)
Student	Female	26	Friend (1)
Student	Female	29	Alone
Student	Male	31	Friend (1)
Student	Male	29	Friend (1)
Student	Female	25	Alone
Student	Female	28	Partner (1)
Student	Male	28	Alone
Actor	Female	28	Partner (1)
Graphic Designer	Male	34	Partner (1)
IT Consultant	Male	34	Family (2)
HR Specialist	Male	25	Alone
Consultant	Male	34	Family (2)
Dancer/Actor	Male	25	Family (3)
Analyst	Male	35	Family (6)
NHS Manager	Female	34	Partner (1)
Business Development Manager	Female	34	Partner (1)
E-Commerce Assistant	Female	25	Family (2)
Teacher	Female	34	Family (4)
Office Manager	Female	34	Family (U)

Table 22. "Consumer Attitudes Towards Smart Packaging" Participants' Demographic Profiles

3.3.1.12 Venue

Focus groups were ran in the meeting rooms at the School of Computer Science at the University of Nottingham. In compliance with the guidelines recommended by the focus group literature, the venue chosen was easily accessible and where participants were likely to feel comfortable (Kitzinger, 1994; Krueger and Casey, 2014; Ritchie et al., 2013; Smith, 1972). The university is not only easily accessible by public transport but also well equipped with ample parking space (even free after-

hours). Additionally, with Nottingham being a student town and the recruitment targeted at locals, participants were very likely to have heard of the university or may have even visited it. This, in conjunction with its reputable image as an educational institution and frequent involvement with the local community should be sufficient to reassure participants of the legitimacy of this study.

Rooms selected were those fairly spacious for a group of six yet not big to the extent that it would dwarf participants (Krueger and Casey, 2014). Participants and the researcher were seated in a circle/oval around a table throughout the discussion. This arrangement commonly used in focus groups (Folch-Lyon and Trost, 1981; Kitzinger, 1994; Powell and Single, 1996) ensured that everyone in the group (including the researcher) could be easily seen and heard, maximising face-to-face contact and encouraging participant interaction (Flores and Alonso, 1995; Krueger and Casey, 2014; Ritchie et al., 2013) that is integral to group dynamics. This arrangement also mitigated the potential issue of the group fragmenting into smaller conversations (i.e. participants only speaks to those seated closer to them) that may happen if participants felt left out of the discussion as a result of being seated too far away from the current speaker. The video camera was mounted on a tripod and located out of eyeshot to maintain an unobtrusive presence that won't inhibit participant interaction (Powell and Single, 1996) and at the centre of the table, a tablet that serves as a backup audio recording device was placed.

3.3.1.13 Compensation

Participants were given a £10 Amazon voucher as a token of appreciation for their time, sent to an email address of their choosing. This amount was loosely based on the University of Nottingham's School of Computer Science's normative study participation rate of £10 per hour. Shopping vouchers were provided instead of monetary payments to avoid implications concerning taxation or benefits that may otherwise arise.

3.3.1.14 Data Collection

Focus group discussions were recorded using a video camera and a tablet which functioned as a backup audio recorder. A total of 411 minutes of footage was recorded which was then transcribed to 135 A4 pages (single spaced with a font size

of 11). All of the participants' names were changed to fictional ones during transcription in order to mask their identities.

3.3.2 Analytical Approach

Having explained the rationale behind the design and conduct of this study, the thesis now proceeds to describe and justify the approach that was used to analyse the data: thematic analysis. Thematic analysis is an analytical method which focuses on the identification of patterned meanings in qualitative data. As an analytical method, one of its major strengths lies in its flexibility to adapt to various epistemologies and types of qualitative data. Ironically, this, in conjunction with the absence of clear and concise guidelines in the early iterations of this method (Merton, 1975) also placed it in a position subject to the 'anything goes' critique made of qualitative research (Antaki et al., 2003) which led to its diminished use. It was not until 2006 that use of thematic analysis resurged. This was largely due to the publication of Braun and Clarke's 2006 article in which they addressed the aforementioned issues and proposed a generic six-phase approach (depicted in Table 23 below) to conducting thematic analysis that is now widely considered to be the most well-established and systematic form of contemporary thematic analysis (Howitt and Cramer, 2007; King and Brooks, 2018; Maguire and Delahunt, 2017).

Phase	Activities
One	Data familiarisation and writing familiarisation notes
Two	Systematic data coding
Three	Generating initial themes from coded and collated data
Four	Developing and reviewing themes
Five	Refining, defining, and naming themes
Six	Writing the report

Table 23. Braun and Clarke's six-phase approach to thematic analysis
Source: Braun and Clarke, 2006

In relation to this study, thematic analysis was selected as the analytical method to adopt due to its compatibility with the objectives of this study. Based on the academic literature, thematic analysis has been found to be particularly successful in exploring how participants conceptualise or perceive phenomena and concepts (Joffe, 2012) while also highlighting the similarities and differences of said perspectives across different participants which could potentially lead to the generation of unexpected insights (Braun and Clarke, 2006; King, 2004). While

thematic analysis is traditionally used in this manner, they have however also been found to be highly effective in identifying factors of adoption or reasons why participants would or would not use certain services (Ayres, 2007; Eze et al., 2020; Leeuw et al., 2019; Said, 2017). Given that the goals of this study were to investigate how consumers felt about smart packaging and identify design factors which could encourage or discourage consumers to use smart packaging features, thematic analysis was deemed to be an excellent fit for this study.

Additionally, in line with the recent recommendation made by Braun and Clarke (2020) to explicitly specify the variation of thematic analysis undertaken in academic scholarship, the researcher would like to clarify that although the thematic analysis conducted for this study still followed Braun and Clarke's (2006) generic six-phase approach, the use of a coding frame (elaborated further in Section 3.3.2.2 below) during the coding phase is much more in line with what Braun and Clarke (2020) refers to as a codebook approach, resembling a coding approach typically used in template analysis (Brooks et al., 2015; King, 2012; King and Brooks, 2018) as opposed to Braun and Clarke's reflexive approach of purely open coding. While reflexive thematic analysis is generally thought to be the golden standard of thematic analysis due it being the variation practiced by Braun and Clarke who many consider to be the foremothers of contemporary thematic analysis, a codebook approach was ultimately considered to be more appropriate for this study due to its goals.

Although the researcher acknowledges the advantages of an open coding approach practiced by reflexive thematic analysis (e.g. coding is less likely to be influenced by underpinning theory) over a codebook approach's use of a coding frame when aiming to conceptualise a phenomenon, the focus of this study was to identify design factors of smart packaging features which are capable of influencing how smart packaging facilitates value co-creation or co-destruction and consequently, their likelihood of consumer interaction. Given this study's theoretical underpinning (i.e. predetermined value dimensions), a codebook approach to thematic analysis was considered to be more suitable as the use of a coding frame allows the researcher to identify instances of the dataset to code for in a much more consistent and targeted manner. Having briefly described the nature of the thematic analysis that was

conducted for this study and its rationale, each phase of Braun and Clarke's (2006) six-phase approach will now be elaborated in turn.

3.3.2.1 Phase One: Data familiarisation and writing familiarisation notes

Transcription was how the researcher familiarised himself with the data. Since thematic analysis does not necessitate the same level of detail as other methods such as conversational or discourse analysis (Braun and Clarke, 2006), only verbal accounts (i.e. dialogue) were transcribed. Transcripts were transcribed verbatim (i.e. word-for-word) and were considered complete once all dialogue has been transcribed and checked against the footage for accuracy. An excerpt of a transcript can be found in Appendix D.

Despite the common misconception of transcription being merely an act of putting spoken sounds on paper (Lapadat and Lindsay, 1999), transcription is generally considered to be an excellent way for researchers to immerse themselves within the data (Riessman, 1993) and has even been argued by qualitative methodologists to be a key stage of the analysis itself (Bird, 2005). Data familiarisation through transcription has also been recommended by Braun and Clarke (2006) as familiarisation is expected to occur naturally from the number of times the researcher is expected to listen to the footage and read the transcripts when verifying their accuracy. For instance, while the academic literature suggests researchers to go through their transcripts at least two (Maguire and Delahunt, 2017) to three (Houghton and Houghton, 2018) times to familiarise themselves with the data, the total number of times the researcher went through the transcripts (and its parts) easily exceeded this number due to the inherent nature of the process. This is evident from how it took the researcher approximately eight hours to transcribe an hour of footage, a time period that is much longer than the minimum familiarisation threshold of three hours identified by Hawkins (2018). Collectively, this strongly suggests that the transcription process was sufficient for the researcher to familiarise himself with the dataset.

There are also several advantages of having the researcher transcribe the footage himself, the main one being minimal data loss. Given the researcher's knowledge of the subject and his role as the moderator of the focus group discussions, it was less

likely for context-dependent data to be lost if transcription was carried out by the researcher himself instead of a third party (Halcomb and Davidson, 2006). Additionally, having the research transcribe the data himself allows him to develop a more nuanced understanding of each participant by taking into consideration subtle traits that were only apparent in the footage (e.g. voice, body language). This is particularly useful during the coding phase of the analysis as verbatim dialogue may not always be sufficient to fully capture the intent of a participant who may not be fully fluent in English.

3.3.2.2 Phase Two: Systematic data coding

During this phase, the researcher identifies parts of the dataset likely to be of greater interest in relation to the studied phenomenon. Said parts were assigned codes, basic indicators of meaningful segments within the dataset (Boyatzis, 1998) which were used to filter out 'noise'. Coding is described by Tuckett (2005) as an act of organising data into meaningful groups that is considered to be an integral part of the analytical process (Miles et al., 2018). It allows the researcher to strategically focus on analysing specific parts of the dataset that are likely to be more informative as opposed to conducting a blanket analysis on the entire set, saving valuable time throughout the analytical process.

A combination of both theory-driven (deductive) and data-driven (inductive) approaches were used throughout the coding process, a style that is not only common in studies using thematic analysis (Braun and Clarke, 2006) but also argued to be inevitable (Braun and Clarke, 2020) as it is simply not possible to enter a theoretical vacuum (i.e. adopting a purely inductive approach) when conducting thematic analysis. The analytical approach was deductive in the sense that the coding phase was guided by a coding frame (i.e. coding for instances of value co-creation and co-destruction) predetermined by the underpinning theory and goals of this study. On the other hand, the approach was also inductive in the sense that the themes output by this study themselves were completely data driven.

As previously mentioned, this study's codebook approach to thematic analysis made use of a coding frame in a way similar to how it typically is employed in template analysis (Brooks et al., 2015; King, 2012; King and Brooks, 2018). Following the

advice of renowned methodologist Patton (2002) who acknowledged the unique requirements necessitated by each qualitative study and argued that there is no one true coding or combination of coding methods applicable to all qualitative inquiry, a bespoke coding approach for this study was developed with the guidance of Saldana's (2015) coding manual.

3.3.2.2.1 Coding Frame

As the coding frame 'directs' the nature of the themes output by this study, the goals of this study are once again referred to during its design. To recap, this study aims to output themes which represents design factors for smart packing designers to consider when designing smart packaging due to their potential in facilitating consumer value co-creation and co-destruction. Given the targeted nature of the themes of this study, the coding frame specifically coded for instances of value co-creation and co-destruction facilitated by smart packaging. These codes are termed primary codes and characterise what brought about the phenomenon. In consideration of the next phase of the analysis during which primary codes are clustered, primary codes were also labelled in a shorter and more concise manner as opposed to how first order codes are traditionally labelled in thematic analysis (i.e. longer and more verbose phrases) to reduce the need for further pre-processing that longer codes may need due to the different linguistic ways the same concept can be coded (e.g. the use of synonyms). While one can argue that the use of shorter codes results in entries which are not as rich in context, the researcher argues that this is provided through the use of accompanying structural and subcodes. Besides the primary code, a coded instance is also required to be accompanied by a structural code (termed the scenario code) indicating the smart packaging features which induced this effect, a dimensional subcode denoting the dimension of value affected (i.e. utilitarian, hedonic, social) as well as a valence subcode (i.e. positive, negative, neutral) that describes the whether the smart packaging feature is facilitating value co-creation, co-destruction, or explicitly denote the absence of either. Alternatively, coded instances may also relate to the recommendations, concerns, and requirements (identified by the scenario code) of smart packaging voiced out by participants which if so, does not require an accompanying valence subcode. Table

24 below shows how the coding frame is used to enforce certain rules throughout the coding phase, followed by two examples of coded instances within the dataset.

Code	Possible Choices	Notes
Primary Code	Not Applicable	Compulsory. They either characterise the cause of valenced effects on value or recommendations, concerns, or requirements that participants voiced out regarding the smart packaging feature(s) denoted by its accompanying scenario code.
Scenario Code	"Smart Sunscreen"	Compulsory. The choices represent the smart packaging feature (s) depicted in their corresponding storyboards. For instance, "Smart Alcohol (2)" refers to the smart packaging feature(s) depicted in the second storyboard of the Smart Alcohol scenario which can be found in Appendix B. "General" means that the context refers to smart packaging features in general as opposed to a specific one or set depicted in the storyboards.
	"Smart Alcohol (1)"	
	"Smart Alcohol (2)"	
	"Smart Alcohol (3)"	
	"Smart Coffee (1)"	
	"Smart Coffee (2)"	
	"Smart Coffee (3)"	
	"General"	
Dimensional Subcode	"Utilitarian Value"	Compulsory. The first three choices denote the dimension of value affected or explicitly unaffected (depending on its accompanying valence subcode) by the smart packaging features denoted by its accompanying scenario code and for reasons denoted by its accompanying primary code. The other choices are used in the following manner: • "Recommendations" – Recommendations on designing the smart packaging feature(s) denoted by the accompanying scenario code • "Concerns" – Concerns with the smart packaging feature(s) denoted by the accompanying scenario code • "Requirements" – Requirements of the smart packaging feature(s) denoted by the accompanying scenario code which needs to be fulfilled before the participant would use it
	"Hedonic Value"	
	"Social Value"	
	"Recommendations"	
	"Concerns"	
	"Requirements"	
Valence Subcode	"Positive"	A valence subcode is compulsory only if the accompanying dimensional subcode is either "Utilitarian Value", "Hedonic Value", or "Social Value". "Positive" indicates value co-creation, "Negative" indicates value co-destruction, and "Neutral" indicates an absence of effect.
	"Negative"	
	"Neutral"	

Table 24. Coding Frame for the Thematic Analysis conducted for "Consumer Attitudes towards Smart Packaging"

Example One

> *"The genuinely fake alcohol is like good, me and the lads in a day. We've got this new subsidy island which we bought we said "oh yeah it's a good deal", put it in the freezer, and then got it out like 12 hours later and it was frozen and we're just like 'Is it meant to be vodka? I don't think we should drink this'."*

Codes:

Primary Code : "Fake Alcohol Experience"
Scenario Code : "Smart Alcohol (1)"
Dimensional Subcode : "Utilitarian Value"
Valence Subcode : "Positive"

This coded instance indicates that the participant thought that the smart packaging features depicted in the first storyboard of the Smart Alcohol scenario was able to provide utilitarian value through reassurance that the alcohol is authentic and untampered. This coded instance of the data is assigned four different codes due to its dimensional subcode being "Utilitarian Value".

Example Two

> *"I think as long as it was environmentally friendly, as in we weren't using more energy and resource to send a refill and to have the tin cause I think yeah I was wondering when it was describing it, okay so I've got my tin which is my fixed product. What does the coffee come in? And therefore you know, are we contributing to being environmentally friendly?"*

Codes:

Primary Code : "Sustainability"
Scenario Code : "Smart Coffee (3)"
Dimensional Subcode : "Concerns"

This coded instance indicates that the participant has expressed concern about the sustainability of the smart packaging features depicted in the third storyboard of the Smart Coffee scenario. This coded instance only has three codes and does not have a

valence subcode due to its dimensional subcode being “Concerns” and not “Utilitarian Value”, “Hedonic Value”, or “Social Value”.

With regards to formal coding methods, the coding frame made use of five different coding methods described in Saldana’s (2015) coding manual. Due to how rarely complex social interactions occur in neat and isolated units (Glesne, 2016), a simultaneous coding (i.e. assigning more than one code to a coded instance) approach was adopted. This not only helped the researcher identify specific segments of the corpus a coded instance refers to (saving time throughout the entire analytical process) but was also instrumental as variables used during the clustering process in the next phase. Besides simultaneous coding, other coding methods that were used included subcoding (represented by the use of the valence and dimensional subcodes) and structural coding (represented by the use of scenario codes). Subcoding was used as coding grammar to detail and organise data into preliminary groups (Saldana, 2015) and entry-enriching tags (Miles et al., 2018) while structural coding facilitated an indexing mechanism which allows the researcher to quickly access data likely to be relevant to a particular analysis from a larger data set (Namey et al., 2008), also providing an additional layer of data segmentation and alternate perspective of cross and intra-segment analysis (Guest and MacQueen, 2008). This was then supplemented by magnitude and provisional coding. Magnitude coding was used to identify the ‘direction’ (Fielding, 2008) of value-cocreation and co-destruction through the valence subcodes while provisional coding was demonstrated through the use of fixed and predetermined choices within the coding frame.

Once the coding frame had been designed, the researcher then went through the transcripts, coding for phenomena compatible with the template specified by the coding frame. More specifically, this meant coding for participant recommendations, concerns, or requirements of smart packaging features or how they facilitate the co-creation or co-destruction of utilitarian, hedonic, or social value. Once each transcript has been coded, the researcher then goes through each one two more times to ensure that no data worth coding was left out.

3.3.2.3 Phase Three: Generating initial themes from coded and collated data

Themes "captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set" (Braun and Clarke, 2006). In this phase, the researcher looked for common patterns among the coded instances in order to look for recurrent themes. To do so, the researcher first entered all the coded instances into Microsoft Excel (Bree and Gallagher, 2016). Once all the coded instances have been entered into a spreadsheet (a segment is presented in Appendix E), the researcher would then begin by looking for clusters based on the similarities between their dimensional and valence subcodes. This was done by systematically filtering out the coding matrix based on the two subcodes. For instance, the matrix would be filtered out for coded instances where the dimensional code is "Utilitarian Value". A second level filter would then be applied for each possible valence code ("Positive", "Neutral", and "Negative") to make it easier for the researcher to identify all the instances in which smart packaging was perceived by the participants to facilitate utilitarian value co-creation , co-destruction, or had no influence whatsoever. Using this approach, a total of 12 filtered tables were examined (filter parameters shown in Table 25 below)

Filter Number	Dimensional Subcode	Valence Subcode
1	"Utilitarian Value"	"Positive"
2	"Utilitarian Value"	"Neutral"
3	"Utilitarian Value"	"Negative"
4	"Hedonic Value"	"Positive"
5	"Hedonic Value"	"Neutral"
6	"Hedonic Value"	"Negative"
7	"Social Value"	"Positive"
8	"Social Value"	"Neutral"
9	"Social Value"	"Negative"
10	"Recommendations"	Not Applicable
11	"Requirements"	Not Applicable
12	"Concerns"	Not Applicable

Table 25. Filter Parameters for the Coding Matrix

Within each of these filtered tables (an example of the results of a filter can be found in Appendix F which depicts an example of the processing done at this stage), clusters of equivalent primary codes are first identified. For the context of this analysis, clusters are merely defined as a group of two or more coded instances sharing the same primary code, dimensional subcode, and valence subcode. Clusters

are then compared with each other to identify similarities between them. If similarities are spotted, coded instances in the relevant clusters are assigned an intermediate code that characterises said similarity. If a coded instance within a cluster may not be compatible with the intermediate codes of the other instances within the cluster, it can also be assigned a different intermediate code either through promotion (i.e. using the same primary code as an intermediate code) or reframing (i.e. identifying the core essence of the primary code and using it as the intermediate code). The same applies for coded instances within clusters unable to merge with another cluster. Once all the coded instances of the identified clusters have been assigned an intermediate code, the remaining coded instances are then processed. At this step, these instances are first examined whether they can be assigned an existing intermediate code. If this is not possible, only then are these coded instances considered for intermediate code assignment through promotion or reframing. By the end of this stage, all coded instances are assigned an intermediate code.

The same procedure is then repeated for the intermediate codes. In a similar manner to the previous stage, this stage begins by assigning themes to coded instances with intermediary codes in clusters (i.e. recurs at least twice) based on similarities between them. The remaining coded instances (i.e. those not in clusters or are incompatible with the theme assigned to its current cluster) are then re-examined once more. Those that can be associated or classified under an existing theme are then assigned that theme whereas those that are not are given the theme of “Miscellaneous” as suggested by Braun and Clarke (2006).

3.3.2.4 Phase Four: Developing and reviewing themes

Following the recommendations of the academic literature (Braun and Clarke, 2006; Maguire and Delahunt, 2017), once all the coded instances have been assigned themes, themes then needed to be compared against each other to ensure that they are sufficiently distinct from each other (external heterogeneity) and are internally coherent (internal homogeneity). To check for external heterogeneity of a theme, the researcher systematically compared all the coded instances of each theme with those of all the other themes while constantly asking himself whether or there is

sufficient relevance and similarity between the coded instances of both themes for them to combine. Themes were considered externally heterogeneous when no coded instance was able to be associated with more than one theme. This was then followed by the check for internal homogeneity which involved the researcher systematically going through all the coded instances of each theme to ensure that all of them revolved around the same central concept underpinning the theme. When themes did not meet this criterion, alternate theme mappings (to coded instances) were trialled until they did. While this phase generally involves the classical dance between data and theory, this was not applicable for this study due to the lack of established academic literature within this domain (i.e. value co-creation in smart packaging). Finally, coded instances assigned the "Miscellaneous" theme are re-examined for compatibility with any of the finalised themes due to the change in the pool of themes since their initial assignment. Incompatible ones are then omitted from the findings.

3.3.2.5 Phase Five: Refining, defining, and naming themes

In this phase, each theme is first defined by clarifying its 'essence' (Braun and Clarke, 2006) or underpinning central concept. While these have already been identified in the previous phase, a revision of all the intermediate codes assigned to each theme not only served as an additional layer of validation but also prompted the researcher to think about alternative names to the working title of each theme. The 'scope' of each theme was then compared with that of each other's to verify whether they all belong on the same hierarchical level or include a sub-theme. This was carried out by summing up each theme in a couple of sentences and comparing their level of complexity and diversity. As these were found to be relatively equal, themes were not required to be broken down into sub-themes. Finally, the name of each theme is then finalised. Given the targeted nature of the themes of this study (i.e. design factors for smart packaging designers to consider), themes were named in a concise manner that loosely fits into the phrase "*theme* of smart packaging (users)".

3.3.2.6 Phase Six: Writing the report

In this phase, the findings of this study are reported. The production of the report involves a detailed write-up of each theme and the selection of data extracts that

best capture their essence. Quotes were primarily selected based on diversity to show readers how each theme can affect value co-creation in both a positive and negative manner or why it had no effect within a wider variety of smart packaging features. Seven themes representing design factors of smart packaging that are capable of influencing consumer value co-creation were output by this study and are reported in Section 4.1. This marks the end of the section concerning the methodology of the first study. The next section of this chapter will elaborate on the methodology of the second study: "Obrien's Coffee".

3.4 Obrien's Coffee

"Obrien's Coffee" was the second study that was conducted for this research. It involved the deployment of technology probes into the homes of 12 participants for a 4-week period, during which they were given the opportunity to interact with a bespoke smart packaging experience designed around coffee. Unlike the previous study where participants were only asked to respond to hypothetical applications of smart packaging, this study examined actual participant interaction with smart packaging in a naturalistic real-world setting. The goals of this study were to:

1. Revise the working definition of smart packaging engagement with empirical findings
2. Investigate how consumers co-create value and engage with smart packaging

Having conducted the previous study which revealed factors affecting the likelihood of consumer interaction with smart packaging and its subsequent value co-creation, the researcher believes that it is now feasible to design a smart packaging experience that participants may find engaging. Additionally, given the expectations of engagement to translate into corporate benefits, the study also examined the potential effect of smart packaging engagement on brand relationships. Esch et al.'s (2006) conceptualisation of brand relationships which comprises three dimensions (brand trust, brand satisfaction, and brand attachment) was selected as the proxy for corporate benefits as this construct is likely to be of more interest to the individuals interested in smart packaging research (i.e. industrial practitioners) given its current state in academia and the expected influence of smart packaging (albeit not

explicitly framed as smart packaging engagement due to the industrial nature of the articles) on brand relationships (Armstrong et al., 2018; Hancock, 2019). The focus of this study is framed as the area enclosed by the red box in Figure 5 below. Much like the previous section, this section is also split into two parts. The first part elaborates on the rationale behind the decisions made concerning the design and conduct of the study, while the second covers its analytical approach.

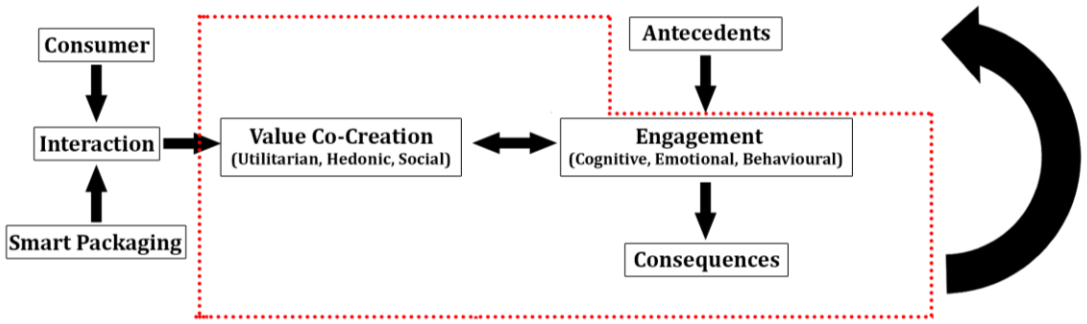


Figure 5. The Focus of "Obrien's Coffee"

3.4.1 Study Design and Conduct

3.4.1.1 Technology Probes

Data collection for research concerning smart packaging engagement introduces a new challenge that engagement research within other contexts do not typically face: participant scarcity. Whereas interaction with online brand communities or social media is already ingrained into the daily lives of many, the same cannot be said for interaction with smart packaging. Despite the numerous smart packaging concepts and campaigns that have been announced and launched, the number of individuals who have had the experience of interacting with smart packaging is minimal. This can be attributed to the limited availability of smart packaging that are typically only trialled during exclusive events but very rarely makes it to the shelves.

To address this issue, this study developed technology probes for participants to interact with to facilitate data collection for research relating to smart packaging engagement. Technology probes are technologies introduced into the homes of participants which they are expected to interact with as part of their regular routines. Originally developed by Hutchinson et al. (2003) for the field of human-computer interaction (HCI), it is a method intended for co-designing technology with

participants which aims to achieve three interdisciplinary goals: “the social science goal of collecting data about the use of technology in a real-world setting, the engineering goal of field-testing the technology, and the design goal of inspiring users and researchers to think about new technologies” (p. 18). Due to its strengths in encouraging participant co-design, technology probes are often used to pilot technology at early stages of development (Hutchinson et al., 2003). Although use of technology probes as a method within the service and marketing literature has been minimal (Mindshare, 2016), they have been used in fields such as healthcare to explore the potential effectiveness of digital interventions to persuade a more active lifestyle in teenagers (Edwards et al., 2011), better monitor conditions such as asthma (Yun et al., 2010), and improve the effectiveness of physical therapy (Huang et al., 2014) as well as sociology in which they have been used to study how families (Hutchinson et al., 2003), senior citizens (Güldenpfennig and Fitzpatrick, 2013), and couples (O’Brien and Mueller, 2006) communicate. It is also important to note that despite the connotations associated with the term ‘probes’, technology probes are not required to be physical objects. Depending on the research context, they can take on the form of purely software-oriented solutions (e.g. websites and apps), standalone devices, or a combination of both.

Practically, technology probes are renowned for its ability to collect data with minimal human intervention within a naturalistic environment. It is especially suitable for longitudinal studies where use of the probe may not be frequent or regular and longitudinal data is required to make better sense of the participants’ usage behaviours. This method is often supplemented by other data collection techniques, effectively forming a triangulation approach that is contended to explain in greater detail the richness and complexity of human behaviour (Altricher et al., 2007; Cohen et al., 2017). Supplementary methods that have been used in the past includes interviews, focus groups, observation, participatory design workshops, automated logging, and questionnaires (Bourgeois et al., 2013; Edwards et al., 2011; Güldenpfennig and Fitzpatrick, 2013; Huang et al., 2014; Hutchinson et al., 2003; O’Brien and Mueller, 2006; Yun et al., 2010). The use of technology probes enables the researcher to deliver the experience of using smart packaging to participants,

effectively solving the issue of participant scarcity. In-house development of the probes also facilitates an exploration of smart packaging that can be carefully tailored to certain features that are not commercially available (e.g. multi-platform networked technology, sensitive personal data collection and visualisation).

3.4.1.2 Procedure

Due to how technology probes are not a commonly used method which may not be easily understood, the researcher believes that it is best that the procedure of this study is first explained so that readers would find it easier to comprehend the following sections in this chapter. It should first be clarified that although the term 'technology probe' may mislead readers into thinking of it as a standalone piece of technology (e.g. a device) that participants use throughout the study, it is not. The technology probe refers to the entire smart packaging experience that is facilitated by three elements: NFC tags (attached to three 250g blank brown paper bags of coffee), a custom-made Smart Scale (simulating the sensing functionality of future smart packaging), and the "Obrien's Coffee" app designed for Android smartphones (shown in Figure 6 and 7 below).

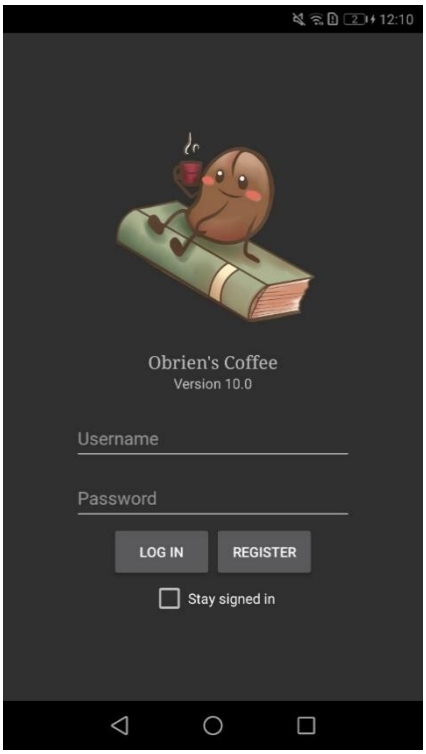




Figure 6 (left). Login Screen of the Obrien's Coffee app
Figure 7 (right). Smart Scale and NFC Tag (prior to attachment to coffee packs)

To begin with, there are three stages to this study: a technical briefing, in-home deployment, and an interview. As this study involves the deployment of said probes into the participants' homes, it is essential that participants understand how the probes function. Due to the technical complexity of some of the smart packaging features that were implemented, it is vital that participants first familiarise themselves with the technology so that they do not disregard certain features due to a lack of understanding or awareness (i.e. not realising they exist). It was for this reason that a technical briefing is first conducted before deploying the probes into the participants' homes. Briefings were conducted within a one-on-one setting to allow the researcher to dedicate all of his attention to just one participant.

A day before the technical briefing, participants are sent either an email or text message to remind them of the date, time, and venue of the briefing. On the date and time of the meeting, the researcher first introduces himself upon meeting the participant before guiding them to the venue, where they are then seated by a table. The participant is then asked to read the participant information sheet and sign the informed consent form. Once this has been completed, the researcher then provides an explanation of how all the smart packaging features works before asking the participant to complete a checklist of activities to ensure that the technology is well understood. The participant may ask the researcher questions at any time during the session or request for guidance in completing the checklist. Once the checklist has been completed, the researcher provides the participant with the equipment to bring home, progressing them to the in-home deployment stage of the study. Participants bring home the following: Three 250g packs of coffee (each with an NFC tag attached to its packaging), an Android smartphone with the "Obrien's Coffee" app installed, a coffee tin, and the Smart Scale. If at any time participants finish the coffee supplied to them, they may request for additional coffee from the researcher at no cost.

The in-home deployment stage lasts for four weeks. During this stage, participants are expected to scan the NFC tags and empty the coffee packs one at a time (i.e. finish consuming one pack before moving onto the next) into the tin. The tin would then need to be set on the smart scale at all times, remove only when displacement

is necessary during refilling or the coffee brewing process. The smart scale will need to be plugged into a power socket. As the scale requires Internet connection in order to transmit the weight measurements into the app's database, the researcher will have programmed it to automatically connect to the participant's home Wi-Fi network (credentials requested in advance) or a hotspot network created by the loaned smartphone (participants are instructed to keep this phone charged at all times and close to the scale). Participants are then expected to consume coffee as usual (i.e. the study does not require or force them to change their coffee consumption habits). However, for each day that they consume the coffee or interact with the app, they are required to complete an audio diary entry using the pre-installed Recordr app on the loaned smartphones. The diary style of data collection was chosen due to how engagement was posited by Brodie et al. (2011) to be a state that likely to change over time. Given that many of the value propositions identified from the existing applications of smart packaging reviewed in Section 2.4.1 were 'disposable' value propositions that may not persist over time, the researcher was interested in exploring how this may potentially differ feature to feature over time. Audio diaries were to be completed with the guidance of prompts (elaborated in more detail in Section 3.4.1.5), a common practice in audio diary studies (Williamson et al., 2015; Worth, 2009) to help keep the diary entries relevant to the goals of this study. As the participants recruited for this study are regular coffee drinkers (elaborated in more detail in Section 3.4.1.8), a fairly high number of diary entries was expected. Ultimately, the audio diary approach was selected over the traditional written diary approach for its natural ability in eliciting a more nuanced and micro-level account of the investigated phenomenon as well as its higher attrition rates (Hislop et al., 2005). Additionally, all interactions on the "Obrien's Coffee" app are also automatically logged (elaborated in more detail in Section 3.4.1.6). Once the four-week study period is up, the researcher gets in touch with the participants to collect the loaned equipment.

Taking into account the criticism of audio diaries of being unable to stand on its own (Williamson et al., 2015) and its tendency to 'stray' away from the focus of the research (even with the guidance of prompts), a concluding interview was then

conducted after the in-home deployment stage following the suggestion made by Hislop et al. (2005). The interviews were conducted 2 – 4 days after the equipment has been returned to allow the researcher time to go through the logs and audio diaries before the interview so that the researcher can flag material that may require further probing. Details of the questioning route used in the interview are elaborated further in Section 3.4.1.7

3.4.1.3 FMCG Selection

The smart packaging experience that this study would investigate was designed around coffee. This was primarily due to its compatibility with many of the smart packaging features this study was interested in. First of all, the researcher felt that it was absolutely necessary for the study to investigate NFC tags given the industry's high expectations of the technology. Based on the review of existing applications of NFC tags (refer to Table 8 in Section 2.4.1.1), it was observed that they are typically used to direct consumers to more information about the product. Additionally, as there is a huge pool of information (e.g. provenance, tasting notes) around coffee which consumers are interested in (refer to Section 3.3.1.2), the researcher argues that this feature offers various value propositions for consumer value co-creation that are likely to result in engagement.

Aside from NFC tags, the researcher also deemed it essential to investigate consumer response towards connected packaging. This was due to how connected packaging is expected to proliferate rapidly within the near future, providing features that can continuously offer value propositions instead of disposable or limited-use ones like information (i.e. once information has been absorbed or learned by consumers, there is no value in re-learning it). Additionally, connected packaging is also strongly associated with personal data collection as the canonical long-term service (i.e. replenishment) it aims to provide is typically based on the continuous monitoring of consumption habits. As it has already been argued in Section 3.3.1.2 that coffee is a frequently consumed FMCG that requires frequent replenishment, it was deemed a good fit for exploring connected packaging.

There were also practical factors that needed to be considered when selecting the FMCG. It would ideally be located in 'tech friendly' locations within the home,

avoiding areas such as the bathroom where it would be susceptible to damage from steam, condensation, or liquid contact or the fridge which not only prevents any form of radio communication but also imposes the additional requirement of needing a reliable power source (e.g. battery) on the smart packaging. As coffee is typically stored in the kitchen cupboard, away from liquids and the sun to preserve its quality, it is deemed to be a 'safe' product to design smart packaging for.

Finally, coffee was one of the FMCGs that was explored in the first study. This meant that in comparison with other potential FMCGs, coffee has the advantage of having some of its intended smart packaging features 'tested' with consumers, which although was conveyed through fictional scenarios was still able to provide the researcher with additional insight on how to design an engaging smart packaging experience. Having taken into account all of the reasons above, coffee was ultimately selected as the FMCG that this study would focus on.

3.4.1.4 Smart Packaging Experience

Having decided on the FMCG that the smart packaging experience would be designed around, this section now explains the rationale behind the decision to implement the smart packaging features in "Obrien's Coffee". These decisions were made based on two factors: industrial prominence and the likelihood of eliciting engagement. Industrial prominence refers to the likelihood of these features (or similar) being implemented in industry, giving them ecological validity. This was gauged using the review of existing smart packaging applications in Section 2.4.1. On the other hand, the likelihood of eliciting engagement was gauged using the likelihood of facilitating value co-creation (based on the second foundational proposition of Brodie et al.'s conceptualisation of customer engagement). This was derived from the findings of the first study. Table 26 below shows the targeted value propositions that each feature aims to offer. Finally, the smart packaging experience was also designed be cohesive (i.e. not overloaded with features merely for the sake of exploring them). With these considerations in mind, the researcher finally decided on the implementation of five features: NFC tags, Consumption Tracking, Community, Ratings and Reviews, and the Logbook. The individual features and their design are

now described in turn (readers may also refer to Appendix G for a full technical specification of the "Obrien's Coffee" app).

	Utilitarian Value	Hedonic Value	Social Value
NFC Tags	✓	✓	✓
Consumption Tracking	✓	✓	✓
Community	✓	✓	✓
Ratings and Reviews	✓		
Logbook	✓		✓

Table 26. Targeted Value Propositions Of Each Smart Packaging Feature

3.4.1.4.1 NFC tags

The NFC tag feature is a feature that participants can use by scanning the NFC tags found attached to the packs of coffee provided to the participants. Upon scanning the NFC tag with an Android smartphone with the "Obrien's Coffee" app installed, participants 'unlock' the coffee in a digital collection scheme and is given access to information about the coffee, such as where it was grown, expert tasting notes, and its Q grade (a metric that denotes the speciality of a coffee). This reflects a common implementation of NFC tags within the industry where it primarily used to convey additional information about the product. The digital collection scheme was inspired from the findings of the first study which found that consumers may enjoy the process of filling up their digital collection by scanning NFC tags, especially for products that comes in 'sets' such as alcohol (i.e. tasting all the whiskeys that comes from a particular distillery). In this study, the NFC tags were also the only way that participants could receive information about the coffee. Due to how this study was designed to be free of any branding material to remove the potential bias arising from existing brand attitudes, participants were provided their coffees in sealed, airtight blank brown paper bags void of any printing or information.

The implementation of this feature aimed to offer utilitarian (from information that may advise them on how to best brew the coffee), hedonic (from the act of scanning the NFC tags and unlocking it in the compendium), and social (from knowing more about how the coffee was sourced) value propositions.

3.4.1.4.2 Consumption Tracking

The consumption tracking feature is a feature that provides data indicating how much coffee participants consume on a daily basis. Participants were instructed to place their tin of coffee on the smart scales provided to them at all times (aside from when they refill or brew their coffee) so that the weight of the tin can be measured and transmitted daily. Difference between measurements are then calculated, indicating how much coffee (in grams) has been consumed daily that participants can view and download through the "Obrien's Coffee" app on their smartphones. The consumption tracking feature reflects an application of connected packaging within the industry that is expected to become increasingly common within the next few years alongside the rapid proliferation of the Internet of Things. It was inspired by the findings of the first study, which indicated that participants were concerned with firms collecting their personal data (including their consumption habits) and how the lack of transparency about the practice is perceived by some as a violation of privacy.

The implementation of the consumption tracking feature aimed to offer utilitarian (from better knowledge of their personal consumption habits), hedonic value (from the perceived violations of privacy), and social (from the adherence or disobedience to recommended daily caffeine thresholds) value propositions.

3.4.1.4.3 Community

The community feature is the social media platform of the "Obrien's Coffee" app where participants can post (text and image only), like, and comment on coffee-related content. Over the four week study period, participants are also able to earn raffle tokens by posting and commenting on certain topics (resembling actual implementation such as that of Malibu and Bodegas Barbadillo in Table 8) that will be announced by the researcher and notified to participants through both e-mail (provided during registration) and posts on the community. The three tasks were as follows:

- Post about your coffee brewing set up at home
- Comment on a post about the qualities you seek for in your coffee

- Correctly guess the supplier of the coffee for this study

Completing each of these tasks awards participants with one raffle token each which is then drawn at the end of the study. Participants are also given the ability to share posts that they make on their personal Facebook profiles if they would like. The community feature reflects how smart packaging can facilitate or drive sharing a consumption experience with others. The community was inspired by the findings of the first study which suggested that participants would be keen on finding out about how other people use products through a social media platform of sorts (referred as the "Instagram of Alcohol").

The implementation of the community aimed to offer utilitarian (from learning about how others consume the coffee), hedonic (from consuming content they might find interesting), and social (from comparing own brewing behaviour and knowledge with that of others) value propositions.

3.4.1.4.4 Ratings and Reviews

The ratings and reviews feature is a feature that enables participants to keep a personal record how they liked coffees that they have tried. Similar features has been trialled by brands in the alcohol sector (e.g. Boen) that has a huge range of products. Although designed for the personal use of the participants, functionality which enables participants to share their ratings and reviews to the community was also implemented. This feature was inspired by the findings of the first study which indicated that for products with a wide range such as alcohol and cheese, it can be very difficult sometimes for consumers to recall a specific variant due to the immense choice when shopping.

The implementation of the ratings and reviews feature aimed to offer utilitarian (from aiding recall of previous purchase evaluation that could advise future purchases) value propositions.

3.4.1.4.5 Logbook

The logbook is a feature that enables participants to keep a record of the differences in how their coffee tastes based on how they brew it. As coffee can be brewed in many different ways with various 'settings' (e.g. water temperature, coffee dose,

tamping pressure, time) that affect how it tastes, this feature was meant to encourage participants into experimenting with different brewing methods and techniques. It would also assist participants in learning more about the coffee brewing process through a series of 'do-this-get-this-taste' logs that can help them better understand how to brew coffee that better suits their personal palate based on its characteristics (i.e. whether it was washed or unwashed, roasting profile, tasting notes, origin).

The implementation of the logbook feature aimed to offer utilitarian (by assisting participants in learning more about the coffee brewing process and subsequently, brew coffee that better suits their personal taste) and social (by gradually building the self-image of a coffee expert) value propositions.

3.4.1.5 Audio Diary Prompts

It has been established that one of the weaknesses of diary studies is the low quality of diary entries that results from the lack of participant motivation in completing them and guidance on what these entries should include (Williamson et al., 2015). This can be mitigated by the provision of guide or prompts that can reduce the cognitive burden on participants in completing their diary entries in addition to encouraging participants to complete entries that remain relevant to the study goals. The audio diary prompts for this study can be found in Appendix H.

As this study was more interested in the micro-level accounts of how consumers engage with smart packaging, the researcher wrote the prompts in way that was more likely to elicit diary entries in the form of a narrative rather than the use of 'why' questions that can lead to generalisations (Worth, 2009). Like the questioning route used in the first study, prompts were also written in the form of a funnel. It begins with the easier questions which does not require critical thought, such as merely asking them to describe the occasion of their consumption. This is then followed by questions that were targeted to elicit responses specifically relating to smart packaging engagement. These probed for the cognitive, emotional, and behavioural manifestations of engagement that emerged as a result of their interaction with smart packaging. The next set of questions focused on the potential influence of their experience with smart packaging on brand relationships. It probes

for how their experience may have affected their satisfaction, trust, and attachment to the fictional brand of coffee. It then concludes with questions that asks whether their experience with smart packaging as a whole has improved or harmed their consumption experience and whether or not the participants have any suggestions or feedback for improvement.

3.4.1.6 Logs

Automated logging was implemented in the programming of the "Obrien's Coffee" app that logged the following:

- Number of times each screen of the "Obrien's Coffee" was accessed
- How long each screen of the "Obrien's Coffee" app was accessed for

The researcher also had access to the following information that relates to the participant's interaction with the smart packaging experience, such as:

- Number of posts each participant made and its contents
- Number of likes each participant makes and the post being liked
- Number of comments each participant makes and the comment itself
- Date and time of each comment
- Reviews and ratings of the coffees each participant rated and reviewed
- The number of logbook entries each participant made, and its contents

3.4.1.7 Interview Questioning Route

The interview questioning route (Appendix I) was designed to fill in the 'holes' that were expected from the lack of attrition of the audio diaries. The beginning of the interview was designed to build a rapport with the participants and ease them into the interview. This was done by asking some very general questions such as how they liked the coffees. The researcher would then brief the participants on the structure of the interview and let them know that they do not have to answer any questions they don't feel comfortable answering. Participants will also be notified that the researcher may ask them questions concerning some specific aspects of

their experience that has been identified or flagged from the analysis of their logs and audio diaries prior to the interview to avoid potentially blindsiding them.

The main body of the interview is split into five parts (one for each smart packaging feature) which goes through the participant's experience with each feature in detail. The questions in this section were written with the intent of investigating whether interaction with these smart packaging features were able to drive value co-creation (on all three dimensions) and subsequently, engagement. Participants were also asked how each of smart packaging features affected their relationship with the fictional brand in terms of trust, satisfaction, and attachment.

After all five smart packaging features had been covered, the interview concludes with questions on whether or not the smart packaging experience as a whole influenced the participants' relationship with the fictional brand.

3.4.1.6 Sample Size

In deciding how many participants were to be recruited for this study, other published academic articles that also made use of technology probes in similar settings were consulted. Unfortunately, these were scarce and typically did not explain their reasoning in selecting their sample sizes. Table 27 below shows the number of participants that were recruited in said identified articles.

Reference (s)	Study Synopsis	Sample Size
Hutchinson et al., 2003	Deployed a probe to study how multi-household families send each other messages	2 families
O'Brien and Mueller, 2006	Deployed a probe in the shape of a stress ball that participants squeeze when they feel like holding their partner's hands	4 couples
Yang and Newman, 2013	Diary study of about their Interviewed participants about their experience of having a smart thermostat (Nest) in their household and	23 individual interviews but only 10 diary studies
Huang et al., 2014	Deployed a probe to study participant response towards a physical therapy support system	10 individuals

Table 27. Sample Size of Technology Probe Studies Identified from Academic Literature

As part of the smart packaging experience involves a community which by definition requires a group of people, the researcher was aware that the number of

participants could not be too low. At the same time, there were also practical constraints involved with running the study with too many participants from a logistical perspective, such as the need for a larger budget to build more connected scales, purchase more coffee, and Amazon vouchers to compensate participants. After taking into consideration the aforementioned factors, the researcher eventually decided to recruit a total of 12 participants, a reasonable number that he felt would not be too low (exceeding the highest number of participant units in other published academic articles) but is sufficient to be considered a small community.

3.4.1.7 Duration

The technical briefing for each participant was scheduled to last for up to 60 minutes. This was sufficient for participants to read through the information sheet, fill out the informed consent form, and successfully complete the checklist of activities provided. This was then followed by the in-home deployment phase of the study that took place over a period of four weeks. When deciding on the duration of this phase, other published academic technology probe studies (depicted in Table 28 below) were consulted. Unfortunately, the rationale behind the duration of said studies were never mentioned, severely limiting the material the researcher could reference.

Reference (s)	Duration
O'Brien and Mueller, 2006	7 days
Hutchinson et al., 2003	7 days
Huang et al., 2014	3 weeks
Yang and Newman, 2013	6 weeks

Table 28. Study Duration of Technology Probe Studies Identified from Academic Literature

In some ways, it would be preferable if participants consumed as much coffee as possible throughout the study period as it would then open up more opportunities for more interaction with the smart packaging experience (e.g. scanning more NFC tags, writing more reviews, discussing tasting notes on the Community) but the researcher understood that for the study to remain objective, the participants' coffee consumption habits needed to remain free from interference. In order to

determine how long the study duration should be, the researcher eventually used the estimate of how long it would take for participants to finish a bag of coffee, aiming for a duration where ideally they would have at least refilled the tin once (i.e. started consuming their second bag of coffee).

Based on the golden ratio of coffee grounds (grams) to water volume (ml) of 1:18 provided by the Speciality Coffee Association of America (SCAA), a 250g bag should make approximately 12 (rounded down) 350ml cups of coffee. As all participants drink coffee at least three times a week (one of the recruitment criteria), this meant that it would take at most four weeks for them to finish a bag of coffee. However, the researcher also expected participants to occasionally make more than three cups a week due to occasions where they might make it for visiting friends or family or simply drink more themselves. Hence, the four-week duration was deemed sufficient for participants to at least get into their second bag of coffee. Additionally, as the study contains a diary element, the researcher would also like to avoid setting a study period that is too long as participant attrition rates are likely to fall over time.

To decide the duration of the concluding interview, the researcher followed the recommendations of the methods literature which generally advises a duration between 30 - 60 minutes (DiCicco-Bloom and Crabtree, 2006; Rowley, 2012). While the guidelines for the duration of interviews are similar to those of focus groups (covered in Section 3.3.1.8.), interviews are generally scheduled to run for a shorter duration as attention only needs to be dedicated to a single individual rather than an entire group. Taking this into consideration, the interviews were ultimately scheduled to last up to 60 minutes. This provided ample time for the researcher to cover the material required while also not being excessively long that participants grow tired and disengaged throughout the session. Additionally, setting the upper bound of the range recommended by the literature as the duration also reduces the likelihood of having to rush through interviews when a shorter duration might not be sufficient.

3.4.1.8 Participant Demographic Profile

Participants recruited for this study were home baristas aged between 18 and 44. For the purpose of this study, home baristas are defined as individuals who regularly

brew and drink coffee in their own home at least three times a week. As the word brew may be somewhat vague, a list of the more commonly used coffee brewing methods (listed below) eligible for this study was compiled for participants to check against (brewing methods not on the list needs to be manually approved by the researcher), also specifically excluding instant coffee and the use of coffee pod/capsule machines (e.g. Nespresso) as eligible brewing methods for this study. The rationale behind this criterion was to increase the likelihood of recruiting coffee enthusiasts. Given that many elements of the smart packaging experience (e.g. provenance, logbook) were designed for coffee enthusiasts, having them as participants would be beneficial as they are much more likely to interact and engage with the implemented features, consequently resulting in a richer data set.

- Drip/Filter/V60
- Chemex
- French Press
- Aero Press
- Moka Pot
- Vacuum/Siphon
- Cold brew
- Espresso Machine

Compared to the previous study, this study recruited from a wider age range due to its focus on coffee drinkers. Given that statistics from the British Coffee Association (shown below) indicate that coffee consumption tends to increase as one gets older, the researcher believed that recruiting older participants could be beneficial.

Age Group	**No. of Cups a day**
Generation Z (< 20)	0.5
Millennials	1.3

(20 – 37)	
Generation X (38 – 52)	2.1
Baby Boomers (53 – 71)	2.2
72+	2.2

Table 29. Average Cups of Coffee Drank Per Day in the UK. Source: British Coffee Association

However, the research also needed to recruit participants who are receptive to new technology (especially mobile technologies and social media), a characteristic much more prominent within the younger population. Combined with reports from the National Coffee Association in the United States which indicate that the under 40 demographic is highly responsible for driving the supply and demand of new ways to drink coffee, the market research industry standard of the 35 – 44 years old age group was then used as the upper limit of the participant demographic profile, consequently resulting in the research decision to recruit 18 – 44 year old coffee drinkers for this study.

3.4.1.9 Recruitment

The recruitment for this study followed a similar approach to that of the previous (refer to Section 3.3.1.11). Participants were recruited through flyers put up on noticeboards at the University of Nottingham as well as public areas with high footfall traffic. Digitally, these flyers were also sent out via email to various mailing lists on the University of Nottingham network and shared through social media. A total of 12 participants were recruited for this study and their basic demographic profiles are shown in Table 30 below.

Alias	Age	Brewing Method(s)	Cups*
Alice	28	French Press	6
Charles	28	French Press, Cold Brew	7
Emma	20	Drip/Filter/V60, French Press, Cold Brew	7
Harriet	27	Drip/Filter/V60, French Press	6
Hunter	23	French Press, Aero Press	7
Jack	24	French Press, Aero Press, Espresso Machine	7
Kyle	21	Drip/Filter/V60, French Press, Moka Pot, Cold Brew, Vietnamese Drip	5
Nancy	34	French Press	5
Patrick	35	French Press, Moka Pot	7
Reuben	40	Espresso Machine	5
Samantha	37	French Press	7
Tina	22	French Press	6

Table 30. Demographic Profile of Participants recruited for "Obrien's Coffee"
**Cups = Average number of cups of coffee brewed and drank at home weekly*

Additionally, it should also be mentioned that due to the time constraints and logistical difficulties experienced during the recruitment process, it was not possible to schedule all 12 participants to start on the same day. The active study period of each participant (relative to each other's) is depicted by Figure 8 below.

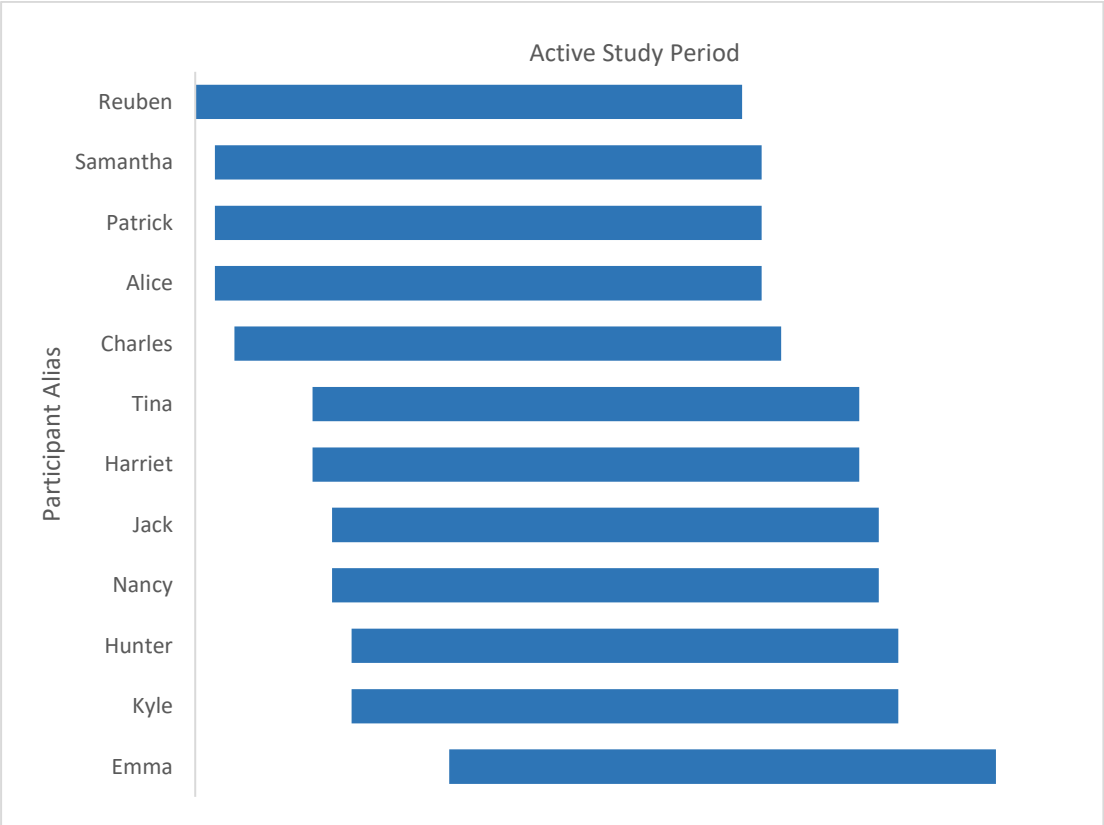


Figure 8. The Active Study Period of Each Participant of the "Obrien's Coffee" Study

3.4.1.10 Venue

For reasons similar to those detailed in Section 3.3.1.12, the technical briefing and individual interviews were also conducted in the meeting rooms at the School of Computer Science at the University of Nottingham. The in-home deployment phase, as its name suggests, took place in the participants' homes.

3.4.1.11 Compensation

Participants were given a £15 Amazon voucher as a token of appreciation for their time. Additionally, they were also provided with three 250g packs of speciality coffee (each one costing approximately £7.40) sourced from Cartwheel, a local roastery in Nottingham. Ten additional £10 Amazon vouchers were also distributed to participants as raffle prizes (refer to Section 3.4.1.3 for further details). Like the

previous study, shopping vouchers were provided instead of monetary payments to avoid implications concerning taxation or benefits that may otherwise arise.

3.4.1.12 Technical Implementation

The "Obrien's Coffee" app was coded by the researcher on Android Studio and designed to deploy on the Lollipop version of the Android operating system. While Lollipop is a relatively old version, this was a compromise that had to be made as the only smartphone with 12 available units which satisfies the research requirements (i.e. Android smartphones with NFC functionality) were LG Nexus 4s, fairly dated smartphones released in 2012. The app database was hosted on the MYSQL servers managed by the School of Computer Science, University of Nottingham.

Each smart scale was assembled from a Raspberry Pi Zero (running on Raspbian Stretch), a load cell, and a Sparkfun Openscale circuit board. The load cell is hooked up to the Sparkfun Openscale to generate the weight measurements which are then transmitted to the Raspberry Pi Zero and uploaded into the database (from which the app populates data). Through a Python script that is scheduled using CRON, measurements are taken and uploaded to the database everyday at midnight. The enclosure of the scale was cut using a laser cutter and made of 3mm thick Perspex.

3.4.1.13 Possible Confounding Factors

While the researcher strived to design this study as airtight as possible, there were several factors that potentially could have influenced the dataset that was collected from the participants. These are described in Table 31 below.

Possible Confounding Factor	**Explanation**
Weak Branding	Although one of the subgoals of this study was to explore how smart packaging could affect brand relationships,

	the branding of the fictional brand ("Obrien's Coffee) was relatively weak. Coffee was distributed to the participants in brown paper bags void of any branding material and the smart scale was also provided as is (i.e. the Raspberry Pi brand is visible on the casing), meaning branding was done solely through the app.
Different Study Periods	As previously mentioned in Section 3.4.1.9, the study period of the participants were not completely synchronised. While this was not made known to them, it could have influenced their use of the Community feature that is affected by the activity of other participants (i.e. participants

	may be less reluctant to use this feature if they perceive the community to be inactive). This effectively meant that the audience size of the posts and comments are not always the same.

Phone Quality	**Participants were provided with a relatively outdated smartphone with limited battery life. This could have deterred them from interacting with the app more than they would have if the app had been installed on their personal phones.**
Database Downtime	For a short period (one hour), the database the app was dependent on was down for maintenance. This could have

	discouraged additional participant interaction (although it can be inferred that it did not given that it was not brought up in the audio diaries and interviews)

Table 31. Possible Confounding Factors of "Obrien's Coffee"

3.4.2 Analytical Approach

3.4.2.1 Phase One: Data familiarisation and writing familiarisation notes

Akin to the analytical approach adopted in the previous study, transcription was once again how the researcher familiarised himself with the data. The same steps (refer to Section 3.3.2.1) were followed while following the same convention (i.e. only transcribing dialogue and checked against the footage for accuracy) with the only difference being the type of footage being transcribed (audio diaries and interviews as opposed to focus group discussions).

3.4.2.2 Phase Two: Systematic data coding

The coding stage made use of the same coding methods used in the previous study (refer to Section 3.3.2.2), them being:

- Structural Coding
- Subcoding
- Simultaneous Coding
- Magnitude Coding
- Provisional Coding

For this study, each primary code is still accompanied by a structural code (i.e. a feature code) and two subcodes (i.e. the dimensional and valence subcodes). The feature codes play the same role as the scenario codes in the previous study, merely having a different set of possible values due to the difference in context. There is

however a slight difference in how subcodes were used in this study as each primary code is now accompanied by a valence code regardless of the value of its dimensional subcode, effectively resulting in all coded instances to be tagged with four codes: a primary code, feature code, dimensional subcode, and a valence subcode. Feature, dimensional, and valence code were provisionally determined (shown in Table 32 below) based on the design and aims of this study (i.e. feature codes were determined by the smart packaging features implemented in the technology probes, dimensional codes were determined by the theoretical aims of this study, valence codes were referenced from Saldana's (2015) coding manual). The dimensional codes once again guided the researcher in his search for instances to code, them being instances in the corpus relating to how or why (denoted by the primary code) a smart packaging feature (denoted by its feature code) did or did not have an influence (denoted by its valence subcode) on its dimensional subcode.

Feature Codes	**Dimensional Subcodes**	**Valence Subcodes**
NFC Tags	Utilitarian Value	Positive
Consumption Tracking	Hedonic Value	Neutral
Community	Social Value	Negative
Ratings and Reviews	Cognitive Engagement	
Logbook	Emotional Engagement	
	Behavioural Engagement	
	Brand Trust	
	Brand Satisfaction	
	Brand Attachment	

Table 32. Provisional Codes of "Obrien's Coffee"

To better illustrate the coding process, an example of how the corpus is coded is provided below.

> "*Sometimes in the morning when I was, when I'm waiting for my coffee I'd look at it.*"

Codes:

Feature Code: Community

Dimensional Code: Behavioural Engagement

Valence Code: Positive

Primary Code: Routine Interaction

This indicates that the Community feature of the smart packaging experience managed to influence the participant's behavioural engagement in a positive manner for reasons explained by its primary code (i.e. "routine interaction").

3.4.2.3 Phase Three: Generating initial themes from coded and collated data

Once all the transcripts had been coded, the researcher began to search for themes. A similar approach to that of the previous study's was adopted, starting with inputting all the coded instances into Microsoft Excel, resulting in a matrix akin to that depicted in Figure 9 below.

Alias	Feature Code	Dimensional Subcode	Valence Subcode	Primary Code
Alice	Community	Behavioural Engagement	Positive	Comparing Aroma Notes
Charles	NFC Tags	Emotional Engagement	Negative	Annoyance
Alice	Consumption Tracking	Emotional Engagement	Negative	Anti profiling
Alice	NFC Tags	Utilitarian Value	Positive	Coffee Characteristics
Nancy	Community	Emotional Engagement	Positive	Anticipatio
Alice	Community	Emotional Engagement	Positive	Belonging
Charles	NFC Tags	Behavioural Engagement	Positive	Comparing Aroma Notes
Jack	Consumption Tracking	Cognitive Engagement	Positive	Awareness
Alice	Community	Emotional Engagement	Positive	Belonging
Alice	NFC Tags	Brand Trust	Negative	Transparency
Alice	NFC Tags	Brand Satisfaction	Negative	Sustainability
Alice	NFC Tags	Brand Attachment	Neutral	Lack of Branding
Samantha	Community	Emotional Engagement	Positive	Belonging
Samantha	Logbook	Emotional Engagement	Neutral	Chore
Kyle	Consumption Tracking	Emotional Engagement	Negative	Confusion
Reuben	Consumption Tracking	Emotional Engagement	Negative	Confusion
Alice	Consumption Tracking	Utilitarian Value	Positive	Consumption Tracking
Nancy	Consumption Tracking	Cognitive Engagement	Positive	Awareness
Emma	NFC Tags	Behavioural Engagement	Positive	Comparing Aroma Notes
Alice	Consumption Tracking	Brand Trust	Negative	Transparency
Alice	Consumption Tracking	Brand Satisfaction	Positive	Scientific
Alice	Consumption Tracking	Brand Satisfaction	Positive	Research Setting
Alice	Consumption Tracking	Brand Satisfaction	Positive	Nice to have
Alice	Consumption Tracking	Brand Attachment	Negative	Transparency
Alice	Community	Hedonic Value	Positive	Research Setting
Alice	Community	Brand Trust	Negative	Capitalistic
Harriet	Community	Behavioural Engagement	Neutral	Consistent Brewer
Alice	Consumption Tracking	Emotional Engagement	Positive	Cool
Alice	Community	Hedonic Value	Positive	Pleasant
Emma	Consumption Tracking	Emotional Engagement	Positive	Cool
Reuben	Consumption Tracking	Cognitive Engagement	Positive	Awareness
Alice	Community	Social Value	Positive	Premium Consumer
Samantha	Logbook	Behavioural Engagement	Neutral	Consistent Brewer
Alice	Community	Brand Trust	Positive	Well Moderated
Alice	Community	Brand Trust	Positive	Research Setting

Figure 9. Excerpt of the Code Matrix of "Obrien's Coffee"

At this stage, having transcribed and coded the dataset, it was apparent to the researcher that the variance in this dataset was significantly greater than that of the previous study. Consequently, this meant that adopting the canonical style of reporting the majority of the findings of a study in a few themes (i.e. the approach used in the previous study) is likely to be ineffective as it would most likely result in themes which are too broad and incapable of capturing the nuances found within

the dataset. As a result, a decision to segment the dataset based on their dimensional subcodes was made, narrowing down the scope that the proposed themes would be required to have otherwise. Each dimensional subcode was then framed as an overarching theme (Braun and Clarke, 2006) which umbrellas the themes reported by the thematic analysis on each of their respective segments.

For each segment, clusters of primary codes (those that recur at least twice) were first identified and compared with other clusters. Coded instances of each cluster were then compared with those of every other cluster on an inter-cluster level to see whether or not they shared any similarities that would allow all the coded instances within them to be grouped together under a common intermediate code. When this was not possible, the primary code that identifies the clusters are promoted to intermediary codes. Each coded instance that did not belong to a cluster is then checked for whether or not they can be assigned an existing intermediate code or require a new one to be created for them through promotion or renaming of their primary code.

Once all coded instances have been assigned an intermediate code, the promotion from an intermediate code to a theme is merely defined by the number of times the intermediate code recurs. Under their respective overarching themes, all intermediate codes that recur more than once are then promoted to themes while those that are not are categorised under the “Miscellaneous” theme. To clarify this process, the pseudocode of this phase and a worked example (refer to Table 33) is provided below.

In this example, it is shown how the intermediate code “routine interaction” was conceptualised from the two clusters with the “daily interaction” and “morning routine” primary codes respectively. This was then promoted to a theme due to the number of instances (i.e. four) associated with the intermediate code. On the other hand, there was only one coded instance with the primary code of “reading”. This was then promoted to an intermediate code as itself due to its incompatibility in forming a cluster with any other coded instance and later and later classified under the “miscellaneous” theme due to there only being one coded instance with this intermediate code.

Raw Corpus	Codes	Intermediate Code	Theme
I quite enjoyed like I say catching up maybe like every night before like I did the audio log or something, I'd have a look through and I guess that made me feel like I was coming back to it everyday? So like I'm a regular part of the experience…or sometimes in the morning if I was like brewing an espresso, waiting for my machine to heat up I'd be like scrolling through to see what was going on so like yeah, sort of like integrated into the experience	Primary Code: Daily interaction Feature Code: Community Dimensional Subcode: Behavioural Engagement Valence Subcode: Positive	Routine Interaction	Routine Interaction
Yeah, I think it sort of becomes routine as well. You sort of get into the routine of doing something every day and then you just do the same thing. And I guess it reinforces what you're having as well because you do forget, you forget what I'm having and so it's just nice to re-read the same thing again.	Primary Code: Daily Interaction Feature Code: NFC Tags Dimensional Subcode: Behavioural Engagement Valence Subcode: Positive	Routine Interaction	Routine Interaction
Sometimes in the morning when I was, when I'm waiting for my coffee I'd look at it	Primary Code: Morning routine Feature Code: Community Dimensional Subcode: Behavioural Engagement Valence Subcode: Positive	Routine Interaction	Routine Interaction
Yeah, it was fun, I think it was the section I looked at the most probably. I used to, like I said, I check it every morning when I made coffee.	Primary Code: Morning routine Feature Code: Community Dimensional Subcode: Behavioural Engagement Valence Subcode: Positive	Routine Interaction	Routine Interaction
I'm pretty sure like nine times out of ten you won't be inclined to actually, like read all the things, like this coffee was made in blah and like and it smells of blah blah blah. So like, those kind of things actually help a lot like if you see them really really quickly	Primary Code: Reading Feature Code: NFC Tags Dimensional Subcode: Behavioural Engagement Valence Subcode: Positive	Reading	Miscellaneous

Table 33. From Codes to Themes of "Obrien's Coffee"

The pseudocode of this phase is as follows:

1. Enter all coded instances into Microsoft Excel as per Figure 9
2. Segment the dataset into 9 segments based on their dimensional subcodes
    2.1. For each segment, identify clusters of primary codes (recurs at least twice)
        2.1.1. For each cluster, compare its coded instances with those of every other cluster (individually) on an inter-cluster level, checking whether there are any similarities between them which would allow them to be grouped together under the same intermediate code. When this is possible, assign all the coded instances of the clusters being 'merged' the same intermediate code. For clusters that are unable to be merged, promote the primary code itself to an intermediate code.
    2.2. For every coded instance not in a cluster, check whether they can be assigned an existing intermediate code (either created in step 2.1.1 or this step). If they cannot, only then is a new intermediate code created and assigned to them either through promotion or renaming of their primary code.
3. Once all the coded instances have been assigned an intermediate code, promote all intermediate codes that recur more than once to a theme. All other intermediate codes are then categorised under the "Miscellaneous" theme.

3.4.2.4 Phase Four: Developing and reviewing themes

During this phase, themes are reviewed to ensure that they are sufficiently coherent (internally homogeneous) and not redundant (externally heterogeneous). This was conducted in a similar manner to how it was carried out during the analytical stage of the previous study. Each of the coded instances associated with a theme were gone through one more time in order to confirm whether or they contained the core essence of its respective theme. The core essence of each theme was then compared against those of other themes (individually) to see if any additional 'merges' were possible. For instance, there were several instances where themes were combined

despite them being initially separate. An example would be how the "experimentation" theme under the "behavioural engagement" dimension initially comprised of the themes "changing brewing methods" and "changing dosage" before they were combined.

3.4.2.5 Phase Five: Refining, defining, and naming themes

The final step of the analytical process involved writing up a detailed analysis of each theme, allowing the researcher to better identify the 'story' behind each one (Braun and Wilkinson, 2003) and ensure that they are not overly complicated. In this phase, themes were also renamed to better suit the overarching theme they are categorised under (i.e. themes under behavioural engagement were renamed to imply actions whereas those under emotional engagement were renamed imply emotions)

3.4.2.6 Phase Six: Writing the report

The analysis outputted themes under each major theme along with miscellaneous primary codes (also technically intermediate codes as they were promoted as themselves due to them not being a part of any cluster) which the researcher believes should not be excluded. Much like the themes reported by the first study, these too were written up in detail and accompanied with carefully selected data extracts that communicates the essence of each theme in an easily understood manner. Findings are reported in Section 4.2.

This marks the end of the section concerning the methodology of the second study as well as this chapter. The thesis now proceeds to the next chapter in which the findings of each study are reported.

Chapter 4: Findings

This chapter reports on the findings of the two studies conducted for this research. It is divided into two sections, each one dedicated to each study. In each section, the themes (alongside their supporting quotes) identified from the thematic analysis carried out for the corresponding study are presented in turn. Readers should however keep in mind that while this section reports the findings of this research, they are not discussed in this chapter, providing a clear distinction between the data and its interpretation.

Quote Notation System:

Example Quote:

"Aglio aglio aglio [A] olio olio olio [B]" [XYQ01]

- XY = Participant ID
- [XYQ01] = Quote ID
- [XYQO1 – A] = Refers to the beginning of the quote to the [A] found in the quote (i.e. "aglio aglio aglio" in this example)
- [XYQO1 – B] = Refers to the beginning of the quote from right after the [A] notation to the [B] notation in the quote (i.e. "olio olio olio" in this example)

Example Conversation:

A: "Do you have a pen?"
B: "Yes, but I am not going to lend it to you." [CV1]

- [CV1] = Conversation ID
- A = Participant ID
- B = Participant ID

4.1 Study 1: Consumer Attitudes Towards Smart Packaging

Seven themes were identified from the thematic analysis conducted on the transcripts of the 5 focus group discussions of the first study: sustainability, communication, control, data handling, scepticism, trade-off, habits and characteristics. In this section, an explanation of each theme alongside their supporting quotations are presented in turn.

4.1.1 Sustainability

The sustainability theme refers to the influence of the consumer perceived sustainability of a smart packaging experience on the likelihood of their interaction and ensuing value co-creation with smart packaging. Participants were concerned with how the implementation of smart packaging is likely to result in additional waste from not only the electrical components found on the packaging itself (e.g. NFC tags and sensors) which are unlikely to be reusable or recyclable (refer to NGQ01) but also from other aspects of the infrastructure supporting the smart packaging experience, such as the increased number of coffee deliveries that would result from the implementation of the reordering system depicted in the smart coffee storyboards (refer to DDQ01).

> *"Yeah for me its environment sustainability. Environmental sustainability and people sustainability. If I'm applying something on my skin and then it goes into the ocean and kills all the oysters, I won't use it. I'd rather die. I mean, I wouldn't rather die but you get the point."* [NGQ01}

> *"I would need someone to really convince me that this is sustainable. Cause yes, I'll press a button, but that thing still has to come to my door right? So on one hand, you need to convince me that it is viable, not just for me financially and for the company but the fact as a whole that somebody says "Alright, DD wants more coffee.", hops on his bike and comes all the way to wherever the hell I am and brings me one packet of coffee. Surely, it would have been better to bundle that in an order of everything and save the trip."* [DDQ01]

The concern has prompted participants to make recommendations on how smart packaging could be designed to be more sustainable, such as through the separation

of technical components (that can be reused) from the core product (i.e. modular design) which would allow consumers to purchase just the core product in the future (without the technical components that they already have) and reduce wastage from the disposal of the excess components consumers might otherwise accrue (refer to RVQ01).

> *"Yeah, there's another model where we, the sensor parts is not completely linked to the bottle. It's just something, you plug it on and you, you offer it once as a promotional item and people may buy your bottle because it has this promotional item but next time they'll plug it into a competitor's product or something."* [RVQ01] concerning the packaging design of the smart sunscreen

However, despite the general agreement among participants that products should ideally be sustainable, with some even claiming that it is prerequisite for purchase, there were also some who believe that it does not necessarily influence their purchase decisions in a significant manner (refer to MJQ01).

> *"Well I think concerning recycling, did anyone ever not buy things just because the packaging is odd and not recyclable? You would be annoyed a bit but it's not going to prevent you from buying it and then at a certain point, you just forget."* [MJQ01]

4.1.2 Communication

The communication theme refers to the influence of how messages are delivered to consumers (i.e. tone and framing, medium) throughout a smart packaging experience on the likelihood of their interaction and ensuing value co-creation with smart packaging. Participants expressed their worries about numerous implementations which could result in value co-destruction. For example, in the discussions concerning the smart sunscreen, participants noted that the beeping noise would most likely be considered to be annoying by a lot of people, especially if it were to occur at a large scale (refer to RVQ02).

> *"The other thing is, you have to think how it works when, if it's something that scales up and you have hundreds of families with this and it starts*

beeping all around and people say "Okay, I'm never going to have a summer like this" so from now on we think its socially unacceptable to have this beeping so people don't use it because the beeping is seen as unacceptable." [RVQ02] concerning the beeping depicted in the smart sunscreen storyboards

Participants also expressed how the beeping and voice messages can be embarrassing in public settings (refer to CPQ01 and KDQ01) and that perhaps alternative mediums can be considered (refer to CSQ01).

"It could be embarrassing like if you're on a coach or something and that starts beeping and you're like trying to get your bag and shut it up." [CPQ01]

"The, I think yeah I agree with the voice command thing cause when I read that I thought. Emm it's like I wasn't sure where this building was on this campus so I had Google Maps on but I'd be really embarrassed if it did the sound thing so I make sure that's off." [KDQ01]

"I don't think it necessarily needs to speak to you to tell you a message." [CSQ01]

However, despite the participants' negative view on smart packaging's use of audio to communicate, several participants actually expressed an interest in using it within household settings. This was observed during the discussions concerning the smart coffee in which participants suggested that audio alerts could be implemented in the coffee tin to alert consumers when their coffee is about to expire (refer to DGQ01) or transition to a less optimal state (refer to TSQ01).

"You could make it with an alarm like a day before it expires, it makes sounds" [DGQ01]

"But I also noted that down maybe there should be some kind of reminder if possible when to get a new one. So I know you already have how many grams are left, so this means automatically that you have to buy a new one. But maybe like a voice command or something." [TSQ01]

Aside from the delivery mechanism of the messages communicated to consumers, participants also brought up the importance of message framing. For example,

during the discussions concerning the smart coffee's consumption tracking feature, some participants noted that they wouldn't like it if they felt judged for their excessive caffeine consumption (refer to MJQ02). It is however also important to recognise that there are consumers who prefers honest and blatant messages (refer to ADQ01) over sugar-coated ones.

> *"I have enough judgmental friends, I don't need a judgmental tin as well."* [MJQ02]

> *"Whilst I wouldn't necessarily want to a product to tell me what I should and shouldn't do, there would be a sense of honesty in the product because the company is not holding back by telling you our product does have this in it and you should only have this much of this amount per day, that's the recommended guideline and you had more. I would feel more inclined to use a product that was completely transparent and honest with me than one say that will hold back on telling me what you said probably shouldn't because it might deter you from engaging more with the product or using more of it."* [ADQ01]

In addition to potentially annoying consumers, participants also noted that the framing of messages could also potentially encourage wasteful behaviours. In discussions concerning the smart coffee, participants claimed that framing expiration using date (which is absolute) may end up encouraging consumers to throw away the coffee once that day has passed, even when it is very much likely still safe to consume but simply no longer at its optimal state (i.e. coffee loses flavour over time). As some participants do not like wastage, this concern has prompted them to make suggest alternate ways to frame expiration, such as framing them as optimal consumption periods (refer to CV1) that may be less likely to encourage consumers to dispose of their coffee as soon as its expiration date has passed.

> *JB: So if you had something that'd say "Oh maybe, you've got 3 days while it's still at its best" so it's kind of a reverse, almost a countdown so you know now it's at its best. Enjoy while it while it still, it doesn't even have to be a*

countdown just enjoy it now while it's still good and afterwards it's like the message changes slightly, so it's not about time and date.

AD: So it's not telling you that it's like gone or anything but this is its best life. [CV1]

Participants also noted that even if messages are delivered with good intentions in mind, they should only be communicated if consumers have been made aware that they might receive these messages. This was observed during the discussions pertaining to the smart alcohol in which participants mentioned that they would feel violated if they received messages telling them to slow down their drinking. Although the smart alcohol storyboards did not include a consumption tracking feature, participants asserted that through logging of when the NFC tags were scanned, firms could extrapolate consumer drinking behaviours based on how many tags were scanned within a period of time. While they acknowledged that there may be value in using this opportunity to remind users to drink responsibly, this would feel like a violation of privacy unless consumers were told of the possibility that this may happen prior to beginning the consumption experience (refer to CV2).

HW: "Yeah something like, "Oh, you scanned 3 bottles in a measure of, I don't know, an hour or so maybe you should check out…"

AD: "Maybe you should slow down"

JB: "The responsibility thing is quite nice, I'd consider it a violation if a company contacts me after I scanned 3, however if someone contacted me without any regard, I'd find it a violation. However, if I was going through a lot of stuff and it's like "Oh, are you having a party?". You know if like something "Here are some suggestions for how to have a really good party" but also that's when you kind of feed back. "Oh by the way, please remember to drink responsibly " Well that would be fine." [CV2]

Lastly, the frequency of communication was also brought up. Participants expressed that they would not be happy were they to receive a lot of push notifications throughout their smart packaging experience, especially if it had to do with

advertising. While some generally do not mind seeing adverts from time to time, they mentioned that it could be very off-putting to receive them frequently (refer to ADQ02 and SGQ01).

> *"You also don't want it to be, something that's just overly, too many push notifications about "ooo, now try this" or "here's another thing. Sometimes you want to drink your drink, you don't want it to become like the toaster on Red Dwarf that's just like "Hey, you got any toast? Do you want more toast? Do you want more toast?" That is it, literally it. You don't want a product that is just pushing on you all the time."* [ADQ02]

> *"I've got a lot of things going on in my life, I don't need a pop up saying remember to go and buy a bottle of wine every 10 minutes or whatever, it's that balance of I don't mind having adverts when I'm choosing to see them if that makes sense."* [SGQ01]

4.1.3 Control

The control theme refers to the influence of the consumers' degree of control over a smart packaging experience on the likelihood of their interaction and ensuing value co-creation with smart packaging. Participants wanted to be able to make the decisions over how certain aspects of the smart packaging experience works. The most prominent manifestation of this phenomenon was their need for the ability to turn off certain features. For example, during discussions pertaining the smart sunscreen, while participants appreciated the usefulness of the beeping reminders, they would also like to be given the ability to turn it off as it could disrupt their capacity to relax (refer to CPQ02).

> *"Yeah, so I'd like to be able to turn that bit off. Yeah, because I think I'm adult enough to know when I need to reapply. So I'd like to, I appreciate for some people it might be quite useful, especially if you're, you know doing an activity and you might forget but I think you should be allowed to have the option if you want to relax to relax."* [CPQ02]

Another example was identified during the discussions relating to the smart coffee in which participants noted that they would not want the screen on the tin to be consistently on but rather made accessible on demand (refer to NGQ02).

> *"So maybe, I don't know. It's something that I would find, or it's like hidden or sort of mellowed down rather than in front of my eyes all the time cause that's too much information."* [NGQ02]

The issue of automation was also brought up by participants who felt uneasy about automated features such as automated posting on social media depicted in the smart alcohol storyboards (refer to YHQ01). They expressed the need for manual confirmation, suggesting that perhaps it could be amended so that it prompts the user but does not post until approved by a user.

> *"I think the problem is automatically so if it's, for example drafts a post for me and then I have to, it requires me to submit or post it. Then it's better."* [YHQ01]

However, participants also recognise the potential value of automation, suggesting how it can be applied to update the displayed information on the screen of the coffee tin. They mentioned that it would be convenient if they did not have to manually scan the NFC tag on new packs of coffee by having the tin automatically update itself when a new pack of coffee has been tracked as delivered (refer to AYQ01).

> *"I guess if you've got an app with presumably your loyalty things through, if it's connected to your tin anyway then could it not update that, like when your order arrives, it just kind of detects it.*" [AYQ01]

Finally, participants also expressed the need for customisability. This was brought up during the discussions concerning the potential applications of linking the smart alcohol with other smart devices within a smart home environment (refer to SGQ02).

> *"Yeah as long as it's, its customisable enough so that as you say, you open your bottle of wine or open a bottle, whatever it might be that you're doing. What I don't want to happen is let's say the lights go down and the funk*

music kicks in and the fireplace turns on when you have your in laws around. So you need to be able to, you don't want that exact thing to happen due to one time you do want it and then every subsequent time afterwards. It needs to be easy enough to say okay, I want the lights to come down but I don't want the music to turn on, or you know, yeah." [SGQ02]

4.1.4 Personal Data

The personal data theme refers to the influence of a firm or brand's data handling policies in terms of how it collects, stores, and makes use of consumer personal data throughout a smart packaging experience on the likelihood of consumer interaction and ensuing value co-creation with smart packaging. Participants were found to be concerned with firms collecting their personal data, especially those sensitive in nature (e.g. alcohol consumption) which could potentially put them at risk or a disadvantage. This was observed in discussions concerning the smart alcohol where even though there was no explicit feature implemented to track how much consumers drink, participants mentioned that they wouldn't use it out of fear that the existence of a record of the social media posts automatically made whenever they drink can be used to extrapolate drinking habits, possibly increasing the price of their insurance premiums or moving their position on a liver transplant waiting list with the National Health Service (NHS) further down were if this data were to be made accessible to them (refer to RVQ03). Participants were much more likely to err on the side of caution when it came to smart packaging features which makes use of personal data, asserting that that even if firms claim that this data will not be shared or sold to other organisations, it may still be stolen or leaked from hacking as long as the data exists (refer to MJQ03).

"But you're right, the issue of sending this data to the NHS is that there's been talks about not having people or not prioritising people for liver transplants if they have a history of drinking. If this data is online, you are less likely to. Or if you're privately insured because some people says there is a high risk of the NHS being privatised. If it's privatised, then you'd pay higher fees just because you've been telling you've been drinking on Facebook and your insurance will go up. " [RVQ03]

> *"I mean how does that work? Is that, it contributes to Big Data and then somebody will know although I didn't post it? But for me if it offers to share, the Internet already knows that I drank it or that I'm going to. So at some point, somebody is going to hack me and tell my employer or whatever that I have a serious drinking issue although I never shared it. It just collects all the data that would be an issue I guess."* [MJQ03]

However, these worries can be mitigated to a certain extent by anonymization as the findings do suggest that participants are much more comfortable with sharing personal data if it is anonymised (refer to HWQ01) and not transmitted over the Internet (refer to DDQ02) .

> *"If there would be a way to have a special social media network so to say where I could have a profile which wouldn't be linked to my actual real name. It sounds bad for me but if there was a way to do it anonymously …"* [HWQ01] concerning the likelihood of using the link to social media feature of the smart alcohol

> *"Yeah so this scenario where it was a smart disposable tin like this one and the data is just an e-ink display and it was all local, that was fine but a smart connected thing in my house that tells yes me, and everybody else my coffee habits. There I start to get a bit…"* [DDQ02] concerning the likelihood of using the consumption tracking feature of the smart coffee

It should also be noted that not all participants share the same view concerning personal data sharing. While some are very reluctant to do so, others are more willing if it means that they get rewarded in return (refer to SGQ03 and JNQ01) or has just become indifferent to this practice after getting used to it for so many years (refer to RVQ04).

> *"Yeah I think it is very much that balance between, I don't mind them collecting data as long as I get free recipes or something that makes my life better you know. Yeah…I would be a bit more nervous on who is actually using this data and what's happening to it. I think that once I start, once I'm*

happy with the brand, I'll probably stick with them a lot more because very much that they are using the data for you know." [SGQ03]

"It depends on what's being collected and how it's used. If it's being used to like advance my life by giving me things that I actually want, then its fine." [JNQ01]

"I think because I've been sharing data with corporations for years and years, I'm a bit numb to most of privacy issues but when it becomes very visible and public like on social media then I start caring again." [RVQ04]

Despite the various views that participants have on personal data sharing, they did generally agree that they would look more favourably towards firms which convey their approach of collecting, using, and storing personal data to consumers, ideally in an easily readable and understood manner (refer to IFQ01) as opposed to lengthy documents (e.g. terms and conditions agreement) which contains a lot of jargon .

"Not writing it in ways us folks won't understand." [IFQ01]

4.1.5 Scepticism

The scepticism theme refers to influence of how sceptic consumers feel about a smart packaging experience on their likelihood of interaction and ensuing value co-creation with smart packaging. There are two subthemes to the scepticism theme: technical and purpose. Technical scepticism refers to the participants' doubts about the reliability of the technical implementation of the smart packaging experience. This was observed in discussions regarding the smart sunscreen in which participants expressed concerns on the accuracy of the calculated reapplication time, stemming from how the provision of incorrect information in this case this can potentially result in bodily harm. Participants suggested that this issue could perhaps be addressed by having third parties certify the technology to indicate that it is functioning as intended (refer to AGQ01).

"I will be curious about how long that it should be. So the recommendation maybe we take for granted it's accurate. But if my type, I'm curious as to is it true? So I need to make sure that this is not just some of marketing campaign.

Yeah, so it should be some third party or any other person who approved that" [AGQ01]

This was also observed in the smart coffee scenario in which participants were concerned with the durability of the smart coffee tin (refer to NGQ03).

Well I just find it really difficult to trust something like that, First off all cause it might just malfunction at some point and I don't know what it's going to be made of but what if I accidentally pour some water or milk on it. It's like psssh, that's it and then it doesn't work anymore. Then I'll be annoyed because I'll be expecting to use that, you know feature. [NGQ03]

The purpose subtheme refers to how the participants perceive a firm or brand's motive for implementing smart packaging. Participants noted that although they understand that profit maximisation is considered to be critical by most firms, there are several practices ingrained into smart packaging features which they do not agree with and refuse to interact with. An example would be the loyalty club depicted in the smart alcohol storyboards. Participants claimed that this would encourage drinking as that is the only way for consumers to attain a higher status or gain points in the club (refer to DNQ01). Additionally, participants were also concerned that this feature could function as an additional barrier of entry for smaller brands into the market as it would encourage consumers to only purchase products from a specific brand (i.e. the only way they can expand their digital collection), enabling and possibly encouraging unethical competitive practices such as predatory pricing or price fixing (refer to MJQ04, RVQ05, and JBQ01).

"I don't know if I like a loyalty club, like it sends out a really bad message people . I mean like, the only way you could improve in the VIP club is to go out and drink more and like, that doesn't necessarily encourage safe drinking." [DNQ01]

"Yeah you peer pressure small companies into joining the system and if they don't, they just don't show up and no one will ever see them basically." [MJQ04]

"This puts another barrier for them, because if you want to make them pay for that. It's a multinational corporation taking money from small producers. " [RVQ05]

"I really don't like the idea of locking down products to certain brands, I think that's very, passive-aggressive or it engenders sinister cabals, it encourage price fixing because you can only, because you sell a product and then you are enforce everybody else to conform to your way or get out basically." [JBQ01]

On the other hand, if participants genuinely perceive the firms' intentions of implementing the smart packaging to be altruistic (e.g. improving consumer wellbeing as depicted in the smart sunscreen scenario), they are be much more likely to be receptive to interacting with smart packaging (refer to KDQ02).

Maybe for health based things, I might find it more useful if it was giving you advice like the sunscreen one seems, to me I would be more likely to have a more positive view of that company than if people trying to selling coffee or alcohol or other products. [KDQ02]

4.1.6 Trade-off

The trade-off theme refers to the influence of a consumer's cost benefit analysis of their interaction with smart packaging on their likelihood of interaction and ensuing value co-creation with smart packaging. The use of smart packaging requires resources (i.e. time and effort) which although may be trivial is still a cost nonetheless. Participants acknowledged that although smart packaging does offer value propositions, it is often unnecessary and comes at a cost that is most likely not worth the benefits, most of them only providing short term value-propositions that are 'disposable' (refer to ADQ03).

"Yeah beyond novelty. It has to have some kind of function. Like actual functionality but has some slight kind of impact on my routine. It isn't just something that id buy and go "oh that's nice"" [ADQ03]

For example, during the discussions pertaining to the consumption tracking feature of the smart coffee, participants initially perceived it as useful but when they

realised that it was collecting data they might not be willing to give, requires signing up to another account and having to scan the NFC tag to update the tin every time they get a new pack of coffee, the advantages and benefits seems miniscule in comparison to the additional workload required to make use of this feature (refer to DDQ03).

> *"I'm a reasonably technical person, I like my gadgets. If you told me that every time I have to, every item I bought in my shopping bag or got delivered, I have to go through yet another process of tapping and doing and this and that. Even though the whole NFC "touch these two together" which eliminates the middlemen would be nice it's just one more thing I don't really need." [DDQ03]*

A similar observation was made during the discussions pertaining to the smart alcohol storyboards in which participants noted that they would not be bothered to scan the NFC tag on the bottle simply because it is not worth the effort (refer to CTQ01).

> *"It's just kind of so complicated and it's not that worth it. Like if you're going out and have a drink"* [CTQ01]

While participants mentioned that the provision of monetary incentives such as discounts or freebies can encourage them to use smart packaging features (refer to JBQ02), it still depends on the perceived cost of this interaction and may not always be feasible (refer to DDQ04)

> *"You need some serious, you need benefits like with any of these options. It needs to deliver to me more than it takes. So if it's going to judge me and take all my data, that's fine if it's giving me 50% off."* [JBQ02] concerning his likelihood of using the link to social media feature of the smart alcohol

> *"The house that I drink the coffee in maybe. That's the kind of incentive that would convince me to be an R&D node for admittedly. Not much less than that."* [DDQ04] concerning the likelihood of using the consumption tracking feature of the smart coffee

Additionally, it should also be noted that some costs of interaction may be unforeseen, such as how having to use an app to interact with the smart packaging experience requires users to download and install an app. While smartphones are now fairly common, the need for specific apps can discourage interaction as some participants are only willing to keep apps they use frequently (refer to KDQ03).

> *"The app, how many apps do people expect to have in their lives. I know I'm continuously deleting them because my phone doesn't have that much memory. And I'm like, I have a rubbish phone but it is, you know there's a priority system on what is there is an app and what isn't. If I'm only going to use it once every two months, probably not on my phone to be honest."* [KDQ03]

4.1.7 Habits and Characteristics

The habits and characteristics theme refers to the influence of the consumers' personal habit and characteristics on their likelihood of interaction and ensuing value co-creation with smart packaging. During the focus group discussions, there were numerous instances identified of varied participant response towards smart packaging that were highly dependent on their participants' personal habits and characteristics. For example, during the discussions relating to the smart sunscreen, participants noted that their natural tolerance to sunburn (refer to IFQ02) or whether or not they have kids (refer to SGQ04) influenced how valuable they felt the smart packaging features depicted in this scenario were.

> "*I think, it'd do my head in. The sun tan would do your head in more but unfortunately I'm not one that gets burnt. I don't put much sunscreen on, I've got foreign, my Italian skin so I'm alright.*" [IFQ02]

> *"Yeah, I mean I've got 3 young children, so honestly remembering when to put suntan lotion on them is, you know… we just randomly throw them back on again so actually having that kind of reminder would be really useful. "* [SGQ04]

This phenomenon was also observed in the discussions surrounding the authenticity verification feature depicted in the smart alcohol storyboards. Although participants

generally did not find it useful because of their levels of trust in commercial regulations (refer to SGQ05), participants who were more paranoid due to prior experience with fake alcohol (refer to IFQ03) or have lived in a country where fake alcohol was more common (refer to CTQ02) perceived more value in this feature.

> *"I've never had an issue with fake booze but, I suppose, most of the time I buy it from Tesco or other high street retailers. I don't really have a concern in I suppose, I don't know, once you go to pub or bar or restaurant, I suppose id expect it to be genuine. Not to say they always will be but , yeah I've never really worried too much you know about buying fake booze but I do know it's a thing."* [SGQ05]

> *"The genuinely fake alcohol is like good, me and the lads in a day. We've got this new subsidy island which we bought we said "oh yeah it's a good deal", put it in the freezer, and then got it out like 12 hours later and it was frozen and we're just like Is it meant to be vodka? I don't think we should drink this."* [IFQ03]

> *"I guess the only exception is when you go out to a shop and you buy it, I come from Vietnam so fake liquor is kind of like a problem with us as well. So if I'm going out and I buy an alcohol then I might consider to scan whether it's like authentic or not."* [CTQ02]

Individual difference has also been identified as a cause for varied participant response towards the consumption tracking feature depicted in the smart coffee storyboards. Participants who have experienced a form of addiction or have a tendency to consume too much coffee perceived more value in being able to track their consumption (refer to CSQ02) as opposed to those who only drink coffee in negligible amounts (refer to CTQ03).

> *"Yeah I think this will be quite, like the caffeine side of it. That's quite clever. We're at a society who has Fitbits and we monitor every other aspect we can monitor, like I'm wearing mine now…how much I walk, how many stairs I do, how long I sleep. So it to know how much caffeine I was drinking would be*

quite clever. I definitely think some days I get the shakes cause I drink too much." [CSQ02]

"If I'm drinking like 4 or 5 cups of coffee per day then it would be my concern but now like I only have 1 per day so it's not really a big deal." [CTQ03]

Additionally, it is also worth noting that this theme inherently has a stronger influence on the other themes than the prior ones on each other. This is evident from the numerous examples depicted in the write up of said themes which indicates how the participants' habits and characteristics influenced the relevance of the theme, such as their preferred communication styles or level of comfort with personal data sharing.

4.1.8 Summary

This study identified seven factors which influence the likelihood of consumer interaction and its ensuing value co-creation with smart packaging. This should prove useful as a starting point for practitioners (i.e. smart packaging designers) to consult throughout their development of smart packaging experiences (i.e. checking whether their design has considered the expected preferences of the consumer segment they are targeting in relation to these themes). This marks the end of the findings section of the first study. This thesis now proceeds to the next section which reports on the findings of the second study: "Obrien's Coffee"

4.2 Study 2: Obrien's Coffee

This section reports on the findings of the "Obrien's Coffee" study. It elaborates on the themes identified from the thematic analysis conducted on the transcripts of the interview and audio diaries collected from the study. As previously mentioned, this study undertook a hybrid analytical approach to thematic analysis that combined aspects of both deductive and inductive reasoning in which major themes were already decided prior to analysis. Hence, more specifically, this section elaborates on the themes categorised under each dimension of said major themes, providing a comprehensive account of how these phenomena can manifest through actual consumer interaction with smart packaging.

Major	Higher

Themes	Order Construct
Cognitive Engagement	Smart Packaging Engagement
Emotional Engagement	Smart Packaging Engagement
Behavioural Engagement	Smart Packaging Engagement
Utilitarian Value	Value
Hedonic Value	Value
Social Value	Value
Brand Trust	Brand Relationship
Brand Satisfaction	Brand Relationship
Brand Attachment	Brand Relationship

Table 34. Presentation Order of the Findings of "Obrien's Coffee"

Much like the previous section, this section presents an elaboration of each theme alongside their supporting quotes in turn. Themes are presented in the order shown in Table 34 above with an additional section under each dimension dedicated to the miscellaneous primary codes which although did not recur and was unable to be promoted into a theme, can still provide additional insight that contributes towards developing a better understanding of smart packaging engagement.

4.2.1 Behavioural Engagement

Themes classified under behavioural engagement relate to physical actions that manifested as a result of participant interaction with smart packaging.

Routine Interaction

Routine interaction refers to the participants' integration of their interaction with the smart packaging experience into their daily routines. This behaviour was most apparent in the form of regular participant interaction with the Community, typically during pockets of idle waiting time when brewing coffee, often in the morning as evidenced by quotes SAQ01 and KAQ01.

> *"Yeah, it was fun, I think it was the section I looked at the most probably. I used to, like I said, I check it every morning when I made coffee."* [SAQ01]

"*Sometimes in the morning when I was, when I'm waiting for my coffee I'd look at it.*" [KAQ01]

Besides the participants' routine interaction with the Community, another type of routine interaction was also observed in a participant who developed a routine of regularly scanning the NFC tag of the coffee she was drinking. Although the NFC tags for each pack were designed to be scanned only once throughout the consumption experience, subsequent scans are still able instantly bring up the pack's information on the app. The participant scanned it every time she brewed her coffee, stating that this behaviour was driven by her liking for a reminder of the finer details of the coffee that would otherwise become forgotten over time (refer to TAQ01).

"Yeah I think it sort of becomes routine as well. You sort of get into the routine of doing something every day and then you just do the same thing. And I guess it reinforces what you're having as well because you do forget, you forget what I'm having and so it's just nice to re-read the same thing again." [TAQ01]

Discussion

Discussion refers to the participants' discussion about the provided coffees with other individuals. Participants generally discuss a variety of topics, such as whether they liked the coffee, how it compares to other coffees, characteristics or traits of the coffee that they did or did not like, and whether or not they agree with the tasting or aroma notes provided by the brand (refer to HAQ01 and CAQ01).

"Yeah so I told my housemate about it and we actually had a cup each, like together so I was like telling about why I thought this coffee was nice and about the flavour notes. Cause I quite like thinking about what coffees taste like I'm trying to describe cause like when you first start drinking it, you can't tell one from the other so it takes a while to kind of figure out the different kind of like, like things like mouthfeel and acidity so it's quite nice to, so yeah I do like to chat to people about it and go 'I know this ones like this, this ones like that." [HAQ01]

> *"Yes, so I spoke with my roommate, the one who was smelling the coffees and I remember like we tried one day, I gave him a little bit of the, what's it called? Kurage? Yeah the jellyfish and I think his comment was like, it's good but there is one that you've got that smells really, really good and then he went away."* [CAQ01]

Participants noted that the discussion was largely prompted by the information about the coffee that was unlocked by scanning the NFC tags, serving as a reference point and stimulus material that participants used to enrich their discussions (refer to HAQ02).

> *"I think because you had the actual information, you could talk about it and actually kind of have a reference point whereas like if you haven't got that information, it would be a case of 'this coffee is kind of nice' but you wouldn't necessarily react to, enhance like on the details and that."* [HAQ02]

As the discussion topic often concerns the taste of the coffee, it is typically held only after participants and their discussion partner(s) have sampled the coffee, providing them with a first-hand experience that allows them to form a more comprehensive opinion of how the coffee tastes.

Word of Mouth

Word of mouth refers to the participants' initiative of bringing up smart packaging features in conversation. Aside from the Logbook feature which most participants did not use or completely forgot about, all other features were brought up by participants in their conversations with other individuals. Participants talked about the features as they not only found them to be interesting but were also curious about what their peers thought of them or whether they have encountered them before. Content that was presented through the NFC tags and the Community was actually shown by participants to their peers (refer to EAQ01 and HAQ03) as opposed to just being talked about like the Ratings and Reviews (refer to TAQ02) and Consumption Tracking (refer to SAQ02) features.

"I mentioned in my audio diaries that I'd given it to some of my friends and showed them. I didn't really have much to talk about it at the time but yes, they all thought that was quite cool as well." [EAQ01] concerning NFC tags

"Emm, I think I probably show people, I think I showed my housemate one of the discussions about like the caffeine intake only cause I was slightly surprised at how much caffeine people seem to be drinking." [HAQ03] concerning Community

"Well I asked them, I asked my other friends. Do you ever think about what you rate your coffee when you drink it and reviewing it and do you ever reflect on what you've drunk basically and then it's a bit robotic but my friends were like 'no we just drink it for the caffeine. We don't really think about the taste or sit down and think I can taste this note, I can taste this'. So its interesting that the app sort of gets you to reflect on what you're drinking." [TAQ02] concerning Ratings and Reviews

"I suppose this is the interesting one isn't it, the kind of cause, cause for debate. Like, lots, cause I've talked to people about doing this study and loads of people saying 'but you know I know how much coffee I use and I know when I ran out' and then other people say 'and you know, and if its just so that the same brand coffee is automatically ordered and paid for from your account, then its just a way of tying you into a kind of consumer relationship that you might not necessarily want.' [SAQ02] concerning Consumption Tracking

Experimentation

Experimentation refers to the participants act of changing their brewing methods or techniques as a result of their interaction with the smart packaging experience. Said changes were found to vary based on not only the smart packaging features which triggered this behaviour but also the participants' personal characteristics. Although most of participants were experimenting in order to be able to brew a better cup of coffee, there were others who experimented with other goals in mind, such as wanting to fully 'explore' the coffee before reviewing it (Refer to NAQ01).

> *"Because I wanted to try different ways, like different brewing ways and then, you know decide which brewing method, I mean brewing technique is best for me and then you know, say that oh the coffee is good or not. Because I don't want to rush with my rating if for example I brew the coffee for 3 minutes and I don't l like it but then I brew the coffee for 7-8 minutes and I like it. Do you understand what I'm saying? So I want to get the best, result that I think is the best according to me and then review it."* [NAQ01]

Besides the consumption tracking feature, all other features have been found to affect the participants' brewing process. The information about the coffee that participants unlock by scanning the NFC tags did affect the brewing method that the participants would use, such as Charles who ended up trying the coffee as a Cold Brew as opposed to brewing it using the French Press as he normally would (refer to CAQ02). More coffee-savvy participants were also able to use this information to fine-tune the lower-level details of the brewing process like the extraction time for an espresso (refer to JAQ01).

> *"Like I'm pretty sure that actually helped me go into trying it as a cold brew"* [CAQ02]

> *"Yeah kind of. I was definitely experimenting cause I like to experiment different brew methods with a new coffee anyway so I was kind of experimenting anyway but like I say if I saw that something was, looks a bit like something that I know makes good espresso or something like that, like a blend with you know south American, a bit of African to add like a bit of perhaps then that may be more likely to try out that brew method but I was kind of experimenting anyway, yeah I'd say the information guided me slightly. In terms of extractions times and stuff as well."* [JAQ01]

Similar kind of changes were also made by the participants based on what they have read on the Community. Participants were found to have made modifications to how they brewed their coffee based on what they have seen other people do and say, such as Nancy who decided to try and have her coffee with milk after reading another participant's opinion stating that combination to be bad, just to see if she

would feel the same way (refer to NAQ02) and Hugo who experimented based on seeing what other participants have done (refer to HBQ01).

> *"Well it was interesting, interesting but some other information for example about this coffee. The Fukuro one, well people were saying 'oh its bad with milk.' I then, I tried it once with Milk and then I agreed and I decided to drink it black. So yeah it was useful, some of the posts were actually useful."* [NAQ02]

> *"Yeah, I tried brewing it a couple of different ways based on what people are saying, just how they've had their coffee more than anything. So I remember the first type of coffee which I drank, I can't quite remember the name, but it was quite bitter and things like that and the other people were saying about how it was bitter and they just mentioned how they were brewing it and to make it nice and things like that. I quite like bitter coffee so I didn't mind it, its just yeah, so I tried it different ways."* [HBQ01]

Due to its lack of use, the Logbook was less impactful in influencing how the participants experimented with their coffees (despite it being solely designed for experimentation). Participants who used it for experimentation did however use it as it was intended for, noting down how they brewed it and how it tasted so that they could have a written record of what they have tried (refer to HBQ02).

> *"Yeah. Because what I do, normally do is scoop out 30, 20-30 grams. That's about 2 tablespoons. I mean I weigh it out, I got the scale and things like that but normally I'd go for, I'd start out on 20 and then if it tastes a bit weak, I just slowly add more and that's what I did here."* [HBQ02]

On the other hand, the Ratings and Reviews feature was actually found to limit experimentation. The data suggests that participants may at times note down how they like or not like the coffee as part of their personal reviews. When reading the review in the future, they would then brew according to the guidelines that they have written themselves, reducing the likelihood of them trying something new (refer to JAQ02).

"Like I think this first one I got a review for here, I'd forgotten about this. Maybe this is the value. I'd said that its not very good in milk based drinks like lattes so I maybe wouldn't make one of those again if I ordered it so its useful to have that I guess as a record so, I think it would affect me if I ordered it again. I would just have a look and be like 'yeah okay I shouldn't make it like that'". [JAQ02]

Meticulous

Meticulous refers to the participants' meticulous approach to brewing their coffee that was driven by their sense of duty to write an objective review. Participants mentioned that they would like to be able to review the coffees fairly and would like to avoid cases where their ratings and reviews were negative not because of the low quality of the coffee but due to their inability to brew it well (refer to CAQ03).

"So you want to make this brand justice, so you want to make a really good French press coffee for example, you want to make a really good cold brew. You don't want to like do thing badly, you want to make things right." [CAQ03]

Comparing Aroma Notes

Comparing aroma notes refers to how some of the participants smelled the coffees in order to see whether they could try and identify the aroma notes described in the description about the coffee that was unlocked from scanning the NFC tags (refer to CAQ04 and EAQ02).

"Without going into the tags, we started like smelling the 3 coffees and <inaudible> what we thought of it…like, like, I dunno, like help you see like "Oh you know what, I actually smell this nutty aroma." [CAQ04]

"So I'll have a smell, I might even make the coffee first and see what I thought and then I go and read it and I'll be like "Oh, I got that flavour but I didn't see that. Oh they thought it was good for this thing and I thought the same". Stuff like that." [EAQ02]

Household Clarification

Household clarification refers to the participants' explanation of how the consumption tracking feature works to other people in his or her household. This generally stems from the concern of the participants' housemate(s) that the consumption tracking feature (which requires the Smart Scale to connect to the participant's household network) may be collecting more data than what it lets on or is mining cryptocurrency, resulting in the participants' reassuring their housemate(s) that the technology is safe (refer to AAQ01).

> *"The only thing I talked to about my housemate about, the scale, that they know what it is and they don't think that, I don't know, I'm mining bitcoin in our kitchen or something cause of the tech stuff."* [AAQ01]

Miscellaneous

There were two behaviours that were unique to just a single participant: reading and research. Reading refers to how Charles believed that the use of NFC tags to present information about the coffee in a concise manner encouraged him to actually read it, something he would not have done if it had just been printed regularly on the packaging itself (refer to CAQ05).

> *"So like, when you read like all this stuff. Cause like if you go to Tesco for example and buy random ground coffee. I'm pretty sure like nine times out of ten you won't be inclined to actually, like read all the things, like this coffee was made in blah and like and it smells of blah blah blah. So like, those kind of things actually help a lot like if you see them really really quickly."* [CAQ05]

Research refers to how the provision of information about the coffee stimulated Hugo's thirst for knowledge, prompting him to conduct further research about coffee on his own (refer to HBQ03).

> *"I did, yeah it is interesting cause I know, I know that different regions have got all the different taste and things like that but I just never really looked into and it made me do some more Google research outside of the app."* [HBQ03]

4.2.2 Cognitive Engagement

Themes classified under cognitive engagement relate to cognitive thoughts that emerged as a result of participant interaction with smart packaging.

Reflection

Reflection refers to how the participants looked back and thought more critically on how the coffees actually tasted. Enabling participants to review and rate coffees was found to be a primary driver of reflection as participants mentioned that in order to be able to give an accurate review of the coffee, critical thinking was required (refer to RAQ01).

> *"Maybe, in which obviously cause you have to think about it, you have to like consider what you actually thought about it and like writing mock reviews, you just like, hold your critical thoughts on let say taste and stuff yeah."* [RAQ01]

Some participants reflected more critically, not only reflecting on how the coffee tasted but also tried to better understand why they did or did not like the coffee by narrowing it down to which traits were 'responsible' for aspects of taste that they did or did not enjoy. This was done by consulting the detailed blend characteristics unlocked by scanning the NFC tags (refer to HAQ04-A and TAQ03) as well as the user-generated content on the Community (refer to HAQ04-B).

> *"Definitely when you're drinking because you've read the description and you're like, can I taste the notes that it's mentioned. So you try and compare the written description to your own taste whereas normally you wouldn't, you just drink it. You just taste it without having anything to compare it to."* [TAQ03]

> "*Yeah definitely, having the information does make you think more about you know why you like it and what it tastes like… [A] And, its, cause sometimes you taste the coffee and maybe you like it or you don't like it and you're not entirely sure why but if you read what other people are saying about it, what they like and dislike about it, maybe you can put that down as like that's why I disliked that certain bit of the coffee, maybe the bitterness or something like*

that. Well in the converse as well, why you like certain bits of the coffee [B]." [HAQ04]

Awareness

Awareness refers to the increased awareness that participants experience as a result of seeing their consumption statistics with the consumption tracking feature. Participants reported that they not only became more aware of how much coffee they were consuming regularly (refer to TAQ04 and JAQ03) but also of how much coffee remains in their tin (refer to RAQ02). This observation was much less apparent in participants who are already very much aware of their regular coffee consumption.

"I'm just more aware that I'm drinking this amount." [TAQ04]

"I was more aware of every time you use coffee I was like 'Oh there's a smart scale so that I'll know how much I'm using." [JAQ03]

"I was thinking about it today, I actually paid more attention to the, how much coffee in the jar." [RAQ02]

Refinement

Refinement refers to the participant's plans to modify their coffee brewing methods and techniques. Although similar, it is different from the "Experimentation" theme classified under behavioural engagement that refers to actual physical experimentation as opposed to simply planning to. Refinement was mostly driven by the guidance, inspiration, and ideas derived from the participants' consumption of coffee-related content on the Community which includes but are not limited to how other participants brew their coffee, recipes, and coffee-related trivia (refer to CAQ06). Similar thoughts were also induced in the participants by the Logbook, encouraging participants to think about changes they could make to the brewing process that could result in a better cup of coffee (refer to HBQ04).

"So for example like, you start thinking about things that, so you don't want to feel left behind. So you start thinking about things that you don't

necessarily think about in a normal day. For example, some people were describing the exact temperature they were putting like milk to prepare a latte and maybe I would go like "oh this is warm milk"... So you're almost like learning from it and applying it to your own experience? [CAQ06]

"It made me a bit more thoughtful about how I was just making it. Particularly like for this third one, every single time I was making it I was thinking a lot more about how I was making it and what was going to make it better?" [HBQ04]

Thought Inducing

Thought inducing refers to how the addition of an extra step of scanning the NFC tag to the consumption process encouraged participants to think more about the coffee. Participants claimed that this was a unique aspect of the product that distinguishes itself from other brands (refer to HBQ05 and SAQ03) that also reminds them of the characteristics of the coffee they are drinking which are occasionally forgotten (refer to JAQ04)

"I think its literally just because you added another step to the consumption of coffee. You're not just making a pot of coffee and then drinking it, you're also actively scanning something in and then auto, it opens up, what you're reading so then you read it so, its just interesting in that way. [HBQ05]

"Well, I think the act of scanning, makes you think about the product and sort of reminds you that it's, it's a product that you haven't encountered before. It's not just coffee generically, it's a particular type of coffee and maybe you could be thinking about it in a more particular type of way so, yeah different from just you know unscrewing the lid on an instant coffee jar." [SAQ03]

"I'll read that stuff when I'm ordering the coffee but then when it comes, I don't really think about it. I just kind of like drink it. So I guess it was good in the sense that it made me think about it just before I started a new coffee. I guess because I only scanned it once for each one that was only the first time I drank it. It kind of like, But I guess it made me remember more, the normal what, the can origins and what the information was." [JAQ04]

Miscellaneous

There were two primary codes under cognitive engagement that were unique to just a single participant: sustained thought and energy use. Sustained thought refers to the participant's state of regularly thinking about updates on the Community that they have yet to check out (refer to NAQ03).

> *"Well there were sometimes during the day that I, you know I was wondering what other people would have said about the coffees. Especially after I drank the coffee and then before I was about to make the recording, when I was looking through the app. You know, it was, you know, I was thinking about it "Oh, it will be interesting to see what people have posted today" or if there is any new information."* [NAQ03]

Energy consumption refers to the thoughts a participant has about the amount of energy that was being consumed by the smart scale (refer to SAQ04).

> *"There's a question about resources I suppose so anytime you plug in a new device in your home like you always wonder sort of how much energy is it using. What's, what's the significance of this but not, not to the extent that I actually went and looked at the smart meter to see, I'm sure, cause you know I was fairly confident that it was using a very tiny amount of energy."* [SAQ04]

4.2.3 Emotional Engagement

Themes classified under emotional engagement relate to feelings that were aroused as a result of participant interaction with smart packaging.

Intrusive

Intrusive refers to how participants felt about the collection of their personal data. Many assumed that this data would be used simply for targeted advertising and hence, did not feel comfortable giving them away they believe that it can very easily be misused if it falls into the wrong hands, such as how consumption data could be used to infer their presence at home (refer AAQ02) or how date of birth can facilitate identity theft (refer PAQ01).

"They could probably tell when I'm home, so this is another thing. Okay when you take a shower you know that you have a spike in energy so you can tell that someone's home. I think this has a similar Internet of Things issue that you could say that 'okay look, there has been days where they haven't had any coffee so maybe they're not at home'." [AAQ02]

"I would want to avoid putting the date of birth in a publicly, in an easily publicly accessible place because that's one of those numbers that always ends up tied to personal details. Whenever the bank wants, whenever the bank or the pharmacy wants to confirm to me, they'd ask for my date of birth" [PAQ01]

Another reason participants found this practice intrusive was their doubts regarding whether or not the personal data being collected would actually improve a firms capacity to provide better personalised service (refer to AAQ03). As participants perceived the degree of intrusiveness to be inversely related to the potential benefits they receive in exchange for their data, the notion that they would be giving their data away for lesser rewards made it seem much more so.

"I'm not sure why gender needs to be in there, so like, that was something that confused me a little because I feel like coffees not a very gender kind of thing, I feel like if people bring that in, I was a bit like "do you have ideas that I don't know, ladies drink more cappuccinos or something like that" so that rubs me the wrong way. Like I don't see the use in this." [AAQ03]

Participants were however much more nonchalant about firms collecting product-oriented data they consider much more relevant for personalisation, such as their personal preferences for coffee, the times at which they drink coffee throughout the day, and to a certain extent, their daily levels of consumption (refer to AAQ04).

"I think I would be okay with giving that (consumption data) because I feel like that's not something where I'm like if these things get triangulated back to me, it's not really that harmful. Like I feel that this is something where I wouldn't mind a breach so much if people know I drink, I don't know, 5 cups of coffee a day [A]. I think that's okay… I think I would have preferred much

more like when do you drink coffee, how much coffee do you drink, do you drink coffee to get started in the morning, is it more relaxation thing, so more about my coffee habits instead of asking me all this arbitrary personal stuff. [AAQ04]

Intriguing

Intriguing refers to how the participants felt about the smart packaging features. Participants generally found the smart packaging features to be somewhat interesting, even if they did not interact much with them. Participants thought the NFC tags were an interesting and cool feature, not only because of the information it unlocked when scanned (refer to NAQ04) but also due to the gamification elements it introduced by functioning as a key to unlock coffees on the compendium (refer to JAQ05).

> *"Yeah because it gave me, you know I was able to see the details about the coffee and the provenance and how it is described by the people, that they sell it. Like what kind of flavours and has. Yeah so it was, it was kind of interesting after I managed to activate it"* [NAQ04]

> *"It was cool cause you kind of unlock the coffees as you go, it had like that gamey kind of element."* [JAQ05]

Content on the community was also generally well received, with participants noting that it was interesting to read about how other participants brewed their coffee and the various tidbits of coffee trivia that was posted (refer to SAQ05).

> *"I think the thing that I found most interesting was other people commenting on their views about the coffee and comparing that with mine and sharing mine, so yeah that, that was, and other people using a French Press and whether that was having an impact so I thought there could have been a lot more community activity but what there was, was you know, was interesting."*[SAQ05]

Although participants did not interact much with the consumption tracking feature, many still found it intriguing. Their opinion on it was fairly split, with regular and

consistent coffee drinkers not thinking much of it as opposed to the more irregular coffee drinkers who were much more curious to find out more about their own coffee drinking patterns (refer to HBQ06).

> *"Yeah I think it's just interesting to comparisons, different days of the week as well, so just where I drink more coffee and what that, why that is and my schedule and things like that cause normally I drink loads of coffee on a Sunday because you know I'm at home, with things like that and you can spend the time, that's when I use the app. Reading more about it and then it just be interesting to see the difference how much I consume when I'm going through my normal week and not really thinking about the coffee and just drinking it because I'm a coffee addict."* [HBQ06]

In a similar manner, although the reviews and ratings feature was not talked about as enthusiastically as the others, participants were still able to find its potential applications intriguing, such as Charles who mentioned that it could be used to track how his taste buds might change over time (refer to CAQ07).

> *"I think it was good because sometimes, especially if we're growing older. Sometimes our taste buds may actually start changing, for the better or worse. Depending on what kind of flavours you like. For example, there's the olive example like kids usually hate olives but the moment you start growing up, you start liking them and that kind of flavour so like for future, I'm talking years but for this kind of thing, it's like, it can actually help or maybe if you move out of the country. Coz like I moved out of my country for a couple of years now and I definitely felt that my taste has changed for some things so like having those records at least could be of interest to you as a person. I'm not sure if for a brand, but at least for you as a person could be very interesting."* [CAQ07]

Novelty

Novelty refers to the participants' impression of the NFC tags. Participants found not only the use of NFC tags but also the information it unlocks to be novel. Although participants have generally heard of or are aware of what NFC tags are, for many,

this was their first experience of actually scanning one themselves. Additionally, some have also never experienced being provided with such detailed information about the coffee, adding to the novelty of this smart packaging experience (refer to HBQ07). It should however be noted that this sense of novelty is reported to wear off over time (refer to JAQ06)

> *"I mean, it's the first time I've ever really had a coffee and looked more into it in terms of like its origin and taste, scores and things like that so yeah it was, it was valuable because yeah like I said, I've never done it before so it's interesting."* [HBQ07]

> *"I guess the first time it was something new so I was kind of curious seeing what would happen, then I got used to it so. It probably had less of an impact then"* [JAQ06]

Unnecessary

Unnecessary refers to how over-the-top participants perceived some of the smart packaging features to be. Some participants felt that although the NFC tags were interesting and novel, it was simply unnecessary. They believed that the information unlocked by scanning the NFC tags didn't need to hide behind a technology (refer to AAQ05) and in fact shouldn't as the information it unlocks is taken into consideration when making the purchase decision (refer to HAQ05).

> *"Yeah useful, it was I think just to give an idea of where the, <inaudible> of the coffee and like the notes that is has and this and that, but yeah, I think, it for me personally, it didn't need to be hide behind a tech."* [AAQ05]

> *"Personally I don't think they are necessary. I think that if you had an app where you can view the different coffees anyway and select the one you are currently drinking, cause the only difficulty was that you had to scan the tag to be able to see the coffee and actually I think it'd be quite nice to be able to see the coffees you haven't got yet so you can start browsing their data rather than having to buy it and then get the data cause obviously you don't really want to know all about the origin and taste of the coffee once you've*

bought it, you normally want to know the information as that helps you buy it. So I would probably say that they're not really necessary." [HAQ05]

The logbook was also perceived by to be an unnecessary feature as most participants do not regularly brew coffee in so many different ways such that they require assistance to help keep track of the optimal brewing techniques for each one. Even if this was the case, participants noted that they would simply try to remember it rather than put in the effort to explicitly maintain a record (refer to HAQ06).

"And I know you can keep your own record of things but if I was going to keep my own record, I'd do it somewhere myself. I'd probably just keep it in my head to be honest. So I didn't, I just didn't, this was the part I thought was a bit superfluous." [HAQ06]

Need to catch up

Need to catch up refers to how the participants felt the constant need to check the Community for content they have yet to consume. It reflects the emotional aspect of the miscellaneous "Sustained Thought" primary code classified under cognitive engagement. Participants enjoyed the content on the Community and often checked back to see what other participants have posted about the coffee (refer to JAQ07 and NAQ05).

"I don't know if it was really emotion but like 'you must catch up'. Like I would check it like maybe every night or in the morning and it was good to see the new stuff that people has posted." [JAQ07]

"Throughout the day I had a quick look at my statistics, my consumption statistics and then also the community posts. I wanted to see if there were any more pots or reviews posted online." [NAQ05]

Timesink

Timesink refers to how the participants felt about the use of some of the smart packaging features (refer to RAQ03 and KAQ02). There were several features which participants perceived to be simply a waste of time, the most common one being the

logbook feature that many noted could be easily replaced by their own heads (refer to HAQ06 above under "Unnecessary").

> *"I'd have resented that, if I was, I don't really see how I would spend that time doing that. Like, I think, time's just, it's the, it's the rarest commodity we've got."* [RAQ03]

> *I think one thing that I was reluctant on exploring the app is because I didn't really like spending too much time on it. Because I already spend a lot of time on brewing my coffee, grinding it every morning and I kind of don't want to spend too much time on my, on the app just think about it, especially in the morning.* [KAQ02]

Miscellaneous

There were four primary codes that were unique to just a single participant: worry, disappointment, wasteful, and confusion. Worry refers to how the participant felt when he saw his excessive consumption statistics (refer to CAQ08).

> *"I think I was more worried about myself rather than about you guys."* [CAQ08]

Disappointment refers to how the participant felt when she discovered that the only thing scanning the NFC tag accomplished was unlocking it in the compendium when she expected something more to happen (refer to AAQ06)

> *"It was something like where I was "okay, okay. Like I've gone through the trouble of scanning it, now I expect something more to happen. Because I've done this extra step" So, I mean I guess in this sense maybe there wasn't enough…"* [AAQ06]

Wasteful refers to how the participant felt about the smart packaging components as they require resources to build and might not be recyclable, NFC tags being one of the examples (refer to RAQ04)

> *"Okay it's like a plain package which looks great, paper I think is really good. Its recyclable, but, and then if, if like the radio frequency tag, that's just gonna*

get chucked out and I don't think that's a great, great thing you know. Its like foil. " [RAQ04]

Confusion refers to how the participant felt when looking at his own consumption statistics. Due to technical issues, the consumption data of some participants were incomplete and this resulted in some confusion when the participants looked at their consumption statistics.

> *"I mean I looked at it but I got kind of confused cause I don't understand why certain bars will be, its not there. I don't really know what's on this axis, is that per day?"* [KAQ03]

4.2.4 Utilitarian Value

Themes classified under utilitarian value relate to the utilitarian value propositions (those providing information) that participant believe were offered by the smart packaging experience.

Blend Characteristics

Blend characteristics refers to the utility derived by the participants from reading information about the coffee, such as the region where the beans were harvested from, the type of coffee beans used, and its flavour notes. As previously mentioned, this information has been attributed with guiding some of the more coffee-savvy participants in making decisions that affect aspects of the brewing process such as the brewing method or extraction times for espresso (refer to quotes CAQ02 and JAQ01 respectively under the "Experimentation" theme in Section 4.2.1).

Consumption Data

Consumption data refers to the utility derived from the tracked consumption data provided by the consumption tracking feature of the smart packaging experience. Participants perceived this data to be potentially useful as it provides a loose indicator of how much caffeine they consume on a daily basis that many believe can be used and should be kept in check for their general health. Participants who are aware of their tendencies to drink too much coffee or knows someone who is trying to cut down saw greater potential in this feature, noting that it could be used to monitor daily caffeine consumption more accurately (refer to CAQ09)

> *"But I think specially if people are trying to moderate the amount, cause some people like for example my dad really wanted to take a step back from all the coffee he was drinking so for example for him, an app like this is just like heaven because he doesn't, he's actually looking at how much he's actually consuming, how much he can actually take back."* [CAQ09]

On the other hand, participants who regularly drink a limited and constant amount of caffeine daily (e.g. just one cup of coffee) found this data to be less valuable (refer to KAQ04)

> *I think for me, my coffee intake is really quite consistent. For now anyway when I get, when its exam period my schedule kind of goes a little bit haywire than I'm more interested in the coffee consumption at that time."* [KAQ04]

Beyond treating it as a loose indicator of caffeine consumption, some participants have also come up with other ways that this data could be used, such as Nancy who believes that this information can be used to budget her spending on coffee as well as schedule her coffee purchases to ensure that she doesn't run out while also not purchasing it too early and having it sit for too long (refer to NAQ06).

> *"Yes, that as well because it will as I said in the long term, it will help with my budgeting and also deciding how much coffee because another thing with coffee is that they are brewed and they are freshly cut is that when you buy a coffee, then you want it to be as fresh as possible so you don't really want to buy 2 packs of freshly cut, freshly you know. Yes so that will help me and see "oh, I see this week or this month, I needed 2 packs or I needed 3 packs" so I will know that next month I will buy one pack for 2 weeks and then I will go for the second pack after 2 weeks so I will have more fresh coffee."* [NAQ06]

Purchase Decisions

Purchase decisions refer to the utility derived from information that would allow participants to make better-informed purchase decisions. The ratings and reviews (both personal as well as those shared by others on the community) were the influential factors in dictating whether or not participants would purchase a specific blend again as well as which one they would try next. Unsurprisingly, participants

would lean towards coffees that share similar characteristics to those that have been reviewed positively by themselves or other participants (refer to HAQ07 and EAQ03).

> *"I think it makes you pay a bit more attention to it and I guess it means that in the future if I was reading, looking for a new coffee. I'd look at the things this coffee has described, so for example it talks about it being a creamy or chocolatey taste, I might think about the fact that if I was looking for another one, perhaps I would look for another one that also describes it as a creamy or chocolatey taste and so yeah, it talks about the fruitiness and things like that so maybe I'd look at other coffees with similar things in."* [HAQ07]

> *"Yeah obviously if I rate a coffee and review it good, then I'm more likely to buy it. If I see other people's reviewed it well, I'm more likely to buy that but yeah obviously, I tend to follow other people's reviews quite closely so yeah if there's a way to look at that feature, it will alter what I choose to purchase"* [EAQ03]

Taste Profile

Taste profile refers to the utility derived from the participants' development of a better understanding of their personal preferences that is instigated by their interaction with the smart packaging experience. At a basic level, this may involve merely facilitating participants to keep a record of which coffee blends they were liked or disliked with the reviews and ratings feature (refer to SAQ06 below). There were however some participants who took this further by personally scoring how much they like or dislike various coffee traits that they know is present based on the information unlocked by scanning its respective NFC tag (refer to HAQ08)

> *"Reviews or my own preference will influence which one I choose over others …. And it might help to be able to remember what I liked and what I didn't like so much and I can see that, that might work with other products. I suppose I keep on going back to wine or beer or something like that where there are other products where I feel that, taste is considered to be very important but its, I don't feel particularly confident or you can often feel intimidated by, you know highfalutin language or so like, you kind of build up*

a sense of what you like on a very basic level like you know, I like Pinot Grigio but I don't like Chardonnay or whatever but to actually have, have a record over time of specific brands or types or places you bought things, might be helpful cause sometimes when there's a lot of choice, all you take with you is I don't like Merlot or whatever yeah. [SAQ06]

"And just because it's quite nice to compare what I think of it to the characteristics cause that's how, to me that's how I've learned what coffees I like. By going "Oh I really like this one " and reading the information thinking "Oh, that's really strange. I seem to like these coffees a lot and I seem to like pick these ones. I wonder what it is and you can start to see like oh maybe it's because these are naturally processed coffees and I like these better than the washed coffees or all these coffees seem to come from the same part of the world. So I quite like being able to read and compare them." [HAQ08]

Accessibility

Accessibility refers to the utility derived from being able to quickly access information about the coffee. Participants believed the NFC tags to be an effective delivery mechanism that allows them to quickly get a concise summary of the coffee (refer to NAQ07 and TAQ05)

"Because it's always very important when you read the description of how the coffee and what notes it has and things like that. It is important because you know, people have different tastes so I would you know, by scanning the tag when I'm on a you know, supermarket and I get the information over there straight away then it's easier for me to read it on the phone and then revise and then decide what coffee I would like to, what blend I would like to buy." [NAQ07]

"Just to get a summary because I think without trying something it's very difficult to compare different coffees and its nice to sort of get a written summary without trying it, without opening the packet, knowing what you're expecting inside." [TAQ05]

Brewing Notes

Brewing notes refers to the utility provided by the brewing notes that participants had made for themselves which they can then consult when deciding how to brew a specific coffee in the future. Brewing notes are usually 'saved' by the participant as part of their personal reviews, community posts, or as logbook entries. Depending on the notes that has been made, they can help participants avoid brewing the coffee in less optimal ways, such as in the manner explained by Jack in his quote (refer to JAQ02 under the "Experimentation" theme in Section 4.2.1). Participants who did not find the brewing notes useful were those who believe that their memory is sufficient in aiding them to achieve similar results, often simply because they do not have as many brewing methods to keep track of or just brew their coffee the same way regardless of the coffee blend.

Miscellaneous

There were two miscellaneous primary codes under utilitarian value that were identified from the data: barricade and selection. Barricade refers to how a participant believed that the NFC tags actually became a barricade to information about the coffee as he was unable to scan it successfully, resulting in him not knowing anything about the coffee he was consuming (refer to RAQ05).

> *"But also it's like a layer of, it's a layer of information taken away from you. It's not giving you more, it's taking away from you."* [RAQ05]

Selection refers to how a participant would use past logbook entries to gauge the difficulty and time requirement of brewing a good coffee with different blends of coffee. This participant believes that certain types of coffee taste better but may take longer to brew correctly. The past logbook entries would then help her decide what coffee she would choose to drink given the available time and effort she is willing to put in the brewing process (refer to AAQ07)

> *"Yeah I think so, especially with like more coffee that's maybe more difficult to get right but then it tastes really nice. You can also put in there, okay this is one of the candidates where you have to take more care and if you have multiple coffees, then you say "okay ill pick the one that's a little bit easier" if*

you're in a rush for example and then I don't know if you come back home, you're like "okay, I'll try the one that has more notes and is really nice but takes a bit more care to prepare. Sure". That you give yourself a little bit "okay this is the easy no fuss and this is the one that's more okay, this is more artisan coffee you know." [AAQ07]

4.2.5 Hedonic Value

Themes classified under hedonic value relate to the hedonic value (feelings and emotions) propositions that participant believe were offered by the smart packaging experience.

Belonging

Belonging refers to the feeling of togetherness and sense of solidarity that participants feel as part of a group. Participants liked seeing how other people brew the same coffee they drink as well as sharing and reading opinions of it on the community (refer to CAQ10 and HBQ08), stating that it made them feel less alone (refer to KAQ05).

> *"It was really good to see like how other people were, how other people make their coffees with same brands that you're handling."* [CAQ10]

> *"Consuming coffee in conjunction with a lot of other people, you know you're drinking the same type of coffee as well, that's really interesting aspect about it. I really enjoyed that. Yeah it gives a community feeling to it"* [HBQ08]

> *"I think it might be, it was nice seeing other people doing it as well. It didn't feel alone doing it."* [KAQ05]

This was in particular observed to be very apparent when participants felt relieved that they were not alone when experiencing issues trying to brew a specific blend of coffee well (refer to AAQ08 and NAQ08).

> *"But there was something where I was like okay, in the community, I think in the community page somebody mentioned that the one I was drinking, the Fukuro one. That they also had problems like getting it to a right kind of, like it hasn't, to a right kind of colour I would say because normally this is how I*

judge when it's ready. And it was a bit light and I saw that somebody else was having problems with it so in that, it was not just me. That was nice." [AAQ08]

"Was good to know for example about the Fukuro that it wasn't just me that didn't like it. So you know you get that feeling "oh okay" of relief that it wasn't just me that didn't like the blend that much." [NAQ08]

Enjoyment

Enjoyment refers to the how the participants enjoyed their interaction with the smart packaging experience. Participants enjoyed reading about the blend characteristics that were unlocked by scanning the NFC tags (refer to HAQ09), seeing whether they can guess the correct flavour notes (refer to EAQ04), thinking about the coffee they've tasted more critically (refer to SAQ07), trying to discover the optimal way to brew their coffee (refer to AAQ09), as well as sharing and comparing their opinions with that of others (refer to EAQ05).

"Yeah, I did. I quite enjoy reading about the origin of the coffee and how it's prepared because it's quite nice to know what it is you're drinking." [HAQ09]

"Yeah I kind of do. I kind of liked having to do that to find out. It was kind of a bit more of a mystery. I don't know, that might be just me cause I quite enjoy anything like that. I like surprise boxes or anything silly so that might be my own taste but I do find that quite fun cause I can kind of guess it first." [EAQ04]

"It was fun to think that part of the point of doing this was to think about the coffee and whether it was to your taste, you know, compare that to other people's opinions" [SAQ07]

"Yeah definitely. I, definitely, I think it would be something that I could enjoy in the long run. Just to get into it as a thing, just to, because it's quite a, I guess it's a enjoyable thing, a little bit like playing scientist I guess so. Yeah I guess so, definitely. I mean it's also something where I feel like with a lot of the artisan coffees and the speciality coffees, they are quite expensive. So it would be something whereas like "okay, if I feel like spoiling myself, then I

would buy myself a more expensive coffee". So it's something that I probably wouldn't use too often but if I had something like this, I think I would enjoy using it. Definitely." [AAQ09]

"Yeah, yeah I'd say it's nice to sort of share opinions and I say generally I quite enjoy doing that, quite like posting things on TripAdvisor and stuff like that, I just think it's a nice experience." [EAQ05]

Pleasant

Pleasant refers to how the participants feel about their interaction with the smart packaging experience. Although somewhat similar to enjoyment, what distinguishes between the two are their triggers. Unlike enjoyment which typically results from active actions conducted with specific intent (e.g.. writing a review, guessing flavour notes, reflecting on the taste of the coffee), pleasant is more of a by-product of passive actions or an inert situation. It was the community that was primarily responsible in evoking pleasant feelings in the participants. Participants noted that it felt pleasant to see a community that was much less hostile compared to other online social platforms they have used in the past (refer to AAQ10 and SAQ08).

"I thought it was like more, it was more cute that people were sharing these things because I think sometimes social media can be quite hostile, like with lots of like antagonising and stuff so I guess it was nice to just see people talking about their coffee and that's it, so to have a kind of space where there is no arguing for a moment." [AAQ10]

"Yeah, I find it positive to look at the community each morning, it was you know, I didn't kind of feel like I was particularly communicating with anybody personally you know, it was a fairly sort of anonymous subject specific area but you know that was fine. I don't really pay much attention to the hashtags and things I suppose. " [SAQ08]

Excitement

Excitement refers to the feeling of anticipation or excitement that participants felt in response to their exposure to the smart packaging experience. Scanning the NFC tags was one of the activities that participants found exciting as it enabled them to

learn about the characteristics of the blend which they know completely nothing about (refer to SAQ09). Jack also found the first few days his consumption data was tracked to be exciting as it allowed him to better understand his coffee consumption habits that he previously did not know too much about (refer to JAQ08).

> *"Well yeah, its, there's a kind of little feeling of anticipation and like it's a kind of special thing that the idea of unlocking makes it, makes it a bit more special something you don't know anything about yet. And you're gonna find out a bit about and then you're gonna get to try for the first time, I think that's a nice journey."* [SAQ09]

> *"Maybe in the first couple of days I was quite excited to see that changed."* [JAQ08]

Frustration

Frustration refers to how some of the participants felt in response to the technical issues they faced throughout their interaction with the smart packaging experience. Technical issues were generally faced with the consumption tracking feature, which required the Raspberry Pi Zero to remain powered on and connected to the Internet at the time of transmission daily, both of which would fail from time to time (refer to PAQ02 and EAQ06)

> *"I don't think so, I was kind of grumpy that the scale kept unplugging." [PAQ02]*

> *"Mild frustration when I couldn't get it to work." [EAQ06]*

Miscellaneous

There was only one miscellaneous primary code classified under hedonic value: fulfilling. Fulfilling refers to how Kyle felt when rating and reviewing a coffee. Kyle describes this action as something that completes his consumption experience with the blend of coffee (refer to KAQ06).

> *"It feels complete, like you just give a little review and you kind of know what the coffee is about." [KAQ06]*

4.2.6 Social Value

Themes classified under social value relate to the social value propositions (those that affects one's self-concept) that participants believe were offered by the smart packaging experience. The thematic analysis did not however output any themes classified under social value as there were only five instances in the data in which a primary code was accompanied by the social value dimensional code, each one unique. The five primary codes were: excessive drinker, premium consumer, productive, coffee connoisseur, and contributor.

Excessive drinker refers to how Charles perceived himself after finding out how much coffee he consumes on a regular basis. As part of the consumption tracking feature does educate participants on the daily caffeine threshold recommended by the National Health Service (NHS), Charles felt that this feature emphasised on how much coffee he was drinking, making him feel less of himself (refer to CAQ11).

> *"I think I was worried, because I was just looking at how all the peaks were going up and up and going "oh my god" like I know I'm drinking a lot of coffee but this is probably not too good."* [CAQ11]

Premium consumer refers to how the community feature was able to augment the perceived image of the coffee as a premium product which, in turn also affects how Alice perceives herself as a consumer (refer to AAQ11).

> *I guess so, that I felt like a bit "okay like this seems like very high class coffee and I guess I shouldn't like drink it just like that and just so have a moment. okay like, okay ill drink this as a side. Treating it like an expensive coffee".* [AAQ11]

Productive refers to how a participant felt regarding how the use of the logbook would make him feel productive as it creates a structured, written record that could be looked back on in the future (refer to JAQ09).

> *"Just keeping a record of it makes me feel like, its good because I feel like I can reference back to it so it feels like I'm doing something kind of almost*

productive and its like, recording what I thought of it in like a structured way. " [JAQ09]

Coffee connoisseur refers to how a participant felt that being given the ability to rate and review the coffees is a brand's way of saying they value his opinion highly, making him feel as if he is a coffee connoisseur (refer to CAQ12)

> *"I think, I think I rated them because well you see the stars and you almost feel inclined to do it. Like, but but yeah, I would say that like you almost feel inclined to do it like as if you're a coffee connoisseur. Yeah I liked it"* [CAQ12]

Contributor refers to how a participant felt that by sharing her opinion of the coffee, she is helping the coffee company improve their selection as well assisting other participants with making better purchase and selection decisions. This stems from the participants own personal practice of looking at reviews before making a purchase (refer to HAQ10)

> *"I review it I guess, partly so that I can let the company know what I thought of their product. Because you know even if, I guess its quite nice for something to have feedback. And also because I know that if someone came to read it in the future, it'd give them, so I try to write reviews that are useful, that actually gives you information rather than just being "oh yeah it was cool, it was great". I try to give details because one of the things that I do when I shop online is, in fact even if I go in a store and shop, I quite often go onto the website and check the reviews you know, for anything from like food, shoes, restaurants you always check the reviews before you go, if you're gonna buy new shampoo, check the reviews, and because it gives you a bit, otherwise you're buying it with absolutely no idea what it's going to be like and you're a bit blind whereas if you got reviews you're going "well I bought this with some knowledge beforehand". "* [HAQ10]

4.2.7 Brand Trust

Themes classified under brand trust relate to factors of the smart packaging experience which affect participant trust in the fictional brand.

Due Diligence

Due diligence refers to the participants' increased levels of trust in the fictional brand that resulted from provision of detailed blend characteristics unlocked by scanning the NFC tags. Participants reported that they were more likely to trust a brand that has done the thorough research required to supply this information to its consumers (refer to CAQ13) and believes that provenance information helps distinguish a product from others, improving their trust in the brand in turn (refer to HAQ11).

> *"I would say it affected positively how I view the brand because like, you have to have all these information studied to start with in order for you to make an NFC tag talking about it."* [CAQ13]

> *"The information I think gives more trust because you're not just drinking just a anonymous product, you're getting a product that you've actually got, you know where it came from, how it was then processed and bought to you, so you have like a story behind how the coffee got to you and I think that does increase trust."* [HAQ11]

Lack of Transparency

Lack of transparency refers to how the lack of transparency concerning the personal data collection practices involved in a smart packaging experience has a detrimental effect on consumer trust in the brand. Participants are generally concerned about the motive, storage, and use of the personal data being collected. This has led them to come to a general consensus that unless the brand is very open and transparent about the personal data they collect and what it is being used for, participants are much more likely to distrust brands which collect personal data (refer to AAQ12, HAQ12, and RAQ06).

> *"Definitely not positive I would say, maybe negative depending on how much info I could find, how they're using it, what's in there, and how the scanning process with the app works… Again it would, I think it would really depend on how they are storing it. I would really carefully study the privacy policy and security and safety and how they are storing it and this and that but yeah I*

think in general out and about, I don't think I would be a customer to install this. I think I would be like the positives are not big enough for me to use something like this." [AAQ12] concerning NFC Tags

"If this feature was there as actually a feature I had to use to drink the coffee, I think it'd probably make me less likely to trust the brand because I'd be worried about why they need the information. I mean am I gonna, if I stop drinking coffee am I gonna get an email going "Hey, it seems you're not drinking anymore coffee, do you want some or you know have you run out?" and that's just a bit, it's a bit too much and…so yeah I'd rather not." [HAQ12] concerning Consumption Tracking

"If the company's collecting information on you, they are not to be trusted. End of. It's been shown again and again, even if they're not selling that data. They're, I, how do I know they're not going to be hacked? They probably will be hacked. And whatever passwords they, or personal details whatever are, what's a coffee company are on, washing up, clothes washing company or whatever. What's their business knowing what you're doing? That's the question I've got." [RAQ06]

Community Atmosphere

Community atmosphere refers to how the environment of the community section of the app helps build brand trust. Participants believe that the community demonstrates the willingness of the brand to accept criticism by providing an uncensored platform for consumers to discuss potentially negative things about the brand. This openness to impartial reviews and the open nature of the conversation about the product facilitated by the community was reported to promote a more trustworthy image by the participants (refer to TAQ06 and HAQ13).

"I think it increases your trust because you're reading posts by people that aren't necessarily affiliated to the brand. So to see the general public doing posts I think is quite, it gives you confidence in the brand itself. " [TAQ06]

"But I liked, I like doing reviews because it does make you think, when you have impartial reviews from outside people it makes you trust the product

more. Because this isn't the description the company's given, this is the description somebody else out there, a customer has given and I think that makes a difference. …I think having a community increases the trust cause there's actually users of the product that you can talk to. So the company, cause obviously the company, you'd like to be able to trust everything they say but at the end of the day, they're trying to sell a product whereas customers aren't trying to sell it, they're trying, they're just talking about it." [HAQ13]

Aside from the open nature of the community, a participant also asserted that the existence of an administrator (the researcher in this case) who actively interacts with the participants on the community can be helpful to building brand trust. The participant noted that this helps participants 'map a face' to the brand rather than it remaining nameless (refer to EAQ07).

"Yeah, I would say so because I'm obviously you are kind of, well you are the admin so I'd say that interaction with admins are generally quite good for building up trust. Certainly in other forums when you kind of see that the people who run it are quite, they're eager to contribute, they're eager to engage with the community. I'd say that's always a good thing and that always make people more trusting because you can put a face to this you know what otherwise might be like this big nameless company or this nameless app. You know, you can kind of, you got someone." [EAQ07]

Another factor of the community feature found to affect the participant's likelihood of building trust in the brand was moderation. Alice noted that being assured that there was moderation in place that would not make it possible for nasty or offensive content to be posted (refer to AAQ13)

"I mean I felt, I felt a bit more secure in looking at the community stuff and maybe using it because it was heavily moderated. So yeah, really really as I was saying, I guess if this was more of an open thing outside the study with more people and it wasn't so heavily moderated then I would feel very different about it. That I was like, okay I know that you are, you're checking

the posts and you wouldn't let people post some nasty shit then yeah." [AAQ13]

Miscellaneous

There were nine miscellaneous primary codes accompanied by the brand trust dimensional code which were not promoted to themes: ingenuity, rapport, positive reinforcement, general distrust, product quality, reciprocation, capitalistic, and technical issues. Ingenuity refers to the increased levels of trust in a brand that a participant has as a result of the consumption tracking feature. Jack believes that despite some of the technical issues he faced with the feature, the very notion that the brand came up with this implementation showcases ingenuity, which in turn improves his trust in the brand (refer to JAQ10).

> *"I say the smart scales did because I think it's a really cool and good idea but the actual statistics themselves didn't if that makes more sense…I guess the smart scales were kind of. It shows ingenuity by the company and like an interest in user experience and stuff whereas the actual stats themselves are partly because of like problems with then and partly because, yeah because I guess I kind of know how much coffee I'm drinking ish. So I guess it was more like the intent and the technology rather than the actual results for me."* [JAQ10]

Rapport simply refers to the rapport built up through Tina's repeated use or routine interaction of scanning the NFC tag of her coffee every time she brews it, positively influencing her trust in the brand (refer to TAQ07).

> *"I think so, I think it did. At first I didn't think so but I think over time, when you keep using it then you kind of build a rapport with the brand."* [TAQ07]

Positive reinforcement refers to the Charles's increased trust in the brand as a result of seeing other participants react positively towards the various blends of coffee on the community (refer to CAQ14).

> *"I would say yes in a positive way because you're looking at how other people are interacting with it and most of them are having really positive views on it. So I would say yes."* [CAQ14]

General distrust refers to Samantha's general disposition of not trusting brands, owing to her belief that a firm's primary goal is to generate as much profit as possible, even if it means exploiting their consumers.

> *"Trust, trust is a weird thing. I don't think I particularly trust in any brand or providers. Probably a bit cynical about consumerism so like I don't know, you know, like, like I use Apple products but I don't trust them as a brand or Google or anyone else, I think they're kind of, they're out to make as much money as possible and god knows how they're doing it but so yeah."* [SAQ10]

Product quality refers to the increased trust in the brand resulting from the improved product quality perceived by Emma as a result of being able to access detailed blend characteristics of the coffee (refer to EAQ08)

> *"Yeah, I'd say it improve my trust in the quality. Yeah, I'd say that perhaps I wouldn't mind, it does but it's not something I really think about."* [EAQ08]

Reciprocation refers to the increased levels of trust in the brand that Charles has as a result of his impression that the brand trusts his reviews and ratings of the various blends of coffee more than those of others (refer to CAQ15). While this was never actually the case, it did make him believe that it was only right for him to reciprocate that same level of trust in return, even when participants were never actually told how these ratings and reviews were to be used by the brand (they were originally designed solely for participants to keep and maintain their own personal record of their opinion of the coffee blends they have sampled).

> *"Hmm, positively I would say because they are being open about me like, like they're almost, I almost feel like they were disregarding the other coffee reviewers if you will and taking my opinion."* [CAQ15]

Capitalistic refers to the reduced trust in the brand caused by Alice's inherent belief that the brand is implementing smart packaging ultimately for capitalistic purposes,

such as profit maximisation rather than improve the consumption experience of their consumers (refer to AAQ14).

> *"Okay this brand has this feature in this app and it's much more like I would feel like they have this in this so I'm engaging with the app more so I drink more coffee so I buy more coffee."* [AAQ14]

Technical issues refers to the reduced trust in the brand due to the technical issues Reuben experienced when trying to scan the NFC tags. Reuben noted that when the brand cannot deliver what it claims to, brand trust would decrease (refer to RAQ07).

> *"Well in the sense that it didn't work so I couldn't trust what was in, and what it was. It could have been anything, it could have been like, doing a study where this one, this is like the crappiest coffee you're gonna get ever. I have no idea so yeah."* [RAQ07]

4.2.8 Brand Satisfaction

Themes classified under brand trust relate to factors of the smart packaging experience which affect participant satisfaction with the fictional brand.

Useful

Useful refers to the improved satisfaction with the brand that participants felt as a result of the utility the smart packaging experience provided. Participants attributed this to various smart packaging features (refer to Section 4.2.4 for further details on how participants were able to co-create utilitarian value with the value propositions offered by the smart packaging experience).

Due Diligence

Due diligence refers to the improved satisfaction that Charles felt about the brand as a result of the brand's provision of detailed blend characteristics. Similar to how participants believed the brand's provision of detailed blend characteristics helps promote a trustworthy image, participants also believe that this represents how invested the brand is into its products, which in turn affect's the participant's brand satisfaction in a positive manner (refer to CAQ16).

"Because like people are invested into it so therefore like it's something that's worth it?"[CAQ16]

Positive Reinforcement

Positive reinforcement refers to the participants' improved satisfaction in the brand resulting from the positive outlook of the conversation and interaction regarding the various blends of coffee on the community, similar to how it was identified under brand trust (refer to CAQ17 and TAQ08).

"This is almost like retroactive because you see most people being, reacting positive to the brands. So, and you're acting positive with them so it's almost like, this cycle of, of positive reinforcement I would say."[CAQ17]

"Yeah I think it does make you more satisfied because I think as human beings, we tend to just follow what everyone else says so if someone else says something is good, like if somethings rated like 4/5 stars by 1000 people you're more likely to trust it than if somethings rated 1/5 stars by 1000 people so seeing other people say positive things, I think it gives you satisfaction" [TAQ08]

Novelty

Novelty refers to the participants' improved satisfaction in the brand as a result of the NFC Tags feature which they found gimmicky. They mentioned that designing the NFC tags as something consumers would scan as part of the consumption experience was novel and distinguishes the product from that of other competitors' (refer to SAQ11, EAQ09, and HBQ09).

"Yeah I think so, definitely. It adds something, yeah that you wouldn't have if it was just a, you bought a pack of coffee, you opened it, and you used it yeah." [SAQ11]

"Yeah, it definitely helped with that. I definitely enjoyed it more cause it came with this gimmick." [EAQ09]

"I think it improved my satisfaction, it just makes the whole experience a lot more interesting. [HBQ09]

Community Interaction

Community interaction refers to the participants' improved satisfaction in the brand which resulted from their consumption of content posted on the community. Participants enjoyed reading and learning about how other participants brewed the various blends of coffee in different ways and whether or not they enjoyed them (refer to NAQ09 and JAQ11), creating visible artifacts that capture their consumption experience (refer to EAQ10), sharing their own reviews and ratings (refer to SAQ12), and feeling a sense of belonging (refer to SAQ13), all contributing to their increased satisfaction with the brand.

> *"But with the satisfaction, I think it increases the satisfaction. Because it's always interesting to interact and learn from other people's experiences and read feedback and take on board what other people say and you know, try to implement it."* [NAQ09]

> *"Yeah definitely boosted satisfaction just because it was nice to see other people posting. I saw some other people's reviews about different things. People posted about what certain coffees tasted like with a given brew method which was cool because I think some people didn't like one of the coffees with a cafetiere. So I thought that was interesting because I've use something similar to cafetiere but not cafetiere and it'd been good so I was like "oh that's interesting, it must be something to do with the different filters". So, it was definitely interesting and good to have that and improved my satisfaction."* [JAQ11]

> *"Yeah, I'd say it does improve it because you can kind of see that more about what you're doing"* [EAQ10]

> *"Yeah I think so. Definitely cause you know it was another, it was another part of the app experience and another thing you could share with the community."* [SAQ12]

> *"Yes I think so, well with the whole experience being part of the, of the study, definitely. I think the community was probably the biggest part of that. Yeah it all went together but I think, yeah feeling like there were other people*

doing the same thing as you and you, having similar experiences, or that you could compare to your own was valuable." [SAQ13]

Ingenuity

Ingenuity refers to the participants' increased levels of brand satisfaction as a result of their perception of the brand demonstrating ingenuity. This was largely driven by the participants' positive outlook of the brand's implementation of the logbook feature (refer to AAQ15 and HBQ10).

> *"Yeah definitely, I would say this, if again it's a useful thing in there so it's like okay, it's cool that they're thinking about that stuff and that even you are a normal consumer, you could also do something like this if you wanted to."* [AAQ15]

> *"I guess a bit more satisfied, it's nice to know that the utility is there for you to do this."* [HBQ10]

Miscellaneous

There were eleven miscellaneous primary codes accompanied by the brand satisfaction dimensional subcode which were not promoted to themes: sustainability, moderation, interactive, provenance, enthusiasm, rapport, scientific, personalisation, appreciation, personal record, and technical issues. Sustainability refers to the Alice's concern that the NFC tags would make the packaging less recyclable, stating that if this was the case, it would actually affect her brand satisfaction to the extent that she would not purchase it (refer to AAQ16).

> *"I think so, I think I wouldn't, like me personally, I guess I wouldn't buy something like this because I, for me it feels wasteful to put a tag in there for what it, for what it does and I would be more concerned about like the packaging to be nicely recyclable and these kind of things so more of a sustainability aspect than having some like, let's say cooler or more engaging features. I would rather have like let's say a box , standard or more innovative packaging that's easy to recycle that has different features like I don't know, keeping the aroma better stay for longer."* [AAQ16]

Moderation refers to the Alice's higher levels of brand satisfaction which resulted from a good moderation of the community. Alice believes that this demonstrates the brand's awareness of the potential toxicity of social media environments and their initiative in in putting preventive safety measures in order to improve their consumer experience (refer to AAQ17).

> *"I, like I think, I feel like if people or brands have good community management. It always makes me think that they care that not everything should be heard equally. That there are things that don't have a space where people come together, that you, some opinions shouldn't be allowed in the space or like, like phrases or sentences or words or whatever, that it's just, it makes me feel a bit nicer, and then maybe a bit more safe, and also maybe people will step in if there is like harassment or people are trying to stalk each other through the app and all sorts of things that could come with these things right? That, like if there's heavy community management or moderation, I always feel like "okay, maybe they're a bit more on that" like they know this would happen…Yeah definitely. It would make, yeah it would make me think that they know that leaving an open space doesn't mean that people will police themselves. "* [AAQ17]

Interactive refers to Hugo's higher levels of brand satisfaction which resulted from the consumption tracking feature. Hugo asserts that this feature makes the consumption experience more interactive between the brand and himself and less of a one-way relationship that is typically attained with other brands (refer to HBQ11).

> *"It makes it feel like more interactive you know that it's constantly measuring your coffee consumption and giving you feedback on it."* [HBQ11]

Provenance refers to Harriet's higher levels of brand satisfaction which resulted from the provision of the detailed blend characteristics that participants could unlock by scanning the NFC tag (refer to HAQ14)

> *"Yeah I think so, I quite like having coffee with a bit of a story behind it. Like you know, you kindda know where it's come from?" [HAQ14]*

Enthusiasm refers to the Hugo's higher levels of brand satisfaction which resulted from being able to rate and review the various coffees. This was due to how Hugo considered the act of reviewing and rating coffees to be an enjoyable activity and one that he looks forward to carrying out after sampling the coffee, hence, creating enthusiasm during the consumption process (refer to HBQ12).

> *"Made the process a bit more satisfying cause you know that you're going to want to be reviewing coffee after you drink it."* [HBQ12]

Rapport refers to the Tina's higher levels of brand satisfaction which resulted from building a rapport through the repeated scanning of the NFC tags and reading the blend characteristics (refer to TAQ09).

> *"Yeah I think in the same way, because you build a rapport with it. You're more happy with what you're drinking."* [TAQ09]

Scientific refers to the Alice's higher levels of brand satisfaction which resulted from the availability of the consumption tracking feature. Alice mentioned that she enjoyed looking at her own consumption data, especially if it was visualised as charts and graphs (refer to AAQ18)

> *"To having this feature? I think having this feature I think for some people, they would really really enjoy it. Like throughout, when I had it, Okay, I like looking at bar charts and that kind of stuff, it feels like you're doing something scientific."* [AAQ18]

Personalisation refers to Kyle's higher levels of brand satisfaction which resulted from the brand's collection of his personal data. Kyle was optimistic and believed that this data will be used to tailor his consumption experience at a more personal level, despite it having never been stated that that was how it was going to be used (refer to KAQ07).

> *"I mean emm, if they're trying to use this information to personalise the information they want to give me, then I don't, I probably have a better, higher satisfaction because then I know that they try to tailor their product*

services to me so I think I might even be more likely to see things that I'm more likely to enjoy. " [KAQ07]

Appreciation refers Charles's higher levels of brand satisfaction which resulted from being given the ability to rate and review the different blends of coffee. Charles believes that this makes it seem like the brand considers his opinion into their decision-making process which makes him feel appreciated and satisfied (refer to CAQ18).

"Definitely helps. For a very, very related reason because you are being taken into account for like how they do things?" [CAQ18]

Personal record refers to Nancy's higher levels of brand satisfaction which resulted from the brand's facilitation of a log of her personal record which indicates the blends of coffees she did and did not like, noting that it would help her decide which blend to purchase in the future (refer to NAQ10).

"Definitely the satisfaction because I know that I have somewhere stored information which I can access when I want to decide which blend to buy. So definitely with the satisfaction, it's definitely increasing my satisfaction to the brand." [NAQ10]

Finally, technical issues refers to Reuben's lower levels of brand satisfaction which resulted from the technical issues he was facing. More specifically, Reuben could not manage to scan the NFC tags despite multiple attempts and felt uncomfortable not knowing what the product really was (as the product packaging was completely blank to reduce brand bias). He also claimed that the smartphone provided was not functioning very well which consequently further discouraged and limited his interaction on the community when he wanted to, resulting in a generally negative user experience for him (refer to RAQ08 and RAQ09).

"I was disappointed because I couldn't tell what the second coffee was. First coffee, you scanned, was really great coffee. The second coffee was, was different and I would have liked to know more about it. So it affected my connection with it cause it disconnected me." [RAQ08]

"Lower. Yeah just because I couldn't be involved. I felt very like, I couldn't do anything with it so it was a shame." [RAQ09]

4.2.9 Brand Attachment

Themes classified under brand trust relate to factors of the smart packaging experience which affect participant attachment to the fictional brand.

Belonging

Belonging refers to the higher degree of brand attachment that participants felt resulted from the implementation of the community feature. Participants liked interacting and talking to other people about the same things they are doing and feeling that there is a platform to discuss the product (refer to CAQ19 and HAQ15)

"Because of the community? Yeah. Yeah definitely. So you don't feel as detached from a brand, like you're there. Interacting with people who are doing the same things as you." [CAQ19]

"I think because when you're actually engaging with a conversation about something? You are slightly more connected to it? And as that increases, you're more likely to become connected to something as its own as it becomes you know, something you talk about, have opinions about." [HAQ15]

Time Investment

Time investment refers to the higher degree of brand attachment that participants felt resulted from the prolonged use of the logbook and ratings and reviews features. Participants asserted that the more time they spent using these features, the more attached they become and the more upset they would be if these features were to disappear as the 'work' they have put in would then become redundant (refer to EAQ11 and SAQ14).

"Yeah, like I'd be sad if I kind of lost all this information that I bothered to write I suppose." [EAQ11]

"Emm, certainly connects you to the process because you're taking the time to, sort of taking the time out of your day to do that so. So yeah, feels like a

kind of personal investment, a tiny micro personal investment in some way." [SAQ14]

Personal Record

Personal record refers to the higher degree of brand attachment that participants felt resulted from having a personal record of their previous interactions with the brand's products. Although somewhat similar to the time investment theme above, the key difference lies in how the attachment that stems from time investment refers more towards the participants not wanting to waste the effort that they have already put in whereas the attachment that results from participants having a personal record is caused by the participants' desire to the expand this record (refer to HAQ16) and having something to show for their past interactions (refer to JAQ12)

> *"I think it would make me more likely to go back to that brand because you've already used their other products and you've start using the whole reviewing process for those coffees. Because you've, I don't know, it makes you, it means that you want to carry on adding to that, I want to build up the amount of coffees that I drink."* [HAQ16]

> *"Yeah I think so because it's like, its all of this brand's coffee and then you've kind of got your own log of all the different reviews so all having it in one place is definitely, makes you feel more connected to the brand rather than if you're just ordering from different brands all the time, you've got nothing to show for it."* [JAQ12]

Transparency

Transparency refers to the higher or lower degree of brand attachment that participants felt resulted from the brand's practice of collecting their personal data. Participants were split on this theme, with some stating that having their personal data being collected for purposes not made clear to them does make them more likely to distance themselves away from the brand (refer to AAQ19 and HAQ17).

> *"I think it would make me a bit more skeeved out if anything, just like I don't know. What are they doing with this? Like with this data, that they're profiling me to say "Oh, I'm a casual coffee drinker right?" so with these kind*

of things, I feel always a bit like "Hmm, I'm not so sure". Like it's nice to have this data but I'm always a bit afraid of what people do with it."[AAQ19]

"Again I think if it was an arbitrarily feature it would make me feel more distant from the brand because it'd make me a bit more wary." [HAQ17]

On the other hand, there were also participants who responded in the opposite manner, claiming that the more data the brand has on them, the stronger their attachment is, stemming from their belief that the brand now knows more about them (refer to CAQ20).

"Probably more attached yeah, because because, because in the end like you're sharing your email, you're sharing your age, some comments on the app so so, I think probably more attached. Definitely more attached than a Tesco brand." [CAQ20]

Miscellaneous

There were three miscellaneous primary codes accompanied by the brand attachment dimensional subcode which were not promoted to themes: distinct identity, reflection, and receptive brand. Distinct identity refers to the Charles' higher degree of attachment to the brand as a result of the brand's implementation of NFC tags and logos to distinguish itself from its competitors (refer to CAQ21)

"Hmm, yeah. I would say, a combination. Well the logos and the NFC tags like just pop in. Especially like Kitsune, I really love KItsune. And like if that one was to disappear with all these features, I would definitely be sad." [CAQ21]

Reflection refers to Tina's higher degree of attachment to the brand as a result of her reflection that took place when rating and reviewing her coffee (refer to TAQ10).

"I'm not sure of trust, personal connection yes because you can sit down and pause and reflect on it." [TAQ10]

Receptive brand refers to Charles' higher degree of attachment to the brand that resulted from being able to rate and review the coffees. Charles once again felt that the brand was reaching out to him for his opinions which helped form a personal connection between him and the brand (refer to CAQ22)

"Again I think it completely links up cause you, you feel like a personal connection to a brand that's almost listening to you." [CAQ22]

4.2.10 Supplementary Findings

In addition to the themes reported above. some quantitative data was also collected through automated logging. As previously mentioned in Section 3.2, this was used as supplementary data to help the researcher interpret the response of the participants. Figure 10 depicts the average amount of time participants spent on each feature over the 4-week study period (the NFC tags and reviews and ratings feature share the same screen, hence the shared line).

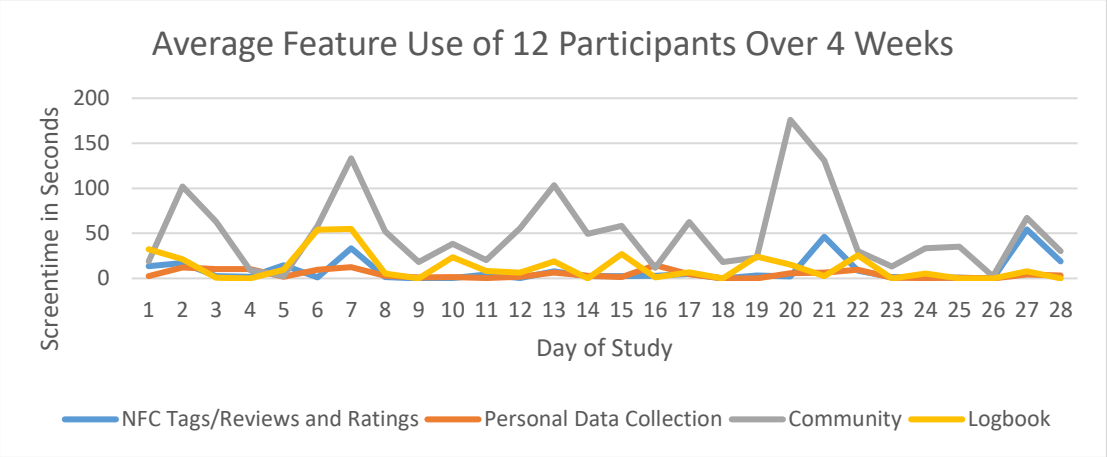


Figure 10. Average Feature Use of 12 Participants Over 4 Weeks

Chapter 5: Discussion

In this chapter, the findings of this research are discussed in relation to its theoretical and practical implications. The discussion chapter is structured into three sections. The first section discusses the seven factors identified to influence consumer interaction and value co-creation with smart packaging. In this section, findings related to these factors are compared with the extant literature. As previously highlighted in the literature review chapter, due to the minimal amount of academic work that had been done on smart packaging, the body of literature on smart retailing and smart domestic products was also reviewed for their utilisation of similar technologies. The same approach is adopted in this section in which said factors are discussed not only in relation with smart packaging but smart technologies as well. This is then followed by the second section which discusses the practical implications of this research. This section elaborates on how practitioners can utilise the factors identified from the first study as guideposts throughout their design of smart packaging. Finally, the last section of this chapter revisits the conceptualisation of smart packaging engagement. In this section, the working definition of smart packaging engagement previously conceptualised in Section 2.6 is refined and updated with regards to the findings of this research.

5.1 Expanding Marketing's View of Packaging

One of the aims of this research was to identify the factors that could encourage or discourage consumer engagement with smart packaging. Given that the working definition of smart packaging engagement adopted by this research posits that it can only manifest as a result of value co-creation dependent on consumer interaction with smart packaging, it was deemed necessary to first identify factors which can encourage consumers to do so. This was accomplished by the first study of this research which identified seven factors of smart packaging that influence the likelihood of consumer interaction (use implied) with them. In this section, each factor is discussed in relation to their mentions within the academic literature,

particularly in variations of the Technology Acceptance Model (TAM) explored within the context of smart retailing and smart home technologies.

5.1.1 Sustainability

Despite sustainability being one of the major driving forces responsible for the relatively recent resurgence in packaging research (Rundh, 2005) as well as the development of the first generation (i.e. those designed to reduce food waste) of smart packaging (Ahvenainen and Hurme, 1997; Biji et al., 2015), the influence of its sustainability on the likelihood of consumer use of its features is a novel finding of this research that has yet to be discussed within the academic literature. Participants of this research expressed their concerns regarding the sustainability of smart packaging, noting that many electrical components are still challenging or impossible to recycle. While this was anticipated given the effect that sustainability has on shaping consumer perception of traditionally packaged FMCGs (Magnier et al., 2016; Steenis et al., 2017), what was unexpected however was that consumer concerns about sustainability were not reported by the study conducted by Mindshare (2016). As the only study identified from the literature review that explored actual consumer interaction with smart packaging which even involved relatively technically complex applications, it was surprising that no mentions of sustainability were made in their findings report.

Based on this observation, it is theorised that the framing of smart packaging implicitly induces bias in how they are perceived by the participants of studies investigating them. More specifically, framing smart packaging in a way that leans heavily towards it being a technology is posited to implicitly sway participants into viewing it in such a way that may not accurately reflect how they would within a real-world setting. For instance, while literature has shown that consumers take packaging sustainability into consideration when forming their perceptions of FMCGs, this phenomenon is argued to be much weaker or even absent within the context of technological products. Consumer have not been shown to make purchase decisions for technological products such as smart phones, laptops, smart domestic products based on the sustainability of their packaging. Additionally, depending on whether or not a ‘Wizard of Oz’ approach was adopted by Mindshare (this was not discussed in

their report) in their conduct of the study, it is possible that the unsustainable elements of smart packaging simply did not exist and was consequently neglected or ignored by the participants. The 'Wizard of Oz' approach is an approach commonly used within the field of human-computer interaction to emulate technical functionality through manual human intervention (Dahlbäck et al., 1993; Riek, 2012; Weiss et al., 2009). Through this approach, functionality such as notifying participants when their products are about to expire could be done through the researchers manually sending out push notifications to the participants' smartphones as opposed to the typical automated approach that requires participants to 'pair' their smartphones with the product by scanning an embedded mobile tag, effectively eliminating the need to have a mobile tag such as an NFC tag on the product in the first place, which in turn could implicitly bias participants to not concern themselves with this issue.

Alternatively, another possible explanation for this phenomenon is the intention-behaviour gap. The intention-behaviour gap is a well-established phenomenon within the field of sustainable consumer behaviour which posits that the positive and noble intentions of consumers to act in a sustainable way seldom translates into actual behaviour (Ketelsen et al., 2020; Nguyen et al., 2019; Vermeir and Verbeke, 2006). As the study conducted by Mindshare (2016) examined actual participant behaviour instead of hypothetical (like the first study of this research) behaviour, this possibly explains why sustainability was not prominent enough to be classified as a theme in the second study of this research (which also explored actual participant behaviour) but was reported as one in the first study.

Nonetheless, this finding indicates that sustainability is a factor that consumers take into consideration when making their decision on whether they would like to purchase and use a smartly packaged FMCG. Whether or not the weight of its influence is equivalent between the context of smart packaging and traditional packaging is a research gap that future research may opt to address that could better clarify the extent to which smart packaging strays away from traditional packaging and whether or not it is suitable for them to be studied in the same way.

5.1.2 Communication

While communication between consumers and traditional packaging is generally limited to a consumer seeing and reading what is printed on the packaging (Silayoi and Speece, 2007; Underwood and Klein, 2002), the implementation of smart packaging introduces new facets to this dynamic which highlights the limitations of marketing's current perspective of packaging in marketing communications. Through the use of smart packaging, consumers are encouraged and expected to receive additional communication from the brand in various forms such as push notifications, alarms, displays that are designed to facilitate their value co-creation experience. Unsurprisingly, user or consumer response to these facets of communication have not been studied by traditional consumer packaging studies as these would have simply been considered to be out of scope in the past but given that they have been identified to influence smart technology adoption, it is argued that it may be beneficial for marketers to not only adopt a perspective that views smart packaging as a channel for marketing communications but also that of a technology. With regards to the findings of this research concerning how smart packaging communicates, while most were consistent with what has been reported by prior work, there were also those which were contradictory.

For instance, although the findings of this research suggest that voice communication had been poorly received, participant response to voice communication has actually been found to be generally positive when applied within the context of the smart home (Caivano et al., 2018; Cheng et al., 2018; Johnson et al., 2007). Given that the participants of this research largely attributed their negative opinions of voice communication to the embarrassment associated with its use in public (how it was depicted within the storyboards), this deviation is theorised to be likely due to a difference in setting.

As the home is commonly perceived to be a safe and private space (Scholz and Duffy, 2018), it is not surprising that consumers find voice communication within the home to be much more tolerable. Additionally, as voice communication is how consumers generally communicate with smart home assistants like Amazon Alexa and the

Google Assistant, it is now viewed to be an intuitive way of communicating with technology within domestic environments. This is supported by the findings of this research which reported participants suggesting the use of voice messages to remind them when their products are about to expire within the home. Collectively, this provides a plausible explanation for the positive response towards voice communication within the home that has been reported by prior work.

Besides the findings concerning voice communication, findings regarding the other facets of communication identified in relation to this factor were fairly consistent with those of prior work. These include the discontent towards the 'nagging factor' of behavioural advice centred around consumption monitoring that was observed from the findings of this research as well as Hargreaves et al.'s (2013) investigation of user response towards smart energy monitors. Another shared similarity between the findings of this research and prior work concerning smart domestic products is the resistance to a high frequency of notifications (Papachristos et al., 2020). This was not surprising given the huge amount of information (e.g. push notifications, advertising, junk mail) consumers are overloaded with on a regular basis (Savolainen, 2007), a price most willingly pay in exchange for the benefits of living in a constantly connected world. Ultimately, the identification of this factor reinforces smart packaging's identity as a technology within the digital ecosystem. Consequently, this also suggests that the scope of marketing's view of packaging needs to be extended to encompass the additional facets and dimensions introduced by smart packaging which are not currently covered. Given the differences between traditional and smart packaging, further work exploring the similarities and differences in how both types communicate is encouraged in order to support theory generation of how smart packaging can be designed to communicate effectively.

5.1.3 Control

Like communication, control is another factor identified by this research to influence the likelihood of consumer interaction with smart packaging that has also been reported by prior work (Balta-Ozkan et al., 2013; Friedewald et al., 2005; Hansen and Hauge, 2017; Marikyan et al., 2019) to influence the adoption of smart domestic products. More specifically, it is concerns regarding the potential loss of control over

their homes that users have reported to be a major barrier to adoption, often resulting from their inability to understand complex technical functionality of said smart domestic products (Marikyan et al., 2019). Besides this similarity that is shared between the two factors, both factors have also been also neglected by traditional consumer packaging studies. This is not surprising as unlike smart packaging, the development of traditional packaging has primarily been focused on cost reduction rather than improved functionality. Consequently, this has resulted in there being close to no implementation of traditional packaging with aspects that consumers are able to control to modify their functionality. Collectively, these observations further reinforce the gap between smart and traditional packaging, supporting its identity and positioning as a technology as well as highlighting the need for marketing's expanded view of packaging to facilitate its study through a technology-centric perspective.

While marketers often emphasise user control when marketing smart domestic products (Wilson et al., 2017) due to findings which indicate that consumers prefer a higher degree of control over smart technologies (Kumar et al., 2016; Rijsdijk and Hultink, 2003), there has also been contradictory findings which indicate that a higher degree of control does not necessarily translate to better user evaluation of a technology (Kim, 2021) as it may also introduce limitations such as non-optimal performance (Behmann and Wu, 2015). This is consistent with the findings of this research which reports that although participants did report that a higher degree of control is generally desirable, lack of control is not necessarily detrimental. For instance, while participants reported that they would like to be able to turn off or disable certain smart packaging features, they also appreciate the time-saving benefits of automating regular tasks (e.g. manually scanning NFC tags) and adhering to pre-set structures (e.g. logbook templates) which implicitly provides them with direction on how to use said features, even if it means giving up some degree of control. Although this research does not confirm whether users and consumers would prefer a higher degree of automation in exchange for loss of control, it does shed more light on the circumstances in which consumers are willing to forego control for performance or efficiency. An example would be updating smart coffee

tins with the information of new coffee bags once it has been delivered automatically (assuming the supporting technical infrastructure is in place) rather than requiring consumers to manually scan the NFC tags themselves, even if they have not yet finished their current bag of coffee (i.e. non-optimal performance). The identification of this factor brings into attention the need to identify conditions which determine a consumer or user's preferred degree of control over smart packaging. This exploration is likely to benefit not only effective design of smart packaging but also that of smart domestic products that are typically marketed for their ability to automate (Furszyfer Del Rio et al., 2020; Li et al., 2016; Sovacool and Furszyfer Del Rio, 2020).

5.1.4 Personal Data

Similar to control, personal data is another factor which this research has identified to influence the likelihood of consumer interaction with smart packaging that prior work (Balta-Ozkan et al., 2013; Benlian et al., 2020; Chan et al., 2009; Demiris et al., 2008; Ehrenhard et al., 2014; Jacobsson et al., 2016; Kotz et al., 2009; Mani and Chouk, 2019, 2017; Yang et al., 2017) has also reported to be a barrier to the adoption of smart technologies. As previously mentioned in the literature review chapter, the mainstream media often casts a bad light on personal data collection due to its potential to facilitate intrusive Orwellian systems that pose a risk to privacy. As a result, it is neither uncommon nor surprising that society is cautious in adopting new technologies involving this practice.

The findings of this research concerning this factor were generally consistent with what has been reported by prior work. For instance, the concerns that participants of the first study expressed about sharing personal data suggested that they were much less tolerant than what was observed from the findings of the second study, resembling the privacy paradox (Norberg et al., 2007) which asserts that users tend to be much more vocal about their privacy concerns than how they truly feel based on their actual behaviour. Besides the privacy paradox, participants of both studies also exhibited behaviour posited by the privacy calculus (Dinev and Hart, 2006), noting how they would under certain conditions willingly give up their personal data in exchange for the benefits offered by smart packaging, resembling what was

observed from many prior studies (Acquisti and Grossklags, 2005; Barth and Jong, 2017; Berendt et al., 2005; Gutierrez et al., 2019; Keith et al., 2013; Xu et al., 2011). Additionally, consistent with the findings of Gu et al. (2017), participants also noted that they could be persuaded to share their personal data much more easily if firms were much more transparent (i.e. avoiding the use of technical jargon commonly found in terms of service agreements) in providing details on what is being collected as well as how they are being used and stored, stating that this would help break down their image of firms as greedy and unethical corporations which prioritise profits above all else.

There were however also some novel findings of this research which contradict those of prior work. For instance, contrary to the findings of Zheng et al. (2018) which report that users are often unaware of the privacy risks of smart technologies which do not explicitly collect audio or visual data (e.g. smart home assistants such as the Amazon Alexa and smart surveillance devices), the participants of this research were not only able to identify some of the non-obvious privacy risks based on consumption data (e.g. reduced employment prospects, higher insurance premiums) but also recommend technical solutions to mitigate them such as anonymisation and localised data storage (i.e. storing personal data on a storage device that users have full control over rather than on the cloud). Collectively, this suggests that society is becoming increasingly well informed about the privacy risks associated with sharing their personal data. As this is likely to lead to stronger consumer resistance towards this practice, further research is encouraged to better understand how this issue can be addressed effectively.

Another noteworthy observation was how the participants of this research treated different types of personal data with varying levels of concern. While this notion had been proposed and proven by prior quantitative work (Milne et al., 2017; Phelps et al., 2000), this research contributes a more in-depth qualitative perspective on why consumers are more willing to share certain types of personal data than others. According to the participants, there are two types of personal data discussed throughout this research they are concerned about: personal information (e.g. date of birth, gender, full name) and product-related data (e.g. daily consumption, flavour

preference), each one eliciting a different level of concern. For instance, some participants noted that they were more comfortable sharing product-related data than their personal information, believing them to be more relevant and useful than demographic data in improving the accuracy of features such as personalised recommender systems. Although minimising the use of personal information in developing recommender systems is detrimental to accuracy based on the findings of Friedman et al. (2016), this does suggest that consumers may be more willing to share personal information if they believe the data is actually being used to improve the functionality of certain smart packaging features. This argument is also supported by prior work (Chen et al., 2016; Ghafur et al., 2020; Seltzer et al., 2019) which found that individuals are often more willing to share personal data (even those of a sensitive nature such as healthcare data) if it is to be utilised for social good (e.g. research) or their own benefit rather than commercial purposes.

Alternatively, similar to what was found by Milne and Bahl (2010), established norms were also found to influence the participants' willingness to share personal data. Participants noted that for data such as debit or credit card information, they have simply grown accustomed to making online payments that this is no longer a concern. While it can be argued that personal information and consumption data (inferred from purchase data) has also been collected by retailers for more than a decade through loyalty cards (Pathak et al., 2010; Yang and Gao, 2017), consumers may have already been conditioned to this state before realising that their personal data was being collected. Given that consumers are now much more aware of the ramifications of sharing their personal data, it is likely that this may be why the collection of personal data for the purpose of facilitating smart packaging applications faces a much larger backlash than those in the past. Additionally, findings of this research also suggest that there is a hierarchy to personal data within the same category. For example, the findings of this research suggests that participants were much more uncomfortable sharing alcohol consumption data than coffee consumption data in fear of the possible undesirable social consequences (e.g. reduced employment prospects, higher insurance premiums, moved down liver transplant waiting lists) if this data were to leak or fall into the wrong hands.

The identification of this factor highlights two aspects of smart packaging research that future work is advised to take into consideration. First, it is recommended for research involving smart packaging features which make use of personal data to design studies which examine actual participant interaction with smart packaging as due to the privacy paradox, data collected from studies that are hypothetical in nature (like the first study of this research) is less likely to reflect actual real-world behaviour of smart packaging users. This argument is supported even further by the limited market penetration of smart packaging. As participants are more likely to misunderstand smart packaging functionality if they've never used them before, it is advised to design studies which collect actual interactional data to avoid potentially making conclusions based on misinterpreted data (i.e. if participants misunderstand the smart packaging functionality in question, data collected from them may be interpreted by the researcher in a manner that is not consistent what the participant intended). Second, it was apparent from the findings of this research that despite the seemingly prevalent resistance towards the practice of personal data collection, consumers are still willing to do so provided they receive benefits in return. However, relatively little is known regarding how they make this evaluation. Given that this research also found that participants treated different types of personal data (e.g. consumption data, personal information) with varying levels of concern, additional research is encouraged to explore the factors which influence a consumer's willingness to share personal data. By investigating the specific types of personal data consumers are willing to give up at a more granular level, practitioners will be able to have a more accurate approximation of the nature of consumer personal data they are able to collect (those consumers will reasonably give up) to tailor their designs accordingly, resulting in the rollout of smart packaging applications more likely to be well-received by consumers.

5.1.5 Scepticism

As previously mentioned in the literature review, within the context of FMCGs, packaging is generally considered to be a part of the product (Silayoi and Speece, 2004; Simms and Trott, 2010). As a result, although there is an abundant amount of literature which reports consumers to be sceptical about packaging (Aschemann-

Witzel et al., 2013; Chan et al., 2005; Fenko et al., 2016; Hamilton et al., 2000; Szykman et al., 1997), it is generally certain characteristics of the actual product that they are sceptical about. On the other hand, the scepticism observed from the findings of this research was primarily concerned about the actual packaging itself, stemming from the doubts they had whether certain smart packaging features were capable of performing as advertised as well as whether these features were implemented for consumer benefit or greed (e.g. implemented to justify higher prices or crush smaller firms unable to cost-effectively implement smart packaging due to limited economies of scale). While this was not surprising given how new smart technologies (Balta-Ozkan et al., 2013; Friedewald et al., 2005; Shirani et al., 2020) and novel traditional packaging implementations such as microwavable plastic bags have also been perceived the same way (Fernqvist et al., 2015), what was particularly interesting was the one of the solutions that the participants proposed to address this issue: third-party certification. Based on the findings of this research, third party certifications were demanded by consumers to reassure them that smart packaging applications functions as it should (i.e. accurately calculating the personalised duration of a sunscreen application). Within the context of traditional packaging, third party certifications are generally used to assure consumers of a product's fulfilment of certain requirements (Fenko et al., 2016; Hainmueller et al., 2015; Herman, 2010), often relating to how the product is sourced (e.g. Fairtrade, Rainforest Alliance, free range) or whether it satisfies religious requirements (e.g. Halal, Kosher).

However, unlike the mature traditional packaging market which has already identified the type of third-party certifications demanded, there have yet to be any established guidelines on the type of smart packaging functionality that consumers demand third party certifications for. As it is simply not feasible nor realistic for firms and designers to aim for the certification of every use case of smart packaging functionality given the wide scope of smart packaging, future research is encouraged to identify the nature or characteristics of smart packaging functionality that are likely to be dependent on third party certifications. As a starting point, the findings of this research suggest that it is unlikely for consumers to demand third party

certifications for trivial or common use cases of technical functionality (e.g. weighing). Rather, it is posited that they are only required for functionality that may pose a risk to consumers when they do not perform as expected. This was inferred from how participants expressed their demands for third party certifications primarily on the sunscreen duration advisor (noting that the wrong recommendation could potentially result in bodily harm for its users) but not on the other smart packaging features discussed throughout this research. To complement this work, future research could also investigate how marketing strategies could be developed to market smart packaging as an altruistic implementation, reassuring consumers that these are not implemented solely for the firms' self-interest. As consumers are less likely to use smart packaging features they consider to be dubious, further research on how consumer scepticism can be reduced is likely to be beneficial to theory generation on effective smart packaging design.

5.1.6 Trade-off

Unsurprisingly, trade-off is another factor that has been neglected by traditional packaging studies. Given that the primary functions of traditional packaging are generally containment and information provision (Ampuero and Vila, 2006), it generally does not require much effort from consumers (typically just opening and closing lids for the former and reading for the latter) in order for it to accomplish its purpose. On the other hand, the same cannot be said for smart packaging which although does offer a much wider range of functionality, will also require more resources (e.g. time, effort) from consumers for it to be utilised. Although typically framed differently (e.g. effort expectancy, perceived ease-of-use), trade-off has been regularly identified within the literature as a prominent factor that influences smart technology adoption (Ahn et al., 2016; Hubert et al., 2019; Kim et al., 2017). Additionally, it was also reported in Mindshare's study (2016) that minimal consumer effort in their interactions with smart packaging is likely to be a major driving force for its adoption.

The findings of this research were fairly consistent with what was reported by prior work. For instance, participants of this research noted that although initially they might be more willing to spend some time to try out a smart packaging feature for its

novelty, it is not likely to last unless their continued use is rewarded with monetary incentives, similar to what was reported by Hargreaves et al. (2013) in their study of smart energy monitors. However, it should also be noted that the study found monetary incentives (i.e. cost savings) to be insufficient in encouraging their continued use over time, possibly due to how ingrained energy consumption habits (e.g. heating) are compared to those of FMCG consumption. Nonetheless, the identification of this factor highlights the lack of research that has been done in investigating what consumers require of smart packaging in terms of usage cost (i.e. the resources required of consumers to use the feature) and incentives.

5.1.7 Habits and Characteristics

The final factor identified from this research was habits and characteristics. Like the trade-off factor, this too has been identified by prior work (Pham and Ho, 2015; Ramos-de-Luna et al., 2016; Tan et al., 2014) to be a factor that influences the adoption of smart technologies, albeit as differently framed constructs (Personal Innovativeness with Information Technology being a particularly common one) under variations of the TAM model. This factor highlights how a consumer's individual habits and characteristics (e.g. being a parent, experience with counterfeit goods) affects how they consume FMCGs and their likelihood to use certain smart packaging features.

5.1.8 Summary

All in all, as one of the first pieces of academic work investigating consumer interaction with smart packaging, this research made the contribution of identifying factors which influence the likelihood of consumer interaction and subsequent value co-creation and engagement with smart packaging. Additionally, it also highlights marketing's outdated view of packaging that needs to be revised in order to encompass the technical dimensions introduced by smart packaging. While the number of influencing factors shared between the adoption of smart packaging and smart retailing and home technologies suggests that the traditional methods used to study packaging (i.e. mock ups with varied visuals, material, and shape) can be used to capture certain facets of consumer sentiment towards smart packaging, it also suggests that they are unable to capture the more technically oriented aspects which

user evaluation studies commonly used within the field of computing have been shown to be suitable for. This does not however indicate that methods used in traditional packaging studies should be replaced and are completely irrelevant as there are some aspects of smart packaging which traditional packaging studies have been shown to explore more effectively (e.g. sustainability). Rather, it is suggested by this research that future work exploring smart packaging combines research methods and techniques from both marketing and computing disciplines to paint a more vivid picture of consumer sentiment towards smart packaging.

5.2 Practical Implications

As previously mentioned, one of the most significant contributions of this research lies in its capacity to provide practitioners (i.e. smart packaging designers) with insight that could guide their design process. In this section, the practical implications of this research's findings are discussed in relation to each of the factors discussed in the previous section.

5.2.1 Sustainability

While it is generally assumed that smart packaging will inevitably contribute to additional packaging waste, smart packaging designers should not take this assumption as a green light for wasteful design. Based on the findings of this study, it was apparent that consumers prefer recyclable packaging. Therefore, designers should consider very carefully whether the inclusion of additional technological components that may introduce issues in recycling are necessary, possibly opting for greener alternatives. For instance, while the use of NFC tags over an older and more traditional mobile tag such as QR codes have been reported to be preferred by consumers, it should be noted that the findings of this research does not completely support these assertions. There were numerous instances in the findings where participants questioned why the use of NFC tags in both studies could not be replaced by QR codes which do not add an additional unrecyclable element to the packaging.

Rather than assume that smart packaging can only add to packaging waste, practitioners should also consider how it could potentially reduce it. For instance, it

was identified in the findings that participants noted that there were potential ways that smart packaging could reduce packaging waste. An example would be through compartmentalising the smart or technical aspects of the packaging into a reusable module which can then integrate itself with refillable packs and encouraging their use through loyalty programs or incentives for repeated purchases, cutting down on the amount of packaging waste that would otherwise be generated by larger packaging (i.e. ground coffee in paper bags as opposed to glass jars). This approach would not only alleviate consumer concerns about the additional waste generated by smart packaging but is also likely to result in additional savings (refillable packs are generally sold at cheaper prices) that may motivate its adoption. Additionally, this would also allow firms to justify the relatively higher prices of smart packaging through the long-term savings it would afford.

5.2.2 Communication

While smart packaging can advise consumers on their consumption behaviour based on their collected personal data, the findings of this research shows that the way this is communicated to consumers can be potentially detrimental to their view of smart packaging. Language used (if any) should avoid the connotation of being authoritative as participants have been found to dislike the feeling of being told what to do by a machine, even when designed with altruistic intentions ind mind (e.g. discouraging excessive alcohol or caffeine consumption for health-related purposes). It is likely to be a safer approach for practitioners to provide data or information in more neutral ways that are less likely to be viewed as offensive instead. For instance, rather than explicitly advice consumers to stop drinking coffee for the day once they have exceeded a certain amount, a more neutral approach could be to have this data available but not shown unprompted (e.g. shown only when consumers explicitly requests to view it). Aside from language, other aspects of communication that also should be considered are its channels, frequency, and timings. Practitioner should take into account how and when consumers would like to communicate. Oral or voice communication in particular should be avoided if communication is to be done outside the home as participants have reported it to be potentially embarrassing in public spaces, possibly opting for more subtle options such as beeps or flashing lights.

With regards to timings, this research has also showed that depending on the context of consumption, there are primary timeslots throughout the day when consumers are likely to be more receptive towards receiving communication (e.g. waiting time during their coffee brewing process each morning). All these facets of communication should be taken into consideration during the design of smart packaging in order to increase the likelihood that they are well received by consumers. Although communicating with users throughout their interaction with smart packaging may seem like a risky venture given the amount of messages that are considered to be spam in our constantly connected society, it should not be avoided as information provision and creative delivery are often the primary value propositions offered by smart packaging, evident from participants who expressed their desire for more regular notifications to encourage or prompt their interaction with smart packaging.

5.2.3 Control

The practical implications of the identification of control as a factor that could influence how consumers interact, co-create value, and engage with smart packaging relates to the level of control that consumers are given over the entire consumption experience. The findings from this research shows that while participants acknowledged the potential benefits of smart packaging, they would prefer them to be additional extras that they could opt to use rather than mandatory replacements. Participants expressed concerns that the implementation of smart packaging could potentially force them to change their regular consumption habits which if so, would likely result in their negative perception of smart packaging. For instance, this could be through changing the way product information is conveyed to consumers (e.g. from being printed on packaging to requiring the scan of a mobile tag). Hence, it is suggested that practitioners gradually ease consumers into the use of smart packaging rather than enforce its adoption.

However, it should be noted that while participants voiced out the need for a greater degree of control over their choice to use smart packaging features, they also noted that guardrails and a lesser degree of control could be beneficial in guiding the use of said features (e.g. providing templates for logbook entries in the “Obrien’s Coffee”

app). Hence, designers are encouraged to explore how limiting affordances could be potentially beneficial in their design of smart packaging. Additionally, they should also take into account the volatile nature of consumer needs and wants and design smart packaging in a modular way, allowing consumers to adopt an 'opt-in-opt-out' approach that provides them with the freedom to use the smart packaging features if they wish to do so.

5.2.4 Personal Data

As previously highlighted, the use of consumer personal data in marketing is becoming increasingly prevalent throughout the digital era. While it can be tempting to design smart packaging experiences which collect consumer personal information under the guise of "simply being like everyone else", there is a segment of consumers who are becoming increasingly resistant towards having to share their personal data in order to benefit from their use of smart packaging. What should be clarified here is that the findings of this research do not advocate for the collection of less personal data but rather, the collection of only necessary personal data. The findings of this research show that when consumers are made aware that use of this data can be beneficial for them, they are much less likely to have any issues with their collection. What should be avoided is however having consumers feel blindsided about why their personal data is being collected. As such, practitioners are recommended to only collect personal data that is processed for consumer benefit such as personalised service. Furthermore, practitioners are also advised to be transparent in conveying information about the personal data being collected in addition to how they are being stored (e.g. duration, anonymisation, encryption) and utilised to consumers to avoid being perceived as intrusive. Finally, measures should also be taken to convey this information in a manner that consumers can easily understand rather than lengthy documents containing complex technical or legal jargon like most services do.

5.2.5 Scepticism

Given that there were two types of scepticism identified from the findings of this research, there are also two set of practical guidelines that are recommended in relation to this factor. The first type of scepticism refers to the lack of trust in the technical functionality of smart packaging to behave in its expected manner. In order to address this issue, practitioners are recommended to seek third party acknowledgement or certification when applicable. While this research did not output an exhaustive list containing the types of functionality which consumers would like certified, it is theorised that the need for them is directly proportional to the degree of risk posed by faulty behaviour of the smart packaging in question (e.g. sunburn in the smart sunscreen scenario). The second type of scepticism refers to scepticism regarding the firms' motives of implementing smart packaging. In order to address this issue, practitioners are encouraged to design smart packaging applications which offers more meaningful and altruistic value propositions to their consumers rather than 'shallower' ones such as hedonic entertainment or monetary incentives. While this research does not discourage said value propositions, practitioners should note that the findings does indicate that these types of value propositions are more likely to be perceived by consumers as 'hooks' which bait consumers in for selfish corporate goals (e.g. sales growth, personal data collection). Nonetheless, there is likely to also be a segment of consumers who prefer said 'shallower' value propositions. Hence, practitioners are encouraged to consider the consumer segment they are targeting when they take this factor into account during the design process.

5.2.6 Trade-off

The practical implications of this factor on smart packaging design relate to the additional resources required of consumers in their use of smart packaging relative to their regular consumption behaviours. Resources are not defined restrictively but generally refers to the length of time (how much longer is needed to use this feature) and mental workload (how much more cognitive thought is needed to use this feature) required to partake in the smart packaging experience. Participants noted that despite the value propositions offered by smart packaging, consumers may not

be willing to put in the required resources to co-create them, effectively rendering them worthless. Hence, practitioners are recommended to develop a detailed understanding of consumer consumption habits, including how they physically handle (e.g. opening, closing) and store packaging as well as their typical use occasions in order to tailor smart packaging features to be more effortless to use. At such an early stage of adoption, practitioners should adopt a more conservative approach and assume that consumers are not willing to change their regular consumption behaviours to utilise smart packaging features. Alternatively, practitioners may attempt to persuade consumers to use smart packaging by augmenting the value propositions they offer (e.g. larger monetary incentives) but given the nature of FMCGs, these are likely to come at a unsustainable cost.

5.2.7 Habits and Characteristics

The concern of participants on the effects of implementing smart packaging on sustainability was not surprising given the significant amount of academic and industrial work on sustainable consumption. Consumers have become increasingly concerned about global environmental damage that has been continuously getting worse, resulting in consumption behaviours that heavily favours sustainable products (i.e. Rainforest Alliance Certified). However, what was interesting from the findings that relate to this theme was the suggestion that participants made during the discussions concerning sustainability. Participants noted that rather than considering sustainability as a requirement that needs to be fulfilled, firms could look into designing smart packaging experiences explicitly aiming to promote sustainability. This idea came about from the discussions concerning the smart coffee tin, during which participants mentioned that the tins would have to be reusable as given the number of technical components embedded into them, it would otherwise result in excessive waste. Given that research by Unilever (2019) found that within the UK, 83% of respondents wish that they have access to more refillable products and only one in six (16%) are currently buying refills, there is a huge potential gap in the market that smart packaging could try to penetrate. The researcher proposes that it may be worthwhile for future research to look into the acceptability and adoption of smart packaging features that explicitly aim to

encourage sustainability in the future (e.g. incentivising refills, conveying to consumers how they have contributed to sustainable causes)

Sustainability concerns were also identified in the findings of the second study. Participants noted that they felt the NFC tags added an unsustainable element to the product as they were not sure whether these tags were recyclable. However, it was apparent that the sustainability concerns voiced out by the participants of the second study were not as prominent compared to those of the first study (i.e. participants still scanned the NFC tags and were able to co-create value with it). This is consistent with the intention-behaviour gap from the ethical consumerism literature that asserts that the ethical intentions of consumers diminish in magnitude when translated to their actual consumption behaviours (Auger and Devinney, 2007). Alternatively, the researcher posits three possible reasons to explain this behaviour. The first was that by having already provided the coffee packs to the participants, participants did not feel as repulsed by the unsustainable elements of the packaging as it eliminates the act purchasing the product that participants associate with personally supporting unsustainable practices. Second, the NFC tags are much smaller in size than some of the components (i.e. sensors) depicted in the storyboards of the first study, suggesting that it is likely that there are multiple levels of perceived sustainability that invites further work on its determination. Third, the packaging of the coffee packs were made out of recyclable paper that may have mitigated the participants' sustainability concerns, inviting thoughts along the lines of "only a small part of the packaging is unsustainable, it's not that bad". These findings strongly suggest that although this research indicate that sustainability is an important factor to consider when designing smart packaging experiences, it is possible that its strength in playing the role is overestimated by the methods employed by this research which does not take into account actual purchasing behaviour.

5.3 Revisiting Smart Packaging Engagement

After running the second study, the working definition of smart packaging engagement was revisited in order to supplement it with the empirical findings of this research (i.e. how cognitive, affective, and behavioural engagement manifests

within this context), a conceptualisation approach akin to that of Brodie et al.'s (2013) in their conceptualisation of consumer engagement within a virtual brand community. This section elaborates on the changes made to how each dimension was defined, concluding with an updated conceptualisation of smart packaging engagement.

5.3.1 Cognitive Dimension

The researcher's decision to define the cognitive dimension of smart packaging using the adapted definition of Hollebeek et al.'s (2014) construct of 'cognitive processing' still stands. However, findings from the research did prompt further elaboration on how to better capture the nature of cognitive engagement with smart packaging. Based on the empirical findings of the second study, the researcher argues that the implied threshold set by existing conceptualisations in classifying social phenomenon as cognitive engagement is too restrictive and its scope of acceptance needs to be expanded. More specifically, the restriction set by existing conceptualisations (D. Hollebeek and Chen, 2014; Dwivedi, 2015; Hollebeek et al., 2014) that specifies cognitive engagement as a psychological state that can only manifest during active interaction with the engagement context needed to be removed as it was not consistent with the findings which discovered that participants were still able to be cognitively engaged even when not actively interacting with smart packaging, such as when thinking about what other participants may have posted on the community at arbitrary times throughout their day. Subsequently, this conceptualisation would then also have to acknowledge micro instances of cognitive engagement (e.g. slightly heightened awareness of being monitored) as opposed to only those occurring at higher degrees of magnitude which are characterised by existing conceptualisations using terms such as 'fully absorbed' (Higgins and Scholer, 2009) and 'deeply engrossed' (Patterson et al., 2006; So et al., 2014) and much less likely to manifest outside active interaction. In a nutshell, the proposed change would mean that cognitive engagement with smart packaging does not solely manifest during active interactions with smart packaging at high degrees of magnitude that are heavily implied by existing conceptualisations, but are also able to manifest outside active interaction at lower degrees of magnitude.

5.3.2 Emotional Dimension

Based on the findings of the second study, a majority of the identified instances of emotional engagement were found to be more of a reflection of the participants' feelings about the smart packaging features such as whether or not they felt it was novel, intriguing, or intrusive. There were however also instances where more primitive or raw emotions were expressed, such as confusion from viewing their consumption statistics or the need to catch up with the community that participants felt as a result of their interaction with the smart packaging experience. The researcher argues that the two groups of subthemes are fairly distinct from each other and that this dimension is better defined as two separate constructs rather than a joint one, noting that the distinction would be helpful in guiding future relational or nomological research as the antecedents and consequences of each one are likely to be different. Furthermore, this separation is also supported by the feeling and emotion divide that is prevalent in the psychology literature (Munezero et al., 2014; Shouse, 2005) and consistent with Dessart et al. (2016) who conceptualised cognitive engagement using the two lower order constructs of enthusiasm (reflecting the feelings regarding the engagement partner) and enjoyment (reflecting emotions derived from interactions with the engagement partner). Based on this argument, the research proposed the affective dimension of smart packaging engagement to be conceptualised as two separate constructs: emotion and outlook whereby emotion is defined as "emotions aroused in a consumer as a result of their interaction with smart packaging" and outlook as "how consumers feel about smart packaging".

5.3.3 Behavioural Dimension

Having conducted the second study, it became apparent that a majority of the behavioural manifestations that emerged were in fact merely micro-changes to consumer consumption habits, such as discussing the taste of coffee in greater detail (due to having accessed the blend characteristics unlocked by scanning the NFC tags) when consuming it with their peers or making changes to their brewing process (instigated by both knowledge of the blend characteristics and information read on the community). While there were also behavioural manifestations that reflect use

of smart packaging features such as routinely checking the community for new content or repeatedly scanning the NFC tags to get a reminder of the details of the coffee they are drinking, these were not as prominent. This is perhaps due to the nature of coffee as a product that is often consumed relatively quickly (e.g. in the morning, when taking a break), limiting the opportunities for interaction with smart packaging and subsequently, the behavioural engagement associated with it. For this reason, the researcher proposes to convey the 'microengagement' aspect of this dimension by amending its definition to "passive or active actions which are carried out as a result of consumer interaction with smart packaging"

5.3.4 Summary

This section ends with a recap of the changes that were made to the original working definition of smart packaging engagement (shown in Table 35 below)

Dimension	Initial Version	Updated Version
Cognitive	Cognitive Processing – The level or amount of cognitive thoughts about a product prompted by a consumer's interaction with smart packaging	No change
Emotional	Emotions aroused in a consumer resulting from interaction with smart packaging	Emotion – emotions aroused in a consumer as a result of their interaction with smart packaging Outlook - how consumers feel about smart packaging
Behavioural	A consumer's behavioural manifestations focused around smart packaging	Passive or active actions which are carried out as a result of consumer interaction with smart packaging

Table 35, Changes to the Working Definition of Smart Packaging Engagement

Chapter 6: Conclusions

The final chapter of this thesis summarises the contributions of this research, followed by its limitations, before closing with recommendations for future work and final remarks.

6.1 Contributions

There are three types of contributions made by this thesis: theoretical, empirical, and methodological . In this section, each are presented and explained in turn.

6.1.1 Theoretical Contributions

There are two theoretical contributions that this thesis made towards the academic literature. The first is a theoretical conceptualisation of smart packaging engagement. This contributes towards the conceptual engagement literature and addresses the research gap of the lack of work that been done on engagement within the smart packaging context, a context that is highly expected to be prevalent in the near future. This contribution answers RQ1.

The second theoretical contribution are the factors which influence consumer interaction, value co-creation, and consequently, engagement with smart packaging. Seven empirically supported factors were identified. This contribution answers RQ2.

6.1.2 Empirical Contributions

This thesis made an empirical contribution by providing one of the first empirical datasets on how consumers co-create value and engage with smart packaging and how this influences consumer brand relationships. Given the underdeveloped state of this research context as of the time of writing, 'theory-light' empirical contributions are beneficial as they stimulate the search for explanations which leads to theoretical implications (Hambrick, 2007). This contribution answers RQ1.

6.1.3 Methodological Contributions

"Obrien's Coffee" (the second study) was the one of the earliest pieces of academic consumer research which made use of technology probes to conduct a semi-longitudinal study investigating how consumers consume a smart-packaged product within their personal household environment. It showcased the viability of

conducting data collection within a more natural consumption setting which reduces the bias induced by the observer effect and effectively makes longer study periods feasible. This approach allows researchers to effectively examine the studied social phenomenon from a temporal perspective, enabling them to investigate how it changes over time, an act that would be much more challenging if data was to be collected through more traditional means (e.g. regular visits to the participants' homes). Technology probes provides a reasonable middle ground between methods such as direct observational studies or ethnography that requires a significant amount of resources (e.g. time and manpower) and those which can only feasibly collect relatively limited data (e.g. one-off interviews or surveys).

The use of technology probes also removes the dependency on the participants' prior experience with the studied social phenomenon. For example, in the case of this particular study. It would be tremendously difficult to recruit participants who has had prior interaction with the types of smart packaging features this research was interested in (e.g. consumption tracking). By employing technology probes, the researcher was able to freely design a smart packaging experience tailored to the research objectives. Given how there are not many published technology probe studies as of the time of writing, this thesis serves as reference material for researchers who may want to use technology probes as a method in the future.

6.2 Limitations

This section elaborates on the limitations of this research.

6.2.1 Technical Limitations

Unfortunately, due to the logistical limitations of the equipment bank that the researcher had access to, participants of the second study had to be provided with an LG Nexus 4, a fairly dated Android smartphone model that was not ideal to use. Participants would at times want to access the "Obrien's Coffee" app but were unable to do so due to having forgotten to charge the phone (which needed to be done fairly often due to poor battery life) or simply could not bear the loading times of the 'heavier' screens on the app (i.e. those which needs to load a lot of pictures) such as the community. Participants noted that this discouraged them from

interacting with the smart packaging experience and could have been mitigated if there were more powerful Android smartphones in better condition that could have been loaned for them to use. While this issue could have been addressed by installing the app onto the participant's personal smartphones or primary device, it would however raise other challenges such as having to ensure that the app displays and functions as intended on a wider range of smartphone models and risking potential data loss if participants were given the responsibility to send the audio diaries and log files to the researcher themselves (as opposed to the researcher simply retrieving them himself from the loaned smartphones) in order to avoid the potential ethical concerns of the researcher handling the personal devices of the participants.

6.2.2 Study Period Synchronicity

Unfortunately, due to the difficulties faced during recruitment, not all 12 participants of the second study were able begin the second study on the same day. This was because doing so would require the researcher and all twelve participants to be available at slightly different times of the same day (as they were to be briefed one by one) which was not logistically feasible. This meant that for the first and last few days of the study period, there were fewer active participants which could have influenced the interaction on the community (e.g. there may be posts that participants could not respond to having already finished the study before the post was made).

6.2.3 Absence of the Brand

Participants noted that the lack of actual branding elements (as opposed to a fictional one) in the second study may have influenced their responses regarding brand relationship. They mentioned that it was sometimes difficult to envision brand trust and personal connection without having a more concrete image of the brand. This could have perhaps been addressed by marketing the fictional brand better by building a website or dedicating a section on the app detailing its vision and mission, or imprinting the brand logos on the packs of coffee provided to the participants.

6.2.4 Diary Attrition

The attrition rates for the audio diaries of the participants were poor. Participants noted that their reason for this was often due to how they believed that they had nothing noteworthy to report, despite having been given the explicit instructions to report regardless. This could perhaps have been mitigated by providing participants with a wider variety of smaller sized coffee packs to stimulate interaction that may have led to them having 'more things to report'. Alternatively, completion of audio diaries could perhaps have been incentivised, with more monetary rewards being given to participants with higher attrition rates.

6.3 Recommendations for Future Work

This research has highlighted the scant amount of academic work that has been conducted around smart packaging and revealed that there are still numerous research gaps to fill in this research area. The smart packaging experience that this research focus on was designed around coffee and there are still a huge number of FMCGs that smart packaging can be designed for, each one possibly eliciting a very different responses compared to those reported by this research. Given that the alcohol sector is arguably the largest sector within the FMCG industry invested in smart packaging, research on smart packaging experiences designed around alcoholic products is likely to be impactful and could be conducted.

Each of the factors identified from the first study can also be researched further, such as looking into how they weigh relative to each other or developing scales to measure their magnitude. Like any other engagement construct, nomological work looking into the antecedents and consequences of smart packaging engagement could also be carried out.

6.4 Closing Remarks

This thesis is one of the first pieces of academic work that investigates consumer response to modern-day smart packaging of FMCGs. It illuminates this research area through the provision of empirically based qualitative insight and hopefully establishes foundations that future work can be built on.

References

Aarikka-Stenroos, L., Jaakkola, E., 2012. Value co-creation in knowledge intensive business services: A dyadic perspective on the joint problem solving process. Industrial Marketing Management, Value in Business and Industrial Marketing 41, 15–26. https://doi.org/10.1016/j.indmarman.2011.11.008

Acquisti, A., Grossklags, J., 2005. Privacy and rationality in individual decision making. IEEE Security Privacy 3, 26–33. https://doi.org/10.1109/MSP.2005.22

Adams, A., 2016. The impact of utilitarian and hedonic needs satisfaction on brand trust, brand affect and brand loyalty for selected fast moving consumer goods in South Africa. University of the Western Cape.

Agarwal, R., Prasad, J., 1998. A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. Information Systems Research 9, 204–215. https://doi.org/10.1287/isre.9.2.204

Ahmed, A., Ahmed, N., Salman, A., 2005. Critical issues in packaged food business. British Food Journal 107, 760–780. https://doi.org/10.1108/00070700510623531

Ahn, M., Kang, J., Hustvedt, G., 2016. A model of sustainable household technology acceptance. International Journal of Consumer Studies 40, 83–91. https://doi.org/10.1111/ijcs.12217

Ahvenainen, R., Hurme, E., 1997. Active and smart packaging for meeting consumer demands for quality and safety. Food Additives & Contaminants 14, 753–763. https://doi.org/10.1080/02652039709374586

Altricher, H., Feldman, A., Posch, P., Somekh, B., 2007. Teachers Investigate Their Work: An Introduction to Action Research across the Professions. Routledge, London. https://doi.org/10.4324/9780203978979

Amine, A., 1998. Consumers' true brand loyalty: the central role of commitment. Journal of strategic marketing 6, 305–319.

Ampuero, O., Vila, N., 2006. Consumer perceptions of product packaging. Journal of Consumer Marketing 23, 100–112. https://doi.org/10.1108/07363760610655032

Anaf, S., Sheppard, L.A., 2007. Mixing research methods in health professional degrees: thoughts for undergraduate students and supervisors. Qualitative Report 12, 184–192.

Anderson, E.W., Mittal, V., 2000. Strengthening the Satisfaction-Profit Chain. Journal of Service Research 3, 107–120. https://doi.org/10.1177/109467050032001

Andrew, S., Halcomb, E.J., 2009. Mixed methods research for nursing and the health sciences. John Wiley & Sons, Sussex.

Antaki, C., Billig, M., Edwards, D., Potter, J., 2003. Discourse analysis means doing analysis: A critique of six analytic shortcomings. Discourse Analysis Online 1.

Armstrong, M., Fazio, F., Herrmann, D., Duckworth, D., 2018. Capturing value from the smart packaging revolution, Deloitte Insights. Deloitte.

Aschemann-Witzel, J., Maroscheck, N., Hamm, U., 2013. Are organic consumers preferring or avoiding foods with nutrition and health claims? Food Quality and Preference 30, 68–76. https://doi.org/10.1016/j.foodqual.2013.04.011

Axelrod, M.D., 1975. Marketers get an eyeful when focus groups expose products, ideas, images, ad copy, etc. to consumers. Marketing News 8, 2–4.

Ayres, L., 2007. Qualitative research proposals-part II: conceptual models and methodological options. J Wound Ostomy Continence Nurs 34, 131–133. https://doi.org/10.1097/01.WON.0000264823.57743.5f
Azorín, J.M., Cameron, R., 2010. The application of mixed methods in organisational research: A literature review. Electronic Journal of Business Research Methods 8, 95.
Babin, B.J., Darden, W.R., Griffin, M., 1994. Work and/or Fun: Measuring Hedonic and Utilitarian Shopping Value. Journal of Consumer Research 20, 644–656.
Bagozzi, R.P., 2007. The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. Journal of the Association for Information Systems 8, 244–254. https://doi.org/10.17705/1jais.00122
Baier, D., Rese, A., Schreiber, S., 2015. Analyzing Online Reviews to Measure Augmented Reality Acceptance at the Point of Sale: The Case of IKEA, in: Successful Technological Integration for Competitive Advantage in Retail Settings. IGI Global, pp. 168–189. https://doi.org/10.4018/978-1-4666-8297-9.ch008
Baldus, B.J., Voorhees, C., Calantone, R., 2015. Online brand community engagement: Scale development and validation. Journal of Business Research 68, 978–985. https://doi.org/10.1016/j.jbusres.2014.09.035
Ballantyne, D., Varey, R.J., 2006. Introducing a dialogical orientation to the service-dominant logic of marketing, in: The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions. Routledge, Abingdon and New York, pp. 224–235.
Balta-Ozkan, N., Davidson, R., Bicket, M., Whitmarsh, L., 2013. Social barriers to the adoption of smart homes. Energy Policy 63, 363–374. https://doi.org/10.1016/j.enpol.2013.08.043
Barber, N., 2010. “Green” wine packaging: targeting environmental consumers. International Journal of Wine Business Research 22, 423–444. https://doi.org/10.1108/17511061011092447
Barbour, R.S., Morgan, D.L., 2017. A New Era in Focus Group Research: Challenges, Innovation and Practice. Springer, London.
Barnes, J.G., 2003. Establishing meaningful customer relationships: why some companies and brands mean more to their customers. Managing Service Quality: An International Journal 13, 178–186. https://doi.org/10.1108/09604520310476445
Baron, K., Dorfer, S., 2016. Smart Packaging: Absolut’s IoT Innovation Lab| Innovation Research & Advisory [WWW Document]. Stylus. URL http://www.stylus.com/lcrtjv (accessed 3.7.16).
Barth, S., Jong, M.D.T. de, 2017. The privacy paradox – Investigating discrepancies between expressed privacy concerns and actual online behavior – A systematic literature review. Telematics and Informatics 34, 1038–1058. https://doi.org/10.1016/j.tele.2017.04.013
Bartikowski, B., Llosa, S., 2004. Customer satisfaction measurement: comparing four methods of attribute categorisations. The Service Industries Journal 24, 67–82. https://doi.org/10.1080/0264206042000275190
Barwise, P., Strong, C., 2002. Permission-based mobile advertising. Journal of Interactive Marketing 16, 14–24. https://doi.org/10.1002/dir.10000

Bazeley, P., 2003. Teaching mixed methods. Qualitative Research Journal 3, 117–126.
BBC, 2015. Not in front of the telly: Warning over “listening” TV. BBC.
Beede, D.N., Julian, T.A., Langdon, D., McKittrick, G., Khan, B., Doms, M.E., 2011. Women in STEM: A Gender Gap to Innovation (SSRN Scholarly Paper No. ID 1964782). Social Science Research Network, Rochester, NY.
Begley, C.M., 1996. Using triangulation in nursing research. Journal of Advanced Nursing 24, 122–128. https://doi.org/10.1046/j.1365-2648.1996.15217.x
Behmann, F., Wu, K., 2015. Collaborative internet of things (C-IoT): For future smart connected life and business. John Wiley & Sons, Sussex.
Belk, R., 2010. Possessions and Self, in: Wiley International Encyclopedia of Marketing. John Wiley & Sons, Ltd.
Benlian, A., Klumpe, J., Hinz, O., 2020. Mitigating the intrusive effects of smart home assistants by using anthropomorphic design features: A multimethod investigation. Information Systems Journal 30, 1010–1042. https://doi.org/10.1111/isj.12243
Berendt, B., Günther, O., Spiekermann, S., 2005. Privacy in e-commerce: stated preferences vs. actual behavior. Commun. ACM 48, 101–106. https://doi.org/10.1145/1053291.1053295
Bergh, J.V.D., Behrer, M., 2016. How Cool Brands Stay Hot: Branding to Generations Y and Z. Kogan Page Publishers, London.
Berríos, R., Lucca, N., 2006. Qualitative Methodology in Counseling Research: Recent Contributions and Challenges for a New Century. Journal of Counseling & Development 84, 174–186. https://doi.org/10.1002/j.1556-6678.2006.tb00393.x
Bettels, J., Haase, J., Wiedmann, K.-P., 2020. Shaping consumer perception: effects of vertical and horizontal packaging alignment. Journal of Consumer Marketing 37, 423–431. https://doi.org/10.1108/JCM-05-2019-3231
Biji, K.B., Ravishankar, C.N., Mohan, C.O., Srinivasa Gopal, T.K., 2015. Smart packaging systems for food applications: a review. J Food Sci Technol 52, 6125–6135. https://doi.org/10.1007/s13197-015-1766-7
Bijmolt, T.H.A., Leeflang, P.S.H., Block, F., Eisenbeiss, M., Hardie, B.G.S., Lemmens, A., Saffert, P., 2010. Analytics for Customer Engagement. Journal of Service Research 13, 341–356. https://doi.org/10.1177/1094670510375603
Birchley, G., Huxtable, R., Murtagh, M., ter Meulen, R., Flach, P., Gooberman-Hill, R., 2017. Smart homes, private homes? An empirical study of technology researchers’ perceptions of ethical issues in developing smart-home health technologies. BMC Medical Ethics 18, 23. https://doi.org/10.1186/s12910-017-0183-z
Bird, C.M., 2005. How I Stopped Dreading and Learned to Love Transcription. Qualitative Inquiry 11, 226–248. https://doi.org/10.1177/1077800404273413
Bishop Jr, W.R., 1984. Competitive intelligence. Progressive Grocer 63, 19–20.
Bloch, P.H., Bruce, G.D., 1984. Product Involvement As Leisure Behavior, in: NA - Advances in Consumer Research Volume 11. Presented at the NA - Advances in Consumer Research, Association for Consumer Research, Provo, UT, pp. 197–202.
Bloch, P.H., Richins, M.L., 1983. Shopping Without Purchase: an Investigation of Consumer Browsing Behavior, in: NA - Advances in Consumer Research

Volume 10. Presented at the NA - Advances in Consumer Research, Association for Consumer Research, Ann Abor, MI, pp. 389–393.
Bloor, M., Frankland, J., Thomas, M., Robson, K., 2001. Focus Groups in Social Research. SAGE Publications Ltd, London. https://doi.org/10.4135/9781849209175
Bonetti, F., Pantano, E., Warnaby, G., Quinn, L., Perry, P., 2019. Augmented Reality in Real Stores: Empirical Evidence from Consumers' Interaction with AR in a Retail Format, in: tom Dieck, M.C., Jung, T. (Eds.), Augmented Reality and Virtual Reality: The Power of AR and VR for Business, Progress in IS. Springer International Publishing, Cham, pp. 3–16. https://doi.org/10.1007/978-3-030-06246-0_1
Bourgeois, J., Linden, J. van der, Price, B., Kortuem, G., 2013. Technology probes: experiences with home energy feedback. Presented at the Methods for Studying Technology in the Home, Paris.
Bowden, J.L.-H., 2009. The Process of Customer Engagement: A Conceptual Framework. Journal of Marketing Theory and Practice 17, 63–74. https://doi.org/10.2753/MTP1069-6679170105
Bowden, J.L.-H., Conduit, J., Hollebeek, L.D., Luoma-aho, V., Solem, B.A., 2017. Engagement valence duality and spillover effects in online brand communities. Journal of Service Theory and Practice 27, 877–897. https://doi.org/10.1108/JSTP-04-2016-0072
Bowden, J.L.H., Gabbott, M., Naumann, K., 2015. Service relationships and the customer disengagement – engagement conundrum. Journal of Marketing Management 31, 774–806. https://doi.org/10.1080/0267257X.2014.983143
Boyatzis, R.E., 1998. Transforming Qualitative Information: Thematic Analysis and Code Development. SAGE, Thousand Oaks.
Brack, S., Muth, R., Dietzel, S., Scheuermann, B., 2019. Recommender Systems on Homomorphically Encrypted Databases for Enhanced User Privacy, in: 2019 IEEE 44th LCN Symposium on Emerging Topics in Networking (LCN Symposium). Presented at the 2019 IEEE 44th LCN Symposium on Emerging Topics in Networking (LCN Symposium), pp. 74–82. https://doi.org/10.1109/LCNSymposium47956.2019.9000668
Braun, V., Clarke, V., 2020. One size fits all? What counts as quality practice in (reflexive) thematic analysis? Qualitative Research in Psychology 0, 1–25. https://doi.org/10.1080/14780887.2020.1769238
Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qualitative Research in Psychology 3, 77–101. https://doi.org/10.1191/1478088706qp063oa
Braun, V., Wilkinson, S., 2003. Liability or asset? Women talk about the vagina. Psychology of Women Section Review 5, 28–42.
Bree, R.T., Gallagher, G., 2016. Using Microsoft Excel to code and thematically analyse qualitative data: a simple, cost-effective approach. All Ireland Journal of Higher Education 8, 2811–28114.
Brengman, M., Willems, K., Van Kerrebroeck, H., 2019. Can't touch this: the impact of augmented reality versus touch and non-touch interfaces on perceived ownership. Virtual Reality 23, 269–280. https://doi.org/10.1007/s10055-018-0335-6

Brewer, J., Hunter, A., 1989. Multimethod research: A synthesis of styles. Sage Publications, Inc, Thousand Oaks.
British Association of Dermatologists, 2013. British Association of Dermatologists - Sunscreen Fact Sheet [WWW Document]. URL http://www.bad.org.uk/skin-cancer/sunscreen-fact-sheet (accessed 9.19.19).
British Coffee Association, 2018. Coffee Facts [WWW Document]. British Coffee Association. URL https://www.britishcoffeeassociation.org/coffee-in-the-uk/coffee-facts (accessed 9.19.19).
Brits, H., Winder, C., 2005. Payments are no free lunch. Netherlands Central Bank, Research Department.
Brodie, R.J., Hollebeek, L.D., Jurić, B., Ilić, A., 2011. Customer Engagement: Conceptual Domain, Fundamental Propositions, and Implications for Research. Journal of Service Research 14, 252–271. https://doi.org/10.1177/1094670511411703
Brodie, R.J., Ilic, A., Juric, B., Hollebeek, L., 2013. Consumer engagement in a virtual brand community: An exploratory analysis. Journal of Business Research, (1)Thought leadership in brand management(2)Health Marketing 66, 105–114. https://doi.org/10.1016/j.jbusres.2011.07.029
Brodie, R.J., Löbler, H., Fehrer, J.A., 2019. Evolution of service-dominant logic: Towards a paradigm and metatheory of the market and value cocreation? Industrial Marketing Management 79, 3–12. https://doi.org/10.1016/j.indmarman.2019.03.003
Brooks, J., McCluskey, S., Turley, E., King, N., 2015. The Utility of Template Analysis in Qualitative Psychology Research. Qualitative Research in Psychology 12, 202–222. https://doi.org/10.1080/14780887.2014.955224
Brown, S., 2003. Crisis, what crisis? Marketing, Midas, and the Croesus of representation. Qualitative Market Research: An International Journal 6, 194–205. https://doi.org/10.1108/13522750310479001
Brownlie, D.T., 1994. The New Marketing Myopia: Critical Perspectives on Theory and Research in Marketing. MCB University Press, Bingley.
Brush, A.J.B., Lee, B., Mahajan, R., Agarwal, S., Saroiu, S., Dixon, C., 2011. Home automation in the wild: challenges and opportunities, in: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '11. Association for Computing Machinery, New York, NY, USA, pp. 2115–2124. https://doi.org/10.1145/1978942.1979249
Bryman, A., 2016. Social Research Methods. Oxford University Press, Oxford.
Bunduchi, R., Smart, A.U., 2010. Process Innovation Costs in Supply Networks: A Synthesis. International Journal of Management Reviews 12, 365–383. https://doi.org/10.1111/j.1468-2370.2009.00269.x
Burton, D., 2001. Critical marketing theory: the blueprint? European Journal of Marketing 35, 722–743. https://doi.org/10.1108/03090560110388187
Cadwalladr, C., Graham-Harrison, E., 2018. Revealed: 50 million Facebook profiles harvested for Cambridge Analytica in major data breach. The Guardian.
Caivano, D., Fogli, D., Lanzilotti, R., Piccinno, A., Cassano, F., 2018. Supporting end users to control their smart home: design implications from a literature review and an empirical investigation. Journal of Systems and Software 144, 295–313. https://doi.org/10.1016/j.jss.2018.06.035

Calder, B.J., 1977. Focus Groups and the Nature of Qualitative Marketing Research. Journal of Marketing Research 14, 353–364. https://doi.org/10.1177/002224377701400311
Calder, B.J., Malthouse, E.C., Schaedel, U., 2009. An Experimental Study of the Relationship between Online Engagement and Advertising Effectiveness. Journal of Interactive Marketing 23, 321–331. https://doi.org/10.1016/j.intmar.2009.07.002
Cameron, G., 2020. The Future of Active and Intelligent Packaging to 2025. Smithers.
Camilleri, J., Neuhofer, B., 2017. Value co-creation and co-destruction in the Airbnb sharing economy. International Journal of Contemporary Hospitality Management 29, 2322–2340. https://doi.org/10.1108/IJCHM-09-2016-0492
Capon, N., Glazer, R., 1987. Marketing and Technology: A Strategic Coalignment. Journal of Marketing 51, 1–14. https://doi.org/10.2307/1251644
Carrier, J.G., Luetchford, P.G., 2012. Ethical Consumption: Social Value and Economic Practice. Berghahn Books, New York.
Carson, D., Gilmore, A., Perry, C., Gronhaug, K., 2001. Qualitative Marketing Research. SAGE, London. https://doi.org/10.4135/9781849209625
Carù, A., Cova, B., 2003. Revisiting Consumption Experience: A More Humble but Complete View of the Concept. Marketing Theory 3, 267–286. https://doi.org/10.1177/14705931030032004
Castells, M., 1996. The Rise of the Network Society, The Information Age: Economy, Society and Culture Vol. I. Blackwell, Oxford.
Chan, C., Patch, C., Williams, P., 2005. Australian consumers are sceptical about but influenced by claims about fat on food labels. Eur J Clin Nutr 59, 148–151. https://doi.org/10.1038/sj.ejcn.1602038
Chan, M., Campo, E., Estève, D., Fourniols, J.-Y., 2009. Smart homes — Current features and future perspectives. Maturitas 64, 90–97. https://doi.org/10.1016/j.maturitas.2009.07.014
Chan, T.K.H., Zheng, X., Cheung, C.M.K., Lee, M.K.O., Lee, Z.W.Y., 2014. Antecedents and consequences of customer engagement in online brand communities. J Market Anal 2, 81–97. https://doi.org/10.1057/jma.2014.9
Chandler, J.D., Lusch, R.F., 2015. Service Systems: A Broadened Framework and Research Agenda on Value Propositions, Engagement, and Service Experience. Journal of Service Research 18, 6–22. https://doi.org/10.1177/1094670514537709
Charmaz, K., 2014. Constructing Grounded Theory. SAGE, London.
Chatzidimitris, T., Gavalas, D., Kasapakis, V., Konstantopoulos, C., Kypriadis, D., Pantziou, G., Zaroliagis, C., 2020. A location history-aware recommender system for smart retail environments. Pers Ubiquit Comput 24, 683–694. https://doi.org/10.1007/s00779-020-01374-7
Chaudhuri, A., 2000. A Macro Analysis of the Relationship of Product Involvement and Information Search: The Role of Risk. Journal of Marketing Theory and Practice 8, 1–15. https://doi.org/10.1080/10696679.2000.11501856
Chen, J., Bauman, A., Allman-Farinelli, M., 2016. A Study to Determine the Most Popular Lifestyle Smartphone Applications and Willingness of the Public to Share Their Personal Data for Health Research. Telemedicine and e-Health 22, 655–665. https://doi.org/10.1089/tmj.2015.0159

Cheng, A., Raghavaraju, V., Kanugo, J., Handrianto, Y.P., Shang, Y., 2018. Development and evaluation of a healthy coping voice interface application using the Google home for elderly patients with type 2 diabetes, in: 2018 15th IEEE Annual Consumer Communications Networking Conference (CCNC). Presented at the 2018 15th IEEE Annual Consumer Communications Networking Conference (CCNC), pp. 1–5. https://doi.org/10.1109/CCNC.2018.8319283

Clement, J., 2007. Visual influence on in-store buying decisions: an eye-track experiment on the visual influence of packaging design. Journal of Marketing Management 23, 917–928. https://doi.org/10.1362/026725707X250395

Coenen, M., Stamm, T.A., Stucki, G., Cieza, A., 2012. Individual interviews and focus groups in patients with rheumatoid arthritis: a comparison of two qualitative methods. Qual Life Res 21, 359–370. https://doi.org/10.1007/s11136-011-9943-2

Cohen, L., Manion, L., Morrison, K., 2017. Research Methods in Education, 8th ed. Routledge, London.

Connelly, L.M., Bott, M., Hoffart, N., Taunton, R.L., 1997. Methodological triangulation in a study of nurse retention. Nurs Res 46, 299–302. https://doi.org/10.1097/00006199-199709000-00011

Constantin, J.A., Lusch, R.F., 1994. Understanding Resource Management. The Planning Forum, Oxford.

Corrigan, H.B., Craciun, G., Powell, A.M., 2014. How Does Target Know So Much About Its Customers? Utilizing Customer Analytics to Make Marketing Decisions. Marketing Education Review 24, 159–166. https://doi.org/10.2753/MER1052-8008240206

Cova, B., Paranque, B., 2012. Value creation versus destruction: The relationship between consumers, marketers and financiers. J Brand Manag 20, 147–158. https://doi.org/10.1057/bm.2012.46

Crabtree, A., Hyland, L., Colley, J., Flintham, M., Fischer, J.E., Kwon, H., 2020. Probing IoT-based consumer services: 'insights' from the connected shower. Pers Ubiquit Comput 24, 595–611. https://doi.org/10.1007/s00779-019-01303-3

Crabtree, A., Lodge, T., Colley, J., Greenhalgh, C., Mortier, R., Haddadi, H., 2016. Enabling the new economic actor: data protection, the digital economy, and the Databox. Pers Ubiquit Comput 20, 947–957. https://doi.org/10.1007/s00779-016-0939-3

Crespo, Á.H., Rodríguez, I.A.R.D.B., 2008. Explaining B2C e-commerce acceptance: An integrative model based on the framework by Gatignon and Robertson. Interacting with Computers 20, 212–224. https://doi.org/10.1016/j.intcom.2007.11.005

Creswell, J.W., 2003. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications, Thousand Oaks, CA.

Creswell, J.W., Clark, V.L.P., 2017. Designing and Conducting Mixed Methods Research, 3rd ed. SAGE Publications, Thousand Oaks, CA.

Creswell, J.W., Miller, D.L., 2000. Determining Validity in Qualitative Inquiry. Theory Into Practice 39, 124–130. https://doi.org/10.1207/s15430421tip3903_2

D. Hollebeek, L., Chen, T., 2014. Exploring positively- versus negatively-valenced brand engagement: a conceptual model. Journal of Product & Brand Management 23, 62–74. https://doi.org/10.1108/JPBM-06-2013-0332
Dacko, S.G., 2017. Enabling smart retail settings via mobile augmented reality shopping apps. Technological Forecasting and Social Change 124, 243–256. https://doi.org/10.1016/j.techfore.2016.09.032
Dahlbäck, N., Jönsson, A., Ahrenberg, L., 1993. Wizard of Oz studies — why and how. Knowledge-Based Systems, Special Issue: Intelligent User Interfaces 6, 258–266. https://doi.org/10.1016/0950-7051(93)90017-N
Dainelli, D., Gontard, N., Spyropoulos, D., Zondervan-van den Beuken, E., Tobback, P., 2008. Active and intelligent food packaging: legal aspects and safety concerns. Trends in Food Science & Technology, EFSA Forum: From Safe Food to Healthy Diets 19, S103–S112. https://doi.org/10.1016/j.tifs.2008.09.011
Danermark, B., Ekström, M., Karlsson, J.C., 2019. Explaining Society: Critical Realism in the Social Sciences, Routledge Studies in Critical Realism. Routledge, London.
Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1989. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science 35, 982–1003.
De Waal, C., 2001. On Peirce. Wadsworth, Belmont, CA.
Demiris, G., Hensel, B.K., Skubic, M., Rantz, M., 2008. Senior residents' perceived need of and preferences for" smart home" sensor technologies. International journal of technology assessment in health care 24, 120.
Denzin, N.K., Lincoln, Y.S., 2011. The SAGE Handbook of Qualitative Research. SAGE, Thousand Oaks, CA.
Dessart, L., Veloutsou, C., Morgan-Thomas, A., 2016. Capturing consumer engagement: duality, dimensionality and measurement. Journal of Marketing Management 32, 399–426. https://doi.org/10.1080/0267257X.2015.1130738
Dessart, L., Veloutsou, C., Morgan-Thomas, A., 2015. Consumer engagement in online brand communities: a social media perspective. Journal of Product & Brand Management 24, 28–42. https://doi.org/10.1108/JPBM-06-2014-0635
Dibb, S., Simkin, L., Pride, W.M., Ferrell, O.C., 2005. Marketing: Concepts and strategies, 5th ed. Houghton Mifflin, Abingdon.
DiCicco-Bloom, B., Crabtree, B.F., 2006. The qualitative research interview. Medical Education 40, 314–321. https://doi.org/10.1111/j.1365-2929.2006.02418.x
Diggins, J.P., 1995. The Promise of Pragmatism: Modernism and the Crisis of Knowledge and Authority. University of Chicago Press, Chicago and London.
Dinev, T., Hart, P., 2006. An Extended Privacy Calculus Model for E-Commerce Transactions. Information Systems Research 17, 61–80. https://doi.org/10.1287/isre.1060.0080
Dixon, D.F., 1990. Marketing as production: The development of a concept. JAMS 18, 337–343. https://doi.org/10.1007/BF02723919
do Vale, R.C., Duarte, J., 2013. Classification of FMCG Product Macro-Categories on the Utilitarian vs. Hedonic Dimensions. Laboratório de Psicologia 11, 29–36.
Doan, N., 2014. Consumer adoption in mobile wallet : a study of consumers in Finland. Turku University of Applied Sciences.

Dolan, R., Conduit, J., Fahy, J., Goodman, S., 2016. Social media engagement behaviour: a uses and gratifications perspective. Journal of Strategic Marketing 24, 261–277. https://doi.org/10.1080/0965254X.2015.1095222
Donajgrodzki, E., Saven, M., 2013. Heineken's Smart Packaging [WWW Document]. Stylus. URL http://www.stylus.com/lqksnj (accessed 3.7.16).
Doorn, J. van, Lemon, K.N., Mittal, V., Nass, S., Pick, D., Pirner, P., Verhoef, P.C., 2010. Customer Engagement Behavior: Theoretical Foundations and Research Directions. Journal of Service Research 13, 253–266. https://doi.org/10.1177/1094670510375599
Duffy, M.E., 1987. Methodological Triangulation: A Vehicle for Merging Quantitative and Qualitative Research Methods. Image: the Journal of Nursing Scholarship 19, 130–133. https://doi.org/10.1111/j.1547-5069.1987.tb00609.x
Dwivedi, A., 2015. A higher-order model of consumer brand engagement and its impact on loyalty intentions. Journal of Retailing and Consumer Services 24, 100–109. https://doi.org/10.1016/j.jretconser.2015.02.007
Easton, G., 2010. Critical realism in case study research. Industrial Marketing Management, Case Study Research in Industrial Marketing 39, 118–128. https://doi.org/10.1016/j.indmarman.2008.06.004
Echeverri, P., Skålén, P., 2011. Co-creation and co-destruction: A practice-theory based study of interactive value formation. Marketing Theory 11, 351–373. https://doi.org/10.1177/1470593111408181
Edwards, H.M., McDonald, S., Zhao, T., 2011. Exploring teenagers' motivation to exercise through technology probes, in: Proceedings of the 25th BCS Conference on Human-Computer Interaction, BCS-HCI '11. BCS Learning & Development Ltd., Swindon, GBR, pp. 104–113.
Ehrenhard, M., Kijl, B., Nieuwenhuis, L., 2014. Market adoption barriers of multi-stakeholder technology: Smart homes for the aging population. Technological Forecasting and Social Change 89, 306–315. https://doi.org/10.1016/j.techfore.2014.08.002
Ekman, P., Röndell, J., 2019. Bridging S-D Logic and Business Practice with Midrange Theory : From Dichotomies to Relational Dualities and Beyond, in Central Marketing Concepts, in: The SAGE Handbook of Service-Dominant Logic. Sage Publications Ltd, London, pp. 619–634.
Elliot, R., 1995. Therapy process research and clinical practice: practical strategies, in: Research Foundations for Psychotherapy Practice. John Wiley and Sons, New York, pp. 49–72.
Elliott, R., Fischer, C.T., Rennie, D.L., 1999. Evolving guidelines for publication of qualitative research studies in psychology and related fields. Br J Clin Psychol 38, 215–229. https://doi.org/10.1348/014466599162782
Engine Creative, 2014. 5 Reasons Why Augmented Reality Fails For Brands [WWW Document]. Engine Creative. URL https://www.enginecreative.co.uk/blog/5-reasons-augmented-reality-fails-brands/ (accessed 11.8.20).
Escalas, J.E., 2004. Narrative Processing: Building Consumer Connections to Brands. Journal of Consumer Psychology 14, 168–180. https://doi.org/10.1207/s15327663jcp1401&2_19
Esch, F., Langner, T., Schmitt, B.H., Geus, P., 2006. Are brands forever? How brand knowledge and relationships affect current and future purchases. Journal of

Product & Brand Management 15, 98–105. https://doi.org/10.1108/10610420610658938
Ewers, G., 2019. Gen Z drives forward the adoption of NFC smart packaging [WWW Document]. Inside Packaging. URL http://inside-packaging.nridigital.com/packaging_sep19/gen_z_drives_forward_the_adoption_of_nfc_smart_packaging (accessed 10.7.19).
Eze, S.C., Chinedu-Eze, V.C.A., Okike, C.K., Bello, A.O., 2020. Critical factors influencing the adoption of digital marketing devices by service-oriented micro-businesses in Nigeria: A thematic analysis approach. Humanities and Social Sciences Communications 7, 1–14. https://doi.org/10.1057/s41599-020-00580-1
Fang, Y.-H., 2017. Beyond the Usefulness of Branded Applications: Insights from Consumer–Brand Engagement and Self-construal Perspectives. Psychology & Marketing 34, 40–58. https://doi.org/10.1002/mar.20972
Fenko, A., Kersten, L., Bialkova, S., 2016. Overcoming consumer scepticism toward food labels: The role of multisensory experience. Food Quality and Preference 48, 81–92. https://doi.org/10.1016/j.foodqual.2015.08.013
Fern, E.F., 1982. The use of Focus Groups for Idea Generation: The Effects of Group Size, Acquaintanceship, and Moderator on Response Quantity and Quality. Journal of Marketing Research 19, 1–13. https://doi.org/10.1177/002224378201900101
Fernqvist, F., Olsson, A., Spendrup, S., 2015. What's in it for me? Food packaging and consumer responses, a focus group study. British Food Journal 117, 1122–1135. https://doi.org/10.1108/BFJ-08-2013-0224
Fielding, N., 2008. The role of computer-assisted qualitative data analysis, in: Handbook of Emergent Methods. The Guildford Press, New York, pp. 675–695.
Fiore, A.M., Jin, H.-J., Kim, J., 2005. For fun and profit: Hedonic value from image interactivity and responses toward an online store. Psychology & Marketing 22, 669–694. https://doi.org/10.1002/mar.20079
Fitzmaurice, J., Comegys, C., 2006. Materialism and Social Consumption. Journal of Marketing Theory and Practice 14, 287–299. https://doi.org/10.2753/MTP1069-6679140403
Fleetwood, S., 1997. Aristotle in the 21st Century. Cambridge Journal of Economics 21, 729–744. https://doi.org/10.1093/oxfordjournals.cje.a013695
Flores, J.G., Alonso, C.G., 1995. Using focus groups in educational research: Exploring teachers' perspectives on educational change. Evaluation Review 19, 84–101. https://doi.org/10.1177/0193841X9501900104
Folch-Lyon, E., Trost, J.F., 1981. Conducting Focus Group Sessions. Studies in Family Planning 12, 443–449. https://doi.org/10.2307/1965656
Foroudi, P., Gupta, S., Sivarajah, U., Broderick, A., 2018. Investigating the effects of smart technology on customer dynamics and customer experience. Computers in Human Behavior 80, 271–282. https://doi.org/10.1016/j.chb.2017.11.014
Foss, C., Ellefsen, B., 2002. The value of combining qualitative and quantitative approaches in nursing research by means of method triangulation. J Adv Nurs 40, 242–248. https://doi.org/10.1046/j.1365-2648.2002.02366.x

Freeman, T., 2006. “Best practice” in focus group research: making sense of different views. J Adv Nurs 56, 491–497. https://doi.org/10.1111/j.1365-2648.2006.04043.x
Friedewald, M., Costa, O.D., Punie, Y., Alahuhta, P., Heinonen, S., 2005. Perspectives of ambient intelligence in the home environment. Telematics and Informatics 22, 221–238. https://doi.org/10.1016/j.tele.2004.11.001
Friedman, A., Berkovsky, S., Kaafar, M.A., 2016. A differential privacy framework for matrix factorization recommender systems. User Model User-Adap Inter 26, 425–458. https://doi.org/10.1007/s11257-016-9177-7
Friedman, A., Knijnenburg, B.P., Vanhecke, K., Martens, L., Berkovsky, S., 2015. Privacy Aspects of Recommender Systems, in: Ricci, F., Rokach, L., Shapira, B. (Eds.), Recommender Systems Handbook. Springer US, Boston, MA, pp. 649–688. https://doi.org/10.1007/978-1-4899-7637-6_19
Furrer, O., Yu Kerguignas, J., Delcourt, C., Gremler, D.D., 2020. Twenty-seven years of service research: a literature review and research agenda. Journal of Services Marketing 34, 299–316. https://doi.org/10.1108/JSM-02-2019-0078
Furszyfer Del Rio, D.D., Sovacool, B.K., Bergman, N., Makuch, K.E., 2020. Critically reviewing smart home technology applications and business models in Europe. Energy Policy 144, 111631. https://doi.org/10.1016/j.enpol.2020.111631
Garcia, N.M., Sousa, P., Felizardo, V., 2015. Ambient Assisted Living - From Technology to Intervention, in: Ambient Assisted Living. CRC Press, Boca Raton, pp. 1–4.
Gelici-Zeko, M.M., Lutters, D., Klooster, R. ten, Weijzen, P.L.G., 2013. Studying the Influence of Packaging Design on Consumer Perceptions (of Dairy Products) Using Categorizing and Perceptual Mapping. Packaging Technology and Science 26, 215–228. https://doi.org/10.1002/pts.1977
Gephart, R.P., 2004. Qualitative Research and the Academy of Management Journal. AMJ 47, 454–462. https://doi.org/10.5465/amj.2004.14438580
Ghafur, S., Dael, J.V., Leis, M., Darzi, A., Sheikh, A., 2020. Public perceptions on data sharing: key insights from the UK and the USA. The Lancet Digital Health 2, e444–e446. https://doi.org/10.1016/S2589-7500(20)30161-8
Giese, J.L., Cote, J.A., 2000. Defining consumer satisfaction. Academy of marketing science review 1, 1–22.
Glaser, B.G., Strauss, A.L., 1967. The Discovery of Grounded Theory: Strategies for Qualitative Research. Aldine, Chicago.
Glesne, C., 2016. Becoming Qualitative Researchers: An Introduction, 5th Edition, Pearson. Pearson, New Jersey.
Godfrey, P.C., Hill, C.W.L., 1995. The problem of unobservables in strategic management research. Strategic Management Journal 16, 519–533. https://doi.org/10.1002/smj.4250160703
Goldman, A.E., 1962. The Group Depth Interview. Journal of Marketing 26, 61–68. https://doi.org/10.2307/1248305
Gómez, M., Martín-Consuegra, D., Molina, A., 2015. The importance of packaging in purchase and usage behaviour. International Journal of Consumer Studies 39, 203–211. https://doi.org/10.1111/ijcs.12168

Goss, J.D., Leinbach, T.R., 1996. Focus Groups as Alternative Research Practice: Experience with Transmigrants in Indonesia. Area 28, 115–123.
GoToTags, 2018. The Future of Environmentally Friendly NFC Tags [WWW Document]. GoToTags. URL https://gototags.com/blog/the-future-of-environmentally-friendly-nfc-tags/ (accessed 6.7.19).
Goulding, C., 2005. Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research. European Journal of Marketing 39, 294–308. https://doi.org/10.1108/03090560510581782
Greenbaum, T., 1998. The Handbook for Focus Group Research. SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks California 91320 United States of America. https://doi.org/10.4135/9781412986151
Greenberg, B.A., Goldstucker, J.L., Bellenger, D.N., 1977. What Techniques are Used by Marketing Researchers in Business? Journal of Marketing 41, 62–68. https://doi.org/10.1177/002224297704100217
Greene, J.C., Caracelli, V.J., Graham, W.F., 1989. Toward a Conceptual Framework for Mixed-Method Evaluation Designs. Educational Evaluation and Policy Analysis 11, 255–274. https://doi.org/10.3102/01623737011003255
Grønkjær, M., Curtis, T., Crespigny, C. de, Delmar, C., 2011. Analysing group interaction in focus group research: Impact on content and the role of the moderator. Qualitative Studies 2, 16–30. https://doi.org/10.7146/qs.v2i1.4273
Grönroos, C., 2011. Value co-creation in service logic: A critical analysis. Marketing Theory 11, 279–301. https://doi.org/10.1177/1470593111408177
Grönroos, C., 2008. Service logic revisited: who creates value? And who co-creates? European Business Review 20, 298–314. https://doi.org/10.1108/09555340810886585
Grönroos, C., 2006. What can a service logic offer marketing theory, in: The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions. Routledge, Abingdon and New York, pp. 354–364.
Gronroos, C., 2000. Service Management and Marketing: A Customer Relationship Management Approach. John Wiley & Sons, West Sussex, UK.
Grönroos, C., 1990. Service management and marketing. Lexington Books, Lexington.
Grönroos, C., Voima, P., 2013. Critical service logic: making sense of value creation and co-creation. J. of the Acad. Mark. Sci. 41, 133–150. https://doi.org/10.1007/s11747-012-0308-3
Grossman, R.P., Wisenblit, J.Z., 1999. What we know about consumers' color choices. Journal of Marketing Practice: Applied Marketing Science 5, 78–88. https://doi.org/10.1108/EUM0000000004565
Gu, J., Xu, Y. (Calvin), Xu, H., Zhang, C., Ling, H., 2017. Privacy concerns for mobile app download: An elaboration likelihood model perspective. Decision Support Systems 94, 19–28. https://doi.org/10.1016/j.dss.2016.10.002
Guba, E.G., 1990. The paradigm dialog. Sage Publications, Inc, Thousand Oaks, CA, US.
Guba, E.G., 1987. What have we learned about naturalistic evaluation? Evaluation Practice 8, 23–43. https://doi.org/10.1016/S0886-1633(87)80037-5
Guba, E.G., Lincoln, Y.S., 1994. Competing paradigms in qualitative research, in: Handbook of Qualitative Research. Sage, Thousand Oaks, CA, pp. 105–117.

Guest, G., Bunce, A., Johnson, L., 2006. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. Field Methods 18, 59–82. https://doi.org/10.1177/1525822X05279903
Guest, G., MacQueen, K.M., 2008. Handbook for Team-based Qualitative Research. Rowman Altamira, Plymouth.
Guest, G., Namey, E., McKenna, K., 2017. How Many Focus Groups Are Enough? Building an Evidence Base for Nonprobability Sample Sizes. Field Methods 29, 3–22. https://doi.org/10.1177/1525822X16639015
Guhr, N., Werth, O., Blacha, P.P.H., Breitner, M.H., 2020. Privacy concerns in the smart home context. SN Appl. Sci. 2, 247. https://doi.org/10.1007/s42452-020-2025-8
Güldenpfennig, F., Fitzpatrick, G., 2013. Towards Rapid Technology Probes for Senior People, in: Holzinger, A., Ziefle, M., Hitz, M., Debevc, M. (Eds.), Human Factors in Computing and Informatics, Lecture Notes in Computer Science. Springer, Berlin, Heidelberg, pp. 664–671. https://doi.org/10.1007/978-3-642-39062-3_47
Gummesson, E., 2011. Total Relationship Marketing, 3rd ed. Butterworth-Heinemann, Oxford.
Gummesson, E., 2006. Many-to-many marketing as grand theory, in: The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions. Routledge, Abingdon and New York, pp. 339–353.
Gummesson, E., 1998. Implementation Requires a Relationship Marketing Paradigm. Journal of the Academy of Marketing Science 26, 242–249. https://doi.org/10.1177/0092070398263006
Gummesson, E., 1995. Relationship marketing: its role in the service economy, in: Understanding Services Management. John Wiley & Sons, New York, pp. 244–268.
Gupta, S., Lehmann, D., 2005. Managing Customers As Investments the Strategic Value of Customers in the Long Run, First. ed. Wharton School Publishing, Upper Saddle River, NJ.
Gutierrez, A., O'Leary, S., Rana, N.P., Dwivedi, Y.K., Calle, T., 2019. Using privacy calculus theory to explore entrepreneurial directions in mobile location-based advertising: Identifying intrusiveness as the critical risk factor. Computers in Human Behavior 95, 295–306. https://doi.org/10.1016/j.chb.2018.09.015
Gutman, J., 1982. A Means-End Chain Model Based on Consumer Categorization Processes. Journal of Marketing 46, 60–72. https://doi.org/10.1177/002224298204600207
Haeckel, S.H., 1999. Adaptive Enterprise: Creating and Leading Sense-And-Respond Organizations. Harvard Business School Press, Boston, Massachusetts.
Hainmueller, J., Hiscox, M.J., Sequeira, S., 2015. Consumer Demand for Fair Trade: Evidence from a Multistore Field Experiment. The Review of Economics and Statistics 97, 242–256. https://doi.org/10.1162/REST_a_00467
Hair, J.F., Sarstedt, M., 2021. Data, measurement, and causal inferences in machine learning: opportunities and challenges for marketing. null 29, 65–77. https://doi.org/10.1080/10696679.2020.1860683

Halcomb, E.J., Davidson, P.M., 2006. Is verbatim transcription of interview data always necessary? Applied Nursing Research 19, 38–42. https://doi.org/10.1016/j.apnr.2005.06.001
Hambrick, D.C., 2007. The Field of Management's Devotion to Theory: Too Much of a Good Thing? AMJ 50, 1346–1352. https://doi.org/10.5465/amj.2007.28166119
Hamilton, J., Knox, B., Hill, D., Parr, H., 2000. Reduced fat products – Consumer perceptions and preferences. British Food Journal 102, 494–506. https://doi.org/10.1108/00070700010336454
Hancock, E., 2019. How smart packaging can help drinks brands 'build deeper' relationships with consumers [WWW Document]. The Drinks Business. URL https://www.thedrinksbusiness.com/2019/04/how-smart-packaging-can-help-producers-stay-ahead-of-consumer-trends/ (accessed 10.20.19).
Hansen, M., Hauge, B., 2017. Prosumers and smart grid technologies in Denmark: developing user competences in smart grid households. Energy Efficiency 10, 1215–1234. https://doi.org/10.1007/s12053-017-9514-7
Hanson, W.E., Creswell, J.W., Clark, V.L.P., Petska, K.S., Creswell, J.D., 2005. Mixed methods research designs in counseling psychology. Journal of counseling psychology 52, 224.
Hardyman, W., Daunt, K.L., Kitchener, M., 2015. Value Co-Creation through Patient Engagement in Health Care: A micro-level approach and research agenda. Public Management Review 17, 90–107. https://doi.org/10.1080/14719037.2014.881539
Hargreaves, T., Nye, M., Burgess, J., 2013. Keeping energy visible? Exploring how householders interact with feedback from smart energy monitors in the longer term. Energy Policy, Special Section: Transition Pathways to a Low Carbon Economy 52, 126–134. https://doi.org/10.1016/j.enpol.2012.03.027
Harrigan, P., Evers, U., Miles, M.P., Daly, T., 2018. Customer engagement and the relationship between involvement, engagement, self-brand connection and brand usage intent. Journal of Business Research 88, 388–396. https://doi.org/10.1016/j.jbusres.2017.11.046
Haumann, T., Güntürkün, P., Schons, L.M., Wieseke, J., 2015. Engaging Customers in Coproduction Processes: How Value-Enhancing and Intensity-Reducing Communication Strategies Mitigate the Negative Effects of Coproduction Intensity. Journal of Marketing 79, 17–33. https://doi.org/10.1509/jm.14.0357
Hauser, J.R., Shugan, S.M., 1983. Defensive marketing strategies. Marketing Science 2, 319–360.
Hauser, J.R., Simmie, P., 1981. Profit Maximizing Perceptual Positions: An Integrated Theory for the Selection of Product Features and Price. Management Science 27, 33–56.
Hauser, J.R., Urban, G.L., 1986. The Value Priority Hypotheses for Consumer Budget Plans. Journal of Consumer Research 12, 446–462.
Hawkins, J., 2018. The Practical Utility and Suitability of Email Interviews in Qualitative Research. The Qualitative Report 23, 493–501.
Healy, M., Perry, C., 2000. Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm. Qualitative Market

Research: An International Journal 3, 118–126. https://doi.org/10.1108/13522750010333861
Heinonen, K., Strandvik, T., 2009. Monitoring value-in-use of e-service. Journal of Service Management 20, 33–51. https://doi.org/10.1108/09564230910936841
Helkkula, A., Kelleher, C., Pihlström, M., 2012. Characterizing Value as an Experience: Implications for Service Researchers and Managers. Journal of Service Research 15, 59–75. https://doi.org/10.1177/1094670511426897
Herman, A., 2010. Connecting the Complex Lived Worlds of Fairtrade. Journal of Environmental Policy & Planning 12, 405–422. https://doi.org/10.1080/1523908X.2010.532939
Hess, J.S., Singh, J., Metcalf, L.E., Danes, J., 2014. The impact of consumer product package quality on consumption satisfaction, brand perceptions, consumer investment and behavior. Journal of Applied Packaging Research 6, 4.
Hesse-Biber, S.N., 2010. Mixed Methods Research: Merging Theory with Practice. Guilford Press, New York.
Hietanen, J., Andéhn, M., Bradshaw, A., 2018. Against the implicit politics of service-dominant logic. Marketing Theory 18, 101–119. https://doi.org/10.1177/1470593117692023
Higgins, E.T., Scholer, A.A., 2009. Engaging the consumer: The science and art of the value creation process. Journal of Consumer Psychology 19, 100–114. https://doi.org/10.1016/j.jcps.2009.02.002
Hilken, T., de Ruyter, K., Chylinski, M., Mahr, D., Keeling, D.I., 2017. Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance online service experiences. J. of the Acad. Mark. Sci. 45, 884–905. https://doi.org/10.1007/s11747-017-0541-x
Hill, K., 2012. How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did. Forbes.
Hirschman, E.C., Holbrook, M.B., 1982. Hedonic Consumption: Emerging Concepts, Methods and Propositions. Journal of Marketing 46, 92–101. https://doi.org/10.1177/002224298204600314
Hislop, J., Arber, S., Meadows, R., Venn, S., 2005. Narratives of the Night: The Use of Audio Diaries in Researching Sleep. Sociological Research Online 10, 13–25. https://doi.org/10.5153/sro.1194
Hoffman, G.D., 1984. Our competitor is our environment (Executive Report). Progressive Grocer.
Holbrook, M., Corfman, K., 1985. Quality and Value in the Consumption Experience: Phaedrus Rides Again, in: Perceived Quality: How Consumers View Stores and Merchandise. Lexington Books, Lexington, MA, pp. 31–57.
Holbrook, M.B., 1994. The Nature of Customer Value: An Axiology of Services in the Consumption Experience, in: Service Quality: New Directions in Theory and Practice. SAGE Publications, Inc., California, pp. 21–71. https://doi.org/10.4135/9781452229102.n2
Holbrook, M.B., 1987. What is Consumer Research? Journal of Consumer Research 14, 128–132.

Holbrook, M.B., Hirschman, E.C., 1982. The Experiential Aspects of Consumption: Consumer Fantasies, Feelings, and Fun. Journal of Consumer Research 9, 132–140. https://doi.org/10.1086/208906
Hollander, S.C., 1979. Is there a generic demand for services? MSU Business Topics 79, 41–46.
Hollebeek, L., 2011. Exploring customer brand engagement: definition and themes. Journal of Strategic Marketing 19, 555–573. https://doi.org/10.1080/0965254X.2011.599493
Hollebeek, L.D., Glynn, M.S., Brodie, R.J., 2014. Consumer Brand Engagement in Social Media: Conceptualization, Scale Development and Validation. Journal of Interactive Marketing 28, 149–165. https://doi.org/10.1016/j.intmar.2013.12.002
Hollebeek, L.D., Srivastava, R.K., Chen, T., 2019. SD logic–informed customer engagement: integrative framework, revised fundamental propositions, and application to CRM. Journal of the Academy of Marketing Science 47, 161–185.
Houghton, F., Houghton, S., 2018. An Appraisal of Thematic Analysis: Warts and All. AISHE-J 10, 3521–3525.
Howe, K.R., 1988. Against the Quantitative-Qualitative Incompatibility Thesis or Dogmas Die Hard. Educational Researcher 17, 10–16. https://doi.org/10.3102/0013189X017008010
Howitt, D., Cramer, D., 2007. Introduction to Research Methods in Psychology. Pearson Education, Essex.
Hoyer, W.D., Chandy, R., Dorotic, M., Krafft, M., Singh, S.S., 2010. Consumer Cocreation in New Product Development. Journal of Service Research 13, 283–296. https://doi.org/10.1177/1094670510375604
Huang, K., Sparto, P.J., Kiesler, S., Smailagic, A., Mankoff, J., Siewiorek, D., 2014. A technology probe of wearable in-home computer-assisted physical therapy, in: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '14. Association for Computing Machinery, New York, NY, USA, pp. 2541–2550. https://doi.org/10.1145/2556288.2557416
Huang, M.-H., Rust, R.T., 2018. Artificial intelligence in service. Journal of Service Research 21, 155–172.
Huang, T.-L., Hsu Liu, F., 2014. Formation of augmented-reality interactive technology's persuasive effects from the perspective of experiential value. Internet Research 24, 82–109. https://doi.org/10.1108/IntR-07-2012-0133
Hubert, M., Blut, M., Brock, C., Zhang, R.W., Koch, V., Riedl, R., 2019. The influence of acceptance and adoption drivers on smart home usage. European Journal of Marketing 53, 1073–1098. https://doi.org/10.1108/EJM-12-2016-0794
Hughes, D., 2009. European Food Marketing: Understanding Consumer Wants – The Starting Point in Adding Value to Basic Food Products La commercialisation des aliments en Europe : comprendre des désirs des consommateurs – point de départ pour ajouter de la valeur aux produits alimentaires de base Lebensmittelhandel in Europa: Das Verständnis der Kundenwünsche ist Voraussetzung für zusätzliche Wertschöpfung bei Grundnahrungsmitteln. EuroChoices 8, 06–13. https://doi.org/10.1111/j.1746-692X.2009.00139.x

Hunt, S.D., 1991. Modern Marketing Theory: Critical Issues in the Philosophy of Marketing Science. South Western Publishing, Cincinnati.
Husén, T., 1988. Research paradigms in education. Interchange 19, 2–13.
Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B.B., Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S., Evans, H., Hansen, H., Roussel, N., Eiderbäck, B., 2003. Technology probes: inspiring design for and with families, in: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '03. Association for Computing Machinery, New York, NY, USA, pp. 17–24. https://doi.org/10.1145/642611.642616
Hwangbo, H., Kim, Y.S., Cha, K.J., 2018. Recommendation system development for fashion retail e-commerce. Electronic Commerce Research and Applications 28, 94–101. https://doi.org/10.1016/j.elerap.2018.01.012
Inman, J.J., Nikolova, H., 2017. Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. Journal of Retailing, The Future of Retailing 93, 7–28. https://doi.org/10.1016/j.jretai.2016.12.006
Innovate UK Knowledge Transfer Network, 2018. The UK Packaging Industry - A Strategic Opportunity: A Landscape Review and Technology Roadmap Report. Innovate UK Knowledge Transfer Network.
Isaksson, O., Larsson, T.C., Rönnbäck, A.Ö., 2009. Development of product-service systems: challenges and opportunities for the manufacturing firm. Journal of Engineering Design 20, 329–348. https://doi.org/10.1080/09544820903152663
Islam, J.U., Rahman, Z., 2016. The transpiring journey of customer engagement research in marketing: A systematic review of the past decade. Management Decision 54, 2008–2034. https://doi.org/10.1108/MD-01-2016-0028
Jaakkola, E., Conduit, J., Fehrer, J., 2019. Tracking the Evolution of Engagement Research: Illustration of Midrange Theory in the Service-Dominant Paradigm, in: The SAGE Handbook of Service-Dominant Logic. SAGE Publications Ltd, London, pp. 580–598. https://doi.org/10.4135/9781526470355
Jacobsson, A., Boldt, M., Carlsson, B., 2016. A risk analysis of a smart home automation system. Future Generation Computer Systems 56, 719–733. https://doi.org/10.1016/j.future.2015.09.003
Järvi, H., Kähkönen, A.-K., Torvinen, H., 2018. When value co-creation fails: Reasons that lead to value co-destruction. Scandinavian Journal of Management 34, 63–77. https://doi.org/10.1016/j.scaman.2018.01.002
Jarvis, W., Halvorson, W., Sadeque, S., Johnston, S., 2014. A large class engagement (LCE) model based on service-dominant logic (SDL) and flipped classrooms. Education Research Perspectives 41, 1–24.
Javornik, A., 2016. 'It's an illusion, but it looks real!' Consumer affective, cognitive and behavioural responses to augmented reality applications. Journal of Marketing Management 32, 987–1011. https://doi.org/10.1080/0267257X.2016.1174726
Javornik, A., Mandelli, A., 2012. Behavioral perspectives of customer engagement: An exploratory study of customer engagement with three Swiss FMCG brands. Journal of Database Marketing & Customer Strategy Management 19, 300–310.

Joffe, H., 2012. Thematic Analysis, in: Qualitative Research Methods in Mental Health and Psychotherapy. John Wiley & Sons, Ltd, West Sussex, pp. 209–223. https://doi.org/10.1002/9781119973249.ch15
Jogulu, U.D., Pansiri, J., 2011. Mixed methods: a research design for management doctoral dissertations. Management Research Review 34, 687–701. https://doi.org/10.1108/01409171111136211
Johnson, J.L., Davenport, R., Mann, W.C., 2007. Consumer Feedback on Smart Home Applications. Topics in Geriatric Rehabilitation 23.
Johnson, R.B., Onwuegbuzie, A.J., 2004. Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher 33, 14–26. https://doi.org/10.3102/0013189X033007014
Juric, B., Smith, S.D., Wilks, G., 2016. Negative customer brand engagement, in: Customer Engagement: Contemporary Issues and Challenges. Routledge, Abingdon and New York, pp. 278–289.
Kantar, 2019. Brand Footprint: A Global Ranking of the Most Chosen Consumer Brands (No. 7), Brand Footprint. Kantar World Panel.
Keith, M.J., Thompson, S.C., Hale, J., Lowry, P.B., Greer, C., 2013. Information disclosure on mobile devices: Re-examining privacy calculus with actual user behavior. International Journal of Human-Computer Studies 71, 1163–1173. https://doi.org/10.1016/j.ijhcs.2013.08.016
Kerry, J., Butler, P., 2008. Smart Packaging Technologies for Fast Moving Consumer Goods. John Wiley & Sons, West Sussex, England.
Ketelsen, M., Janssen, M., Hamm, U., 2020. Consumers' response to environmentally-friendly food packaging - A systematic review. Journal of Cleaner Production 254, 120123. https://doi.org/10.1016/j.jclepro.2020.120123
Kim, C., Mirusmonov, M., Lee, I., 2010. An empirical examination of factors influencing the intention to use mobile payment. Computers in Human Behavior 26, 310–322. https://doi.org/10.1016/j.chb.2009.10.013
Kim, Y., 2021. Revitalization of Offline Fashion Stores: Exploring Strategies to Improve the Smart Retailing Experience by Applying Mobile Technology. Sustainability 13, 3434.
Kim, Y., Park, Y., Choi, J., 2017. A study on the adoption of IoT smart home service: using Value-based Adoption Model. Total Quality Management & Business Excellence 28, 1149–1165. https://doi.org/10.1080/14783363.2017.1310708
King, N., 2012. Doing Template Analysis, in: Qualitative Organizational Research: Core Methods and Current Challenges. SAGE, London.
King, N., 2004. Using Templates in the Thematic Analysis of Text, in: Essential Guide to Qualitative Methods in Organizational Research. SAGE Publications Ltd, London, pp. 256–270. https://doi.org/10.4135/9781446280119
King, N., Brooks, J., 2018. Thematic Analysis in Organisational Research, in: The SAGE Handbook of Qualitative Business and Management Research Methods: Methods and Challenges. SAGE Publications Ltd, 1 Oliver's Yard, 55 City Road London EC1Y 1SP, pp. 219–236. https://doi.org/10.4135/9781526430236.n14
Kirchberger, I., Coenen, M., Hierl, F.X., Dieterle, C., Seissler, J., Stucki, G., Cieza, A., 2009. Validation of the International Classification of Functioning, Disability

and Health (ICF) core set for diabetes mellitus from the patient perspective using focus groups. Diabetic Medicine 26, 700–707. https://doi.org/10.1111/j.1464-5491.2009.02762.x
Kitzinger, J., 1995. Qualitative Research: Introducing focus groups. BMJ 311, 299–302. https://doi.org/10.1136/bmj.311.7000.299
Kitzinger, J., 1994. The methodology of Focus Groups: the importance of interaction between research participants. Sociology of Health & Illness 16, 103–121. https://doi.org/10.1111/1467-9566.ep11347023
Kitzinger, J., Barbour, R., 1999. Developing Focus Group Research: Politics, Theory and Practice. SAGE, London.
Kohli, C., 1997. Branding consumer goods: insights from theory and practice. Journal of Consumer Marketing 14, 206–219. https://doi.org/10.1108/07363769710166792
Kotler, P., 1997. Marketing Management: Analysis, Planning, Implementation, and Control, 9th ed. Prentice Hall, Upper Saddle River, NJ.
Kotz, D., Avancha, S., Baxi, A., 2009. A privacy framework for mobile health and home-care systems, in: Proceedings of the First ACM Workshop on Security and Privacy in Medical and Home-Care Systems, SPIMACS '09. Association for Computing Machinery, New York, NY, USA, pp. 1–12. https://doi.org/10.1145/1655084.1655086
Krueger, R.A., Casey, M.A., 2014. Focus Groups: A Practical Guide for Applied Research. SAGE Publications, Thousand Oaks, CA.
Kryvinska, N., Olexova, R., Dohmen, P., Strauss, C., 2013. The S-D logic phenomenon-conceptualization and systematization by reviewing the literature of a decade(2004–2013). J Serv Sci Res 5, 35–94. https://doi.org/10.1007/s12927-013-0002-0
Kuhn, T.S., 1962. The Structure of Scientific Revolutions. University of Chicago Press, Chicago.
Kumar, V., Dixit, A., Javalgi, R. (Raj) G., Dass, M., 2016. Research framework, strategies, and applications of intelligent agent technologies (IATs) in marketing. J. of the Acad. Mark. Sci. 44, 24–45. https://doi.org/10.1007/s11747-015-0426-9
Lapadat, J.C., Lindsay, A.C., 1999. Transcription in Research and Practice: From Standardization of Technique to Interpretive Positionings. Qualitative Inquiry 5, 64–86. https://doi.org/10.1177/107780049900500104
Laurent, G., Kapferer, J.-N., 1985. Measuring Consumer Involvement Profiles. Journal of Marketing Research 22, 41–53. https://doi.org/10.2307/3151549
Leahy, R., 2011. Relationships in fast moving consumer goods markets. European Journal of Marketing 45, 651–672. https://doi.org/10.1108/03090561111111370
Leeuw, R.A. de, Logger, D.N., Westerman, M., Bretschneider, J., Plomp, M., Scheele, F., 2019. Influencing factors in the implementation of postgraduate medical e-learning: a thematic analysis. BMC Medical Education 19, 300. https://doi.org/10.1186/s12909-019-1720-x
Levy, S.J., 1979. Focus group interviewing, in: Focus Group Interviews: A Reader. American Marketing Association, Chicago, pp. 34–42.

Li, R.Y.M., Li, H., Mak, C., Tang, T., 2016. Sustainable Smart Home and Home Automation: Big Data Analytics Approach (SSRN Scholarly Paper No. ID 2834497). Social Science Research Network, Rochester, NY.
Liébana-Cabanillas, F., Ramos-de-Luna, I., Montoro-Ríos, F., 2017. Intention to use new mobile payment systems: a comparative analysis of SMS and NFC payments. Economic Research-Ekonomska Istraživanja 30, 892–910. https://doi.org/10.1080/1331677X.2017.1305784
Lincoln, Y.S., Guba, E.G., 1985. Naturalistic Inquiry. SAGE, Newbury Park, California.
Lincoln, Y.S., Lynham, S.A., Guba, E.G., 2011. Paradigmatic Controversies, Contradictions, and Emerging Confluences, Revisited, in: The SAGE Handbook of Qualitative Research. SAGE, Thousand Oaks, California, pp. 97–128.
Litosseliti, L., 2003. Using Focus Groups in Research. A&C Black, London.
Liu, Y., Li, H., Carlsson, C., 2010. Factors driving the adoption of m-learning: An empirical study. Computers & Education 55, 1211–1219. https://doi.org/10.1016/j.compedu.2010.05.018
Luis Méndez, J., Oubiña, J., Rubio, N., 2011. The relative importance of brand-packaging, price and taste in affecting brand preferences. British Food Journal 113, 1229–1251. https://doi.org/10.1108/00070701111177665
Lusch, R.F., Vargo, S.L., 2014. Service-dominant logic: Premises, perspectives, possibilities. Cambridge University Press, New York.
Lusch, R.F., Vargo, S.L., 2011. Service-dominant logic: a necessary step. European Journal of Marketing 45, 1298–1309. https://doi.org/10.1108/03090561111137723
Lydekaityte, J., 2019. Smart Interactive Packaging as a Cyber-Physical Agent in the Interaction Design Theory: A Novel User Interface, in: Lamas, D., Loizides, F., Nacke, L., Petrie, H., Winckler, M., Zaphiris, P. (Eds.), Human-Computer Interaction – INTERACT 2019, Lecture Notes in Computer Science. Springer International Publishing, Cham, pp. 687–695. https://doi.org/10.1007/978-3-030-29381-9_41
Lydekaityte, J., Tambo, T., 2018. Business perspectives of smart interactive packaging: digital transformation of brand's consumer engagement, in: Proceedings of the 8th International Conference on the Internet of Things, IOT '18. Association for Computing Machinery, New York, NY, USA, pp. 1–4. https://doi.org/10.1145/3277593.3277636
Maanen, J.V., 1998. Qualitative Studies of Organizations. SAGE, Thousand Oaks, CA.
Mackenzie, N., Knipe, S., 2006. Research dilemmas: Paradigms, methods and methodology. Issues in educational research 16, 193–205.
Magnier, L., Schoormans, J., Mugge, R., 2016. Judging a product by its cover: Packaging sustainability and perceptions of quality in food products. Food Quality and Preference 53, 132–142. https://doi.org/10.1016/j.foodqual.2016.06.006
Maguire, J.S., 2010. Provenance and the liminality of production and consumption: The case of wine promoters. Marketing Theory 10, 269–282. https://doi.org/10.1177/1470593110373190
Maguire, M., Delahunt, B., 2017. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. AISHE-J 9.

Mahalik, N.P., Nambiar, A.N., 2010. Trends in food packaging and manufacturing systems and technology. Trends in Food Science & Technology 21, 117–128. https://doi.org/10.1016/j.tifs.2009.12.006
Maleki, S., Aghdaie, S.F.A., Shahin, A., Ansari, A., 2020. Investigating the relationship among the Kansei-based design of chocolate packaging, consumer perception, and willingness to buy. Journal of Marketing Communications 26, 836–855. https://doi.org/10.1080/13527266.2019.1590855
Malhotra, N.K., 2019. Marketing Research: An Applied Orientation, 7th ed. Pearson, Harlow.
Mani, Z., Chouk, I., 2019. Impact of privacy concerns on resistance to smart services: does the 'Big Brother effect' matter? Journal of Marketing Management 35, 1460–1479. https://doi.org/10.1080/0267257X.2019.1667856
Mani, Z., Chouk, I., 2017. Drivers of consumers' resistance to smart products. Journal of Marketing Management 33, 76–97. https://doi.org/10.1080/0267257X.2016.1245212
Marikyan, D., Papagiannidis, S., Alamanos, E., 2019. A systematic review of the smart home literature: A user perspective. Technological Forecasting and Social Change 138, 139–154. https://doi.org/10.1016/j.techfore.2018.08.015
MarketingCharts, 2008. Youth No Longer Defined by Chronological Age; Consumers Stay Younger Longer [WWW Document]. MarketingCharts. URL http://www.marketingcharts.com/traditional/youth-no-longer-defined-by-chronological-age-35-is-new-18-6530/ (accessed 3.2.17).
Marlow, N., Jansson-Boyd, C.V., 2011. To touch or not to touch; that is the question. Should consumers always be encouraged to touch products, and does it always alter product perception? Psychology & Marketing 28, 256–266. https://doi.org/10.1002/mar.20391
Martin, K.D., Kim, J.J., Palmatier, R.W., Steinhoff, L., Stewart, D.W., Walker, B.A., Wang, Y., Weaven, S.K., 2020. Data Privacy in Retail. Journal of Retailing 96, 474–489. https://doi.org/10.1016/j.jretai.2020.08.003
Maslowska, E., Malthouse, E.C., Collinger, T., 2016. The customer engagement ecosystem. Journal of Marketing Management 32, 469–501. https://doi.org/10.1080/0267257X.2015.1134628
Mauroner, O., Le, L., Best, S., 2016. Augmented Reality in Advertising and Brand Communication: An Experimental Study. International Journal of Information and Communication Engineering 10, 422–425.
Mauthner, N.S., Doucet, A., 2003. Reflexive Accounts and Accounts of Reflexivity in Qualitative Data Analysis. Sociology 37, 413–431. https://doi.org/10.1177/00380385030373002
May, T., Williams, M., 2002. An Introduction To The Philosophy Of Social Research. Routledge, Abingdon.
McColl-Kennedy, J.R., Hogan, S.J., Witell, L., Snyder, H., 2017. Cocreative customer practices: Effects of health care customer value cocreation practices on well-being. Journal of Business Research 70, 55–66. https://doi.org/10.1016/j.jbusres.2016.07.006
McCreanor, T., Lyons, A., Griffin, C., Goodwin, I., Barnes, H.M., Hutton, F., 2013. Youth drinking cultures, social networking and alcohol marketing:

implications for public health. Critical Public Health 23, 110–120. https://doi.org/10.1080/09581596.2012.748883
McKenna, E., Richardson, I., Thomson, M., 2012. Smart meter data: Balancing consumer privacy concerns with legitimate applications. Energy Policy, Modeling Transport (Energy) Demand and Policies 41, 807–814. https://doi.org/10.1016/j.enpol.2011.11.049
McNeal, J.U., Ji, M.F., 2003. Children's visual memory of packaging. Journal of Consumer Marketing 20, 400–427. https://doi.org/10.1108/07363760310489652
Merriam, S.B., 1988. Case Study Research in Education: A Qualitative Approach. Jossey-Bass Inc, San Francisco, CA.
Mertens, D.M., 2005. Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative, and Mixed Methods, 2nd ed. SAGE Publications, Inc., Thousand Oaks, California.
Merton, R.K., 1975. Thematic Analysis in Science: Notes on Holton's Concept. Science 188, 335–338. https://doi.org/10.1126/science.188.4186.335
Merton, R.K., Kendall, P.L., 1946. The Focused Interview. American Journal of Sociology 51, 541–557.
Merz, M.A., He, Y., Vargo, S.L., 2009. The evolving brand logic: a service-dominant logic perspective. J. of the Acad. Mark. Sci. 37, 328–344. https://doi.org/10.1007/s11747-009-0143-3
Merz, M.A., Zarantonello, L., Grappi, S., 2018. How valuable are your customers in the brand value co-creation process? The development of a Customer Co-Creation Value (CCCV) scale. Journal of Business Research 82, 79–89. https://doi.org/10.1016/j.jbusres.2017.08.018
Miles, M.B., Huberman, A.M., Saldana, J., 2018. Qualitative Data Analysis: A Methods Sourcebook. SAGE Publications, Thousand Oaks, CA.
Milne, G.R., Bahl, S., 2010. Are There Differences Between Consumers' and Marketers' Privacy Expectations? A Segment- and Technology-Level Analysis. Journal of Public Policy & Marketing 29, 138–149.
Milne, G.R., Pettinico, G., Hajjat, F.M., Markos, E., 2017. Information Sensitivity Typology: Mapping the Degree and Type of Risk Consumers Perceive in Personal Data Sharing. Journal of Consumer Affairs 51, 133–161. https://doi.org/10.1111/joca.12111
Mindshare, 2016. Everyday Connects: Pack to the Future. Mindshare.
Mitchell, V., 1999. Consumer perceived risk: conceptualisations and models. European Journal of Marketing 33, 163–195. https://doi.org/10.1108/03090569910249229
Mollen, A., Wilson, H., 2010. Engagement, telepresence and interactivity in online consumer experience: Reconciling scholastic and managerial perspectives. Journal of Business Research, Advances in Internet Consumer Behavior& Marketing Strategy 63, 919–925. https://doi.org/10.1016/j.jbusres.2009.05.014
Montgomery, A., 2016. UK aims to become "world leader" in smart packaging [WWW Document]. Design Week. URL https://www.designweek.co.uk/issues/28-march-3-april-2016/uk-aims-to-become-world-leader-in-smart-packaging/ (accessed 10.8.19).

Morgan, D.L., 1996a. Focus Groups. Annual Review of Sociology 22, 129–152.
Morgan, D.L., 1996b. Focus Groups as Qualitative Research. SAGE Publications, Thousand Oaks, CA.
Morgan, D.L., 1993. Successful Focus Groups: Advancing the State of the Art. SAGE Publications, Newbury Park, California.
Morgan, D.L., 1989. Adjusting to Widowhood: Do Social Networks Really Make It Easier? Gerontologist 29, 101–107. https://doi.org/10.1093/geront/29.1.101
Morgan, D.L., Krueger, R.A., 1993. When to Use Focus Groups and Why, in: Successful Focus Groups: Advancing the State of the Art. SAGE Publications, Inc., Thousand Oaks, California, pp. 3–19. https://doi.org/10.4135/9781483349008.n1
Morgan, D.L., Spanish, M.T., 1984. Focus groups: A new tool for qualitative research. Qual Sociol 7, 253–270. https://doi.org/10.1007/BF00987314
Morgan, M.G., Fischhoff, B., Bostrom, A., Atman, C.J., 2002. Risk Communication: A Mental Models Approach. Cambridge University Press, Cambridge.
Mortier, R., Zhao, J., Crowcroft, J., Wang, L., Li, Q., Haddadi, H., Amar, Y., Crabtree, A., Colley, J., Lodge, T., Brown, T., McAuley, D., Greenhalgh, C., 2016. Personal Data Management with the Databox: What's Inside the Box?, in: Proceedings of the 2016 ACM Workshop on Cloud-Assisted Networking, CAN '16. Association for Computing Machinery, New York, NY, USA, pp. 49–54. https://doi.org/10.1145/3010079.3010082
Munezero, M., Montero, C.S., Sutinen, E., Pajunen, J., 2014. Are They Different? Affect, Feeling, Emotion, Sentiment, and Opinion Detection in Text. IEEE Transactions on Affective Computing 5, 101–111. https://doi.org/10.1109/TAFFC.2014.2317187
Nagel, T., 1989. The View From Nowhere. Oxford University Press, New York.
Namey, E., Guest, G., Thairu, L., Johnson, L., 2008. Data reduction techniques for large qualitative data sets, in: Handbook for Team-Based Qualitative Research. pp. 137–161.
Naumann, K., Bowden, J., Gabbott, M., 2020. Expanding customer engagement: the role of negative engagement, dual valences and contexts. European Journal of Marketing 54, 1469–1499. https://doi.org/10.1108/EJM-07-2017-0464
Neff, J., 2007. OMD proves the power of engagement. Advertising Age 78, 3–4.
Neuman, W.L., 2013. The Meanings of Methodology, in: Social Research Methods: Qualitative and Quantitative Approaches. Pearson Education Limited, Essex, England, pp. 91–124.
NFC Forum, 2015. NFC Technology: How Changing Consumer Preferences Create New Opportunities for Retailers. NFC Forum.
Nguyen, H.V., Nguyen, C.H., Hoang, T.T.B., 2019. Green consumption: Closing the intention-behavior gap. Sustainable Development 27, 118–129. https://doi.org/10.1002/sd.1875
Nielsen, J., 1997. The use and misuse of focus groups. IEEE Software 14, 94–95. https://doi.org/10.1109/52.566434
Norberg, P.A., Horne, D.R., Horne, D.A., 2007. The Privacy Paradox: Personal Information Disclosure Intentions versus Behaviors. Journal of Consumer Affairs 41, 100–126. https://doi.org/10.1111/j.1745-6606.2006.00070.x

Norman, W., MacDonald, C., 2004. Getting to the Bottom of “Triple Bottom Line.” Business Ethics Quarterly 14, 243–262.
Normann, R., Ramirez, R., 1993. From value chain to value constellation: Designing interactive strategy. Harvard business review 71, 65–77.
O’Brien, S., Mueller, F. “Floyd,” 2006. Holding hands over a distance: technology probes in an intimate, mobile context, in: Proceedings of the 18th Australia Conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments, OZCHI ’06. Association for Computing Machinery, New York, NY, USA, pp. 293–296. https://doi.org/10.1145/1228175.1228226
O’Leary, Z., 2004. The Essential Guide to Doing Research. SAGE Publications, Thousand Oaks, CA.
Olexova, R., Kubickova, V., 2014. The evolution of the S-D logic approach and its impact on service science. J Serv Sci Res 6, 99–124. https://doi.org/10.1007/s12927-014-0004-6
Oliver, R.L., 2014. Satisfaction: A Behavioral Perspective on the Consumer : A Behavioral Perspective on the Consumer. Routledge, New York. https://doi.org/10.4324/9781315700892
Orth, U.R., Malkewitz, K., 2008. Holistic Package Design and Consumer Brand Impressions. Journal of Marketing 72, 64–81. https://doi.org/10.1509/JMKG.72.3.064
O’Shaughnessy, J., O’Shaughnessy, N.J., 2011. Service-dominant logic: a rejoinder to Lusch and Vargo’s reply. European Journal of Marketing 45, 1310–1318. https://doi.org/10.1108/03090561111137732
O’Shaughnessy, J., O’Shaughnessy, N.J., 2009. The service-dominant perspective: a backward step? European Journal of Marketing 43, 784–793. https://doi.org/10.1108/03090560910947043
Overby, J.W., Lee, E.-J., 2006. The effects of utilitarian and hedonic online shopping value on consumer preference and intentions. Journal of Business Research 59, 1160–1166. https://doi.org/10.1016/j.jbusres.2006.03.008
Ozok, A.A., Fan, Q., Norcio, A.F., 2010. Design guidelines for effective recommender system interfaces based on a usability criteria conceptual model: results from a college student population. Behaviour & Information Technology 29, 57–83. https://doi.org/10.1080/01449290903004012
Paetz, A.-G., Dütschke, E., Fichtner, W., 2012. Smart Homes as a Means to Sustainable Energy Consumption: A Study of Consumer Perceptions. J Consum Policy 35, 23–41. https://doi.org/10.1007/s10603-011-9177-2
Pansari, A., Kumar, V., 2017. Customer engagement: the construct, antecedents, and consequences. Journal of the Academy of Marketing Science 45, 294–311.
Pantano, E., Timmermans, H., 2014. What is Smart for Retailing? Procedia Environmental Sciences, 12th International Conference on Design and Decision Support Systems in Architecture and Urban Planning, DDSS 2014 22, 101–107. https://doi.org/10.1016/j.proenv.2014.11.010
Papachristos, E., Merritt, T.R., Jacobsen, T., Bagger, J., 2020. Designing Ambient Multisensory Notification Devices: Managing Disruptions in the Home, in: 19th International Conference on Mobile and Ubiquitous Multimedia, MUM 2020. Association for Computing Machinery, New York, NY, USA, pp. 59–70. https://doi.org/10.1145/3428361.3428400

Parasuraman, A., Zeithaml, V.A., Berry, L.L., 1988. Servqual: A Multiple-Item Scale For Measuring Consumer Perc. Journal of Retailing 64, 12.
Park, C.W., Jaworski, B.J., MacInnis, D.J., 1986. Strategic Brand Concept-Image Management. Journal of Marketing 50, 135–145. https://doi.org/10.1177/002224298605000401
Park, D.-H., Lee, J., Han, I., 2007. The Effect of On-Line Consumer Reviews on Consumer Purchasing Intention: The Moderating Role of Involvement. International Journal of Electronic Commerce 11, 125–148. https://doi.org/10.2753/JEC1086-4415110405
Parkhe, A., 1993. "Messy" Research, Methodological Predispositions, and Theory Development in International Joint Ventures. The Academy of Management Review 18, 227–268. https://doi.org/10.2307/258759
Pathak, B., Garfinkel, R., Gopal, R.D., Venkatesan, R., Yin, F., 2010. Empirical Analysis of the Impact of Recommender Systems on Sales. Journal of Management Information Systems 27, 159–188. https://doi.org/10.2753/MIS0742-1222270205
Patterson, P., Yu, T., De Ruyter, K., 2006. Understanding Customer Engagement in Services, in: Advancing Theory, Maintaining Relevance, Proceedings of ANZMAC 2006 Conference. Presented at the ANZMAC 2006, Queensland University of Technology, School of Advertising, Marketing and Public Relations, Brisbane, Queensland, pp. 4–6.
Patton, M.Q., 2005. Qualitative Research, in: Everitt, B.S., Howell, D.C. (Eds.), Encyclopedia of Statistics in Behavioral Science. John Wiley & Sons. https://doi.org/10.1002/0470013192.bsa514
Patton, M.Q., 2002. Two decades of developments in qualitative inquiry: A personal, experiential perspective. Qualitative Social Work 1, 261–283.
Pawson, R., Tilley, N., 1997. Realistic Evaluation. SAGE, London.
Payne, A.F., Storbacka, K., Frow, P., 2008. Managing the co-creation of value. J. of the Acad. Mark. Sci. 36, 83–96. https://doi.org/10.1007/s11747-007-0070-0
Payne, M.S., 1976. Preparing For Group Interviews, in: NA - Advances in Consumer Research Volume 3. Association for Consumer Research, Cincinnati, OH, pp. 434–436.
Pels, J., Mele, C., 2019. Developing Midrange Theory for Emergin Markets: A Service-Dominant Logic Perspective, in: The SAGE Handbook of Service-Dominant Logic. Sage Publications Ltd, London, pp. 599–618.
Peñaloza, L., Venkatesh, A., 2006. Further evolving the new dominant logic of marketing: from services to the social construction of markets. Marketing Theory 6, 299–316. https://doi.org/10.1177/1470593106066789
Penrose, E., 1995. The Theory of the Growth of the Firm, 3rd ed. Oxford University Press, Oxford. https://doi.org/10.1093/0198289774.001.0001
Perera, C., Wakenshaw, S.Y.L., Baarslag, T., Haddadi, H., Bandara, A.K., Mortier, R., Crabtree, A., Ng, I.C.L., McAuley, D., Crowcroft, J., 2017. Valorising the IoT Databox: creating value for everyone. Transactions on Emerging Telecommunications Technologies 28, e3125. https://doi.org/10.1002/ett.3125
Perry, C., Riege, A., Brown, L., 1999. Realism's role among scientific paradigms in marketing research. Irish Marketing Review 12, 16–23.

Pham, T.-T.T., Ho, J.C., 2015. The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments. Technology in Society 43, 159–172. https://doi.org/10.1016/j.techsoc.2015.05.004

Phelps, J., Nowak, G., Ferrell, E., 2000. Privacy Concerns and Consumer Willingness to Provide Personal Information. Journal of Public Policy & Marketing 19, 27–41. https://doi.org/10.1509/jppm.19.1.27.16941

Pildtich, J., 1972. The Silent Salesman. Business Books Ltd, London.

Plé, L., Cáceres, R.C., 2010. Not always co-creation: introducing interactional co-destruction of value in service-dominant logic. Journal of Services Marketing 24, 430–437. https://doi.org/10.1108/08876041011072546

Pohlmann, A., Kaartemo, V., 2017. Research trajectories of Service-Dominant Logic: Emergent themes of a unifying paradigm in business and management. Industrial Marketing Management 63, 53–68. https://doi.org/10.1016/j.indmarman.2017.01.001

Polasik, M., Górka, J., Wilczewski, G., Kunkowski, J., Przenajkowska, K., Tetkowska, N., 2013. Time Efficiency of Point-of-Sale Payment Methods: Empirical Results for Cash, Cards and Mobile Payments, in: Cordeiro, J., Maciaszek, L.A., Filipe, J. (Eds.), Enterprise Information Systems, Lecture Notes in Business Information Processing. Springer, Berlin, Heidelberg, pp. 306–320. https://doi.org/10.1007/978-3-642-40654-6_19

Polit, D.F., Polit-O'Hara, D., Beck, C.T., 2006. Essentials of Nursing Research: Methods, Appraisal, and Utilization. Lippincott Williams & Wilkins, Philadelphia.

Poushneh, A., Vasquez-Parraga, A.Z., 2017. Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy. Journal of Retailing and Consumer Services 34, 229–234. https://doi.org/10.1016/j.jretconser.2016.10.005

Powell, R.A., Single, H.M., 1996. Focus Groups. International Journal for Quality in Health Care 8, 499–504. https://doi.org/10.1093/intqhc/8.5.499

Prahalad, C.K., Hamel, G., 1990. The Core Competence of the Corporation. Harvard Business Review 68, 79–91.

Prahalad, C.K., Ramaswamy, V., 2004. Co-creation experiences: The next practice in value creation. Journal of Interactive Marketing 18, 5–14. https://doi.org/10.1002/dir.20015

Priporas, C.-V., Stylos, N., Fotiadis, A.K., 2017. Generation Z consumers' expectations of interactions in smart retailing: A future agenda. Computers in Human Behavior 77, 374–381. https://doi.org/10.1016/j.chb.2017.01.058

Quinn, J.B., Doorley, T.L., Paquette, P.C., 1990. Beyond products: services-based strategy. Harvard business review 68, 58–60.

Raber, F., Ziemann, D., Krueger, A., Weir, C., Mazurek, M., 2018. The "Retailio" privacy wizard: assisting users with privacy settings for intelligent retail stores, in: EuroUSEC '18: 3rd European Workshop on Usable Security. Presented at the IEEE Conference on Security & Privacy, IEEE, London.

Ram, S., Jung, H.-S., 1994. Innovativeness in product usage: A comparison of early adopters and early majority. Psychology & Marketing 11, 57–67. https://doi.org/10.1002/mar.4220110107

Ram, S., Jung, H.-S., 1989. The Link Between Involvement, Use Innovativeness and Product Usage, in: NA - Advances in Consumer Research Volume 16. Presented at the NA - Advances in Consumer Research, Association for Consumer Research, Provo, UT, pp. 160–166.

Ramos-de-Luna, I., Montoro-Ríos, F., Liébana-Cabanillas, F., 2016. Determinants of the intention to use NFC technology as a payment system: an acceptance model approach. Inf Syst E-Bus Manage 14, 293–314. https://doi.org/10.1007/s10257-015-0284-5

Ramos-de-Luna, I., Montoro-Ríos, F., Liébana-Cabanillas, F., de Luna, J.G., 2017. NFC technology acceptance for mobile payments: A Brazilian Perspective. Revista brasileira de gestão de negócios 19, 82.

Ramos-de-Luna, I., Montoro-Ríos, F., Sánchez-Fernández, J., Muñoz-Leiva, F., 2019. Mobile payment is not all the same: The adoption of mobile payment systems depending on the technology applied. Technological Forecasting and Social Change 146, 931–944. https://doi.org/10.1016/j.techfore.2018.09.018

Ranjan, K.R., Read, S., 2016. Value co-creation: concept and measurement. J. of the Acad. Mark. Sci. 44, 290–315. https://doi.org/10.1007/s11747-014-0397-2

Rathmell, J.M., 1966. What is Meant by Services? Journal of Marketing 30, 32–36. https://doi.org/10.1177/002224296603000407

Rauschnabel, P.A., Felix, R., Hinsch, C., 2019. Augmented reality marketing: How mobile AR-apps can improve brands through inspiration. Journal of Retailing and Consumer Services 49, 43–53. https://doi.org/10.1016/j.jretconser.2019.03.004

Rayome, A.D., 2018. How Sephora is leveraging AR and AI to transform retail and help customers buy cosmetics [WWW Document]. TechRepublic. URL https://www.techrepublic.com/article/how-sephora-is-leveraging-ar-and-ai-to-transform-retail-and-help-customers-buy-cosmetics/ (accessed 11.26.20).

Redfern, S., Norman, I., 1994. Validity through triangulation. Nurse Researcher 2, 41–56.

Rehman, M., Dean, A.M., Pires, G.D., 2012. A research framework for examining customer participation in value co-creation: Applying the service dominant logic to the provision of living support services to oncology day-care patients. International Journal of Behavioural and Healthcare Research 3, 226–243.

Reid, J., Rout, M., 2016. Getting to know your food: the insights of indigenous thinking in food provenance. Agric Hum Values 33, 427–438. https://doi.org/10.1007/s10460-015-9617-8

Rese, A., Baier, D., Geyer-Schulz, A., Schreiber, S., 2017. How augmented reality apps are accepted by consumers: A comparative analysis using scales and opinions. Technological Forecasting and Social Change 124, 306–319. https://doi.org/10.1016/j.techfore.2016.10.010

Rettie, R., Brewer, C., 2000. The verbal and visual components of package design. Journal of Product & Brand Management 9, 56–70. https://doi.org/10.1108/10610420010316339

Ridout, B., Campbell, A., Ellis, L., 2012. 'Off your Face(book)': Alcohol in online social identity construction and its relation to problem drinking in university students. Drug and Alcohol Review 31, 20–26. https://doi.org/10.1111/j.1465-3362.2010.00277.x

Riek, L.D., 2012. Wizard of Oz studies in HRI: a systematic review and new reporting guidelines. J. Hum.-Robot Interact. 1, 119–136. https://doi.org/10.5898/JHRI.1.1.Riek
Riessman, C.K., 1993. Narrative Analysis. SAGE, Newbury Park, California.
Rifkin, J., 2001. The Age of Access: The New Culture of Hypercapitalism, Where All of Life is a Paid-For Experience. Penguin.
Rijsdijk, S.A., Hultink, E.J., 2003. "Honey, Have You Seen Our Hamster?" Consumer Evaluations of Autonomous Domestic Products. Journal of Product Innovation Management 20, 204–216. https://doi.org/10.1111/1540-5885.2003003
Risjord, M.W., Dunbar, S.B., Moloney, M.F., 2002. A new foundation for methodological triangulation. J Nurs Scholarsh 34, 269–275. https://doi.org/10.1111/j.1547-5069.2002.00269.x
Ritchie, J., Lewis, J., Lewis, P. of S.P.J., Nicholls, C.M., Ormston, R., 2013. Qualitative Research Practice: A Guide for Social Science Students and Researchers, 2nd ed. SAGE, London.
Roberts, D., Baker, S., Walker, D., 2005. Can We Learn Together?: Co-Creating with Consumers. International Journal of Market Research 47, 405–426. https://doi.org/10.1177/147078530504700401
Robson, C., 1993. Real World Research, 1st ed. Blackwell, Massachusetts.
Rocco, T.S., Bliss, L.A., Gallagher, S., Perez-Prado, A., 2003. Taking the next step: Mixed Methods Research in Organizational Systems. Information Technology, Learning, and Performance Journal 21, 19–28.
Rokka, J., Uusitalo, L., 2008. Preference for green packaging in consumer product choices – Do consumers care? International Journal of Consumer Studies 32, 516–525. https://doi.org/10.1111/j.1470-6431.2008.00710.x
Rosenquist, J.N., Murabito, J., Fowler, J.H., Christakis, N.A., 2010. The Spread of Alcohol Consumption Behavior in a Large Social Network. Ann Intern Med 152, 426–433. https://doi.org/10.7326/0003-4819-152-7-201004060-00007
Rothman, A.J., Salovey, P., Antone, C., Keough, K., Martin, C.D., 1993. The Influence of Message Framing on Intentions to Perform Health Behaviors. Journal of Experimental Social Psychology 29, 408–433. https://doi.org/10.1006/jesp.1993.1019
Rowley, J., 2012. Conducting research interviews. Management Research Review 35, 260–271. https://doi.org/10.1108/01409171211210154
Roy, S.K., Balaji, M.S., Sadeque, S., Nguyen, B., Melewar, T.C., 2017. Constituents and consequences of smart customer experience in retailing. Technological Forecasting and Social Change 124, 257–270. https://doi.org/10.1016/j.techfore.2016.09.022
Rubin, B.F., 2019. Amazon stops selling Dash buttons, goofy forerunners of the connected home [WWW Document]. CNET. URL https://www.cnet.com/news/amazon-stops-selling-dash-buttons-goofy-forerunners-of-connected-home/ (accessed 9.29.19).
Rundh, B., 2013. Linking packaging to marketing: how packaging is influencing the marketing strategy. British Food Journal 115, 1547–1563. https://doi.org/10.1108/BFJ-12-2011-0297

Rundh, B., 2005. The multi-faceted dimension of packaging: Marketing logistic or marketing tool? British Food Journal 107, 670–684. https://doi.org/10.1108/00070700510615053
Rust, R.T., Huang, M.-H., 2014. The service revolution and the transformation of marketing science. Marketing Science 33, 206–221.
Ryynänen, T., Rusko, E., 2015. Professionals' View of Consumers' Packaging Interactions – A Narrative Analysis. Packaging Technology and Science 28, 341–355. https://doi.org/10.1002/pts.2107
Said, G.R.E., 2017. Understanding How Learners Use Massive Open Online Courses and Why They Drop Out: Thematic Analysis of an Interview Study in a Developing Country. Journal of Educational Computing Research 55, 724–752. https://doi.org/10.1177/0735633116681302
Saldana, J., 2015. The Coding Manual for Qualitative Researchers. SAGE, London.
Salehi, K., Golafshani, N., 2010. Using mixed methods in research studies: An opportunity with its challenges. International Journal of Multiple Research Approaches 4, 186–191. https://doi.org/10.5172/mra.2010.4.3.186
Samson, A., 2010. Product Usage and Firm-Generated Word of Mouth: Some Results from FMCG Product Trials. International Journal of Market Research 52, 459–482. https://doi.org/10.2501/S1470785309201405
Sánchez-Fernández, R., Iniesta-Bonillo, M.Á., 2007. The concept of perceived value: a systematic review of the research. Marketing Theory 7, 427–451. https://doi.org/10.1177/1470593107083165
Sandström, S., Edvardsson, B., Kristensson, P., Magnusson, P., 2008. Value in use through service experience. Managing Service Quality: An International Journal 18, 112–126. https://doi.org/10.1108/09604520810859184
Sara, R., 1990. Packaging as a Retail Marketing Tool. International Journal of Physical Distribution & Logistics Management 20, 29–30. https://doi.org/10.1108/EUM0000000000372
Savolainen, R., 2007. Filtering and withdrawing: strategies for coping with information overload in everyday contexts. Journal of Information Science 33, 611–621. https://doi.org/10.1177/0165551506077418
Sawyer, A.G., Dickson, P.R., 1984. Psychological perspectives on consumer response to sales promotion, in: Research on Sales Promotion: Collected Papers. Marketing Science Institute, Cambridge, MA.
Schafer, R., 2013. What's new in packaging. Snack Food & Wholesale Bakery 102, 54–59.
Schau, H.J., Muñiz, A.M., Arnould, E.J., 2009. How Brand Community Practices Create Value. Journal of Marketing 73, 30–51. https://doi.org/10.1509/jmkg.73.5.30
Schechter, L., 1984. A normative conception of value (Executive Report). Progressive Grocer.
Schembri, S., 2006. Rationalizing service logic, or understanding services as experience? Marketing Theory 6, 381–392. https://doi.org/10.1177/1470593106066798
Schifferdecker, K.E., Reed, V.A., 2009. Using mixed methods research in medical education: basic guidelines for researchers. Med Educ 43, 637–644. https://doi.org/10.1111/j.1365-2923.2009.03386.x

Schivinski, B., Christodoulides, G., Dabrowski, D., 2016. Measuring Consumers' Engagement With Brand-Related Social-Media Content: Development and Validation of a Scale that Identifies Levels of Social-Media Engagement with Brands. Journal of Advertising Research 56, 64–80. https://doi.org/10.2501/JAR-2016-004

Scholz, J., Duffy, K., 2018. We ARe at home: How augmented reality reshapes mobile marketing and consumer-brand relationships. Journal of Retailing and Consumer Services 44, 11–23. https://doi.org/10.1016/j.jretconser.2018.05.004

Schrag, F., 1992. In Defense of Positivist Research Paradigms. Educational Researcher 21, 5–8. https://doi.org/10.3102/0013189X021005005

Sedley, R., 2010. 4th Annual Online Customer Engagement Survey Report 2010.

Sehrawet, M., Kundu, S.C., 2007. Buying behaviour of rural and urban consumers in India: the impact of packaging. International Journal of Consumer Studies 31, 630–638. https://doi.org/10.1111/j.1470-6431.2007.00629.x

Seltzer, E., Goldshear, J., Guntuku, S.C., Grande, D., Asch, D.A., Klinger, E.V., Merchant, R.M., 2019. Patients' willingness to share digital health and non-health data for research: a cross-sectional study. BMC Medical Informatics and Decision Making 19, 157. https://doi.org/10.1186/s12911-019-0886-9

Sheth, J.N., Newman, B.I., Gross, B.L., 1991. Why we buy what we buy: A theory of consumption values. Journal of Business Research 22, 159–170. https://doi.org/10.1016/0148-2963(91)90050-8

Sheth, J.N., Uslay, C., 2007. Implications of the Revised Definition of Marketing: From Exchange to Value Creation. Journal of Public Policy & Marketing 26, 302–307. https://doi.org/10.1509/jppm.26.2.302

Shih, T.-Y., 2013. Determinates of Consumer Adoption Attitudes: An Empirical Study of Smart Home Services. IJEA 5, 40–56. https://doi.org/10.4018/jea.2013040104

Shin, S., Lee, W., 2014. The effects of technology readiness and technology acceptance on NFC mobile payment services in Korea. Journal of Applied Business Research (JABR) 30, 1615–1626.

Shirani, F., Groves, C., Henwood, K., Pidgeon, N., Roberts, E., 2020. 'I'm the smart meter': Perceptions of smart technology amongst vulnerable consumers. Energy Policy 144, 111637. https://doi.org/10.1016/j.enpol.2020.111637

Shouse, E., 2005. Feeling, Emotion, Affect. M/C J 8. https://doi.org/10.5204/mcj.2443

Silayoi, P., Speece, M., 2007. The importance of packaging attributes: a conjoint analysis approach. European Journal of Marketing 41, 1495–1517. https://doi.org/10.1108/03090560710821279

Silayoi, P., Speece, M., 2004. Packaging and purchase decisions: An exploratory study on the impact of involvement level and time pressure. British Food Journal 106, 607–628. https://doi.org/10.1108/00070700410553602

Silverman, D., Marvasti, A., 2008. Doing Qualitative Research: A Comprehensive Guide. SAGE, Thousand Oaks, CA.

Simmonds, G., Woods, A.T., Spence, C., 2018. 'Show me the goods': Assessing the effectiveness of transparent packaging vs. product imagery on product

evaluation. Food Quality and Preference 63, 18–27. https://doi.org/10.1016/j.foodqual.2017.07.015
Simms, C., Trott, P., 2014. Conceptualising the management of packaging within new product development : A grounded investigation in the UK fast moving consumer goods industry. European Journal of Marketing 48, 2009–2032. https://doi.org/10.1108/EJM-12-2012-0733
Simms, C., Trott, P., 2010. Packaging development: A conceptual framework for identifying new product opportunities. Marketing Theory 10, 397–415.
Smith, A., 1776. An Inquiry into the Nature and Causes of the Wealth of Nations. W. Strahan and T. Cadell, London.
Smith, A.M., 2013. The value co-destruction process: a customer resource perspective. European Journal of Marketing 47, 1889–1909. https://doi.org/10.1108/EJM-08-2011-0420
Smith, J.B., Colgate, M., 2007. Customer Value Creation: A Practical Framework. Journal of Marketing Theory and Practice 15, 7–23. https://doi.org/10.2753/MTP1069-6679150101
Smith, J.K., 1983. Quantitative Versus Qualitative Research: An Attempt to Clarify the Issue. Educational Researcher 12, 6–13. https://doi.org/10.3102/0013189X012003006
Smith, J.M., 1972. Interviewing in Market and Social Research. Routledge & K. Paul, London.
Smithson, J., 2000. Using and analysing focus groups: Limitations and possibilities. International Journal of Social Research Methodology 3, 103–119. https://doi.org/10.1080/136455700405172
So, K.K.F., King, C., Sparks, B., 2014. Customer Engagement With Tourism Brands: Scale Development and Validation. Journal of Hospitality & Tourism Research 38, 304–329. https://doi.org/10.1177/1096348012451456
Sovacool, B.K., Furszyfer Del Rio, D.D., 2020. Smart home technologies in Europe: A critical review of concepts, benefits, risks and policies. Renewable and Sustainable Energy Reviews 120, 109663. https://doi.org/10.1016/j.rser.2019.109663
Sprott, D., Czellar, S., Spangenberg, E., 2009. The Importance of a General Measure of Brand Engagement on Market Behavior: Development and Validation of a Scale. Journal of Marketing Research 46, 92–104. https://doi.org/10.1509/jmkr.46.1.92
Steenis, N.D., van Herpen, E., van der Lans, I.A., Ligthart, T.N., van Trijp, H.C.M., 2017. Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. Journal of Cleaner Production 162, 286–298. https://doi.org/10.1016/j.jclepro.2017.06.036
Stewart, D.W., Shamdasani, P.N., 2014. Focus Groups: Theory and Practice. SAGE Publications, Thousand Oaks, CA.
Storbacka, K., Brodie, R.J., Böhmann, T., Maglio, P.P., Nenonen, S., 2016. Actor engagement as a microfoundation for value co-creation. Journal of Business Research 69, 3008–3017. https://doi.org/10.1016/j.jbusres.2016.02.034

Suresh, A., 2018. A study of factors influencing buying behaviour of utilitarian and hedonic shoppers: Evidence from FMCG, Sports, Jewelry, Books and Apparels Retail Formats. Asian Journal of Management 9, 507–515.
Sweeney, J.C., Danaher, T.S., McColl-Kennedy, J.R., 2015. Customer Effort in Value Cocreation Activities: Improving Quality of Life and Behavioral Intentions of Health Care Customers. Journal of Service Research 18, 318–335. https://doi.org/10.1177/1094670515572128
Sweeney, J.C., Soutar, G.N., 2001. Consumer perceived value: The development of a multiple item scale. Journal of Retailing 77, 203–220. https://doi.org/10.1016/S0022-4359(01)00041-0
Szykman, L.R., Bloom, P.N., Levy, A.S., 1997. A Proposed Model of the Use of Package Claims and Nutrition Labels. Journal of Public Policy & Marketing 16, 228–241.
Szymczyk, M., 2018. Recent Augmented Reality Virtual Dressing Room Use Cases [WWW Document]. Zugara. URL http://zugara.com/recent-augmented-reality-virtual-dressing-room-use-cases (accessed 11.26.20).
Szymczyk, M., 2014. Samsung UK, Ted Baker and Zugara Debut VSS Virtual Dressing Room Tech At RBTE In London [WWW Document]. Zugara. URL http://zugara.com/samsung-ted-baker-and-zugara-debut-vss-virtual-dressing-room-tech-at-rbte-2014-in-london (accessed 11.26.20).
Tan, G.W.-H., Ooi, K.-B., Chong, S.-C., Hew, T.-S., 2014. NFC mobile credit card: The next frontier of mobile payment? Telematics and Informatics 31, 292–307. https://doi.org/10.1016/j.tele.2013.06.002
Tashakkori, A., Teddlie, C., 2010. SAGE Handbook of Mixed Methods in Social & Behavioral Research, 2nd ed. SAGE, Thousand Oaks, California. https://doi.org/10.4135/9781506335193
Teddlie, C., Tashakkori, A., 2009. Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences. SAGE, Thousand Oaks, CA.
Tifferet, S., Shani, N., Cohen, H., 2013. Gender differences in the status consumption of coffee. Human Ethology Bulletin 28, 5–9.
Tommasetti, A., Troisi, O., Vesci, M., 2017. Measuring customer value co-creation behavior: Developing a conceptual model based on service-dominant logic. Journal of Service Theory and Practice 27, 930–950. https://doi.org/10.1108/JSTP-10-2015-0215
Townsend, D., Knoefel, F., Goubran, R., 2011. Privacy versus autonomy: A tradeoff model for smart home monitoring technologies, in: 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society. Presented at the 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 4749–4752. https://doi.org/10.1109/IEMBS.2011.6091176
Truong, K.N., Hayes, G.R., Abowd, G.D., 2006. Storyboarding: an empirical determination of best practices and effective guidelines, in: Proceedings of the 6th Conference on Designing Interactive Systems, DIS '06. Association for Computing Machinery, New York, NY, USA, pp. 12–21. https://doi.org/10.1145/1142405.1142410
Tsoukas, H., 1989. The Validity of Idiographic Research Explanations. AMR 14, 551–561. https://doi.org/10.5465/amr.1989.4308386

Tuckett, A.G., 2005. Applying thematic analysis theory to practice: A researcher's experience. Contemporary Nurse 19, 75–87. https://doi.org/10.5172/conu.19.1-2.75
Tynan, A.C., Drayton, J.L., 1988. Conducting Focus Groups - A guide for First Time Users. Marketing Intelligence & Planning 6, 5–9. https://doi.org/10.1108/eb045757
Underwood, R.L., Klein, N.M., 2002. Packaging as brand communication: effects of product pictures on consumer responses to the package and brand. Journal of Marketing Theory and Practice 10, 58–68.
Underwood, R.L., Klein, N.M., Burke, R.R., 2001. Packaging communication: attentional effects of product imagery. Journal of Product & Brand Management 10, 403–422. https://doi.org/10.1108/10610420110410531
Vargo, S.L., Lusch, R.F., 2017. Service-dominant logic 2025. International Journal of Research in Marketing 34, 46–67. https://doi.org/10.1016/j.ijresmar.2016.11.001
Vargo, S.L., Lusch, R.F., 2016. Institutions and axioms: an extension and update of service-dominant logic. Journal of the Academy of Marketing Science 44, 5–23.
Vargo, S.L., Lusch, R.F., 2011. Stepping aside and moving on: a rejoinder to a rejoinder. European Journal of Marketing 45, 1319–1321. https://doi.org/10.1108/03090561111137741
Vargo, S.L., Lusch, R.F., 2008. Service-dominant logic: continuing the evolution. J. of the Acad. Mark. Sci. 36, 1–10. https://doi.org/10.1007/s11747-007-0069-6
Vargo, S.L., Lusch, R.F., 2004. Evolving to a new dominant logic for marketing. Journal of Marketing 68, 1–17.
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, 145–152. https://doi.org/10.1016/j.emj.2008.04.003
Vaughn, S., Schumm, J.S., Sinagub, J.M., 1996. Focus Group Interviews in Education and Psychology. SAGE, Thousand Oaks, CA.
Vazquez, D., Bruce, M., Studd, R., 2003. A case study exploring the packaging design management process within a UK food retailer. British Food Journal 105, 602–617. https://doi.org/10.1108/00070700310497345
Venter, K., Merwe, D. van der, Beer, H. de, Kempen, E., Bosman, M., 2011. Consumers' perceptions of food packaging: an exploratory investigation in Potchefstroom, South Africa. International Journal of Consumer Studies 35, 273–281. https://doi.org/10.1111/j.1470-6431.2010.00936.x
Verma, H.V., 2013. Coffee and Tea: Socio-cultural Meaning, Context and Branding. Asia-Pacific Journal of Management Research and Innovation 9, 157–170. https://doi.org/10.1177/2319510X13504283
Vermeir, I., Verbeke, W., 2006. Sustainable Food Consumption: Exploring the Consumer "Attitude – Behavioral Intention" Gap. J Agric Environ Ethics 19, 169–194. https://doi.org/10.1007/s10806-005-5485-3
Vermeiren, L., Devlieghere, F., van Beest, M., de Kruijf, N., Debevere, J., 1999. Developments in the active packaging of foods. Trends in Food Science & Technology 10, 77–86. https://doi.org/10.1016/S0924-2244(99)00032-1

Vernuccio, M., Cozzolino, A., Michelini, L., 2010. An exploratory study of marketing, logistics, and ethics in packaging innovation. European Journal of Innovation Management 13, 333–354. https://doi.org/10.1108/14601061011060157
Vila, N., Ampuero, O., 2007. The Role of Packaging in Positioning an Orange Juice. Journal of Food Products Marketing 13, 21–48. https://doi.org/10.1300/J038v13n03_02
Viswanathan, V., Hollebeek, L.D., Malthouse, E.C., Maslowska, E., Jung Kim, S., Xie, W., 2017. The Dynamics of Consumer Engagement with Mobile Technologies. Service Science 9, 36–49. https://doi.org/10.1287/serv.2016.0161
Vivek, S.D., Beatty, S.E., Dalela, V., Morgan, R.M., 2014. A Generalized Multidimensional Scale for Measuring Customer Engagement. Journal of Marketing Theory and Practice 22, 401–420. https://doi.org/10.2753/MTP1069-6679220404
Vivek, S.D., Beatty, S.E., Morgan, R.M., 2012. Customer Engagement: Exploring Customer Relationships Beyond Purchase. Journal of Marketing Theory and Practice 20, 122–146. https://doi.org/10.2753/MTP1069-6679200201
Voyles, B., 2007. Beyond loyalty: Meeting the challenge of customer engagement. Economist Intelligence Unit 1, 1–15.
Wallace, T., 2018. Gin sales triple as Brits turn to high-end booze. The Telegraph.
Wansink, B., Huffman, C., 2001. A framework for revitalizing mature brands. Journal of brand and product management 10, 228–242.
Weinreich, A., 2017. The Future Of The Smart Home: Smart Homes & IoT: A Century In The Making. Forbes.
Weiss, A., Bernhaupt, R., Schwaiger, D., Altmaninger, M., Buchner, R., Tscheligi, M., 2009. User experience evaluation with a Wizard of Oz approach: Technical and methodological considerations, in: 2009 9th IEEE-RAS International Conference on Humanoid Robots. Presented at the 2009 9th IEEE-RAS International Conference on Humanoid Robots, pp. 303–308. https://doi.org/10.1109/ICHR.2009.5379559
Wells, L.E., Farley, H., Armstrong, G.A., 2007. The importance of packaging design for own-label food brands. International Journal of Retail & Distribution Management 35, 677–690. https://doi.org/10.1108/09590550710773237
Wiechert, T., Thiesse, F., Fleisch, E., 2009. A quantitative evaluation of NFC based contactless payment systems in retail, in: ECIS 2009 Proceedings. Presented at the ECIS 2009, 17th European Conference on Information Systems.
Wieland, H., Koskela-Huotari, K., Vargo, S.L., 2016. Extending actor participation in value creation: an institutional view. Journal of Strategic Marketing 24, 210–226.
Wilden, R., Akaka, M.A., Karpen, I.O., Hohberger, J., 2017. The Evolution and Prospects of Service-Dominant Logic: An Investigation of Past, Present, and Future Research. Journal of Service Research 20, 345–361. https://doi.org/10.1177/1094670517715121
Williams, C., 2007. Research Methods. JBER 5. https://doi.org/10.19030/jber.v5i3.2532
Williams, J., 2012. The logical structure of the service-dominant logic of marketing. Marketing Theory 12, 471–483. https://doi.org/10.1177/1470593112457745

Williamson, I., Leeming, D., Lyttle, S., Johnson, S., 2015. Evaluating the audio-diary method in qualitative research. Qualitative Research Journal 15, 20–34. https://doi.org/10.1108/QRJ-04-2014-0014
Wilson, C., Hargreaves, T., Hauxwell-Baldwin, R., 2017. Benefits and risks of smart home technologies. Energy Policy 103, 72–83. https://doi.org/10.1016/j.enpol.2016.12.047
Wilson, C., Hargreaves, T., Hauxwell-Baldwin, R., 2015. Smart homes and their users: a systematic analysis and key challenges. Pers Ubiquit Comput 19, 463–476. https://doi.org/10.1007/s00779-014-0813-0
Winder, D., 2020. How to stop your smart home spying on you. The Observer.
Wirtz, J., Mattila, A.S., Tan, R.L.P., 2000. The moderating role of target-arousal on the impact of affect on satisfaction—an examination in the context of service experiences. Journal of Retailing 76, 347–365. https://doi.org/10.1016/S0022-4359(00)00031-2
Wollin, A.S., 1995. A hierarchy-based punctuated-equilibrium model of the processes of emergence and change of new rural industries (Doctoral dissertation). Griffith University, Brisbane.
Woodall, T., 2003. Conceptualising 'value for the customer': an attributional, structural and dispositional analysis. Academy of marketing science review 12, 1–42.
Woodall, T., Rosborough, J., Harvey, J., 2018. Proposal, project, practice, pause: Developing a framework for evaluating smart domestic product engagement. AMS Rev 8, 58–74. https://doi.org/10.1007/s13162-017-0089-4
Woodside, F., Summers, J., 2008. Packaging exploitation in fast moving consumer goods:consumer processing of sponsorship messages, in: Proceedings of the 2008 Global Marketing Conference. Presented at the 2008 Global Marketing Conference: Marketing in the Dynamic Global World, Korean Academy of Marketing Science, Gyeongnam, Republic of Korea, pp. 1–13.
Worth, N., 2009. Making Use of Audio Diaries in Research with Young People: Examining Narrative, Participation and Audience. Sociological Research Online 14, 77–87. https://doi.org/10.5153/sro.1967
Wright, M., Russell, D., 2012. Some philosophical problems for service-dominant logic in marketing. Australasian Marketing Journal (AMJ), Honoring the Life and Work of Roger A Layton 20, 218–223. https://doi.org/10.1016/j.ausmj.2012.02.002
Wünderlich, N.V., Wangenheim, F. v., Bitner, M.J., 2013. High Tech and High Touch: A Framework for Understanding User Attitudes and Behaviors Related to Smart Interactive Services. Journal of Service Research 16, 3–20. https://doi.org/10.1177/1094670512448413
Xu, H., Luo, X. (Robert), Carroll, J.M., Rosson, M.B., 2011. The personalization privacy paradox: An exploratory study of decision making process for location-aware marketing. Decision Support Systems 51, 42–52. https://doi.org/10.1016/j.dss.2010.11.017
Yam, K.L., Takhistov, P.T., Miltz, J., 2005. Intelligent Packaging: Concepts and Applications. Journal of Food Science 70, R1–R10. https://doi.org/10.1111/j.1365-2621.2005.tb09052.x

Yang, D.-H., Gao, X., 2017. Online retailer recommender systems: a competitive analysis. International Journal of Production Research 55, 4089–4109. https://doi.org/10.1080/00207543.2016.1253888
Yang, H., Lee, H., Zo, H., 2017. User acceptance of smart home services: an extension of the theory of planned behavior. Industrial Management & Data Systems 117, 68–89. https://doi.org/10.1108/IMDS-01-2016-0017
Yang, R., Newman, M.W., 2013. Learning from a learning thermostat: lessons for intelligent systems for the home, in: Proceedings of the 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing, UbiComp '13. Association for Computing Machinery, New York, NY, USA, pp. 93–102. https://doi.org/10.1145/2493432.2493489
Yang, W.-S., Cheng, H.-C., Dia, J.-B., 2008. A location-aware recommender system for mobile shopping environments. Expert Systems with Applications 34, 437–445. https://doi.org/10.1016/j.eswa.2006.09.033
Yin, R.K., 2009. Case Study Research: Design and Methods. SAGE, California.
Yuan, S.-T., Tsao, Y.W., 2003. A recommendation mechanism for contextualized mobile advertising. Expert Systems with Applications 24, 399–414. https://doi.org/10.1016/S0957-4174(02)00189-6
Yun, T.-J., Jeong, H.Y., Lee, H.R., Arriaga, R.I., Abowd, G.D., 2010. Assessing asthma management practices through in-home technology probes, in: 2010 4th International Conference on Pervasive Computing Technologies for Healthcare. Presented at the 2010 4th International Conference on Pervasive Computing Technologies for Healthcare, pp. 1–9. https://doi.org/10.4108/ICST.PERVASIVEHEALTH2010.8839
Zaichkowsky, J.L., 1985. Measuring the Involvement Construct. Journal of Consumer Research 12, 341–352.
Zeithaml, V.A., 1988. Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence. Journal of Marketing 52, 2–22. https://doi.org/10.1177/002224298805200302
Zheng, S., Apthorpe, N., Chetty, M., Feamster, N., 2018. User Perceptions of Smart Home IoT Privacy. Proc. ACM Hum.-Comput. Interact. 2, 200:1-200:20. https://doi.org/10.1145/3274469
Zimmermann, E.W., 1951. World Resources and Industries, 1st ed. Harper and Row, New York.

Appendices

Appendix A: The Horizon Centre of Doctoral Training (CDT)

Unlike traditional doctorate programmes, all doctorates conducted under the Horizon CDT are required to be interdisciplinary. This is characterised by the researcher's requirement to have at least two supervisors who are each based in a different faculty. In this particular case, the researcher's supervisors were based at the Nottingham University Business School (NUBS) and the Mixed Reality Lab (MRL) under the School of Computer Science. In order to equip the researcher with the necessary skills to conduct interdisciplinary research, the programme also involves compulsory taught elements that comprises 180 credits of modules covering interdisciplinary and transferable skills. Additionally, the researcher also begins the degree paired up to an industrial partner who provides the initial scope (shown below) of this research which then is developed into a more concrete and comprehensive research proposal by the researcher during his first year.

> **Augmenting fast-moving consumer goods in the home to support sustainable living and wellbeing**
>
> From washing machines to toothbrushes, smart appliances that contain embedded sensor and display technologies are able to provide feedback about their usage so as to promote more sustainable use or personal wellbeing. Emerging Internet of Things technologies may see this capability extend to the many fast-moving consumer goods that pass through our homes and that we use with such appliances, from washing powders to toothpaste. How can we design these to sense usage and provide appropriate feedback at key touch-points during the user-experience? What novel datasets will they produce, how might we usefully interpret these, and how can they be managed in an acceptable way in a complex social environment of the home?

Furthermore, the researcher also had to do a compulsory 3-month internship (unrelated to the PhD) which was carried out at the Research & Development Centre of his industrial partner (Unilever) in Port Sunlight. The following timeline briefly summarises the structure of the doctorate programme.

Year	**Key Programme Activities**
First	Completion of the taught aspect (i.e. modules) of the programme Development of the research proposal Formation of supervision team
Second	'Traditional' research aspects of the programme
Third	'Traditional' research aspects of the programme 3-month internship
Fourth	'Traditional' research aspects of the programme
Fifth	An unfunded time period of up to one year to write up the thesis

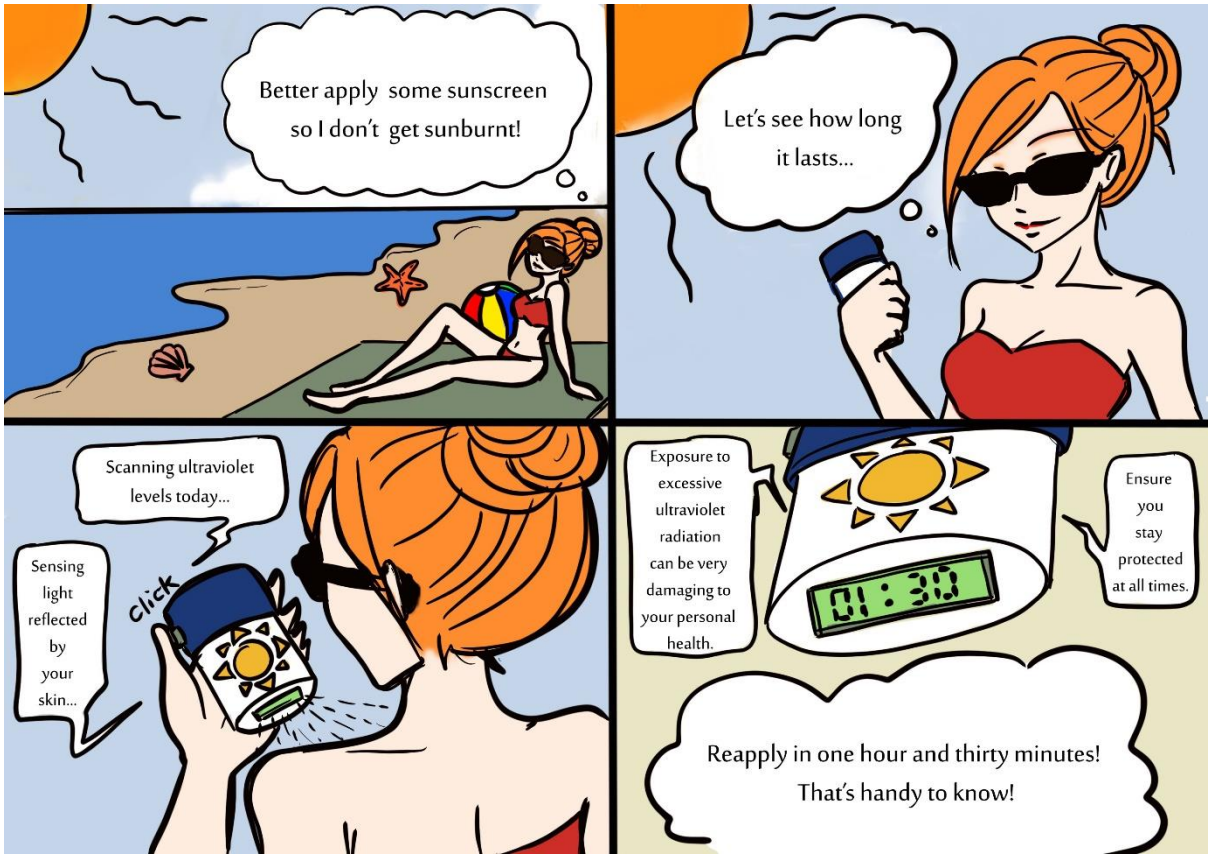
Appendix B: Storyboards

Smart Sunscreen

The Smart Sunscreen is able to calculate the amount of time that a user will be protected from ultraviolet rays once the sunscreen has been applied based on the following information:

- The amount of light reflected by the user's skin
- The amount of ultraviolet radiation

Users can press a button to activate the scanning functions which will require them to point the base of the sunscreen at their skin, then at the sun. Instructions on how to do so will be delivered through a pre-recorded message which will play when users press the button. This information will then be used to compute the amount of safe time that will be displayed on a small screen embedded at the base of the packaging.



Once the safe time has been calculated, users are then delivered a pre-recorded voice message stating "*Exposure to excessive ultraviolet radiation can be very damaging to your personal health. Ensure you stay protected at all times.*". The timer will then start counting down and beep once the safe time is up to prompt users to reapply the sunscreen.

Smart Coffee

Stage 1 – Information Display

The Smart Coffee Tin is a coffee tin for ground coffee that is equipped with a digital screen that displays the following information:

1. The type of coffee (e.g. Sumatra Mandheling)
2. The date the coffee was opened
3. The number of days before its "Best Before" date and expiration date
4. The remaining quantity of coffee in the tin

This is automatically populated when the tin is opened for the first time. The display of information not only serves as a visual cue to warn users when the coffee is about to run out but also reminds users just how long the coffee should be kept for before it goes off or is not suitable for consumption. Additionally, it can also be used as a measuring tool to aid users in brewing a coffee of an appropriate strength.



Stage 2 - Replenishment

The tin is able to send notifications through an app to remind users to restock when the remaining quantity hits a specified threshold. Based on past usage trends, the tin can also warn users a few days in advance before the quantity is expected to hit the threshold. Users can restock by pressing a button found on the coffee tin which when pressed, will reorder a unit of ground coffee refill. The variation of coffee, size, delivery, billing, and payment details are all set up through the app. Once the button has been pressed, a notification will pop up in the app if the order is successful. There can only be one active order of one unit at made with this system at any time, even if the button is pressed many times.



Stage 3 – Mobile Tags

The tin can be reused with new packs of ground coffee. Information on the screen can be replaced by using their smart devices with the app active to tap the NFC tag found on the refills (compatible brands only), and then tapping their device onto the NFC tag on the tin to update the information on the tin's tag. This allows users to scan the NFC tag on the tin to access additional content such as how the coffee was sourced and coffee-making tips and recipes. A scan on each refill also gives the user a "token" which when collected, can be redeemed for free gifts such as filter paper, coffee, t-shirts, and coffee mugs.



Stage 4 - Personalisation

On the app, users can review their coffee purchases through a simple thumbs up and thumbs down interface to indicate whether or not they like the blend they've purchased. The app can then recommend some blends of coffee to the user based on their review history. In addition, upon the sensing of excessive consumption of coffee, the tin can also suggest alternative drinks such as decaffeinated tea or coffee to help prevent a caffeine overdose.

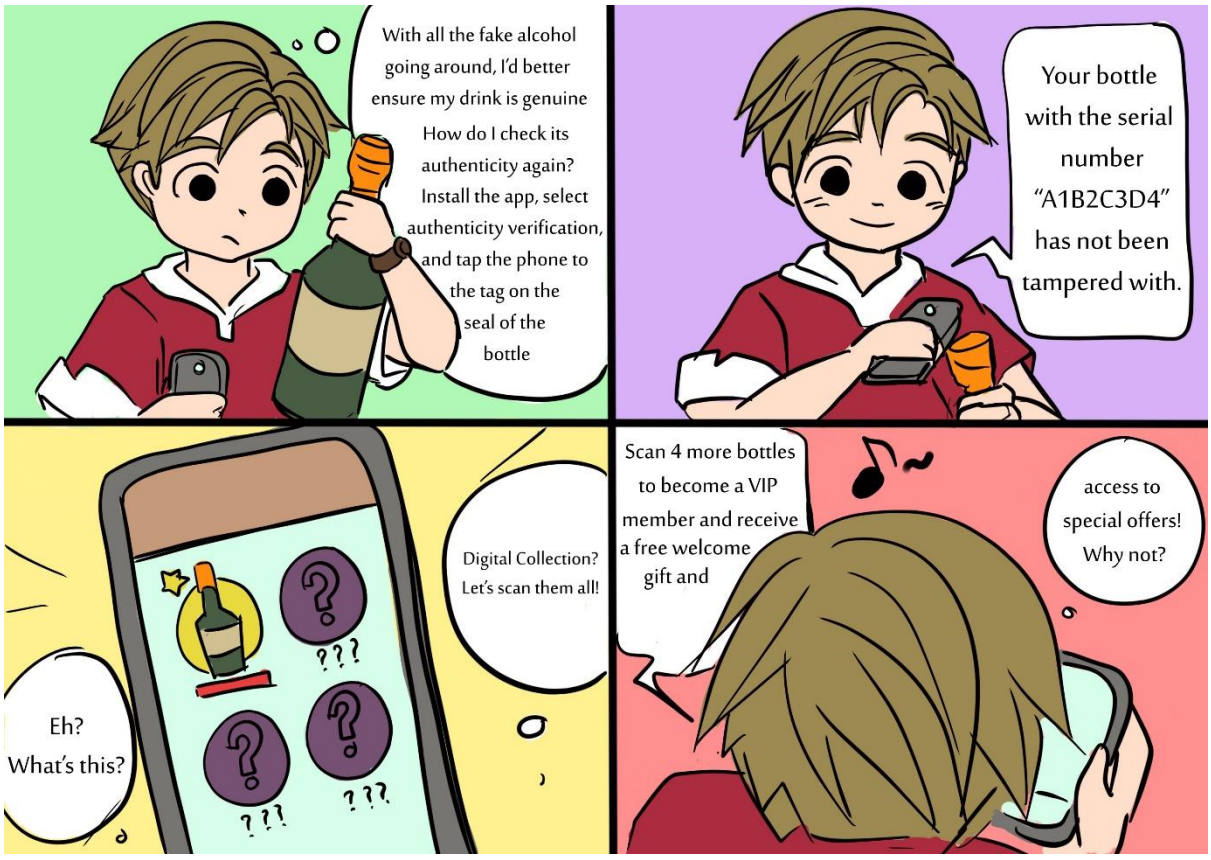
The Smart Alcohol

Stage 1 – Mobile Tags

The Smart Alcohol is a bottle of alcohol designed to spice up the alcohol consumption experience. A Near Field Communication (NFC) tag is integrated into the seal of the bottle which users can scan with an app to ensure that the product has not been tampered with.

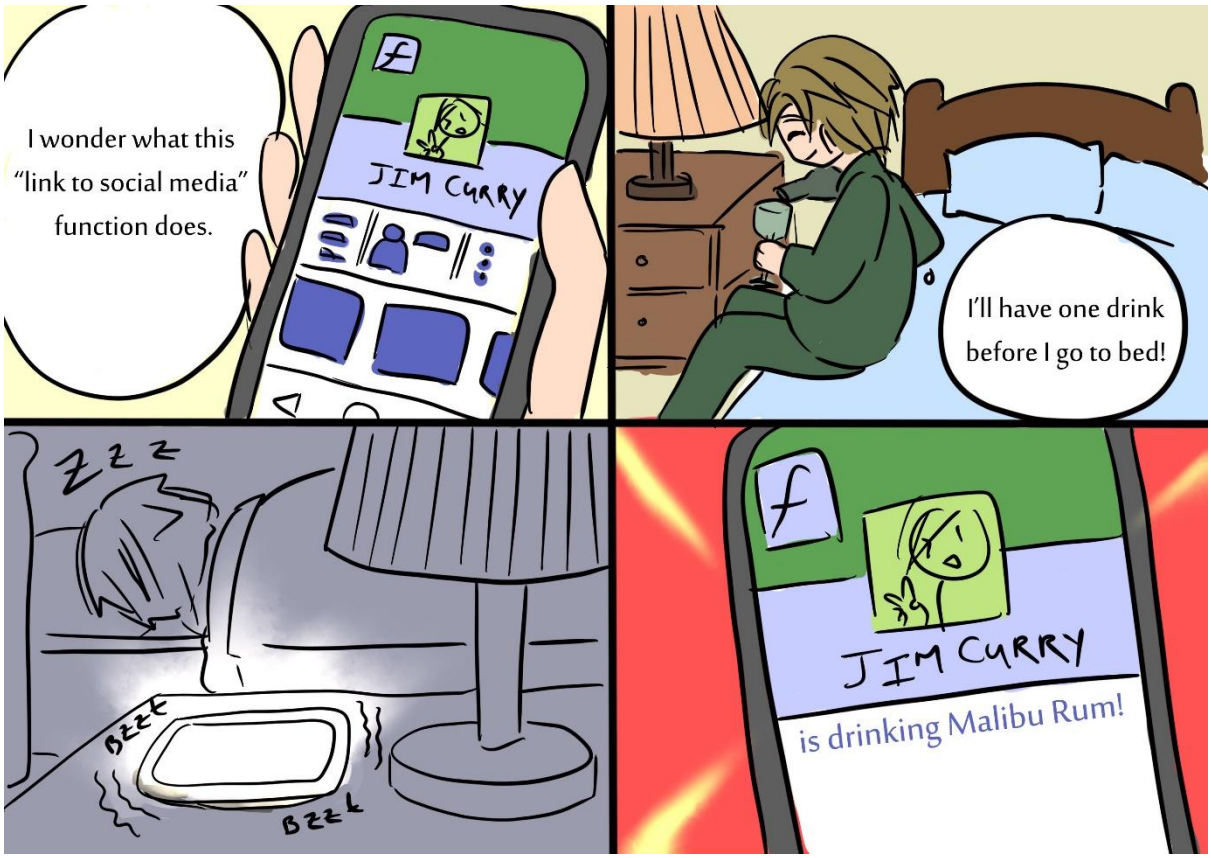
- When the tag is complete (bottle unopened), the scan will direct users to the authenticity verification service
- When the tag is incomplete (bottle opened), the scan will direct users to additional content such as how the drink was made, ongoing promotions, drinking games, and cocktail recipes.

Scanning an incomplete tag of different varieties of drinks under the brand through the app also adds the drink to the user's digital collection which awards them with badges/trophies based on how many they have. When a certain number of a variety of drinks has been scanned, the user achieves "VIP Member Status", giving them access to special offers unavailable to non-members.



Stage 2 – Social Media

Users may also link their social media profiles (e.g. Facebook, Twitter) through the app which can then automatically post status updates every time they drink. Additionally, they can also upload photos or drink recipes surrounding their drink experience through the app and submit them as entries to weekly competitions (e.g. Best Fruity Cocktail, Best Photo By The Pool) that they can share with their social network.



Stage 3 - Connectivity

What makes the bottle unique is also its ability to communicate with other smart devices within the vicinity that is expected to become increasingly common in the near future as more homes become "smart homes" or "connected homes". Some example applications are:

- Pouring the bottle in the kitchen can trigger the dining room or living room lights to turn on as that is where the drink is expected to be consumed.
- Opening the bottle can trigger a specified song to be played (e.g. Happy Birthday, Canon in D Major) on connected speakers for special events.
- Surrounding or nearby cameras that has been set up can take photos every time the bottle is clinked (when the people cheer)
- A system can keep track of all the 'registered' alcohol bottles and their respective amounts in the vicinity and recommend cocktails that can be made using the available drinks.

Appendix C: Study 1 Questioning Route

Scenario 1 (Sunscreen)

Stage 1 – Personalisation	
What do you think about the personalised safe time feature in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. health concerns). • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***?
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public/private settings. • Real life examples/situations • Would they follow the sunscreens cue for them to reapply the sunscreen?
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it.
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.

Scenario 2 (Alcohol)

Stage 1 – Mobile Tags	
What do you think about the application of mobile tags in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. is authenticity a concern for them) • If they wouldn't use it, probe for possible barriers? ***Technical, Personal,***

	Situational factors? • Probe for the factors that affects them to scan a mobile tag? **Visual scans** vs **tapping**? Do the aesthetics of the tag matter? • **What kind of content would they like from the scan? Is gaining VIP membership a good incentive?**
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public/private settings. • Real life examples/situations
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **The type of content that they would like and the tags and scanning behaviour that is ideal for them.**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.
Stage 2 – Social Media	
What do you think about the link to social media feature in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g just for fun, join competitions) • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***?
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public/private settings. • Real life examples/situations
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated

	with the feature's use. **Can this promote social status or interaction? Possible harm of spreading the image that you are an alcoholic?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **Maybe limit the reach of the posts or not have it completely automatic. Revamped to be used for notification systems for recovering alcoholics.**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.
Stage 3 - Connectivity	
What do you think about the connectivity to other smart devices in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. convenience, surprise friends) • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***? • **Probe harder on the technical barriers as setting up may seem quite complex and time-consuming, rendering it to become the most likely deterrent to the use of this function.**
How would you use it? Please give an example.	• Probe for the social contexts (when and where) of their use? Probe for differences between public/private settings. • Real life examples/situations • Ask for specific examples and its use in events such as birthdays, night out at the club, and house parties or gatherings.
What do you think are some of the benefits and risks of using this feature in the examples you have come up with?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use.
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **How to make this more accessible to the consumers? Make setting them up as easy as**

	possible.
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.

Scenario 3 (Coffee)

Stage 1 – Information Display	
What do you think about the display of information and live quantity sensing features depicted in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. less wasteful and better consumption behaviour). • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***? • **Probe on privacy, is the data being publicly displayed sensitive for them? Would some authentication be necessary to display the information?**
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public and private settings • Real life examples/situations • How would they make use of the information displayed on the screen?
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **Probe on the privacy issue and its possible solutions if that came up as a deterrent during the discussion.**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.
Stage 2 – Replenishment	
What do you think about the replenishment	Ask for some general comments regarding the

system that is implemented in this scenario?	feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. convenient, less likely to forget, time-saving). • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***? • Probe for **payment details** in particular which may be sensitive or how the button is too easily accidentally pressed and whether **safeguards** needs to be implemented.
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public and private settings • Real life examples/situations • Discuss shared use and issues such as splitting the payment, who pays first, when is the button pressed, who presses it, who decides the coffee to buy (is this discussed with all users beforehand)
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **More on the safeguards maybe and the reordering system in general, whether confirmation needs to be carried out through the app before finalising purchase.**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.
Stage 3 – Mobile Tags	
What do you think about the use of mobile tags to update the displayed information and direct users to additional content in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so. • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***?

	• Probe for the factors that affects them to scan a mobile tag? **Visual scans** vs **tapping**? Do the aesthetics of the tag matter? • **What kind of content would they like from the scan?**
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public and private settings (e.g. who updates the information on the tin in both spaces) • Real life examples/situations
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **The type of content that they would like and the tags and scanning behaviour that is ideal for them. Other possible ways to update the information on the tin (perhaps remotely).**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.
Stage 4 - Personalisation	
What do you think about the recommendation and consumption monitoring system that is implemented in this scenario?	Ask for some general comments regarding the feature, starting the discussion with something easy to answer
Would you use it? Could you please explain the reasoning behind your decision?	• If they would use it, probe for their motivation to do so (e.g. easy way to try new coffee blends, ensure not consuming too much caffeine). • If they wouldn't use it, probe for possible barriers? ***Technical, Personal, Situational factors***? • Probe for how people may possibly not like 'being told what to do' by the consumption monitoring system
How would this change the way you use this product?	• Probe for the social contexts (when and where) of their use? Probe for differences between public and private settings (e.g. can be completely ineffective in shared spaces unless the number of users is accounted for in the recommender system and monitoring of

	caffeine consumption) • Real life examples/situations • Would they adhere to the warnings against excessive caffeine consumption or buy the recommended coffee blends?
What do you think are some of the benefits and risks of using this feature?	This should have already been lightly touched on when asking why they would or would not use it, but asked more explicitly here. Explores the potential positive and negative values associated with the feature's use. **Can this promote social status or interaction?**
Could you provide some suggestions on how to improve this smart packaging feature?	See what else they would like the packaging to offer and whether they have any ideas on how to improve it. **More on possibly how this can be improved to be used in shared spaces. This might require authentication systems to see how much each individual is consuming or collation of thumbs up/thumbs down responses. Also need to consider the practice of making coffee that typically is made by one for others (a whole carafe) which may cause personal consumption levels to be inaccurate.**
What other products can you see this feature being suitable for?	Find out other products that they think this feature is suitable for.

Wrap-up Questions

How do you think the features provided by smart packaging affect your perspective of the company or brand?	Explore how smart packaging can possibly affect consumer brand engagement
Are these changes positive or negative?	
Can you explain how certain features in the depicted scenarios would cause positive and negative changes in how you perceive the company or brand?	Different features may yield a different 'change in perspective' of the brand or company. How do they differ?
Are there any issues or general concerns which would make you reject or do not use certain smart packaging features right away? Could you explain why?	Identify the possible concerns that consumers may have with smart packaging that deters them from its use. Parts of this will have been discussed during the scenario but this will serve

	as a final general conclusion.
Are there any benefits which would greatly motivate you to use a smart packaging feature? Could you explain why?	Identify what would be instantly attractive for consumers that smart packaging can offer that will very positively affect its likelihood of use. Parts of this will have been discussed during the scenario but this will serve as a final general conclusion.
If you could freely design smart packaging for a product of your choice. What would it be and what would it do? Assuming all technicalities can be taken care of.	Ask for suggestions on smart packaging ideas once all the scenarios have been covered and consumers better understand the potential of smart packaging.

Appendix D: Transcript Excerpt

OS: So you think, personally for you, you wouldn't like to fiddle around with technology while enjoying your drink?

MJ: Well it depends on what kind of drink you're drinking. If you're just on a night out and you just like want to brag how much you drank, that might be something. But if you're going to like expensive wines or whiskey, that might be a different experience.

KD: Well sometimes like, if you have people over for food or things, I don't know how to match things with things. If it told you, what I don't know and it says you know suggestions for cocktails and that kind of things but things like I can't do and people do do is match wine to food and I don't know how to do that. In that case, I would occasionally Google "should this be red wine", "should this be white wine" to that degree. So that could be quite useful or sometimes when you've got bits of alcohol left over and you've got people coming over and you think does this make a cocktail. You try and see and might be useful to know if that was. So I might use it in that way actually. It would be more a thing at home before there are people that I would serve, people less sociably, I probably wouldn't use it but in terms of planning things, I guess maybe.

RV: But I think you're right that the social contexts are very important cause I may not want to have tasting notes for myself but if for example, my father in law who's a great whiskey fan wants to share his tasting notes with me and said "oh, I've tasted this whiskey last week and I think you'd be interested" and he's sharing his tasting notes and I'm sharing my tasting notes and, if you can make it social I think, that's a way to get people to use it. But there's a big barrier to just not bothering to use it and its useful.

AG: I think it would great on rate and recommendation, also it if it leads up to a free drink. Then that's kind…I don't drink liquor but I think as a whole drink industry so soft drinks and other drinks. If you popularise on those kind of drink level, you may have some social drink environment.

MJ: So on the technical aspect, they're talking about NFCs on the bottles which is going to cost something I guess. I think like cameras these days and apps are good enough to for you to scan the label, they will find it

Appendix E: Coding Spreadsheet Extract

Code ID	Scenario Code	Group ID	Dimensional Code	Valence Code	Primary Code	Individual ID
1	Sunscreen	FG1	Utilitarian Value	Positive	Instructions	TC
2	Sunscreen	FG1	Emotional Engagement	Positive	Interesting	TC
3	Sunscreen	FG1	Cognitive Engagement	Neutral	Energy	AG
4	Sunscreen	FG1	Concerns		Recommendation Accuracy	AG
5	Sunscreen	FG1	Recommendations		Third Party Approval	AG
6	Sunscreen	FG1	Utilitarian Value	Positive	Prevents Sunburn	RV
7	Sunscreen	FG1	Hedonic Value	Negative	Annoyance	RV
8	Sunscreen	FG1	Hedonic Value	Negative	Annoyance	MJ
9	Sunscreen	FG1	Concerns		Language	MJ
10	Sunscreen	FG1	Recommendations		Dosage	KD
11	Sunscreen	FG1	Hedonic Value	Negative	Embarrassment	KD
12	Sunscreen	FG1	Recommendations		Reminders (App)	RV
13	Sunscreen	FG1	Utilitarian Value	Positive	Forgetful	AG
14	Sunscreen	FG1	Utilitarian Value	Neutral	Tanner	KD
15	Sunscreen	FG1	Utilitarian Value	Neutral	Parent	RV
16	Sunscreen	FG1	Hedonic Value	Positive	Fun	TC
17	Sunscreen	FG1	Social Value	Negative	Guilt	KD
18	Sunscreen	FG1	Utilitarian Value	Neutral	Sunburn Resistant	MJ
19	Sunscreen	FG1	Concerns		Incorrect Recommendation	MJ
20	Sunscreen	FG1	Concerns		Manufacturing	CT
21	Sunscreen	FG1	Recommendations		Reminders (Wearable)	KD
22	Sunscreen	FG1	Recommendations		Modular Sensor	RV
23	Sunscreen	FG1	Recommendations		AIO Design	CT

Appendix F: Theme Generation Example

Scenario Code	Dimensional Code	Valence Code	Primary Code
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Sunscreen	Hedonic Value	Negative	Annoyance
Smart Alcohol	Hedonic Value	Negative	Annoyance
Smart Alcohol (2)	Hedonic Value	Negative	Annoyance
Smart Alcohol (2)	Hedonic Value	Negative	Comment Baiting
Smart Sunscreen	Hedonic Value	Negative	Embarrassment
Smart Sunscreen	Hedonic Value	Negative	Embarrassment
Smart Sunscreen	Hedonic Value	Negative	Embarrassment
Smart Alcohol (2)	Hedonic Value	Negative	Frustration
Smart Coffee (3)	Hedonic Value	Negative	Judgemental
Smart Coffee (3)	Hedonic Value	Negative	Judgemental
Smart Coffee (3)	Hedonic Value	Negative	Judgemental
Smart Coffee (3)	Hedonic Value	Negative	Judgemental
General	Hedonic Value	Negative	Judgemental
Smart Coffee (2)	Hedonic Value	Negative	Spam Notifications

In this example, the coding spreadsheet was filtered for coded instances with a dimensional code of “Hedonic Value” and a valence subcode of “Negative”. Noting that the table contained three clusters of primary codes (“Annoyance”, “Embarrassment”, and “Judgemental”), coded instances of each cluster were compared with those in every other cluster to search for similarities that would allow them to be grouped together under a common intermediate code at a higher level. An example is shown below (albeit with trimmed coded instances for presentation purposes)

Raw Corpus	Codes	Intermediate Code
I kind of dislike the voice command of this just because for starters, it's going to annoy the other people.	Primary: Annoyance Scenario: Sunscreen Dimensional: Hedonic Value Valence: Negative	Medium of Communication
Beep, beep, beep, beep, and there are like 10 people around you and wondering what this beep is and then all the beeps start going at the same time and it's not relaxing anymore.	Primary: Annoyance Scenario: Sunscreen Dimensional: Hedonic Value Valence: Negative	Medium of Communication
Okay, that'd get very annoying. If it told, explained that whole bit of text. If you hear it again and again and again, it'd get really irritating.	Primary: Annoyance Scenario: Sunscreen Dimensional: Hedonic Value Valence: Negative	Message Frequency
The same with the pre-recorded message, cause imagine you are around other people, it would be embarrassing for me as well.	Primary: Embarrassment Scenario: Sunscreen Dimensional: Hedonic Value Valence: Negative	Medium of Communication
It could be embarrassing like if you're on a coach or something and that starts beeping and you're like trying to get your bag and shut it up.	Primary: Embarrassment Scenario: Sunscreen Dimensional: Hedonic Value Valence: Negative	Medium of Communication
I have enough judgmental friends, I don't need a judgmental tin as well	Primary: Judgmental Scenario: Smart Coffee (3) Dimensional: Hedonic Value Valence: Negative	Message Tone
I don't need to be preached at.	Primary: Judgmental Scenario: General Dimensional: Hedonic Value Valence: Negative	Message Tone

Typically, coded instances within the same cluster are assigned the same intermediate code. However, when this was not possible (e.g. 3rd entry in the table above), the coded instance can be assigned an intermediate code either through promotion or reframing. After assigning intermediate codes to the coded instances, themes are then generated and assigned. A similar process is followed with themes being assigned to clusters of intermediate codes. In this example, the way the frequency of messages ("message frequency"), how they are framed ("message tone") and communicated to users ("medium of communication") was merged under the theme of "communication".

Raw Corpus	Intermediate Code	Theme
I kind of dislike the voice command of this just because for starters, it's going to annoy the other people.	Medium of Communication	Communication
Beep, beep, beep, beep, and there are like 10 people around you and wondering what this beep is and then all the beeps start going at the same time and it's not relaxing anymore.	Medium of Communication	Communication
Okay, that'd get very annoying. If it told, explained that whole bit of text. If you hear it again and again and again, it'd get really irritating.	Message Frequency	Communication
The same with the pre-recorded message, cause imagine you are around other people, it would be embarrassing for me as well.	Medium of Communication	Communication
It could be embarrassing like if you're on a coach or something and that starts beeping and you're like trying to get your bag and shut it up.	Medium of Communication	Communication
I have enough judgmental friends, I don't need a judgmental tin as well	Message Tone	Communication
I don't need to be preached at.	Message Tone	Communication

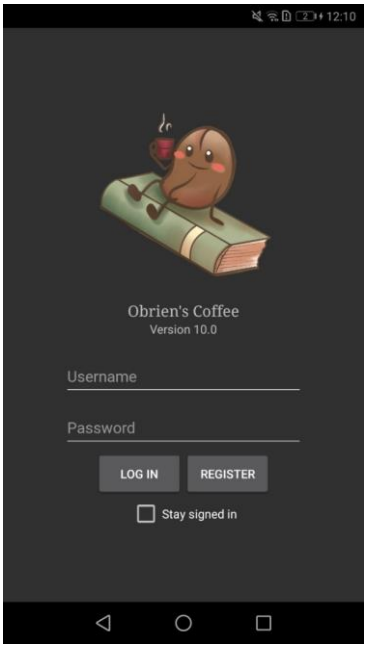
Using the “Obrien’s Coffee” app

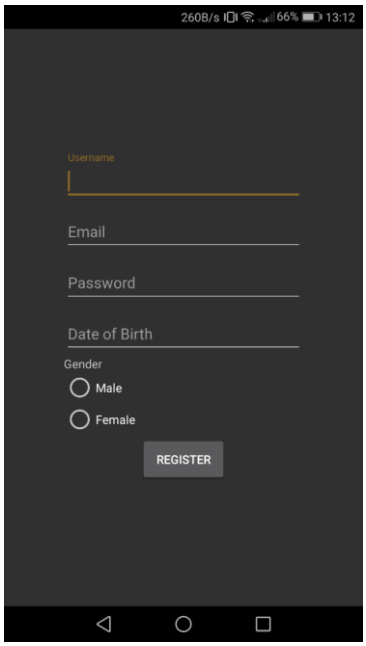
Registration

In order to use the “Obrien’s Coffee” app, participants are required to create an account. Participants are asked to provide the following information during the registration process.

- Username
- Password
- Email
- Date of Birth
- Gender

The **username** is required as it will be the participant’s online identity and the **password** along with it for authentication purposes. **Date of Birth** is required to ensure that participants are older than 18 years of age. **Gender** is collected as part of a collective set of information that describes participants, which may be used to associate participant behaviour with. **Email** is used to communicate with participants, especially when persistent information or a written record is required as push notifications cannot be retrieved once gone. These will typically be for administrative purposes such as welcoming participants or notifying them if they have submitted content that was not approved.





Participants are automatically logged in and redirected to the home screen upon successful registration. If participants exit the app, they will have to log in again unless they have checked the “Stay signed in” checkbox during the login process. From the Home Screen, participants may access the following sub-sections:

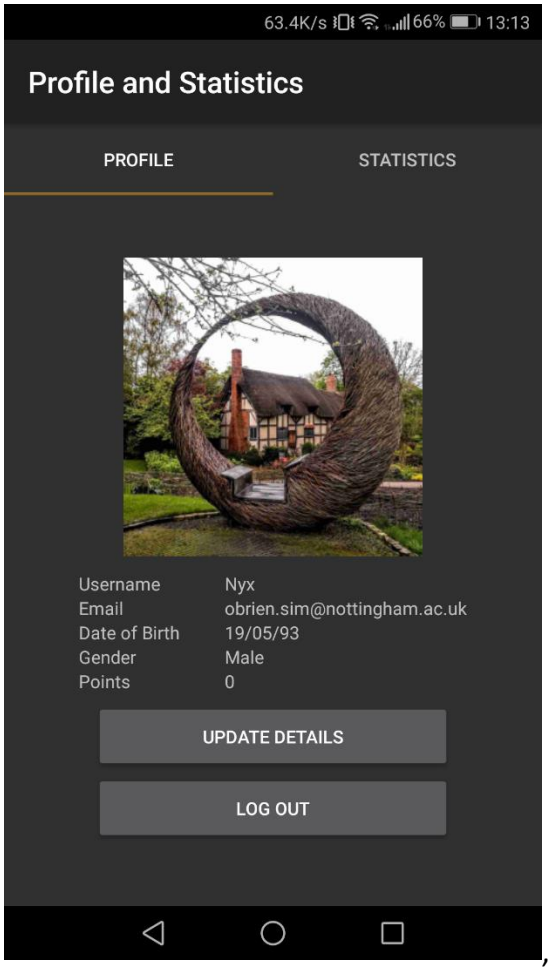
- Profile and Statistics
- Compendium
- Community

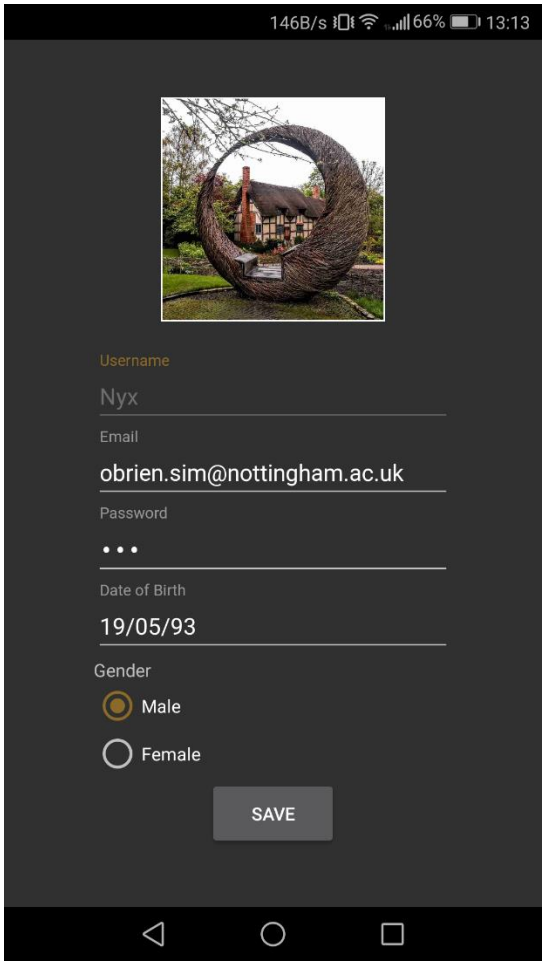


Profile and Statistics

Profile

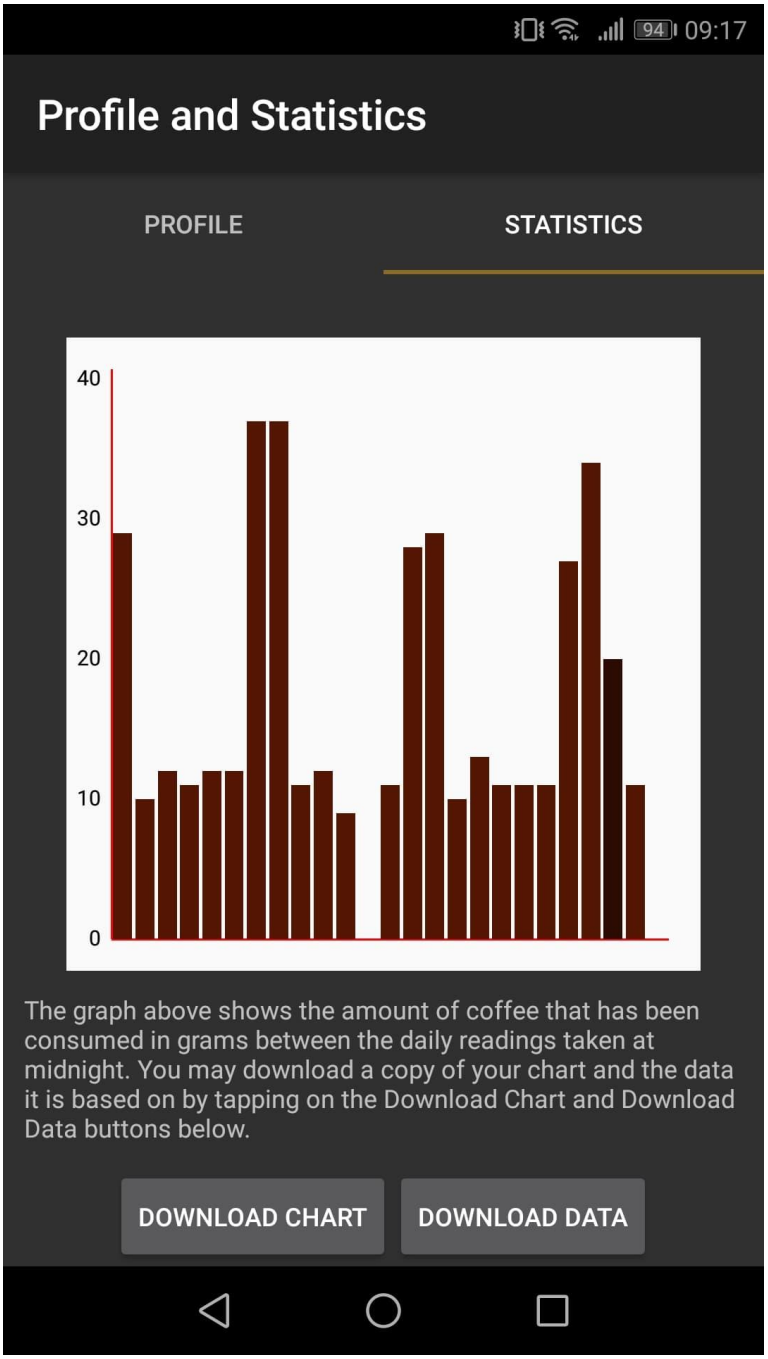
Participants may view and update their personal details (aside from username) that they have provided during registration on this screen. They may also upload an image as their avatar, which they cannot do during the registration process.





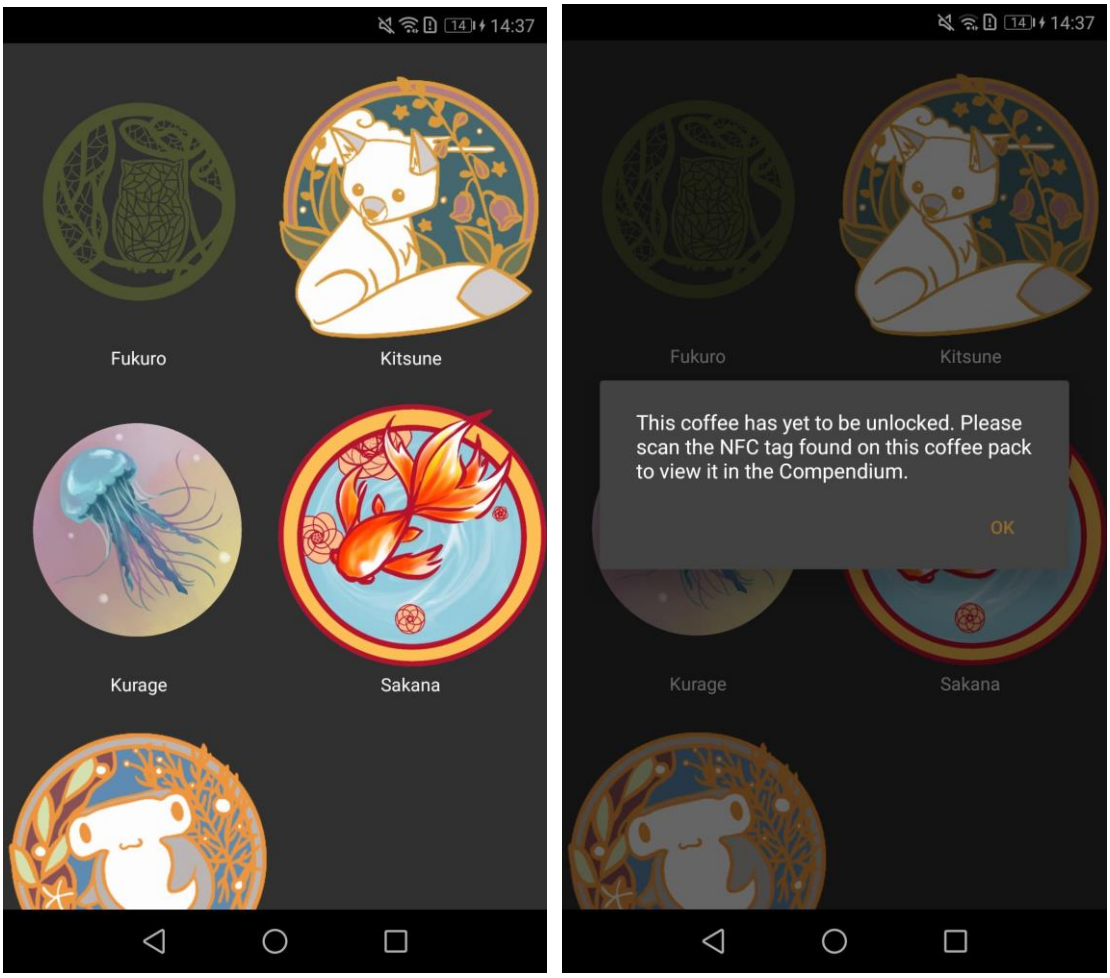
Statistics

Users may view a chart of their coffee consumption data. A brief description of how the data is collected in addition to some consumption guidelines are also provided. Users may also download a copy of the chart (.png) and raw data (.csv) to their mobile phones.



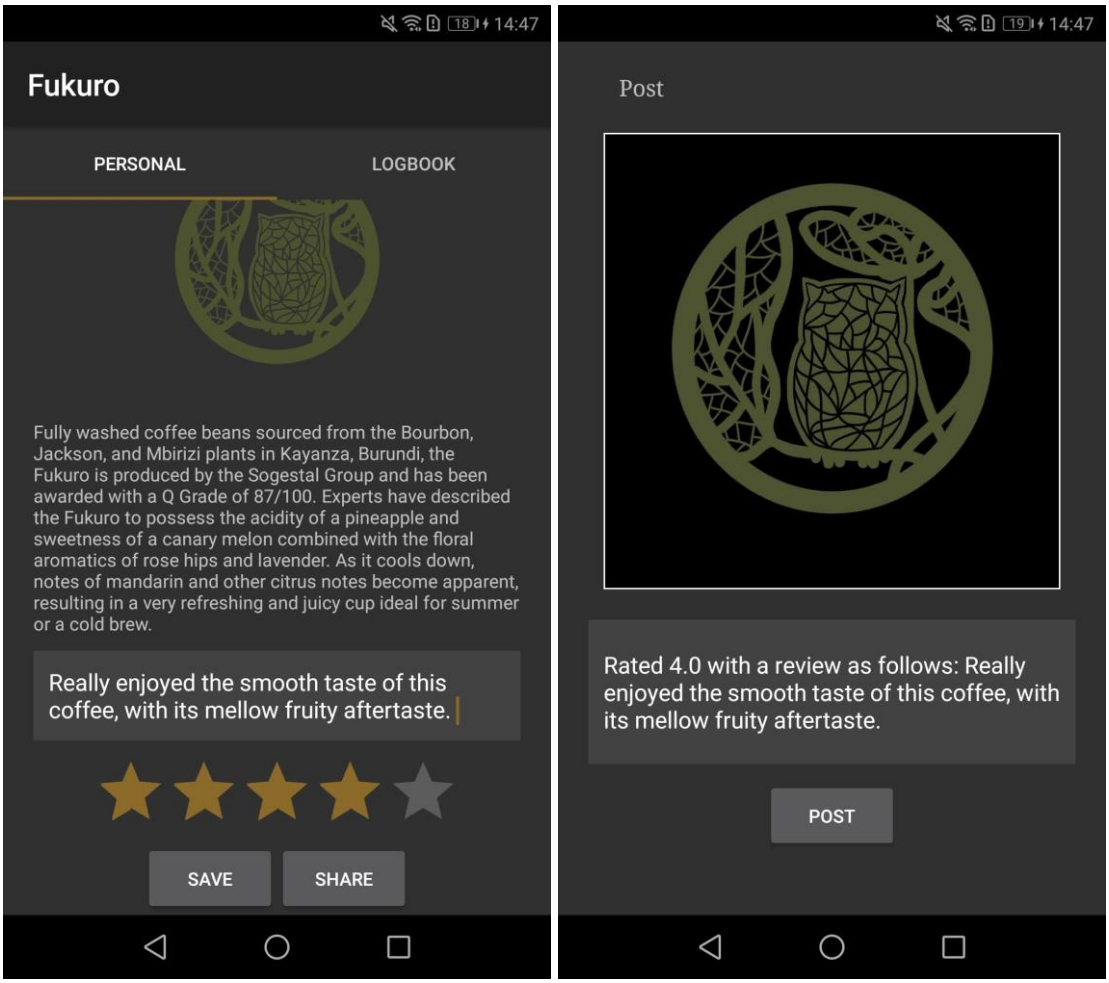
Compendium

Upon tapping on the Compendium image button, users can see a grid of various coffees that are registered on the app. If participants have scanned the NFC tag of a particular coffee, they will be able to access the Personal and Logbook tabs of the coffee. Else, a message that notifies them that the coffee has yet to be unlocked will be displayed.



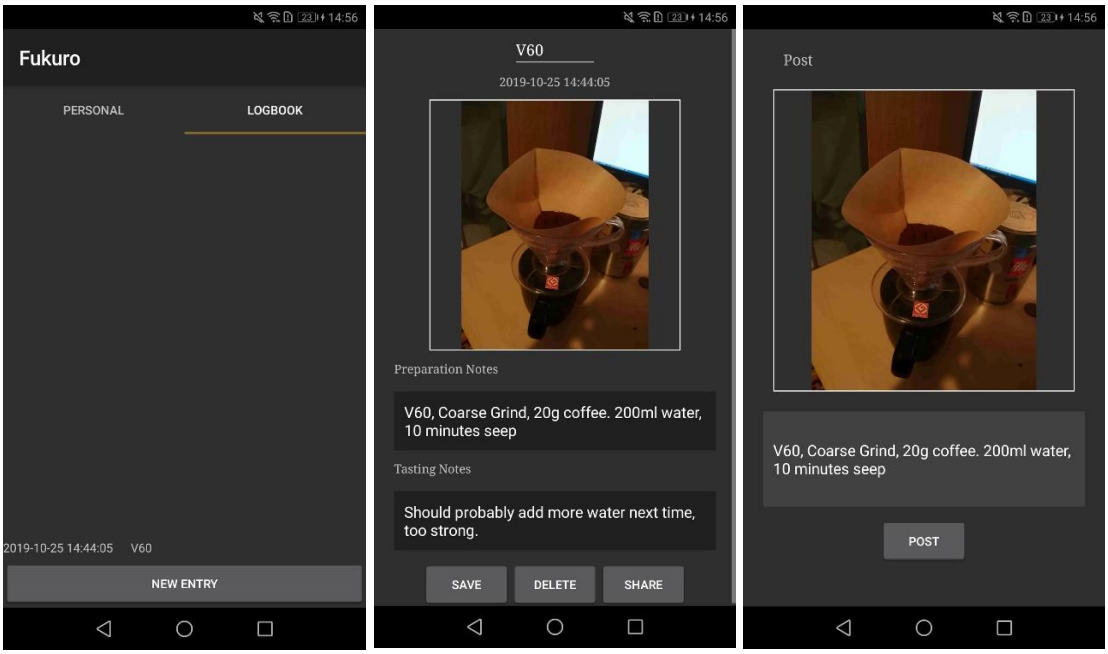
Personal

Participants will be able to view more detailed information about the coffee such as how its ingredients are sourced. They will also be able to rate the coffee with a score between 0 – 5.0 in increments of 0.5 and save their review of the coffee. A button is provided to share their rating and review to the Community. The share button automatically drafts a post based on the latest rating and review of the coffee.



Logbook

Users will be able to make entries on how they have brewed the coffee and how it tasted for their own personal records. Logbook entries are automatically dated at the time of entry and may also include an optional picture. Logbook entries can be updated and deleted by participants. They can also be shared to the Community. The share button automatically drafts a post based on the latest photo and preparation notes of the coffee.

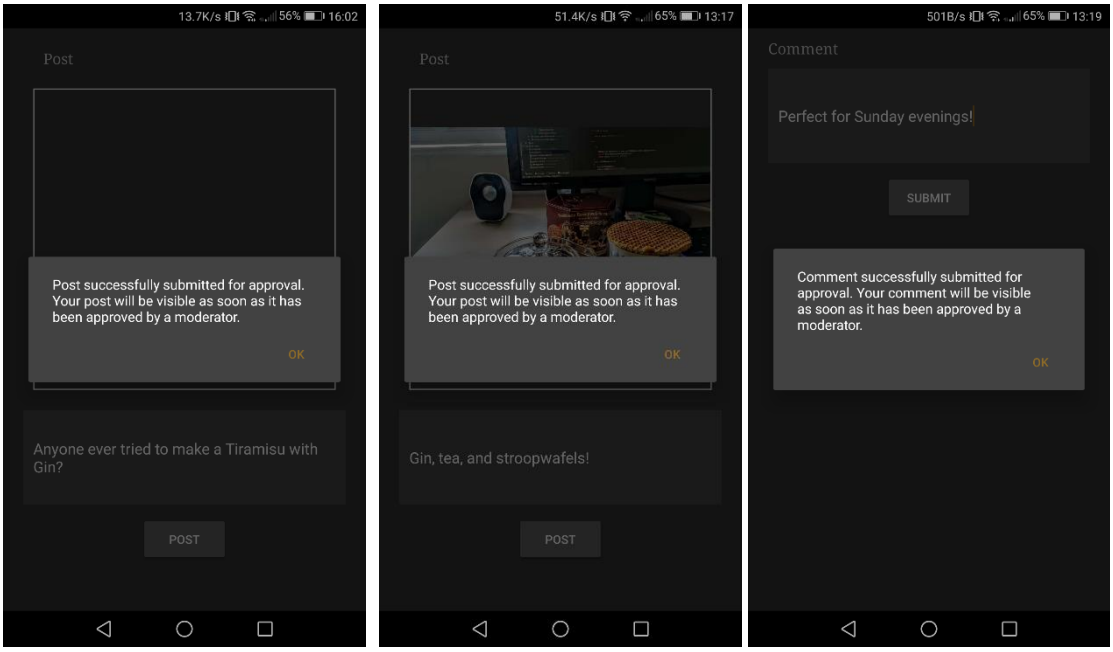


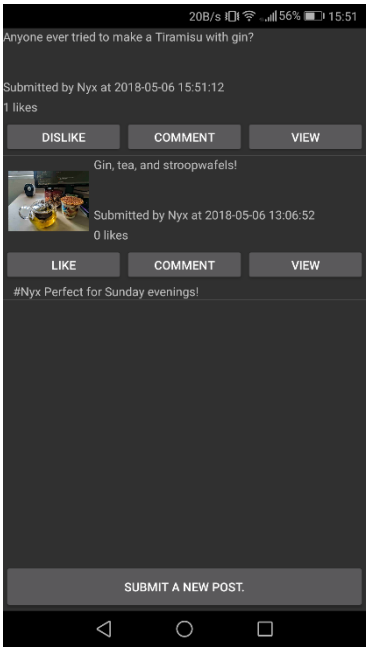
Community

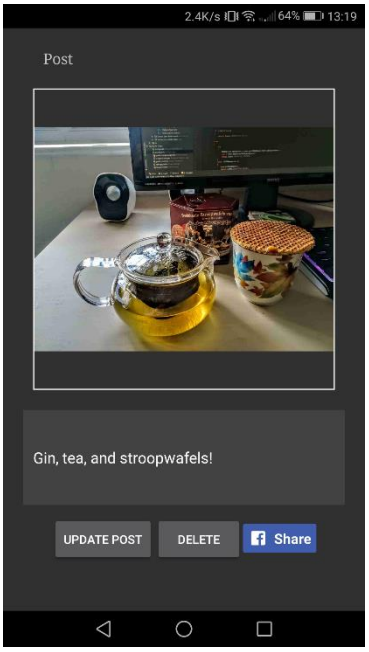
This section is the social media aspect of the app. Posts will be displayed starting with the most recent one. Posts can be made up of an image and text or just text (image is only displayed if an image is provided). Participants will be able to like and comment on posts through the buttons provided on the screen. The number of likes that the post has accrued is shown along with the username of the submitter and date of submission. Comments are listed in order of submission (older comments on top) and shown with the username of the commentator. There are a few available templates (i.e. sharing a memory, sharing ratings and tasting notes) that users can make use of if they choose to share it through the respective buttons in the Compendium section but users are also able to begin drafting a post from scratch if they choose to do so.

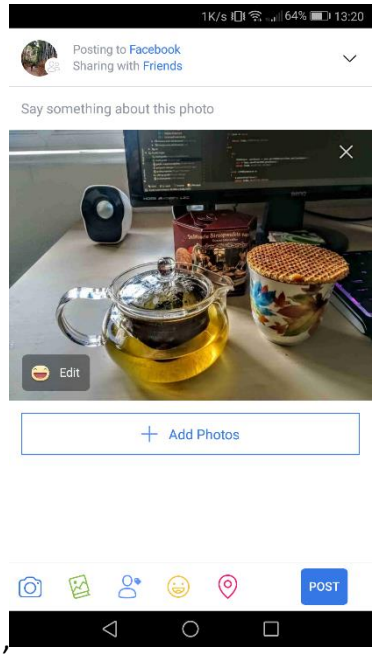
As screen size is quite limited and the posts may seem quite small, participants are able to view a post full screen by tapping on the View button. From this screen, participants will be able to modify or delete posts if they are the creators of the post. Posts that contain an image can also be shared on the user's Facebook profile. Unlike posts, comments will not be able to be edited or deleted once submitted as the researcher deems it a non-vital functionality that comes at the expense of ruining the aesthetics of the screen design (need to make do with the limited screen space). An argument could be made that posts typically contain content that is meant to persist or stay whereas comments are usually used for discussion and represents dialogue, which cannot be taken back once said.

Comments and posts will be moderated by the researcher for potentially abusive content (e.g. pornographic, racist, personal attacks). Comments and posts will require approval (typically quite quickly unless it's made at a strange time such as between 2AM and 10AM) from the researcher before it shows up on the Community section of the app. Push notifications and emails will be sent to users who posted or commented content that may be potentially abusive and the content will be removed. From time to time, the researcher may also post and comment as an administrator in the Community, replicating brand pages on social media.




Anyone ever tried to make a Tiramisu with gin?
Submitted by Nyx at 2018-05-06 15:51:12
1 likes
DISLIKE
COMMENT
VIEW
Gin, tea, and stroopwafels!
Submitted by Nyx at 2018-05-06 13:06:52
0 likes
LIKE
COMMENT
VIEW
#Nyx Perfect for Sunday evenings!
SUBMIT A NEW POST.


Post
Gin, tea, and stroopwafels!
UPDATE POST
DELETE
Share


Posting to Facebook
Sharing with Friends
Say something about this photo
Edit
Add Photos
POST

Appendix H: Audio Diary Prompts

Introduction

- State today's **date** and **when** you drank the coffee.
- Describe the **occasion** when you drank the coffee.
- **Who** else was there (e.g. colleagues, friends, family) and what were they drinking?
- **How** did you drink and brew the coffee? E.g. filter, americano, espresso, latte, flat white, cappuccino?

Smart Packaging Engagement

- What smart packaging features of the tin, coffee, and/or app did you **use** today?
    - **Scan** the pack
    - **Reviews** (Wrote, read, discussed, or shared)
    - **Provenance** (Found out more information about the coffee such as the practices involved in its sourcing)
    - **Consumption** Statistics (Viewed or interpreted)
    - **Logbook** (Created, viewed, or shared)
    - **Community** (Read, posted, commented, liked)
- Please describe specifically **what you did**.

Compared to using an ordinary storage device for your coffee:

(in each case please explain how and why, and relate your answer to specific features if you can)

- Did you **interact** with the product differently?
  (for each question, how, why, which features?)
- Did it change the amount of **attention** you paid to the product when using it?
- Did it change how much and how often you **think** about the product?
- Did it trigger or arouse any **emotions** or feelings? How did it made you feel?
- Did it affect the **amount** of coffee that you drink?
- Did it motivate you to **do** anything else relating to the product? If so, what?

Brand Relationship

- *If this is your first time completing an audio diary, please describe your level of **satisfaction** and **trust** in the brand.*
- How has your use of smart packaging features today changed your **satisfaction** and **trust** in the brand since the last time you used them? Please explain your reasoning.
- How has your use of smart packaging features today affected your **personal connection** with the brand?

- How would you feel if the brand was **withdrawn** from the market? Why?
- Would you be willing to **purchase** this product or other products from this brand in the future? Why?

Overall

- Would you say that the smart packaging features have **improved** or **harmed** your usage experience? Why?
- Are there any **suggestions** or **feedback** that you would like to pass on to the developers and designers of the product?

Appendix I: Study 2 Questioning Route

- Start off with some small talk to build rapport
    - Thank the participants for their participation
    - Ask them what they thought about the provided coffees
- Let participants know that they don't have to answer questions they don't feel comfortable answering and may end the interview if they so wish
- Brief them on the nature of the questioning which will largely be based on the data (audio diaries, logs, account behaviour). Visualisations of these will be used as prompts.

Near Field Communication (NFC) Tags

- What is your opinion on the use of NFC tags on the coffee packs?
- Did you read the information that was unlocked?
    - Why or why not?
    - What did you find (un)interesting?
    - What kind of content would you suggest be posted?
- Was this right away or did you revisit it later on?
- Was there anything valuable from your use of this feature?
    - Was the information unlocked by the scan useful to you?
        - Why or why not?
        - Which parts were useful or useless?
        - What sort of information would you suggest we include?
    - How did you feel when you scanned the tags?
        - Were there any positive emotions?
        - How about negative?
        - Or was it just neutral?
    - Did you show/tell anyone about this feature in a social context?
        - Could you elaborate?
- *Engagement Questions*
    - Did it made you think more about the product?
        - Why or why not?
    - Did this information change the way you brew the coffee?
        - Why or why not? Could you tell me more?
        - What would motivate you to try new brewing methods or recipes?
- How did this feature affect your relationship with the brand?
    - Did it affect your trust in the brand? Why or why not?
    - Did it affect your satisfaction with the brand? Why or why not?
    - Did it affect your personal connection with the brand? Why or why not?

Consumption Tracking

- What is your opinion of the Profile section of the app?
- Did you have any concerns about providing this information during the registration process?
    - Why or why not?
- As a consumer, how would you like to see this information utilised?

- Would you be willing to provide more information (i.e. coffee preferences) if it would give you more personalised content rather than the same content for everyone?
    - What would you suggest? Could you elaborate please?

- What is your opinion of the collection of coffee consumption statistics?
- Did you keep track of how much coffee you were consuming?
    - Why or why not?
- Was there anything valuable from your use of this feature?
    - Was this information useful?
        - Why or why not?
        - How could this be improved?
    - Did the use of this feature trigger any emotions?
        - Perhaps did it make you feel better to know you are not consuming too much?
        - Or guilty that you are consuming way too much?
    - Did you show/tell anyone about this feature in a social context?
        - Could you elaborate?
- Did it make you think about how much coffee you are consuming regularly?
    - Why or why not?
- Did your coffee consumption habits change as a result of this knowledge?
    - Why or why not?
- How did this feature affect your relationship with the brand?
    - Did it affect your trust in the brand? Why or why not?
    - Did it affect your satisfaction with the brand? Why or why not?
    - Did it affect your personal connection with the brand? Why or why not?

Community

- What is your opinion of the Community section of the app?
- Based on our data you seem to have <**Insert Community Interaction Data>**
        - Spent some time but did not interact
        - Spent some time and did interact
        - Did not use at all
    - Could you please tell me more about your experience with the Community section?
- Was there anything valuable from your use of this feature?
    - Was the content helpful or useful to you?
        - Why or why not?
            - Which parts were useful or useless?
            - What sort of information would you suggest we include?
        - How did you feel when you used the Community section of the app?
            - Were there any positive emotions (i.e. from interaction, likes, comments, posts)?
            - How about negative?
            - Or was it just neutral?
        - Did you like interacting with others on the Community?

                - Why or why not?
            - Did you show or tell anyone about the Community or talked about things you learned from it on within a social context?
                - Could you elaborate?
- Did the content on the Community section made you think more about the brand?
    - Why or why not?
    - What do you think might achieve this?
- Did it change your coffee consumption experience?
    - Why or why not?
    - How did it change (e.g. how you brew it, look out for tasting notes)?
- How did this feature affect your relationship with the brand?
    - Did it affect your trust in the brand? Why or why not?
    - Did it affect your satisfaction with the brand? Why or why not?
    - Did it affect your personal connection with the brand? Why or why not?

Facebook Shares

- What is your general opinion of this feature?
- What was the reason that you did not use this feature?

Ratings and Reviews

- What is your general opinion of being able to save your personal rating and review of the coffees?
- Based on our data, you (did not) rate and review the coffees?
    - Why or why not?
- Was there anything valuable from your use of this feature?
    - Do you think these ratings or reviews could be useful to you?
        - Why or why not?
    - Did this feature trigger any emotions? How did you feel about it?
        - Positive? Negative? Neutral?
    - Did you show anyone or talk to anyone about this feature within a social context?
        - Why or why not? Could you elaborate?
- Did rating or reviewing the coffee make you think about it more?
    - Why or why not?
- Did rating or reviewing the coffee change the way you consume the coffee or influence your future coffee purchase decisions?
    - Why or why not?
- How did this feature affect your relationship with the brand?
    - Did it affect your trust in the brand? Why or why not?
    - Did it affect your satisfaction with the brand? Why or why not?
    - Did it affect your personal connection with the brand? Why or why not?

Logbook

- What is your general opinion of the logbook feature?
- *If they ticked multiple brewing methods but did not use the logbook*

    - Despite you reporting as using a variety of brewing methods, our data suggests that you made minimal/no logbook entries for the coffee that we have provided, was there any particular reason for this?
- *If they did not use the logbook*
    - Why did you not use the logbook? How would you suggest this feature can be improved?
- *If they did use the logbook*
    - Could you tell me more about why you used the logbook? What use was it for?
- Was there anything valuable from the use of this feature?
    - Was this feature useful to you?
        - Why or why not?
    - Did the use of this feature trigger any emotions?
        - Why or why not?
    - Did you show anyone or talk to anyone about this feature within a social context?
        - Why or why not?
- Did making the logbook entries make you think about the coffee more?
    - Why or why not?
- Did making the logbook entries change the way you consume the coffee?
    - Why or why not?
- How did this feature affect your relationship with the brand?
    - Did it affect your trust in the brand? Why or why not?
    - Did it affect your satisfaction with the brand? Why or why not?
    - Did it affect your personal connection with the brand? Why or why not?

Raffle Tokens

- I can see that you have collected a few raffle tokens during the study.
    - Was there any particular reason you did not do <insert specific task>
    - How did you feel when doing these tasks?
- I can see that you did not earn any raffle tokens during the study, was there any particular reason for this?
- Do you have any recommendations on what the brand could do to better communicate or engage with you as a participant?

Conclusion

- Based on your experience throughout the study, what would you suggest the brand implement, do, or carry out in order to improve your trust, satisfaction, and personal connection in the brand?
- Could you briefly summarise how your satisfaction, trust, and personal connection to the brand change throughout the study period?
- Provide participants with their Amazon voucher and let them know that they will be emailed the raffle results once all the participants have concluded the study.