Product Experience

Editors:
Hendrik N.J. Schifferstein & Paul Hekkert
CONTENTS

PREFACE  xix
BY DONALD NORMAN

LIST OF CONTRIBUTORS  xxi

Introducing Product Experience  1
PAUL HEKKERT AND HENDRIK N.J. SCHIFFERSTEIN

PART

I FROM THE HUMAN PERSPECTIVE  9

A Senses  9

I On the visual appearance of objects  11
HAROLD T. NEFS

1. On visual appearance  11
  1.1. Introduction  11
2. The physical world  13
  2.1. Shape  13
  2.2. Material  15
  2.3. Illumination  18
  2.4. Color  19
CONTENTS

2 The tactual experience of objects 41
MARIEKE H. SONNEVELD AND HENDRIK N.J. SCHIFFERSTEIN

1. Introduction 41
2. The meaning of touch 43
   2.1. Touch: Physical encounters and awareness of oneself 43
   2.2. Touch: A foundation for knowledge of the material world 43
   2.3. Touch: A foundation for feelings and emotions 44
   2.4. Touch: A communication channel for affection 44
3. Tactual interaction 45
   3.1. Active and passive touch 45
   3.2. Exploration strategies 46
   3.3. Motivations to move 46
4. Tactual properties of objects 49
   4.1. Hardness, elasticity and plasticity 50
   4.2. Temperature 50
   4.3. Texture and patterns 50
   4.4. Shape and size of the object 51
   4.5. Weight and balance 52
5. Tactual sensations: Being touched by objects 52
   5.1. The skin and the skin senses 53
   5.2. The skin sensations 54
   5.3. The body senses and sensations 55
   5.4. Tactual sensitivity 55
6. The body language of objects 56
   6.1. Personality 56
   6.2. Intentions 57
   6.3. Integrity: Tactual feedback 58
   6.4. The perfect match 58
   6.5. Familiarity: Feeling 'mine' or alien 58
   6.6. Power match and being in control 59
   6.7. Challenge of developing physical skills 59
   6.8. Attention: Tactual transparency and tactual noise 60
   6.9. Conclusion on the themes 60
7. The feelings involved in tactual experience 60
8. Educating the tactual senses 62
9. Future developments 63
3 The experience of product sounds  69

RENEVAN EGMOND

1. Whether to be silent  69
2. The domain of product sounds  70
3. Spectral and temporal structure of sounds  71
4. Product sounds  72
   4.1. Spectral and temporal structure of product sounds  72
5. Process of auditory perception  77
6. Designing the experience of consequential product sounds  81
   6.1. Recording  82
   6.2. Analysis  82
   6.3. Concept and sound design phase  85
   6.4. Evaluation  85
7. Conclusion  86

4 Taste, smell and chemesthesis in product experience  91

ARMAND V. CARDELLO AND PAUL M. WISE

1. Introduction  91
   1.1. Importance of taste, smell and chemesthesis to product experience  91
   1.2. Chemical senses as integrated perceptual systems  92
2. Taste  92
   2.1. The experience of taste  92
   2.2. The mechanisms of taste experience  93
3. Taste: Basic phenomena of taste experience  95
   3.1. Taste adaptation  95
   3.2. Repetitive taste experiences and liking  96
   3.3. Combined taste experiences  96
   3.4. Modifying taste experiences  97
   3.5. Innate and early taste experiences and preference  99
   3.6. The effects of learning on taste experience  100
4. Smell  101
   4.1. The experience of smell  101
   4.2. The mechanisms of olfactory experience  101
5. Smell: Basic phenomena of experience  104
   5.1. Olfactory adaptation  104
   5.2. Combined olfactory experiences  104
   5.3. Modification of olfactory experiences  105
   5.4. Innate versus learned odor experiences and preferences  106
6. Chemesthesis  106
   6.1. The experience of chemesthesis  106
   6.2. Peripheral anatomy and receptor mechanisms for experiencing chemesthesis  107
   6.3. Processing peripheral nerve signals into chemesthetic experiences  107
   6.4. Chemesthesis: Basic phenomena  107
7. Measuring chemosensory product experience 109
   7.1. Chemosensory experiences: Consumers versus experts 109
   7.2. Methods for quantifying chemosensory product experiences: Trained panels 109
   7.3. Methods for quantifying chemosensory product experiences: Consumers 110
8. Context, information and expectations in chemosensory and product experience 112
   8.1. Non-sensory influences on product experience 112
   8.2. The effects of context 112
   8.3. The effects of information and expectations 113
9. Age, gender, cultural and social factors in chemosensory and product experience 117
   9.1. The effects of age 117
   9.2. The effects of gender 119
   9.3. The effects of cultural and social factors 120
10. Conclusion 121

5 Multisensory product experience 133
    HENDRIK N.J. SCHIFFERSTEIN AND CHARLES SPENCE

B Capacities and skills 163

6 Human capability and product design 165
    JOHN CLARKSON
CONTENTS

5. Hearing 176
   5.1. Sound detection 177
   5.2. Speech discrimination 178
   5.3. Sound localization 178
   5.4. Context of use 178
   5.5. Design guidance 179
   5.6. Prevalence data 179

6. Intellectual functioning 179
   6.1. Working memory 181
   6.2. Attention and performance 182
   6.3. Visual-spatial thinking 182
   6.4. Learning, recall, and long-term memory 183
   6.5. Context of use 183
   6.6. Design guidance 184
   6.7. Prevalence data 185

7. Communication 185
   7.1. Perceiving 186
   7.2. Acting 187
   7.3. Context of use 187
   7.4. Design guidance 187
   7.5. Prevalence data 188

8. Locomotion 188
   8.1. Walking and balance 189
   8.2. Getting up, down, in and out 189
   8.3. Context of use 189
   8.4. Design guidance 190
   8.5. Prevalence data 190

9. Reach and stretch 191
   9.1. Reaching out in front 191
   9.2. Reaching out to the sides 192
   9.3. Context of use 192
   9.4. Design guidance 192
   9.5. Prevalence data 192

10. Dexterity 193
    10.1. Force exertion without grip 193
    10.2. Precision gripping 194
    10.3. Power gripping 195
    10.4. Two handed tasks 195
    10.5. Context of use 195
    10.6. Design guidance 195
    10.7. Prevalence data 196

11. Summary 197

7 Connecting design with cognition at work 199
DAVID WOODS AND AXEL ROESLER

1. Introduction 199
2. Design and cognition at work: Impaired or unimpaired micro-cognition 201
3. Design and cognition at work: Expanding the impact of macro-cognition 204
4. Contrasting micro- and macro-cognitive viewpoints 206
5. Macro-cognition and expansive adaptations 208
6. Inventing the future of cognition at work 210

8 Designing for expertise 215
AXEL ROESLER AND DAVID WOODS

1. Introduction 215
2. Perspectives on expertise 217
   2.1. A history of the study of expertise 219
   2.2. What is expertise? 222
   2.3. Who are the experts? 224
   2.4. How expertise is acquired? 226
3. Innovation and the eminent level of expertise 227
4. The implications of differences in user expertise for product design 232
5. Summary and conclusion 235

PART II FROM THE INTERACTION PERSPECTIVE 239

9 Holistic perspectives on the design of experience 241
GERALD C. CUPCHIK AND MICHELLE C. HILSCHER

1. Introduction 241
   1.1. The cognitive approach 242
   1.2. Contributions of phenomenology 243
   1.3. Contributions of Gestalt psychology 245
   1.4. Contributions of Kurt Lewin’s experimental phenomenological social psychology 247
2. Personal meanings of design products 247
   2.1. Analyzing the discourse 248
   2.2. Factor analysis 248
   2.3. Reflections on the factor analysis 251
   2.4. Analysis of variance 251
   2.5. Reflections on the analysis of variance 252
3. Application 252

A The aesthetic experience 257

10 Product aesthetics 259
PAUL HEKKERT AND HELMUT LEDER

1. Introduction 259
   1.1. Aesthetics 260
   1.2. Research in aesthetics 261
2. Organizational properties 261
   2.1. Unifying properties 262
   2.2. Complexity and variety 264
CONTENTS

2.3. Unity in variety 265
3. Meaningful properties 266
  3.1. Familiarity and prototypicality 267
  3.2. Originality, novelty and innovativeness 269
  3.3. 'Most advanced, yet acceptable' 270
  3.4. Product expression and association 270
4. Universal aesthetic principles 271
  4.1. A study on cross-cultural aesthetic universals 271
  4.2. Evolutionary aesthetics 273
  4.3. Cross-sensory aesthetic principles 276
5. Cultural and individual differences 277
  5.1. Sensitivity 277
  5.2. Knowledge and experience 277
  5.3. Culture 278
  5.4. The evolution of taste 279
6. Conclusions 280
  6.1. Implications for design and designers 280
  6.2. Future of design aesthetics 281

11 Aesthetics in interactive products: Correlates and consequences of beauty 287
MARC HASSENZAHL

1. Introduction 287
2. Beauty 'Defined' 288
3. Correlates of beauty 291
  3.1. What is beautiful is usable: — Myth or truth? 291
  3.2. Other correlates 293
4. Consequences of beauty 295
  4.1. Beauty as a source of value 295
  4.2. Beauty as appealing to self-referential goals 296
  4.3. Beautiful products work better 298
5. Summary and conclusion 299

B The experience of meaning 303

12 Meaning in product use: A design perspective 305
STELLA BOESS AND HEIMRICH KANIS

1. Meaning in product use 305
2. Product semantics 306
  2.1. Product semantics applied 307
  2.2. Elements of product semantics 308
  2.3. Product semantics and product use 309
3. Affordances 309
  3.1. The introduction of the affordance concept in design 309
  3.2. James Gibson's theory of affordances 310
  3.3. A contradiction in the theory and two arguments to explain it 311
  3.4. Affordances: A mixed blessing for design 313
4. Anticipating meaning in product use  317
   4.1. The unpredictability of use on the basis of prior theoretical considerations  317
   4.2. Imagining product use in design  318
   4.3. Conceptualizing product use for design: Situatedness  320
5. Use cues for research on product use  322
   5.1. Empirical approach  323
   5.2. Story of use  323
   5.3. Use cues for perception, cognition and action  323
   5.4. Observed usage  324
   5.5. Design outcomes  324
   5.6. Limitations  324
6. Use cues in the Delft design course  325
   6.1. A project example  325
   6.2. Reflection  329
7. Conclusions  329

13 Product expression: Bridging the gap between the symbolic and the concrete  333
THOMAS J.L. VAN ROMPAY

1. Introduction  333
2. The expressive object  334
   2.1. Bodily expression  335
   2.2. Arnheim and the Gestalt school  336
   2.3. The ecological approach  337
   2.4. Discussion  338
3. The constructive individual  339
   3.1. Arousal and the aesthetic experience  339
   3.2. Dynamization and empathy  339
   3.3. Metaphor and analogy  340
   3.4. Learned meanings  342
   3.5. Discussion  343
4. The interactional stance  344
   4.1. Lakoff and Johnson on metaphor  344
   4.2. Image schemas  345
   4.3. Image schemas and product expression  346
   4.4. Variability in the perception of product expression  348
5. Conclusion  349

14 Semantics: Meanings and contexts of artifacts  353
KLAUS KRIPPENDORFF AND REINHART BUTTER

1. Preliminaries  353
   1.1. Second-order understanding  354
   1.2. Meanings  354
   1.3. Networks of stakeholders  357
   1.4. Interfaces  358
2. Artifacts and their various contexts 362
   2.1. Observing the meaningfulness of artifacts in context of their use by others 363
   2.2. Interfacing with artifacts according to what they mean, thus being part of their context 366
   2.3. Anticipating context of use from narratives involving particular artifacts 368
3. Three concluding observations 371
   3.1. Meaninglessness 371
   3.2. The size of a context 372
   3.3. Metaphors revisited 373
4. Conclusion 375

C The emotional experience 377

15 Product emotion 379
PIETER M.A. DESMET
1. Introduction 379
   1.1. Scope and structure of the chapter 380
2. Affect and emotion 380
   2.1. Core affect 381
   2.2. Attributed affect: Emotions 382
   2.3. Free floating affect: Moods 383
   2.4. Dispositional affect: Attitudes 384
   2.5. Differentiating between emotions 384
   2.6. Function of emotion 385
3. Approaches to product emotion 386
   3.1. Pleasure approach to product emotion 386
   3.2. Process-level approach to product emotion 387
   3.3. Appraisal approach to product emotion 389
4. Sources of product emotion 391
   4.1. Product emotion related to affect dispositions 392
   4.2. Product emotion related to goals 393
   4.3. Product emotion related to standards 394
   4.4. Mixed emotions 394

16 Consumption emotions 399
MARSHA L. RICHINS
1. Introduction 399
   1.1. Scope of the chapter 400
   1.2. Consumption emotions defined 400
   1.3. Product categories and consumption emotions 401
2. Setting the stage for consumption emotions 402
   2.1. Consumption hypotheses 402
   2.2. Prepurchase affective states 403
3. Eliciting conditions for consumption emotions 404
   3.1. Purchase 405
   3.2. Influences of consumption situation 405
   3.3. Dissatisfaction 407
   3.4. Persistent consumption emotions 407
4. Individual differences in consumption emotion experience 408
5. Research on consumption emotions 409
   5.1. Single emotion studies 409
   5.2. Broad range studies 410
6. Identifying and measuring consumption emotions 414
   6.1. Differential Emotions Scale 415
   6.2. Pleasure-arousal-dominance dimensional representation 415
   6.3. Consumption Emotions Set 415
7. Future directions 416
   7.1. Theory building research 417
   7.2. Managerially oriented research 418

D Specific experiences and approaches 423

17 Product attachment: Design strategies to stimulate the emotional bonding to products 425
RUTH MUGGE, JAN P.L. SCHOORMANS AND HENDRIK N.J. SCHIFFERSTEIN

1. Defining product attachment 425
2. Relevance of product attachment for designers 428
   2.1. Creating emotional experiences 428
   2.2. Stimulating sustainable consumption 429
3. Determinants of product attachment 430
   3.1. Pleasure 430
   3.2. Self-expression 432
4. Conclusion 437

18 Crucial elements of designing for comfort 441
PETER VINK AND MICHEL P. DE LOOZE

1. Attention for comfort in design 441
2. Two entities: Comfort and discomfort 441
3. Comfort and discomfort aspects of importance for design 444
4. Comfort improvement is possible 447
5. The cases 447
   5.1. Case I: Discomfort on an assembly line 449
   5.2. Case II: Comfortable paint scraping 451
   5.3. Case III: Aircraft interior comfort 455
6. Conclusion 459
19 Co-experience: Product experience as social interaction 461
KATJA BATTARBEE AND ILPO KOSKINEN

1. From user experience to co-experience 461
2. Interpretations of user experience in design research 462
3. A philosophical detour 463
4. Co-experiencing mobile multimedia as a process 465
   4.1. Lifting up 465
   4.2. Reciprocating 466
   4.3. Rejecting 467
5. Morphome: Designing for co-experience with prototypes 468
   5.1. Design prototype: The 'IKEA' style study and system scenarios 470
   5.2. The system prototype: Living inside a proactive home as co-experience 471
6. Discussion 473

20 Affective meaning: The Kansei Engineering approach 477
SIMON SCHÜTTE, JÖRGEN EKLUND, SHIGEKAZU ISHIHARA AND MITSUO NAGAMACHI

1. Introduction 477
2. Kansei and Chisei 478
3. Introducing Kansei in commercial product design 479
4. The Kansei Engineering approach 479
5. The Kansei is changing 480
   5.1. Proximity of presentation 481
   5.2. Proximity of interaction 482
6. Kansei Engineering procedure 482
   6.1. Choosing the domain 483
   6.2. Spanning the Semantic Space 483
   6.3. The Space of Properties as a counterpart of the Semantic Space 485
   6.4. Synthesis 487
   6.5. Model building and test of validity 488
7. Applications of Kansei Engineering in industry 488
   7.1. The Mazda Miyata case 488
   7.2. Developing a new hair treatment 489
   7.3. An example of engineering design for driving feeling 491
8. Reflections on Kansei Engineering methodology 493
   8.1. Is Kansei Engineering innovative? 493
   8.2. Reinforcing exterior design using interior qualities 494
   8.3. Reductionism versus holism 494
   8.4. Moving from quantitative to qualitative approaches 495
PART III  FROM THE PRODUCT PERSPECTIVE  497

A  Digital products  497

21 The useful interface experience: The role and transformation of usability  499
JOHN M. CARROLL AND HELENA M. MENTIS

1. Usability  500
2. Usability beyond simplicity  501
3. Digital user experience directions  502
   3.1. Desirable technology experiences  504
   3.2. Adverse technology experiences  507
   3.3. Unexpected technology experiences  509
4. Usability as an evolving concept  512

22 The experience of intelligent products  515
DAVID V. KEYSON

1. Background  515
2. Understanding intelligent products  516
3. Intelligent product functionality and the user  517
4. User experience issues  518
   4.1. Perceived functional performance  518
   4.2. Understanding and sense of control  519
   4.3. Emotionally appealing and engaging  522
5. Experience driven design  525
   5.1. Guiding the experience design process  525
6. Central design considerations  527
   6.1. From ‘use to presence’  527
   6.2. From ‘task-oriented to experience driven design’  528
7. Future  528

23 The game experience  531
ED S. TAN AND JEROEN JANSZ

1. Introduction  531
2. The game  532
   2.1. Digital games  532
   2.2. Game features and experience  535
3. The player  538
   3.1. Gamers  538
   3.2. A framework for describing the game experience  539
   3.3. Conclusion and methodological outlook  551
B Non-durables 557

24 Experiencing food products within a physical and social context 559
HERBERT L. MEISELMAN

1. Introduction 559
   1.1. Overview 559
   1.2. Background 560
   1.3. Terminology 561
2. Products are experienced differently in different contexts 562
3. Which contextual variables contribute to the product experience? 565
   3.1. Effort to obtain food 565
   3.2. Eating duration 567
   3.3. Choice 568
   3.4. Convenience 568
   3.5. The physical environment 570
   3.6. Socialization/commensality 572
   3.7. Service 573
4. Designing products for a meal context 573
5. How to test products to reflect consumer product experience 576

25 The mediating effects of the appearance of nondurable consumer goods and their packaging on consumer behavior 581
LAWRENCE L. GARBER JR., EVA M. HYATT AND ÜNAL Ö. BOYA

1. Appearance as a carrier of brand equity 582
   1.1. Four roles for package appearance 583
   1.2. The role of color 583
2. The relativity of visual phenomena 585
   2.1. The relativity of color 585
   2.2. The relativity of visual novelty 586
3. Color experimentation in marketing 588
4. The interaction of color and flavor 590
5. The interaction of shape and size appearance 592
   5.1. The importance of size to the consumer 592
   5.2. The importance of size appearance to the marketer 592
   5.3. Size/shape research 593
6. A method for empirical visual research 595
   6.1. Calibration for novelty of appearance 596
   6.2. Calibration for meaning inferred from appearance 597
7. Conclusion 600
<table>
<thead>
<tr>
<th>C Environments 603</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>26 Office experiences 605</strong></td>
</tr>
<tr>
<td>CHRISTINA BODIN DANIELSSON</td>
</tr>
<tr>
<td>1. Introduction 605</td>
</tr>
<tr>
<td>1.1. The importance of office design for organizations 607</td>
</tr>
<tr>
<td>2. Environmental stressors and coping strategies in office environments 607</td>
</tr>
<tr>
<td>3. A framework to understand office experiences 609</td>
</tr>
<tr>
<td>3.1. Physical structure 610</td>
</tr>
<tr>
<td>3.2. Physical stimuli 616</td>
</tr>
<tr>
<td>3.3. Symbolic artifacts 621</td>
</tr>
<tr>
<td>4. Discussion 625</td>
</tr>
<tr>
<td><strong>27 The shopping experience 629</strong></td>
</tr>
<tr>
<td>ANN MARIE FIORE</td>
</tr>
<tr>
<td>1. The changing shopping experience 629</td>
</tr>
<tr>
<td>2. Framing the shopping experience 630</td>
</tr>
<tr>
<td>2.1. Consciousness-Emotion-Value (C-E-V) model and Cognition-Affect-Behavior (C-A-B) models for explaining shopping experience 630</td>
</tr>
<tr>
<td>2.2. Amalgamation of C-E-V and C-A-B model components 631</td>
</tr>
<tr>
<td>3. Perceived value and shopping experience 632</td>
</tr>
<tr>
<td>3.1. Typology of value 633</td>
</tr>
<tr>
<td>4. Emergent marketing trends and the engaged consumer 639</td>
</tr>
<tr>
<td>4.1. Pervasive experiential elements 639</td>
</tr>
<tr>
<td>4.2. Customized and interactive experiential elements 640</td>
</tr>
<tr>
<td>4.3. Holistic experiential elements 641</td>
</tr>
<tr>
<td>4.4. Transient experiential elements 642</td>
</tr>
</tbody>
</table>

**Closing reflections 649**  
HENDRIK N.J. SCHIFFERSTEIN AND PAUL HEKKERT  

**INDEX 651**