



Delft University of Technology

Managing product usability. How companies deal with usability in the development of electronic consumer products

van Kuijk, JI

Publication date

2010

Document Version

Final published version

Citation (APA)

van Kuijk, JI. (2010). *Managing product usability. How companies deal with usability in the development of electronic consumer products*. [Dissertation (TU Delft), Delft University of Technology]. s.n.

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.

For technical reasons the number of authors shown on this cover page is limited to a maximum of 10.

Managing Product Usability

How companies deal with usability in the
development of electronic consumer products

Managing Product Usability; how companies deal with usability in the development of electronic consumer products

PhD thesis

Delft University of Technology, The Netherlands
Faculty of Industrial Design Engineering

ISBN: 978-90-816468-1-9

Subject headings: product development, innovation management, human-product interaction, usability, electronic consumer products, consumer electronics

December 2010

© Jasper van Kuijk, 2010

j.i.vankuijk@tudelft.nl / jasper@vankuijk.com

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronically or mechanically, including photocopying, recording by any information storage and retrieval system without permission from the author.

Managing Product Usability

How companies deal with usability in the
development of electronic consumer products

Proefschrift

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
op gezag van de Rector Magnificus prof.ir. K.C.A.M. Luyben
voorzitter van het College voor Promoties,
in het openbaar te verdedigen op maandag 13 december 2010 om 15:00

door

Jasper Ivo VAN KUIJK

ingenieur industrieel ontwerpen,
geboren te Den Haag

Dit proefschrift is goedgekeurd door de promotor:

Prof.ir. D.J. van Eijk

Copromotor:

Dr. H.H.C.M Christiaans

Samenstelling promotiecommissie:

Rector Magnificus, *voorzitter*

Prof.ir. D.J. van Eijk, Technische Universiteit Delft, *promotor*

Dr. H.H.C.M. Christiaans, Technische Universiteit Delft, *copromotor*

Prof. D.A. Norman, PhD, Korea Advanced Institute of Science and Technology

Prof.Dr.-Ing R. Bruder, Technische Universität Darmstadt

Prof.dr. P.P.M.A.R. Heugens, Erasmus Universiteit Rotterdam

Prof.dr.ir. P.H. den Ouden, Technische Universiteit Eindhoven

Prof.dr.ir. J.A. Buijs, Technische Universiteit Delft

Reservelid:

Prof.dr. P.J. Stappers, Technische Universiteit Delft

Drs. H. Kanis heeft als begeleider in belangrijke mate aan de totstandkoming van dit proefschrift bijgedragen.

The research described in this thesis was supported by the Netherlands Ministry of Economic Affairs, Agriculture and Innovation under the Innovation-Oriented Research Programme 'Integrated Product Creation and Realization' (IOP IPCR).



They're using only half of what we're giving

We can put a lot of functionality into a product, but if people are not able to use that product, all that functionality is useless. As the CEO of TeliaSonera (Scandinavia's largest telecom provider) put it:

"It's great that a mobile phone has a built-in camera, but it's far too complicated. Sometimes you have to use up to 12 keys. A client that's not able to do this the first time, is lost forever."

Contents

- CHAPTER 1 | INTRODUCTION 1**
 - 1.1 What is usability and why is it important? 3**
 - 1.1.1 The concept of usability 3
 - 1.1.2 Manifestations and effects of usability 4
 - 1.2 Usability of electronic consumer products under pressure 7**
 - 1.2.1 Signals from product development practice 7
 - 1.2.2 Potential causes 8
 - 1.3 The gap between usability in theory and practice..... 10**
 - 1.3.1 Methods for creating usable products..... 11
 - 1.3.2 The problem may lie in practice 11
 - 1.3.3 Existing research on usability in product development practice..... 12
 - 1.4 Research design..... 13**
 - 1.4.1 Research goal 13
 - 1.4.2 Research approach 14
 - 1.4.3 Research context: the Design for Usability project..... 16
 - 1.4.4 uselog.com | the product usability weblog 16
 - 1.5 Thesis outline..... 17**
- CHAPTER 2 | CENTRAL CONCEPTS FOR FRAMING USABILITY IN PRODUCT DEVELOPMENT 19**
 - 2.1 Identifying central concepts..... 21**
 - 2.1.1 Review of existing research on usability in practice 21
 - 2.1.2 Exploratory interviews with experts on usability in practice 26
 - 2.1.3 Selected concepts..... 26
 - 2.2 Human-product interaction and user experience..... 28**
 - 2.2.1 Framework for human-system interaction..... 30
 - 2.2.2 Human-product interaction for electronic consumer products..... 35
 - 2.2.3 User experience..... 37
 - 2.3 Usability 39**
 - 2.3.1 Defining usability 39
 - 2.3.2 Working definition of usability in this thesis 45
 - 2.3.3 Manifestations and effects of usability 46
 - 2.4 Product development..... 48**
 - 2.4.1 The product development process 49
 - 2.4.2 Development projects 54
 - 2.4.3 Multidisciplinary product development teams 55
 - 2.5 Creating usable products..... 59**
 - 2.5.1 Methodologies for creating usable products 59
 - 2.5.2 The user-centred design cycle 61
 - 2.5.3 If we know all this, what is going wrong? 67

2.6	Conceptual framework for usability in product development	67
CHAPTER 3	CASE STUDY I: EXPLORING USABILITY IN PRODUCT DEVELOPMENT PRACTICE IN FOUR ADJACENT MARKETS	73
3.1	Research design.....	75
3.2	CleanSweep fast-moving consumer goods.....	78
3.2.1	Context description.....	78
3.2.2	Barriers and enablers for usability	80
3.3	HighCar high-end automotive.....	82
3.3.1	Context description.....	82
3.3.2	Barriers and enablers for usability	85
3.4	Home@Work in-office coffee machines.....	86
3.4.1	Context description.....	87
3.4.2	Barriers and enablers for usability	89
3.5	PrintPros professional copiers & printers.....	91
3.5.1	Context description.....	91
3.5.2	Barriers and enablers for usability	93
3.6	Cross-case analysis.....	95
3.6.1	Development process and user involvement	95
3.6.2	Usability in multi-disciplinary teams.....	97
3.6.3	Attitude towards usability.....	98
3.7	Feedback workshop	99
3.7.1	Setup	99
3.7.2	Results	99
3.8	Conclusions	102
3.9	Implications for the subsequent study.....	105
CHAPTER 4	CASE STUDY II: BARRIERS AND ENABLERS FOR USABILITY IN FIVE DEVELOPMENT GROUPS OF ELECTRONIC CONSUMER PRODUCTS	107
4.1	Research design.....	109
4.2	Method	111
4.2.1	Data collection: interviews with product developers	111
4.2.2	Data analysis: from interviews to barriers and enablers	113
4.2.3	Categorizing and visualizing barriers and enablers.....	116
4.2.4	Creating the context descriptions.....	121
4.2.5	Cross-case analysis.....	122
4.2.6	Verification strategies	123
4.3	Context descriptions: the product development groups	124
4.3.1	AV2go personal media players.....	124
4.3.2	EnRoute personal navigation.....	129
4.3.3	WashCare washing machines and tumble dryers.....	133

4.3.4	D-phone mobile phones.....	137
4.3.5	HomeControl thermostats	142
4.4	Cross-case analysis: mechanisms of barriers and enablers	146
4.4.1	Process.....	146
4.4.2	Knowledge	154
4.4.3	Team.....	154
4.4.4	Project.....	156
4.4.5	Company	157
4.4.6	Market.....	158
4.4.7	Distribution of barriers and enablers	159
4.5	Feedback workshop	163
4.5.1	Setup	163
4.5.2	Responses to the barriers and enablers per company	163
4.5.3	Responses to the cross-case analysis	164
4.5.4	Responses to the Trace tool	169
4.6	Conclusions.....	171
4.6.1	Process: Creating usable products	171
4.6.2	Process: Evaluating usability.....	173
4.6.3	Knowledge	174
4.6.4	Team.....	175
4.6.5	Project.....	176
4.6.6	Company	176
4.7	Discussion	178
4.7.1	About the results	178
4.7.2	About the research design and method	179
4.7.3	Implications for the subsequent study	180

CHAPTER 5 	CASE STUDY III: TRACING THE ORIGINS OF USABILITY ISSUES IN THREE PRODUCT DEVELOPMENT PROJECTS	183
5.1	Research design.....	186
5.2	Context description: product development group and projects.....	190
5.2.1	The AV@home product development group.....	190
5.2.2	The product development projects.....	193
5.3	Identifying usability issues in the products	196
5.3.1	Method	196
5.3.2	Results: overview of usability issues per product.....	198
5.4	Describing how usability was dealt with at AV@home.....	199
5.4.1	Method	199
5.4.2	Results: how usability was dealt with at AV@home	203
5.4.3	Feedback workshops.....	217
5.5	Creating causal networks per usability issue	219
5.5.1	Method	220
5.5.2	Results: sample from a causal network	224
5.6	Inducing causal models from causal networks	225
5.6.1	Method	226

5.6.2	Results: causal models of usability in product development	228
5.6.3	Model 1: The usability issue lifecycle	229
5.6.4	Model 2: Generating shared knowledge about usability issues.....	236
5.6.5	Exploring groundedness and accuracy.....	245
5.7	Conclusions	249
5.7.1	On the usability issue lifecycle	250
5.7.2	On generating shared knowledge about usability issues	252
5.8	Scope and limitations of the study	253
CHAPTER 6 	CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS.....	257
6.1	Conclusions	259
6.1.1	Creating usable products requires an organisational approach	259
6.1.2	Four primary drivers for usability	260
6.1.3	Underlying mechanisms influencing usability in the electronic consumer products sector	262
6.2	Discussion	268
6.2.1	Comparison to existing research	268
6.2.2	Reflection on the results	270
6.2.3	Reflection on the research design and method.....	276
6.2.4	Using a weblog as a tool for dissemination, dialogue and reflection	285
6.3	Recommendations for future research	287
6.4	Recommendations for industry (or how I would do it)	289
References		295
Appendices		307
Summary		344
Samenvatting		347
Publications resulting from this work.....		351
Acknowledgements.....		352
About the author.....		355

I may not have all the answers; I wouldn't have it any other way
(as sung by Ilse de Lange, written by K. Halpin)