

Playful User Interfaces: Literature Review and Model for Analysis

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ABSTRACT

Introducing playfulness to applications and services has great potential to improve user experience, as it can be both an effective instrument for the design and a significant addition to current formal user interfaces. Playfulness increases users' motivation to use the product, and learn new features and technologies of the device. Thereby it opens additional capabilities for designers and developers to introduce new functionality.

On basis of a literature review, this paper provides an overview of user interface characteristics that can affect playfulness. We present a set of user interface components with playful interaction possibilities and define a general methodology for analyzing playfulness in user interfaces.

Game industry has a tremendous long-term experience in creating attractive interfaces with the best balance of fun and functionality. This paper shows possibilities how it can be effectively generalized to non-playful applications through playful attributes.

Keywords

playfulness, user interfaces, playful user experience

INTRODUCTION

During the last decade the topic of playful user experience has attracted the attention of many researchers. They argue that product development is not only about implementing features and testing usability but also includes understanding people's daily lives [36]. People are playful by the nature and want to have enjoyment in their lives. User interaction has the possibility to become more enjoyable and pleasant, and expand the functionality of applications and services. For instance Shneiderman [33] emphasizes that "*fun* is part of *functionality*" and "excellence in design is a great facilitator of fun". In past years, user experience research became focused on positive emotional outcomes like joy, fun and pride [20].

In the research presented in this paper we concentrate on user experience in playful user interface domain, and

provide a definition of playfulness and how it can be considered in the design of future applications and services. This paper provides a review of user interface characteristics that can be considered as playful. As a synthesis of the literature review we present a model of user interface components with playful interaction possibilities. The model is suitable for analyzing playfulness in applications and services.

PLAYFUL USER EXPERIENCE

In the first stage of this research we conducted the scientific search of existing studies related to playfulness or playful user experience. The search was conducted through the books and electronic document search in academic databases (ACM Digital library, IEEE Xplore, SpringerLink), and the Internet using Google Scholar and Google Books. The search was conducted in September-October 2008. The following keywords were used for the search: playfulness, playful user interface, enjoyable user interface. Each study and publication was assessed according to the following criteria:

- The study is based on experts' opinions and includes empirical research
- The aims and objectives of the research are clearly reported
- The study includes clear description of research background and context in which it was conducted
- The study is published by reliable source or author(s) has a strong User Experience Design background

In an initial stage we selected publications based on the titles. After that, abstracts and keywords were reviewed. At the last stage, conclusion and research findings were checked.

Overview of the studies

After excluding from the publications workshops, poster and panel sessions, interviews, and news, we identified 32

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studies related to playfulness in user interfaces. Key data, along with a short description of the study, was extracted to a predefined form in order to provide visual clarity concerning our research topic. We categorized studies into several groups: year of publication, publication channel, type of the study and methods of the collecting data.

Most of the studies are published by ACM, HCI, or Springer. Year of publication varies between 1997 and the middle of 2008. A paper published in 1982 [26] was included to the review because it was one of the first publications about playfulness in user interfaces, and it has been often referred to. As can be seen from the Figure 1, the interest to the topic of playfulness has increased for the past decade.

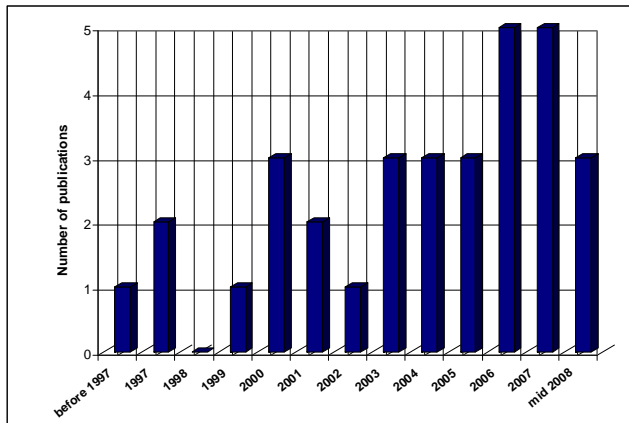


Figure 1: Yearly distribution of the published studies.

We identified two main approaches in the previous work: theoretical and experimental. Theoretical researches are based on strong theoretical studies such as literature reviews, analysis of existing applications, guidelines for the future development and so on. The experimental set includes empirical studies with or without evaluation reports. Almost all studies in the empirical set have a theoretical part and are based on theoretical research findings. 24 theoretical and 8 experimental studies were identified.

If we look at the publication channels distribution we see that half of the studies have been presented in conferences, refer to Table 1. Distribution of the studies by type of publication: 19% appeared in scientific journals, one was published in ACM Magazine and we analyzed three books related to the topic of this research. Table 2 gives a summary of the studies according to publication channel.

Table 1: Distribution of the studies by type of publication.

Type of the publication	Number of publications	Percent
Conference	16	50
Journal	6	19
Book	3	9
Web	3	9
PhD Thesis	2	6
Magazine	1	3
Symposium	1	3
Total	32	100

Table 2: Distribution of the studies after publication channel and occurrence.

Publication channel	Type	Number	Percent
Computer-Human Interaction (CHI)	Conference	3	9
Internet resources	Web	3	9
Designing Interactive Systems (DIS)	Conference	2	6
PhD thesis	Thesis	2	6
Data base for advances in information systems	Journal	2	6
Pleasure with products: Beyond usability	Book	1	3
Product Experience	Book	1	3
Game Design Workshop	Book	1	3

Interactions	Magazine	1	3
Personal Technology	Journal	1	3
Information Technology, Learning and Performance	Journal	1	3
Communications of the ACM (CACM)	Journal	1	3
Designing Pleasurable Products and Interfaces	Conference	1	3
SIGCHI International Conference on Advances in computer entertainment technology	Conference	1	3
Designing Augmented Reality Environments (DARE)	Conference	1	3
Digital Games Research Association (DiGRA)	Conference	1	3
Graphics Interface	Conference	1	3
Human factors in computing systems	Conference	1	3
Internet Research	Conference	1	3
International Conference on Internet and Multimedia Systems and Applications (EuroIMSA)	Conference	1	3
International Conference of Ubiquitous Computing (UbiComp)	Conference	1	3
Mobility Conference	Conference	1	3
International conference on Tangible and embedded interaction	Conference	1	3
Future play	Conference	1	3
European symposium on ambient intelligence (EUSAI)	Symposium	1	3
Total		32	100

We reviewed the aim and research questions for each set of publications to identify the most relative topics for the discussion, see Table 3.

Table 3: Analysis of theoretical papers.

	Study	Aim or main research questions
1	Atkinson and Kydd, 1997 [2]	How does individual characteristic of playfulness influence the use of the World Wide Web?

2	Barendregt 2006 [3]	How can the amount of relevant information yielded by observational evaluations with children be increased? What are the fun problems that should be fixed in order to improve games?
3	Belanger and Van Slyke, 2000 [5]	Paper argues that individuals' play with computer applications can be considered a form of self-directed, experiential learning
4	Chou 2006 [8]	Which characteristics are influences perceived playfulness?
5	Costello and Edmonds, 2007 [8]	Describes the development of a framework of thirteen pleasures of play and outlines the application of this framework during the design process of three interactive artworks
6	Draper 1999 [12]	What are the main areas where fun may be important to software design?
7	Dyck et al., 2003 [13]	Analyzes several current game interfaces looking for ideas effortless community, learning by watching, deep customizability, and fluid system-human interaction.
8	Engeli 2005 [14]	Modifying the first-person shooter game Unreal Tournament as a learning process
9	Follett 2007 [15]	What makes a person want to use one particular digital product or service over its competitor? What makes one user experience more engaging, interesting, or compelling than another?
10	Forlizzi and Ford, 2000 [16]	Proposes a system for talking about experience, and looks at what influences experience and qualities of experience. The aim is to understand what kinds of experiences products can evoke.
11	Fullerton et al., 2004 [17]	Examination of the fundamental elements of game design
12	Garneau 2001 [19]	What is the nature of fun? Why are some things fun and others not?
13	Kangas et al., 2005 [22]	What are the new playful ways of information processing, sharing and delivering, giving support and strengthening feelings of community, participation and empowerment within augmented real life environments?
14	Kim 2006 [23]	How can game mechanics make an interactive experience more

fun, compelling and addictive?

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| 15 | Kozlov and Rheinhold, 2008 [24] | Describes playfulness as a distinct quality of virtual worlds |
| 16 | Lindtner 2003 [25] | Can play be considered an everyday practice? How can we design for an everyday playfulness that pushes boundaries of traditional game concepts and spatial representations, such as the physical and the virtual? |
| 17 | Malone 1982 [26] | Why are computer games so captivating? How can the features that make computer games captivating be used to make other user interfaces interesting and enjoyable to use? |
| 18 | Overbeeke et al., 2002 [28] | Why does interaction design not make electronic interaction more tangible? And, as humans are emotional beings, why not make interaction a more fun and beautiful experience? |
| 19 | Paulos et al., 2003 [29] | Interested in engaging in a critical dialogue around the applicability and adoption. Examined popular ubiquitous computing themes: blogging, tagging, and message play. |
| 20 | Poels et al., 2007 [30] | Describe a focus group study and present a tentative, but comprehensive categorization of game experience |
| 21 | Rosenbloom 2003 [31] | What are the game experiences that can be introduced to any application? |
| 22 | Schifferstein and Hekkert, 2008 [32] | When a design 'works', why does it work? What does influence people interest? |
| 23 | Shneiderman 2004 [33] | How can we design user interfaces to be more fun? |
| 24 | Yager et al., 1997 [36] | Research extends the investigation of playfulness as an individual trait by using a longitudinal study to examine its temporal and situational stability |

From the set of questions described in Table 3 we can see that the most popular topics are related to the nature of playfulness, fun and enjoyment. Many researches try to find which user interface features may be considered as playful and ways to use playfulness in everyday practices. If we look at the content of studies, we see that theoretical studies were based on real-life experiments, literature or overviews of other projects.

Our next step was to review experimental set of papers. We have added the application or service name or category to the overview, see Table 4.

Table 4: Analysis of experimental papers.

<u>Study</u>	<u>Application/service</u>	<u>Aim or main research questions</u>
1 Angeli 2006 [1]	Two websites	Study revealed that perception of information quality is affected by the interaction style implemented in the interface. Beauty is not only an important quality of a product but its effect transcends the objects and influences other judgments, so-called halo effect.
2 Barr et al., 2006 [4]	Grand Theft Auto: San Andreas	Analysis of a form of gameplay called "playing the interface"
3 Block et al., 2004 [6]	Physical cube	Propose a tangible cube as an input device for playfully changing between TV-channels
4 Chao 2001 [7]	The Doom process manager (PSDoom)	Paper explores a novel interface to a system administration task
5 Denis and Jouvelot, 2005 [10]	Cha-Luva Swing Festival project	How video games can be framed as expert tools that naturally reconcile learning and fun?
6 Djajadinin grat et al., 2000 [11]	Appointment manager, Videodeck, Cubby, Alarm clocks	How could augmented reality and product design communities, which share the common interest of combining the real and the virtual, learn from each other
7 Joshi et al., 2007 [21]	Touch display interaction prototype	Present a vision for Natural Interactions and their application on mobile phones as a Generative User Interface. Discuss variables that affect mobile user experience
8 Xie and Antle, 2008 [35]	Jigsaw puzzles	Investigated the relationship between interface style and school-aged children's (7-9 years old) enjoyment and engagement while doing puzzles

As is evident from Table 4, the majority of experimental papers investigate the successfulness of use of novel playful interfaces in commercial applications or research prototypes. Some of these publications provide instructions

for developers and designers [5, 13]. From the reviewed papers we can see that all researches agree that a playful user interface can create a good user experience.

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Defining the phenomenon of playfulness

The review identified that several different definitions of 'playfulness' have been presented. *Play* is often associated with joy, delight and amusement [9]. To be *playful* means to be "fond of games and amusement". A game is also "an activity engaged in for amusement" but more often according to particular rules, as in a "complete episode or period of play, ending in a final result" [18]. Real-world interactions often become playful [21].

Fullerton et al. propose that a "playful approach can be applied to even the most serious or difficult subjects because playfulness is a state of mind rather than an action" [17]. Playfulness is a way to motivate and activate a user on creating new approaches for many not-so-exciting tasks [22].

The definition of *playfulness* in user experience can be crystallized as elements of a design that engage people's attention or involve them into activity for play, amusement, or creative enjoyment [4, 12, 14, 15, 29, 35]. Playful user experience provides users with opportunities to build something new by using existing elements [15], and to develop skills through exploratory behavior [25, 34].

Several design methods can be used to evoke playfulness in the user. A playful application or service can contain elements of role-playing [24], active work with imagination [9, 24, 29], experimentation and exploration [13, 15, 24, 34] contextual metaphor use [1, 7, 11, 21] and social interaction [25, 29, 31, 35]. Playful user interface allows user to customize and individualize the system [6, 13, 21, 36], users can use templates and tags, or organize the interface according to own preferences. Small rewards and positive feedbacks can be applied; during the interaction the application may do something that users like, so-called "fun-in-doing" [12, 19, 23, 28, 30, 33]. Users should feel free to explore and be able to build on top of the work of others [19, 29]. And finally, frivolous interaction such as a 'component of interactive silliness' can be implemented into the application [15].

The concept of 'pamphlets' [11] provides a clear statement for designers: "Don't think ease of use, think enjoyment of the experience". Making things easier doesn't make interaction interesting; user wants to have an interface that is challenging, seductive, playful and surprising, user wants to get enjoyment of the experience [11].

An *enjoyable* user interface is based on three aspects: challenge, fantasy (emotions) and curiosity [26]. Two approaches to put fun into applications have been offered by Kim [23]. This can be achieved by using game mechanics to make applications more attractive for users. Alternatively graphics, animation, user interface

features/techniques can be used. Kim used five game characteristics to identify playfulness in applications or services: collecting data, points, feedback, data exchange and customization.

SYNTHESIS OF THE LITERATURE REVIEW

On basis of the previous studies, playfulness can be seen as an application characteristic which attracts users and provides enjoyable user experience. It should also inspire and enable users to develop their knowledge and skills.

From this bulk of work, we extracted the most common characteristics of a playful application. These are visualized as a term cloud in Figure 2 where the number correlates to the frequency with which the characteristic occurs.



Figure 2: Term cloud summarizing characteristics of playful user interfaces

Creative enjoyment, challenge, curiosity, ability to customize user interface, fun-in-doing, exploration, feedback, fantasy, metaphor and social interaction are the key aspects for a playful user interface.

These characteristics can be divided into three groups according to the classification of the main parts of user interfaces as offered by Mitchell et al. [27]: User Interface Interaction, Visualization, and Style & Complexity. Style & Complexity depend on user interface interaction and visualization. This is a basic model to describe user interfaces. Due to its generality and consistency, this model can be applied to any particular user interface and, if needed, can be further developed. We found that user interface interaction could be divided on User activity and Application/service activity. Based on this findings and literature analysis we created a model (Figure 3) that provides an overview for understanding of characteristics that are important for providing playfulness to each part of a user interface.

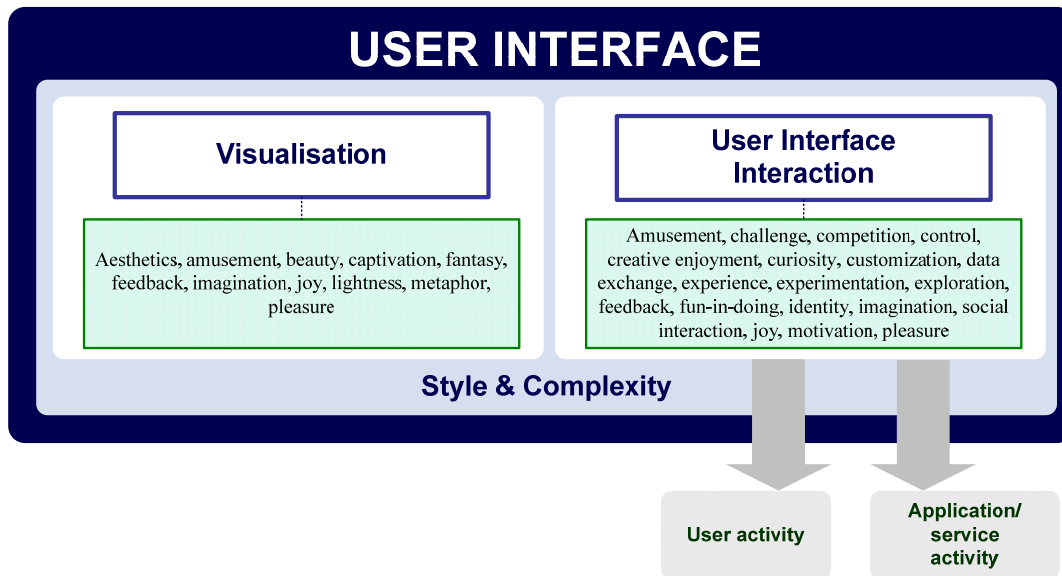


Figure 3: User interface model that groups the identified playful UI characteristics on basis of the UI classification provided by Mitchell et al.

RESULTS

Analysis of experimental papers, proposed user interfaces and some theoretical studies allow us to find four general types of user activities that are important for studying playful features. In any user interface, the user can navigate, browse, control and search. Several UI components can be used to provide an enjoyable user experience. On the other hand, system or application provides notifications about system events, gives feedback and attempts to simplify interaction. Both activities can be applied in a playful

manner to improve the user experience. We identified examples of the listed activities in reviewed publications and in Table 5 present the user interface components that can contain playful elements. Further, based on the information presented in Table 5 we created the model shown in Figure 4 that can be used for analysis playfulness in any application or service.

Table 5: User interface interaction.

<u>Activity</u>	<u>Description</u>	<u>Related UI components</u>	<u>Possible uses</u>
<u>User activity</u>			
Navigate	User can playfully navigate in user interface. Menu appearance animations, sounds, smooth transactions, links with small thumbnail preview can be used.	Menus Navigators Tabs	1. Clicking on the icon of a hand and/or selecting a menu at the top of the screen [1]. 2. Navigation to the next destination allow user to preview the next sides [6]. 3. User rotates the cube to a new position (the cube is used for navigation) [6]. 4. Playful menu: the user

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			may choose options from balcony above the room [7].
		Links	5. Navigating the views with gestures [21].
Browse	Page grid adjusts the view and can be customizable. All transactions are performed with enjoyable animation. Page indicators show in funny manner that there is more information available on another page.	Application specific page organization	1. The metaphor of a telescope is used [1] 2. Players try all available commands [4]. 3. User can rotate the real cube in order to see the different sides and the TV channels [6]. 4. Running processes are instantiated as "process monsters" in a single room in a "dungeon" [7]. 5. To change views within the application card, users need to give a small "Spin" gesture around the arrow sign located on the right corner of the card [21].
		Page grid	
		Page indicators	
Control	User should to be able customize view according to personal preferences. Adding new information, reusing and creating own add-ons for the applications are essential part of playful user interface.	Persona-lization (Customized view)	1. GUI puzzle: turn underlying image on/off, puzzle reset [35]. 2. Use joysticks to control sound synthesis [10]. 3. To open a single application, user grabs the application icon and touches it to "Me" - meaning the "Application is for me" [21]. 4. Drag-and-drop manipulation in UI [35].
		Inputs	
Search	User can be able to use different search methods: tags which are fully customizable or search bar.	Tags	1. Tags are a part of customization [15].
		Search bar	

Application/service activity

Provide noti-fication	System notifications can be provided in playful manner by using different graphical effects, simple text.	Error, info, warning and other notifications	1. Animated characters provide information by speech bubbles, and generating other pictures and information from inside their head [1]. 2. "Percentage complete" statistic, relating to how many of the broad range of
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Give feedback	Pop-ups and messages can be displayed with different graphical effects and sounds, haptic feedback.	Messages	activities has been attempted and completed [4].
		Pop-ups	1. Haptic and visual feedback [35]. 2. Satisfying sound [33].
Simplify interaction	Interaction can be simplified by a font scaling feature, which can be presented in a playful manner.	Direct reaction	1. Animated head provides subject matter and functional help [1]. 2. The reaction of the virtual counterpart is very direct and immediate [6].
		Font scaling	

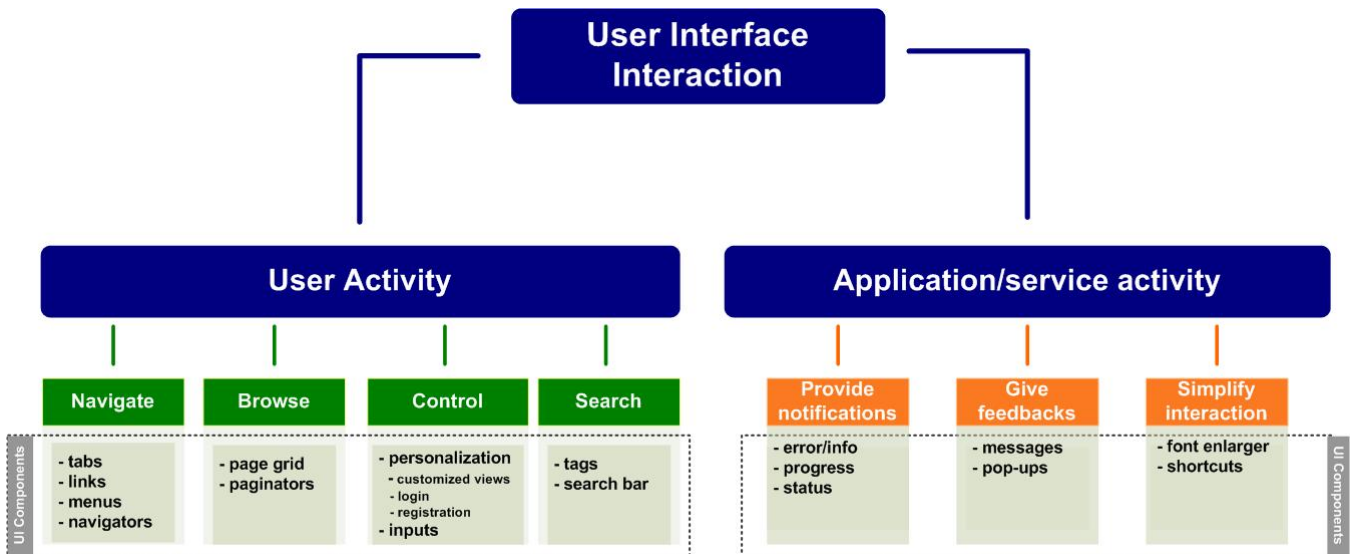


Figure 4: User interface components that can potentially present playful interactions.

CONCLUSION

This study examined playfulness as a characteristic of any user interface that can improve user experience. Based on a literature review we created a model for analyzing playfulness in application or service. This model shows user interface components that can provide playful interaction. All user interfaces can be described in terms of interface interaction, visualization, style and complexity. User interface interaction model contains user and application related activities. Playfulness may be introduced to any part of the user interface, but it should be applied carefully. User interface designers of all kinds of applications and services should take into account the experience and knowledge accumulated by the game industry.

The next stage of our research is to find ways to apply playfulness to existing applications, identify key indicators of attractive and disturbing features, and learn how to support playful approach in a system which is defined as 'not for play'. Such efforts will aid in validating the proposed model.

ACKNOWLEDGEMENTS

I would like to thank my advisor Dr. Juha Arrasvuori from Nokia Research Center for insightful comments and continuous support during this research.

REFERENCES

1. Angeli, A. D., Sutcliffe, A. and Hartmann, J. "Interaction, usability and aesthetics: what influences users' preferences?" In *Proceedings of DIS06: Designing*

- Interactive Systems: Processes, Practices, Methods, & Techniques 2006. pp. 271-280.
2. Atkinson, M., and Kydd, C. "Individual characteristics associated with World Wide Web use: An empirical study of playfulness and motivation". Database for Advances in Information Systems, 28(2), (1997), pp. 53-62.
 3. Barendregt, W. "Evaluating fun and usability in computer games with children". Eindhoven (2006): Technische Universiteit Eindhoven. ((Co-)promot.: prof.dr. D.G. Bouwhuis, dr. H. de Ridder, dr.ir. M.M. Bekker).
 4. Barr, P., Khaled, R., Biddle, R., and Noble, J. "Playing the Interface: A Case Study of Grand Theft Auto". In *Proceedings of OzCHI 2006: the Annual Conference for the Computer-Human Interaction Special Interest Group of the Human Factors and Ergonomics Society of Australia, 2006. (OzCHI/2006)*
 5. Belanger, F. and Van Slyke, C. "End-user learning through application play". Info. Tech. Learning and Perfor. J. 18, 1, (2000), pp. 61-70.
 6. Block F, Schmidt A, Villar N, Gellersen HW. "Towards a playful user interface for home entertainment systems". In: *European symposium on ambient intelligence (EUSAI 2004)*, Springer LNCS 3295. Springer, Berlin Heidelberg New York, pp. 207-217
 7. Chao, D. "Doom as an Interface for Process Management". In: Beaudouin-Lafon, Michel and Jacob, Robert J. K. (eds.) *Proceedings of the ACM CHI 2001 Human Factors in Computing Systems Conference* March 31 - April 5, 2001, Seattle, Washington, USA. pp. 152-157
 8. Chou, J. "Understanding User's Perceived Playfulness toward Mobile Information and Entertainment Services in New Zealand", 2006.
 9. Costello, B. and Edmonds, E. "A Study in Play, Pleasure and Interaction Design", in proceedings of *Designing Pleasurable Products and Interfaces*, August 2007, Helsinki, Finland, pp. 76-91.
 10. Denis, G., Jouvelot, P. "Motivation-driven educational game design: applying best practices to music education", Proceedings of the *2005 ACM SIGCHI International Conference on Advances in computer entertainment technology*, pp.462-465, June 15-17, 2005, Valencia, Spain
 11. Djajadiningrat, J.P., Overbeeke, C.J. and Wensveen, S.A.G. "Augmenting Fun and Beauty: A Pamphlet". In: W.E. Mackay (Ed.) *Proceedings of DARE2000*, Elsinore, Denmark, 12-14 April.
 12. Draper, S. W. "Analysing Fun as a Candidate Software Requirement". *Personal Technology*, 3 (1999): pp. 117-122. <http://www.psy.gla.ac.uk/~steve/fun.html>
 13. Dyck, J., Pinelle, D., Brown, B., and Gutwin, C. "Learning from Games". HCI Design Innovations in Entertainment Software. Proc. 2003 Conf. On *Graphics Interface (GI'03)*, Halifax, 2003
 14. Engeli, M. "Playful Play with Games": Linking Level Editing to Learning in Art and Design; *DIGRA 2005*, 17-20 June 2005, Vancouver
 15. Follett, J. "Engaging User Creativity: The Playful Experience" (2007). UXmatters. Available at <http://uxmatters.com/MT/archives/000252.php>, accessed 13.09.2008
 16. Forlizzi, J. and Ford, S. "The building blocks of experience: An early framework for interaction designers". Proceedings of the DIS00 Conference. Brooklyn, NY, 2000.
 17. Fullerton, T., Swain, C. and Hoffman, S. "Game Design Workshop. Designing, Prototyping, and Playtesting games". CMP Books, San Francisco, CA, 2004.
 18. Galloway, A. "Playful Mobilities: Ubiquitous Computing in the City". In *Alternative Mobility Futures Conference*. 9-11 January 2004, Lancaster, UK.
 19. Garneau, P. "Fourteen Forms of Fun, Gamasutra" (2001). Available at www.gamasutra.com/features/20011012/garneau_01.htm
 20. Hassenzahl, M. and Tractinsky, N. "User Experience - A research agenda". *Behaviour and Information Technology* 25(2), pp. 91-97. 2006.
 21. Joshi, D. and Sagar, A. "Applying naturalized interactions to mobile devices". *Mobility '07*. ACM, New York, NY, pp. 595-598.
 22. Kangas, S. M., Outi, I. and Pöysä, C. "Ambient utility games: connecting utility to play". In Proceedings of the *International Conference on Internet and Multimedia Systems and Applications (EuroIMSA '05)*, pp. 18-24, Grindelwald, Switzerland, February 2005.
 23. Kim, A. J. (2006): Putting the Fun in Functional. URL: <http://shufflebrain.com/etech06.htm>, accessed 15.10.2008
 24. Kozlov, S. and Reinhold, N. "To Play or Not to Play: Can companies learn to be n00bs, LFG, and lvl-up?". In proceedings of *IR 8.0 - Let's Play!*, 8th Association of Internet Researchers Conference, Vancouver, 17-20 October 2007.
 25. Lindtner, S. "Playful Spaces between Fantasy and Real". Position Paper for the *CHI 2007* workshop *Supple Interfaces*, San Jose, CA.
 26. Malone, T. W. "Heuristics for designing enjoyable user interfaces: Lessons from computer games", Proceedings of the *1982 conference on Human factors in computing systems*, pp. 63-68, March 15-17, 1982, Gaithersburg, Maryland, United States

27. Mitchell, K. J., Kennedy, J. B., and Barclay, P. J. "A framework for user-interfaces to databases", Proceedings of the workshop on Advanced visual interfaces, May 27-29, 1996, Gubbio, Italy
28. Overbeeke, C.J., Djajadiningrat, J.P., Hummels, C.C.M, and Wensveen S.A.G. "Beauty in usability: Forget about ease of use!" In: W.S. Green & P.W. Jordan (Eds.) *Pleasure with products: Beyond usability*. Taylor & Francis (2002), pp. 9-18
29. Paulos, E., Brown, B., Gaver, B., Smith, M., and Wakeford, N. "Mobile play: Blogging, tagging, and messaging". Paper presented at Ubicomp 2003, Seattle, Washington
30. Poels Y., de Kort Y., and IJsselstein W. "It's always lots of fun!" Exploring Dimensions of Digital Game Experience using Focus Group Methodology, *Future Play 2007*, pp. 83-89
31. Rosenbloom, A. "A Game Experience in Every Application". *CACM 2003*, 46(7): pp. 28-31
32. Schifferstein H.N.J. and Hekkert P. "Product Experience", Elsevier, 2008
33. Shneiderman, B. "Designing for fun: how can we design user interfaces to be more fun?" In *Interactions 2004*, 11 (5) pp. 48-50
34. Väänänen-Vainio-Mattila, K., Roto, V., and Hassenzahl, M. "Now let's do it in practice: user experience evaluation methods in product development". *CHI Extended Abstracts 2008*: pp. 3961-3964
35. Xie, L. and Antle, A.N. "Are tangibles more fun? Comparing children's enjoyment and engagement using physical, graphical and tangible user interfaces", in *Proceedings of TEI 2008*, Bonn, Germany, ACM Press, pp. 191-198.
36. Yager, S. E., Kappelman, L. A., Maples, G. A., Prybutok, V. R. "Microcomputer playfulness: stable or dynamic trait?", *ACM SIGMIS Database*, v.28 n.2, pp.43-52, Spring 1997.