

MASTER

Multi-user relaxation at home a TV-related product concept to enhance the social TV experience

Hendrikkx, R.J.H.

Award date:
2010

[Link to publication](#)

Disclaimer

This document contains a student thesis (bachelor's or master's), as authored by a student at Eindhoven University of Technology. Student theses are made available in the TU/e repository upon obtaining the required degree. The grade received is not published on the document as presented in the repository. The required complexity or quality of research of student theses may vary by program, and the required minimum study period may vary in duration.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain

Eindhoven, July 2010

Multi-user relaxation at home

A TV-related product concept to enhance the social TV experience

Roel Hendrixx

identity number 0621971

in partial fulfilment of the requirements for the degree of

Master of Science

in Human-Technology Interaction

Supervisors:

Dr. Wijnand IJsselsteijn

Dr. Jaap Ham

Tim Tijs, P.D.Eng.

Dr. Hans Weda

“Tension is who you think you should be. Relaxation is who you are” ~ Chinese proverb

Preface

This master thesis was written in partial fulfillment of the requirements for the degree of Master of Science in Human-Technology Interaction. The graduation project took place at the Display Applications & Technologies Group of Philips Research from March 2009 until November 2009 for a total period of seven months. For the graduation project a one-cycle user-centred design was carried out; starting with a contextmapping, followed by designing and building a product concept and, finally evaluating this concept through a user study at families' homes. Conducting such a design process was something I always wanted to do during my studies and I am grateful to Philips for giving me this opportunity. I want to thank especially my company supervisors Tim Tijs and Hans Weda for believing in me and giving me the freedom to execute this project in the way it was conducted. I highly appreciate their support, (long) discussions and guidance throughout this project. Additionally, I want to thank Robert van Herk from Philips Research and Joost Meijles from Serious Toys for their support with the TagTiles and ESPranto, because without their efforts this project would simply not have been possible. Further, thanks go out to my university supervisors, Wijnand IJsselsteijn and Jaap Ham, for their critical and good suggestions.

My gratitude goes out to all the people that supported me in some way with the accomplishment of this graduation project. Special thanks go out to Job van de Sande, Hanif Babazadeh, Bart van de Bogaard and Marcel van Etten for their support. Lastly, I would like to thank my family, friends and my girlfriend for their interest and support.

Roel Hendriks
July 2010

Summary

Work stress places high taxes on busy adults with young children and, therefore families have to properly prioritize between work and relaxing leisure time in order to prevent health problems and maintain well-being. However, there is a trend towards spending more leisure time with television in solitude and, as a consequence, less time is dedicated to the family. Therefore, this study aims to develop a TV-related product concept for the purpose of multi-user relaxation at home on evenings of workdays. To do so, the nature of relaxation of busy adults with young children was studied with a contextmapping to understand the needs of the target group with regards to multi-user relaxation. From this study, it appeared that the nature of relaxation is mainly familial with two fixed periods during the evening for relaxation. The early evening period is characterized by playing with children, sometimes on a game console connected to the television. The late evening period is typified by ending the day on the couch and engaging in a low-effort activity – often watching television and, sometimes together with the partner. In both periods television appeared to play an important role in facilitating relaxation, detaching from work and bringing family members together. However, television was experienced as sub-optimal for multi-user relaxation. Based on these results three implicit needs were identified with regard to multi-user relaxation: 1) disclosure of children’s personality through social play, 2) interactive television and 3) sociability through television. These needs were used as input for the design process to enhance multi-user relaxation with a TV-related product concept. Through an iterative design process eventually one product concept was selected and worked out into a final design. This product concept, entitled Kids World, is a social game-like TV application that consists of two parts: story building and interactive storytelling. *Story building* is the part in which children create their own fictitious story on the TV by using story content provided in a repository and a set of intelligent tangible objects. *Interactive storytelling* enables parents and children to collaboratively narrate a story on TV in which they are interactive participants – characters in the story world – and, at the same time, make decisions and perform actions that directly affect the course of the story. The interactive storytelling part of Kids World was built as a hi-fi prototype to evaluate its capability to bring families together in front of the TV for relaxation and foster social bonds. Tentative results from a user study conducted at the participants’ home suggest that Kids World facilitates multi-user relaxation after dinner on workdays with work detachment and togetherness as important contributors. In addition, Kids World seems to foster social bonds between family members with storytelling and togetherness as main contributors. Kids World’s capability to enable families to socially interact in a very rich and high qualitative way was highly valued by the target group. Furthermore, the target group had a compelling user experience with Kids World perceiving it as a unique, enriching and creative social play concept. In sum, Kids World was successful in facilitating relaxation and promoting social interaction, fulfilling the needs of busy adults with young children. Moreover, Kids World successfully demonstrated that social play on television can be an antidote to the negative effects of television on family life. Kids World as social play concept turned television from a ‘lean-back’ activity into a ‘lean-forward’ experience tentatively highlighting the benefits of active social interaction on relaxation. That is, social play could serve as medium to build meaningful bridges among family members that can lead to feelings of increased belongingness and secure attachments and, in turn to higher levels of relaxation.

Table of Contents

Preface	3
Summary	4
Table of Contents	5
1 Introduction.....	10
2 Literature research.....	11
2.1 The target group	11
2.1.1 Selection of target group	12
2.2 Work stress and recovery experiences	12
2.2.1 Work stress	12
2.2.1.1 Coping with stress	13
2.2.2 Recovery of stress.....	13
2.2.2.1 Psychological detachment.....	14
2.2.2.2 Relaxation	14
2.2.3 Relaxation techniques and activities.....	15
2.2.3.1 Dedicated relaxation techniques	15
2.2.3.2 Ordinary activities for relaxation	15
2.2.3.3 Relaxation in social contexts	16
2.3 Physical and social contexts at home.....	17
2.3.1 Physical space	17
2.3.2 Social space and domestic routines	18
2.4 Technology to relax: television and other products.....	18
2.4.1 Television as medium to relax.....	18
2.4.2 Television content and its effects.....	19
2.4.3 Television behavior in social contexts.....	20
2.4.4 Other products for relaxation.....	21
2.4.4.1 Game consoles for multi-user relaxation	21
2.4.4.2 Commercial dedicated relaxation products	21
2.4.4.3 Dedicated relaxation products in academics	22
2.5 Research objective.....	23
2.5.1 Problem statement.....	23
2.5.2 Research questions	23

2.5.2.1	Main research questions	23
2.5.2.2	Sub-questions related to the nature of multi-user relaxation	24
2.5.2.3	Sub-questions related to a TV-related design	24
3	Methodology	25
3.1	Identifying needs and establishing requirements	25
3.1.1	Contextmapping	26
3.2	Concept design and prototyping	27
3.2.1	Idea generation	27
3.2.2	Assessment of concepts	27
3.2.3	Prototyping	28
3.3	Prototype evaluation	28
3.3.1	Observations	29
3.3.2	Questionnaires	29
3.3.3	Interviews	29
3.4	Limitations & Assumptions	30
4	Contextmapping	31
4.1	Set-up of contextmapping	31
4.1.1	Participants	31
4.1.2	Procedure of contextmapping	31
4.1.3	Materials of Contextmapping	31
4.2	Contextmapping results	32
4.2.1	Results of diaries	32
4.2.1.1	Evening pattern on workdays	33
4.2.1.2	Participants' definition of relaxation	34
4.2.1.3	Watching TV	34
4.2.1.4	Desirable future product	35
4.2.1.5	Conclusions of diary	35
4.2.2	Results of semi-structured interviews	35
4.2.2.1	Evenings of workdays	35
4.2.2.2	Relaxation during evenings of workdays	36
4.2.2.3	Home routines during workdays	37
4.2.2.4	Playing with children	38

4.2.2.5	Digital versus traditional play.....	39
4.2.2.6	Ideas for future products related to playing	40
4.2.2.7	Watching TV.....	40
4.2.2.8	Potential ideas for future products related to TV.....	42
4.3	Conclusions from contextmapping.....	43
5	Concept design & prototyping	44
5.1	Concept design.....	44
5.1.1	Ideation workshop.....	44
5.1.2	Design process	44
5.1.3	Concept selection	44
5.2	Related work	45
5.2.1	Technology to support storytelling with tangibles	45
5.2.2	Affect of TUIs on play behavior	46
5.2.3	Tangible systems that promote collaborative play.....	47
5.3	Design of product concept: Kids World.....	48
5.3.1	High-level description of Kids World.....	48
5.3.2	Story building with Kids World	49
5.3.3	Interactive storytelling with Kids World	50
5.3.3.1	Psychological mechanisms underlying Kids World	51
5.4	Prototype of Kids World	52
5.4.1	Dedicated story content	52
5.4.2	User-system interaction.....	52
5.4.3	System architecture	53
6	Evaluation of Kids World	55
6.1	Set-up of user study.....	55
6.1.1	Participants	55
6.1.2	Procedure of user study.....	55
6.1.3	Data acquisition and analysis	56
6.2	Results of evaluation	57
6.2.1	Observations.....	57
6.2.2	Questionnaire	57
6.2.2.1	Relaxation and social bonding questionnaire	57

6.2.2.2	AttrakDiff	58
6.2.2.3	Game experience questionnaire	59
6.2.3	Semi-structured Interview	60
6.2.3.1	Relaxation	60
6.2.3.2	Fostering Social Bonds	61
6.2.3.3	User experience with concept.....	61
6.2.3.4	User acceptance	62
6.2.3.5	User Interface	62
6.2.3.6	Usability and Functionality	64
6.2.3.7	Where, when and with whom to use kids World	66
6.2.3.8	Perceived comparable products and activities	66
6.3	Conclusions from prototype evaluation.....	67
7	Final conclusion & discussion	68
7.1	Final conclusion.....	68
7.2	Discussion	68
7.2.1	Nature of multi-user relaxation.....	68
7.2.1.1	Technology as a means to facilitate multi-user relaxation	69
7.2.1.2	Watching TV.....	70
7.2.1.3	Playing with children.....	71
7.2.2	Kids World as contributor of multi-user relaxation	71
7.2.2.1	Effect of game characteristics on multi-user relaxation.....	72
7.2.3	Methods deployed in user-centred design.....	74
7.3	Theoretical implications	74
7.4	Limitations.....	75
7.5	Future work	75
References	76
Appendix A.	Target groups Philips.....	82
Appendix B.	Recovery of resources through homeostatic regulation	84
Appendix C.	Products for dedicated relaxation.....	85
Appendix D.	Overview participants of contextmapping	99
Appendix E.	Mind map about multi-user relaxation for contextmapping	100
Appendix F.	Diary for contextmapping	101

Appendix G.	Interview questions of contextmapping	133
Appendix H.	Affinity diagram of diaries.....	135
Appendix I.	Personal Cardsets	136
Appendix J.	Program ideation workshop	140
Appendix K.	Conceptual new product designs	142
Appendix L.	Multi-criteria matrix for concept selection	145
Appendix M.	Value curve of best three concepts	148
Appendix N.	Overview participants of user study	149
Appendix O.	Relaxation and social bonding questionnaire	150
Appendix P.	Semi-structured interview questions of user study.....	151
Appendix Q.	Categorization of interview from user study.....	152
Appendix R.	Descriptive Statistics of RSBQ, AttrakDiff and GEQ	160

1 Introduction

Dramatic changes in work and life styles during the last few decades have resulted in psychosocial threats and high levels of stress endangering health and well-being (Cox, 1993). Many studies confirm that work pressures and anxieties are the leading source of stress (Stress, 2010), but also a large increase of labor participation by women (with children) (Byrd, 2006) and the pervasiveness of technology in society (Mason, 2010) have put high demands on people. These demands place high taxes on people's bodies and minds, making it essential for them to recover from stress to maintain and improve their health and well-being (Lee, Davidoff, Zimmerman, & Dey, 2008).

To do so, people have to find a healthy balance between work, housekeeping, child care and an enjoyable leisure time. There has been a trend in leisure time towards spending more free time at home and using more electronic media, especially television and computers, for relaxation in the Netherlands from 1975 till 2000 (Van den Broek, Breedveld, De Haan, De Hart, & Huysmans, 2004). However, the amount of contact with members of the household, the sum of talking with housemates, specific attention to children (e.g. playing and chatting) and playing games declined during this same period. The paradox that Dutch families spend more leisure time at home and, at the same time, dedicate less time on social, domestic activities is consistent with the conception of individualization through electronic media such as television. Therefore, the home needs to be a place to efficiently relax with television and, at the same time, enable families to engage in social, meaningful and pleasant activities.

This graduation project was commissioned by Philips Research aiming to find new TV-related product concepts for the purpose of multi-user relaxation at home. Currently, scientific knowledge is lacking on the topic of multi-user relaxation (with television) at home. Therefore, this project aims to fill this gap by doing an explorative research study that will yield insights in 1) the relaxation activities of families at home on evenings of workdays 2) the social context in which these activities happen and 3) the artifacts used in that context. This information can be used by other researchers as ground for more and deeper research on these insights. Furthermore, there are a fairly limited number of products for multi-user relaxation at home and this research can contribute to the development of new techniques or products for this purpose. These products are likely to fulfill the needs of consumers with regards to relaxation and have the potential to improve the social well-being and health of people. The following project goal was formulated:

To acquire information about the needs of dual-career families with regard to multi-user relaxation at home on evenings of workdays and, to devise and evaluate an innovative product concept related to television that helps users to relax in a social, domestic context on evenings of workdays.

To satisfy this goal, a one-cycle user-centred design process was carried out taking into account the current relaxation habits of dual-career families and the social, domestic context. As first step, the PACT framework (Benyon, Turner, & Turner, 2005) was applied in chapter 2 to scope the project with regards to relaxation. Next, chapter 3 discusses the deployed methods to satisfy the project goal in the best possible way. In chapter 4, contextmapping is applied to identify opportunities and gain deeper insights into multi-user relaxation at home. This information was used as input for generating and designing concepts resulting in one final prototype as described in chapter 5. After that, chapter 6 describes the evaluation of the prototype to get initial feedback on multi-user relaxation and the user experience. The final chapter concludes on the project with a discussion and theoretical implications.

2 Literature research

This chapter presents a literature overview focused around four different themes: the target group, relaxation, domestic and social context and technology used for relaxation at the home. These themes are in accordance with the four areas of the People Activity Context Technology framework (PACT) (Benyon, et al., 2005) that facilitates in scoping of the project and gaining new insights.

2.1 The target group

Philips has one core target group that consists of users, both male and female, living in large and mid-sized cities in Europe, USA, Latin America and Asia (Philips Global Marketing Management, 2004). The target group is aged between 25 and 55, well-educated, has a relatively high income and is work-minded as well as family-minded. Despite sparse leisure time, they consciously seek and engage in activities that are social, relieve stress, relax the mind and are entertaining to maintain their health and well-being. To reach this goal, the target group is interested in high quality products that are reliable, easy to use, provide personal benefits and generate quick results.

The Philips core target group can be divided in two groups: the younger and older generation. The younger generation, aged between ± 25 to ± 38 , is career driven and has needs for individuality, self-development and search for meaning. In contrast, the older generation is in midlife, has children of varying ages, up to young adults, and they often have accomplished important career goals. Family values and self-development are of utmost importance to them.

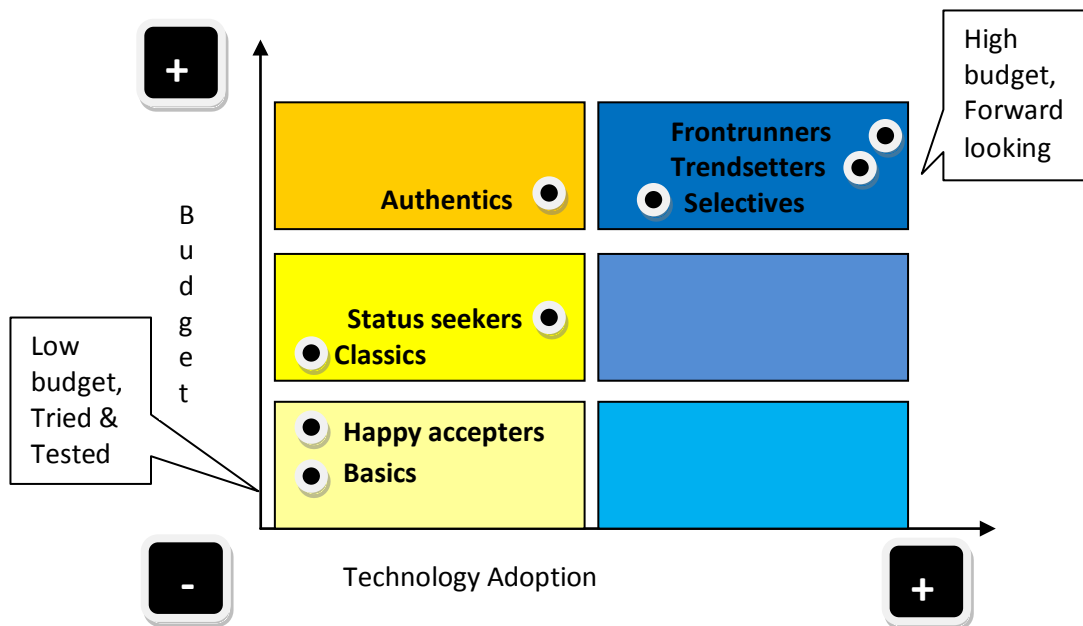


Figure 2.1 Segmentation diagram with different consumer types

In the segment orientation diagram (see [Figure 2.1](#)) different consumer types can be identified based on their budget and degree of technology adoption (Bodlaender, 2008). A consumer type is associated with a product based on its characteristics defined in terms of price and innovativeness. The TV-related product for relaxation was featured as state-of-the-art product in the higher price range. The *Basics*, *Happy Accepters*, *Classics*, *Status seekers* and *Authentics* consumer types are unlikely to adopt such an innovative and expensive product and, therefore were excluded. As a result, the *Front runners*,

Trendsetters and *Selectives* consumer types remain as only potential target group for such a product. A description of these consumer types can be found in [Appendix A](#).

2.1.1 Selection of target group

Based on the description of the consumer types and expert interviews (Alvarez, 2009; Bodlaender, 2009; Krans, 2009) the lifestyles of the *Frontrunners* and *Selectives* appeared to best fit the goal of the product i.e., to relax individuals with television from a busy day of work in domestic and social contexts. In contrast, the *Trendsetters* appeared not to fit well, because they are too young, have a mobile lifestyle, have insufficient financial resources, perceive television as retro and have an internet lifestyle.

The *Frontrunners* and *Selectives* both qualify as potential target group, however, since the researcher had more access to the *Selectives* these were chosen as target group. The *Selectives* – who map to the older generation in the Philips core target group – have a busy lifestyle with children of varying ages and, therefore were referred to as *busy adults with children*. However, this target group is still relatively broad and, therefore was narrowed down to *busy adults with young children*. Throughout this project the following criteria were applied for *busy adults with young children*:

- *Age target group*: 38 – 55 years with children between 4 and 12 years young
- *Income*: modal or higher
- *Education*: vocational (MBO) or higher
- *Lifestyle*: work-minded and social
- *Living situation*: urban or suburban
- *Technology focused*

The selected target group has extremely busy lives experiencing heavy workload, facing household chores and spending considerable time on child care (Beech, et al., 2004). As a consequence, the target group is likely to experience high levels of stress and, therefore, has the utmost need for a product that helps them relaxing.

2.2 Work stress and recovery experiences

There are many life events that can give rise to the experience of stress, but work is the leading source of stress both in chronic and acute conditions (Cox, 1993; Stress, 2010). Work stress depletes bodily resources and people have to engage in recovery experiences to replenish these resources. A healthy balance between work and private life maintains people's well-being and prevents health problems (Sonnetag & Zijlstra, 2006). The work-life balance can be conceptualized as the proper prioritizing between career and ambitions on the one hand and pleasurable leisure time (with family) on the other hand. The first section shortly discusses the concept of work stress and how to cope with these stressors. The second section elaborates on recovery experiences and its effects to recuperate from stress. The third section provides details on dedicated techniques and ordinary activities for relaxation.

2.2.1 Work stress

Stress is a person's physical and subjective (mental and emotional) response to a stressor required to restore equilibrium through the homeostatic regulation of the body (Backs & Boucsein, 2000; NIOSH, 2009). A stressor (e.g. high work pressure) is an external stimulus or situation that upsets the person's

normal quiescent state or equilibrium. Work stress is often caused by an imbalance between the job demands and the capabilities, resources or needs of the worker (NIOSH, 2009). Sonnentag et al. (2007; 2008; 2006) found that unfavorable job characteristics increased an individual's need for recovery, which in turn resulted in health complaints, fatigue, low job performance and poor well-being. In addition, work stress was associated with various biological reactions such as muscle tension, higher blood pressure and cardiovascular diseases (NIOSH, 2009; Smith, Dow-Nelson, & Hilgard, 2003).

2.2.1.1 Coping with stress

When stressed, a person has to expend bodily resources to restore the equilibrium that has been upset by the stressor (Beaumont, 2009). However, the attention and physiological resources the body provides for coping are finite and can be exhausted such as in case of a burnout. The restoration of the equilibrium depends on the severity of stressors, applied coping strategy and recovery experiences engaged in by a person.

People utilize coping strategies to deal with or alter stressful situations in order to master, minimize, reduce or tolerate stress. According to Lazarus and Folkman (1984), coping refers to “constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of a person” (p. 141). In general, people tend to employ one of the two main coping strategies: *problem focused* or *emotional focused* coping such as seeking emotional support to alleviate emotions associated with the stressor (Smith, et al., 2003). In case coping is insufficient, individuals develop a *need for recovery*.

2.2.2 Recovery of stress

Sonnentag et al. (2007) refer to recovery as the “process during which individuals functional systems that have been called upon during a stressful experience return to their pre-stressor level” (p. 205). In the absence of stressors, the pre-stressor homeostasis of biological and psychological systems return to an individual's nominal level (Sonnentag & Zijlstra, 2006). Thus, being temporarily relieved from work demands is an opportunity to recuperate and to replenish internal resources (Sonnentag & Fritz, 2007) and, so diminish the *need for recovery*. For more information about homeostasis, see [Appendix B](#).

Individuals attempt to recover from work stress by engaging in activities – recovery experiences – that result in relief and positive experiences (Sonnentag & Fritz, 2007). However, the concepts of coping and recovery are not identical and, therefore should be distinguished from one another. Coping refers to the stressor and the individual's attempt to deal with stress, whereas a recovery experience refers to the manner an individual replenishes its internal resources. In other words, a person with good coping skills draws less from his or hers internal resources and, therefore needs to engage less in recovery experiences to replenish its resources than someone with poor coping abilities.

Typically, recovery experiences take place during breaks at work, free evenings on workdays, weekends and holidays when no work demands are put on a person (Sonnentag, Binnewies, & Mojza, 2008). However, not only the amount of time available for recovery experiences is an important factor in the recovery process, also the kind of recovery experience and the quality matter (Sonnentag, 2001). Sonnentag *et al.* (2008; 2007) identified two recovery experiences: psychological detachment and relaxation, that predicted recovery from work demands on workdays.

2.2.2.1 Psychological detachment

Psychological detachment not only relates to being physically away from the work place, but also to disengage mentally from work. The subjective experience of 'being away from the work situation' is the physical absence of the work place, the abstinence of work-related tasks (at home) and to stop thinking about work-related issues or problems. Sonnentag & Bayer (2005) showed that psychological detachment from work was positively related to positive mood and low fatigue at bed time in particular on workdays with high time pressure. In another study, Sonnentag et al. (2007) found negative relations between psychological detachment during leisure time and *need for recovery*, health complaints, emotional exhaustion, depressive symptoms and sleep problems. In a similar study, Sonnentag & Krueger (2008) found a relation between the lack of psychological detachment during the evening and increased fatigue, negative affect and arousal the next morning before a new working day. These findings imply that to psychologically detach from work, individuals should engage in *mentally distracting* experiences to recover from work demands (Schwartz & Andrasik, 2003; Sonnentag & Bayer, 2005).

2.2.2.2 Relaxation

Relaxation is the act of doing a pleasant activity that makes individuals become calm and less worried (Cambridge, 2009). When individuals engage in relaxation activities, their psychological and physiological systems (e.g., heart rate, muscle tension and mood) return to an initial state of equilibrium to relief from stress and other negative symptoms (Sonnentag & Bayer, 2005). Sonnentag et al. (2007) found in a self-report study negative associations between relaxation during evenings of workdays and *need for recovery*, health complaints, emotional exhaustion, and sleep problems. In particular, they found that social support as recovery experience was related to relaxation, suggesting that it might be helpful in calming down after work. In a similar study, Sonnentag et al. (2008) found a relation between relaxation on evenings of workdays and morning serenity (e.g. state of being calm, relaxed, and at ease.), but only a weak trend for positive affect. These findings imply that relaxation is a recovery experience that reduces the *need for recovery* and increases positive affect.

Relaxation encompasses a broad range of activities, including meditation, playing tennis, going for a stroll in natural environments, going to the movies with a friend or watching television. In addition, each of these activities is a subjective experience and, therefore the degree of relaxation can differ per person. Sonnentag (2001) studied the effect of three predictors of relaxation i.e., low-effort, social and physical activities, on well-being during evenings of workdays. Low-effort activities are characterized as relatively passive activities such as watching television or browsing through a magazine. Social activities focus on the social interactions such as meeting with family or phoning a friend. Physical activities include exercise and sports. All three predictors of relaxation had a positive effect on the individual's situational well-being before going to sleep. In a similar study, Sonnentag & Zijlstra (2006) found that social activity and physical activity diminished the *need for recovery*. In turn, the *need for recovery* had a negative effect on individuals' well-being at bedtime. However, low-effort activity was not related to the *need for recovery*. This might indicate that watching TV is an ineffective activity for recovery. Interestingly, the quality of these relaxation activities correlated strongly, but negatively with the *need for recovery*. This implies that not only the duration and type of relaxation activity is an important contributor for recovery, but also how positive that activity is experienced. A tentative conceptual model of the stress/recovery homeostasis is graphically represented in [Figure 2.2](#).

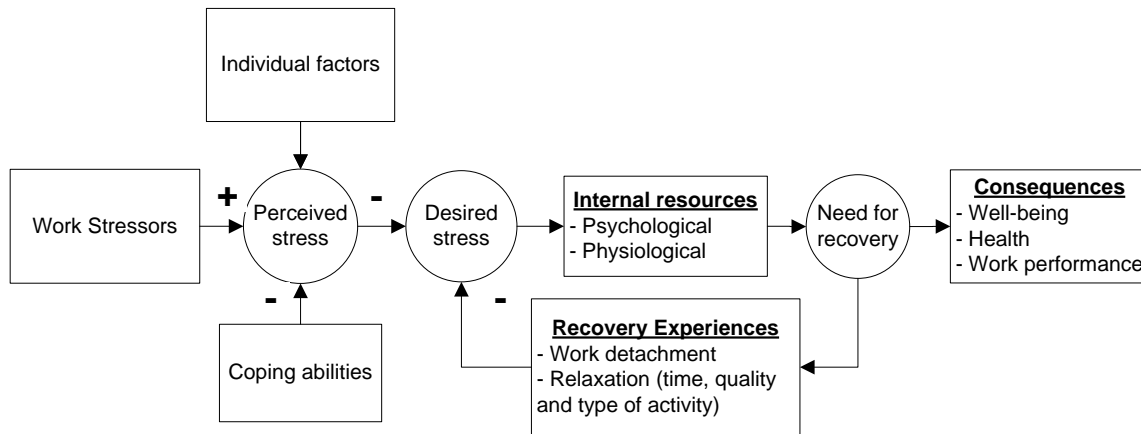


Figure 2.2 Tentative conceptual model of stress/recovery homeostasis

Explanation of conceptual model

The amount of perceived stress depends on the frequency and severity of work stressors and how a person copes with these stressors. If there is a negative difference in level between perceived stress and desired stress level the person's body has to adapt and maintain a desired stress level, thereby depleting his or her internal resources and building up a *need for recovery*. The person has to engage in recovery experiences to reduce or eliminate the strain reactions in mind and body. However, when either work demands remain high or recovery experiences are inefficient, strains accumulate resulting in a higher *need for recovery* and, subsequently in poor well-being, health and work performance.

2.2.3 Relaxation techniques and activities

This chapter describes two categories of relaxation to recover from stress: dedicated relaxation techniques and ordinary activities.

2.2.3.1 Dedicated relaxation techniques

Relaxation techniques can be distinguished into behavioral and cognitive ones. Behavioral techniques including biofeedback, progressive muscle relaxation, deep breathing and meditation induce relaxation and reduce physiological arousal (Mind Tools, 2009a; Smith, et al., 2003). Cognitive techniques such as imagination, autogenic training or self-imagination help individuals to identify stressful situation and to reinterpret related thoughts and beliefs to alter their emotional and physiological response to stressors (Mind Tools, 2009b). These relaxation techniques have been associated with many beneficial health effects such as improvement in sleep quality (Zalaquett, 2000). However, current literature on dedicated relaxation techniques tends to lack solid scientific evidence with respect to efficacy and safety, see for example Carroll & Seers (1998). Additionally, these techniques are typically practiced alone and in a quiet place and require high levels of concentration and, therefore do not suit the goal of this project.

2.2.3.2 Ordinary activities for relaxation

Individuals engage in many ordinary activities for relaxation and these are here considered activities that are clearly different from those described as *dedicated relaxation techniques* in the literature. For

example, De Vries (2008) identified the following relaxation activities during workdays and weekends in a contextmapping:

- Workdays: drinking coffee, backpack preparation, no rush, listening to background radio, 10 minute power nap, household chores, contacting friends
- Weekends: lighting up candles, put on music, drinking wine, quality time together, let go responsibility, being active outdoors

Another study found through interviews the following relaxation activities for the target group 'busy adults': watching television, reading a book, tidying up your space, playing games or cards, taking a shower or a bath, cuddling and talking to partner, shopping, writing things down, consuming delicious foods, doing exercise, avoid irritation, driving a car, getting a massage, gardening, walking in the woods, fresh air and natural smells (Facey, 2008).

Beute (2009) discovered in an online survey about relaxation activities at home on workdays that watching television in the evening was by far the most popular way for relaxation. In addition, reading, playing games and being social were recurring and interesting topics in this study. As expected, not many participants practiced dedicated relaxation techniques in their daily routines and, therefore dedicated relaxation techniques were not pursued as design direction.

2.2.3.3 Relaxation in social contexts

In the previous paragraph three studies showed that individuals frequently engage in social activities for relaxation. Social contact is an important external resource that helps: to replenish resources (Sonnentag, 2001; Thayer, Newman, & McClain, 1994); restoring a desired emotional state (Baumeister & Leary, 1995) and; to decrease anxiety and stimulate the parasympathetic nervous system calming down responses (Mills, Reiss, & Dombeck, 2005b). Therefore, this paragraph further scrutinizes what aspects are important in social activities.

The most fundamental motivation to form and maintain relationships is people's desire for interpersonal attachments – the need to belong (Baumeister & Leary, 1995; Kenrick, Neuberg, & Cialdini, 2007). Two criteria have to be fulfilled to satisfy the need to belong: 1) personal contact and interaction have to happen frequently and without negative affect and 2) the interpersonal bond has to be a stable, enduring relationship in which persons take care of each other's welfare. Having close, intimate relationships with frequent contact is socially rewarding and likely to result in positive affect (e.g. calmness), feelings of pleasure and happiness in life (Baumeister & Leary, 1995).

Social contacts provide several benefits including social support, useful information and pleasant and affective interactions (Baumeister & Leary, 1995; Kenrick, et al., 2007). Most social interaction occurs among co-located family members and is highly valued and serves to support emotional bonding (Mateas, Salvador, Scholtz, & Sorensen, 1996). However, setting time aside for family and friends seems less obvious for dual-income families (Beech, et al., 2004), the more when children are young (Marchena, 2005). Due to shortage of time the quantitative aspect of time seems to be transformed into a qualitative property for families i.e., quality time (Marchena, 2005). Quality time is a temporary, shared moment fundamentally different from all other times that connects family members in a non-obligatory and full attention manner and at the same time invigorates them. Products that

accommodate intimate, close relationships with frequent positive interaction and promote quality time are likely to induce relaxation and foster social bonds between family and close friends.

2.3 Physical and social contexts at home

The home manifests itself as a living space that accommodates the various emotional, social and relaxation needs of family members (Venkatesh, Kruse, & Shih, 2003). Inhabitants often perceive their home as being a sanctuary (Hughes, O'Brien, Rodden, Rouncefield, & Viller, 2000) in which they assume to have full control over ongoing interactions and which enables them to restore their depleted resources. Technology plays an important role in the fulfillment of these needs. Therefore, to design successful domestic products the following aspects are of vital importance: understanding how technology fits into the physical space; the everyday routines of people and; temporal and social organization of the home (Bernhaupt, Obrist, Weiss, Beck, & Tscheligi, 2008; Crabtree & Rodden, 2004; Edwards & Grinter, 2001; Hughes, et al., 2000; O'Brien, Rodden, Rouncefield, & Hughes, 1999). Moreover, the home context as a living space to fulfill the inhabitants' needs is shaped by the complex interplay of these aspects. Therefore, multi-user relaxation activities possibly fulfilling these needs are summarized in a time and space matrix to define the problem domain as shown in [Figure 2.3](#).

Project focus on TV-related activities in co-presence

	Home (same place)	Non-home (different place)
Synchronous relaxation (same time)	<ul style="list-style-type: none"> • Watching television • Playing games • Being / talking with family • Listening music 	<ul style="list-style-type: none"> • Phone calling friends • Playing online games • Internet Protocol TeleVision (e.g., AmigoTV¹)
Asynchronous relaxation (different time)	<ul style="list-style-type: none"> • Leave message at bulletin board • Watching a video recording 	<ul style="list-style-type: none"> • Texting / emailing to family and friends • Looking at picture to memorize family/friends

Figure 2.3 Multi-User relaxation classified in time/space matrix, ¹ (Coppens, 2005)

Based on this classification the project focus was on multi-user relaxation with family and friends in immediate physical presence (co-presence) at home, because these relaxation activities tend to occur most among co-located family members (Van den Broek, et al., 2004) and are most in line with the project goal.

2.3.1 Physical space

Although there is interplay among the physical space, social organization and technology, the physical layout of the home and its associated functionality put an overriding constraint on the possible actions within that space (Venkatesh, et al., 2003). In an ethnographic study, Mateas *et al.* (1996) found that families spend most of their time in the 'command, control and hang-out space' i.e., the kitchen and

living room. Bernhaupt et al. (2008) found that the living room is the most important space for social interaction; it is central for most family-oriented activities with either technology-oriented or non-technology social activities. The five activities that occur most in the living room are: socializing, watching television, listening to music/radio and reading and playing with children (Bernhaupt, et al., 2008). Therefore, the scope of the project was narrowed down to the living room.

2.3.2 Social space and domestic routines

Families embed these physical spaces with technology to cater and enhance home life. In turn, these technologies are used by family members as part of the social space. The social space is a significant aspect of home life encompassing the members of the household, the daily or weekly activities performed by them at home, the time spent on these activities, the interaction between family members and their goals and needs (Venkatesh, et al., 2003). The social space is a complex mixture of activities, social actions, tension and emotion.

Families develop domestic routines to smoothly run the household and alleviate stressful situations at home families (Hughes, et al., 2000; Tolmie, Pycock, Diggins, MacLean, & Karsenty, 2002). Therefore, newly designed products should easily integrate with everyday routines of homes, thereby providing new opportunities of product usage that put no constraints on how families organize their home life (Taylor & Swan, 2005).

Social and domestic spaces are increasingly constituted around products facilitating a wide range of activities of family members and forming new routines (Hughes, et al., 2000). The influence of technology on the meaning of domestic spaces is enormous even leading to routines constituted around technology. For instance, the living room might not only be spatially configured towards the television, but the television itself might be used as a medium to bring family members together at a particular time for entertainment or to socialize with the family. In this case, a space (e.g. the living room) becomes either an entertainment or communication center where the technology is the core (Crabtree & Rodden, 2004; Venkatesh, et al., 2003). However, only when technology supports the feeling of being at home and is experienced as relaxing, it will be adapted into the living space (Bernhaupt, et al., 2008).

2.4 Technology to relax: television and other products

This chapter concentrates on electronic product usage for relaxation and social interaction. The focal point of this section is on television, but other relaxation products related to TV are also discussed.

2.4.1 Television as medium to relax

Bernhaupt *et al.* (2008) found that participants' main goal to use TV was to relax. Also, Taylor & Cohen (2003) reported that a significant proportion of television viewing takes place to relax and unwind. They conclude that "TV is viewed as a device to disengage from particular events, times and spaces" (Taylor & Cohen, 2003, p. 1). More specifically, television is used to stop worrying about stressful events (Mills, Reiss, & Dombeck, 2005a) and to temporary escape from reality into a dream-like world (Bryant, Roskos-Ewoldsen, & Cantor, 2003). Furthermore, two studies found that individuals watch TV to self-regulate (bad) moods (Thayer, et al., 1994; Vorderer, Klimmt, & Ritterfeld, 2004). According to Bryant & Zillmann (1991) viewers have two motivations for watching television: either to calm down after the stressful activities of daily life (e.g. work) or to be aroused to overcome an uneventful, dull and boring state of

affairs. Regardless of the viewers motivation to consume television, it profoundly affects the viewer's level of arousal and, hence the affective and emotional state (Donohew, Sypher, & Higgins, 1988).

Television characterizes a passive form of information acquisition, whereby viewers constantly receive audio-visual information (Blythe, 2003). Processing and understanding this information requires minimal literary skills or can be learned easily with minimum cognitive knowledge. This is in line with the minimal amount of effort viewers are willing to invest in operating and watching TV (Taylor & Cohen, 2003). Besides the minimal cognitive effort required for watching television, the wealth of diverse and continuously changing stimuli offered is likely to involve and absorb watchers immensely (Bryant & Zillmann, 1991). These two properties – low required cognitive effort and diversionary stimuli – make TV not only highly attractive for distraction and relaxation (Bryant & Zillmann, 1991) but also accessible for many.

However, the power of television to relax viewers has also a serious downturn in that, on average, individuals in Western countries devote half of their leisure time on watching (Kubey & Csikszentmihalyi, 2002). For instance, in 2008 inhabitants of the Netherlands watched on average over 3 hours of television per day with peaks of almost 4 hours per day in winter (Van Niekerk & Jacquemijns, 2008). However, the proportion of viewing correlates negatively with demographics such as education and income (Kubey & Csikszentmihalyi, 1990). When watching, viewers feel relaxed and passive, but the sense of relaxation ends immediately when the television is turned off leaving viewers only with feelings of passivity and continuation of lower alertness (Kubey & Csikszentmihalyi, 2002). As a consequence, most viewers feel tired and out of energy. In addition, prolonged, unplanned viewing makes viewers feel guilty since they have not been doing something more productive in this time. Viewers regret spending too much in time in front of the television, but are unsuccessful in reducing the use of this medium. When the television is turned off, viewers report withdrawal symptoms (e.g., stress) indicating signs of television addiction. In sum, television as medium for relaxation should be consumed in limited doses for relaxation and anticipate negative effects.

2.4.2 Television content and its effects

Bernhaupt *et al.* (2008) found that participants watch television for either entertainment or information purposes. Television entertainment is presented in forms as film, series, 'live' sports, talk shows, quizzes and the more. In addition, television as main provider of information such as news and talk shows (Bernhaupt, et al., 2008) connects and exposes viewers to the outside world and so shapes their minds and views of the world. However, the type of content individuals are exposed to on the screen has an influence on the level of physiological activation (arousal) and affective states (Bryant & Zillmann, 1991; Fredrickson & Levenson, 1998). For example, many studies associated comedy viewing with decreased levels of stress and enhanced positive affect (Zillmann & Vorderer, 2000). In another study, Zillmann *et al.* found that bored participants strongly inclined to watch exciting content (i.e., adventure drama, football game and quiz show) resulting in an increasing heart rate. In contrast, half of the participants brought into a state of stress preferred to watch relaxing programs such as underwater nature scenes resulting in a decrease of heart rate. Apparently, the subjects' choice for certain type of entertainment, whether in the need to calm down or excitement, normalized their levels of arousal. Furthermore, there are many commercial providers (e.g. medtainment) of dedicated relaxation content to induce states of deep relaxation but solid scientific evidence with respect to effectiveness of this content is lacking.

The type of content displayed on television has also an influence on social behavior during viewing television. For example, comedy characterizes as frequent lighthearted responses to mundane problems therewith allowing viewers to easily remark on the content. In contrast, movies tend to absorb viewers making it often undesirable to socially interact. Moreover, Zillmann & Bryant (1991) found that annoyed adults exposed to violent content tended to perpetuate levels of arousal, whereas exposure to nonviolent, neutral content effectively lowered both arousal and aggressiveness. They concluded that exposure to the content unrelated to the viewer's affective state has beneficial effects of soothing the annoyed viewer, thereby helping to enhance prosocial behavior. In sum, television content not only influences the level of arousal and alters the affective state of the viewer, but also affects social behavior.

2.4.3 Television behavior in social contexts

Television as means for relaxation cannot be studied in isolation, but is embedded in the situational social, domestic context. Television is both part of the socialization at home and families are socialized around television (Morley & Silverstone, 1990). Viewers often engage in concurrent activities while watching television such as socializing, drinking, ironing or sleeping with varying degrees of attention (Bernhaupt, et al., 2008; Bryant & Zillmann, 1991; Morley & Silverstone, 1990; Taylor & Harper, 2003). Moreover, Bernhaupt *et al.* (2008) found in an ethnographic study that watching television is primarily a shared experience in which viewers socialize, discuss and share information in front of the television. In addition, a Dutch survey found that the majority (80%) of participants regularly watch television together (www.mediaonderzoek.nl, 2009). However, half of the participants have regularly disputes with family members about the TV content being watched. Also, zapping, talking and calling while watching TV were a big source of irritation for most people. Besides, ongoing social interaction is frequently disturbed by television

distraction or worse, family members give up social activities for watching television (Kubey & Csikszentmihalyi, 2002). Brody, Stoneman & Sanders (1980) found that fathers oriented less towards their children and spouses, talked less and made fewer positive facial expressions and children oriented less towards their parents, talked less, and were less active during TV viewing than family play. However, mothers behaved similar for both activities. Likewise, in the Netherlands electronic media usage in particular television related to a decline in the amount of contact and the sum of talking with family members, specific attention to children (e.g., playing games and chatting) and playing familial games (Van den Broek, et al., 2004). The paradox that families spend more leisure at home and, at the same time, dedicate less time on social, domestic activities is consistent with the conception of individualization through television.



Figure 2.4 Family watching television at home for multi-user relaxation. Source: DailyMail

2.4.4 Other products for relaxation

This section gives an overview of product types related to television to extend the scope of the project beyond television itself for (multi-user) relaxation.

2.4.4.1 Game consoles for multi-user relaxation

More recently, video game consoles such as the Sony PlayStation have become popular commercial products for leisure activities with as goal: entertainment, relaxation and to encourage social interaction among family members and friends (Lally, 2002; Poels, Kort, & IJsselsteijn, 2007; Vaida & Greenberg, 2009). Gajadhar, de Kort, & IJsselsteijn (2008) found that playing digital games on a television in a social context had a significant contribution to the game experience. Some scholars even argue that video gaming is fundamentally a social phenomenon with as purpose to bringing family and friends together, socially interact (e.g., teamwork) and share a play activity – game consoles are both an incentive and excuse for gathering with others (Squire, 2003; Sussman, 1985; Vaida & Greenberg, 2009).

The interactive style of the Nintendo Wii (see [Figure 2.5](#)) has made video games much more appealing to a wide audience of users such as seniors and females (TNS, 2008; Vaida & Greenberg, 2009). The natural body movement input devices (Lindley, Couteur, & Berthouze, 2008), shared display (i.e., television), non-competitive and non-violent play and console placed in the living room are significant factors to make the game experience more accessible and social for groups “reminiscent of days of Monopoly, checkers, card games, and jigsaw puzzles” (Mitchell, 1985, p. 134). Interestingly, game consoles are an ideal medium to build bridges between diverse populations such as parents and children to foster social interaction. For some social gaming has even become part of the repertoire of social leisure activities like dinner parties. In sum, game consoles coupled to television, especially the Nintendo Wii, afford social interaction therewith having a positive impact on family life. Nevertheless, relaxation is in fact a byproduct of game consoles and, therefore the next section discusses products specifically tailored to relief stress.



Figure 2.5 Nintendo Wii Fit coupled to TV in social, domestic context. Source: Apartment Therapy

2.4.4.2 Commercial dedicated relaxation products

An overview of consumer products – either on the market or in development – is presented in [Appendix C](#) to get a general impression about different kind of approaches to relax people with products. Most products in this overview, ranging from simple tools to more advanced electronic gadgets, provide a relaxing experience by sensory stimulation. A great number of these gadgets applies muscle vibration to massage parts of the body (e.g. the scalp). Also, a fairly large number of gadgets create an immersive atmosphere with blue light and sometimes with relaxing music in the background such as [AlphaSphereAlphaSphereAlphaSphereAlphaSphereAlphaSphereAlphaSphereAlphaSphere](#).

Another range of products applies brainwave entrainment by means of flashing lights and pulsating rhythmic sound to alter the brainwave frequency to induce a relaxing mental state in the user. Another product, [Brain HUBJ](#), provides neurofeedback to help users to coordinate/control their brainwaves into a relaxing mind state with graphs displayed on a computer screen. In general, biofeedback is used in products to represent real-time feedback on physiological processes in the body. These devices make users aware of physiological information, for example their heart beat or stress level, enabling them to consciously control these functions to naturally relax such as the [StressEraser](#). When users can alter their bodily state in the desired direction (e.g., to calm down), a positive reward is given to the users. The principle of operant conditioning is also used in game applications, where users are rewarded for calming down. That is, the agility of movement of an object or actor in the game depends on the users' level of stress, see [Figure 2.6](#). In essence, devices that provide biofeedback teach users to activate their natural relaxation response. Overall, the quantity of commercial dedicated relaxation products was rather limited, particularly ones related to television.



Figure 2.6 Biofeedback game *Journey to Wild Divine*. Source: [wild-divine.nl](#)

2.4.4.3 *Dedicated relaxation products in academics*

Little research has been done to date on the scientific development of (multi-user) relaxation technologies to diminish the *need for recovery* during leisure time at home. In fact, most relaxation technologies are stress reducing products focusing on facilitating office workers, in particular on preventing physical problems such as RSI. For example, the Wigo, based on a pen metaphor, makes users aware of stress by providing tactile feedback on the way they manipulate the Wigo, thereby guiding them towards more relaxing hand movements (Alonso, Keyson, & Hummels, 2008).

In another study, Manzoni *et al.* (2009) trained, over a three week period, obese female patients with relaxation techniques to reduce stress and negative emotions that would normally induce overeating (as coping mechanism) in this group. The participants practiced the relaxation techniques by means of a virtual relaxation environment or portable mp3 player. Both devices trained the participants to relax according to the given audio instructions and to move around in a green environment either visual or imaginative. The relaxation practice for obese female patients with both devices proved to be effective in increasing relaxation, decrease of heart rate values (physiological arousal), reduce anxiety and increased the perceived self-efficacy for eating control. However, no difference was found between the portable mp3 player and virtual relaxation environment.

Svensson & Sokoler (2008) argue for television technologies as resource to help accommodate peer-to-peer social interaction in senior housing communities. They designed the Ticket-to-Talk-Television concept, a presence remote with which senior citizens can note, plan and share information about their television behavior therewith providing opportunities for openings of social interaction among them throughout everyday life. The first reactions on the remote as mediator for social interaction were positive. This finding is congruent with the authors' goal to turn television in a 'lean-forward' experience that is interactive and social and designed for social well-being.

This section showed that television is the most frequently used product for relaxation at home and often used as a means to share experience. However, social TV experiences can negatively affect relaxation and the number of electronic devices (except video games) to overcome these adversities is rather limited.

2.5 Research objective

This section presents how shortcomings in the literature are translated into a problem statement and which forthcoming research questions attempt to give more insights into this problem.

2.5.1 Problem statement

Home life is centered around the television placed in the living room, simultaneously fulfilling the family's need for relaxation and the desire to be together and share experiences among family members and/or friends. However, concurrent social activities that are taking place while watching television come at the expense of social interaction. In other words, watching TV and socializing simultaneously obstruct people in paying full attention to both activities, thereby compromising either the socio-pleasure or the TV experience. Thus, two problems emerge: (1) it is unknown whether watching TV in a multi-user, domestic context is still experienced as an effective means for relaxation and (2) TV does not appear to provide an optimal opportunity for social interaction.

Further, a study on relaxation products tailored to facilitate (multi-user) relaxation showed a rather limited number of dedicated electronic devices available. Besides, evidence that these devices are indeed relaxing is fairly limited or non-existent. Moreover, the number of relaxation products somehow related to television or displays are quite small and, thereby not inspirational. As exception, video games both commercially available and applied in dedicated relaxation products seem to be promising in relation to relaxation and social interaction. However, all these devices seem to target the opportunity for multi-user relaxation serendipitously.

Since the literature is incomplete in providing sufficient information about multi-user relaxation related to TV at home, the nature of relaxation in a multi-user, domestic context of busy adults with young children was studied. Subsequently, this information served as input for designing and evaluating one product concept related to television that attempts to provide the target group with an opportunity for relaxation in a social, domestic context, thereby diminishing the *need for recovery* and filling up an open market for Philips.

2.5.2 Research questions

In this section the main research questions and sub-questions are formulated to guide this project.

2.5.2.1 Main research questions

There are two main research questions formulated for this project. The first question helps to understand how the target group relaxes at home in social context and was formulated as following:

What is the nature of relaxation in a multi-user, domestic context of *busy adults with young children* during evenings of workdays?

The second question relates to the efficacy of a product concept for multi-user relaxation and was formulated as following:

Will an innovative TV-related product design contribute to the current way of multi-user relaxation?

2.5.2.2 Sub-questions related to the nature of multi-user relaxation

To answer the first main research question, several sub-questions have been defined.

Definition

- What is the target group's definition of relaxation?

Analysis

- What activities do they routinely engage in during evenings of workdays for relaxation?
 - a. Do they actually recover from stress by engaging in relaxation activities?
 - b. Which of these activities are related to television and happen in a multi-user context?
 - I. With whom, where, when and how are they relaxing in this context?
 - II. Does TV as medium bring family members together? And how? And what social interactions take place while watching TV together?
 - c. What (electronic) artifacts do they employ when engaging in these activities?
 - I. Do they desire new (electronic) artifacts or activities for relaxation in a multi-user context that enable them to fulfill their needs?
 - i. If so, how do they envision these (electronic) artifacts or activities? And how do these relate to television?

2.5.2.3 Sub-questions related to a TV-related design

To answer the second main research question, several sub-questions have been defined.

Design

- What design constraints should be kept in mind for the generation of product concepts?
- What assessment criteria for the product concept selection should be included based upon 1) the context mapping and 2) literature sources? And why?

Reflection

- Contributes the TV-related product concept to a satisfying relaxation experience in a multi-user context?
- Has the TV-related product concept the potential to fulfill the target group's needs?
- What are the theoretical implications of this research study?

The next chapter describes the methods deployed to answer these research questions.

3 Methodology

A user-centered design process was deployed to answer the research questions and, at the same time, support the design process of one product concept for multi-user relaxation.

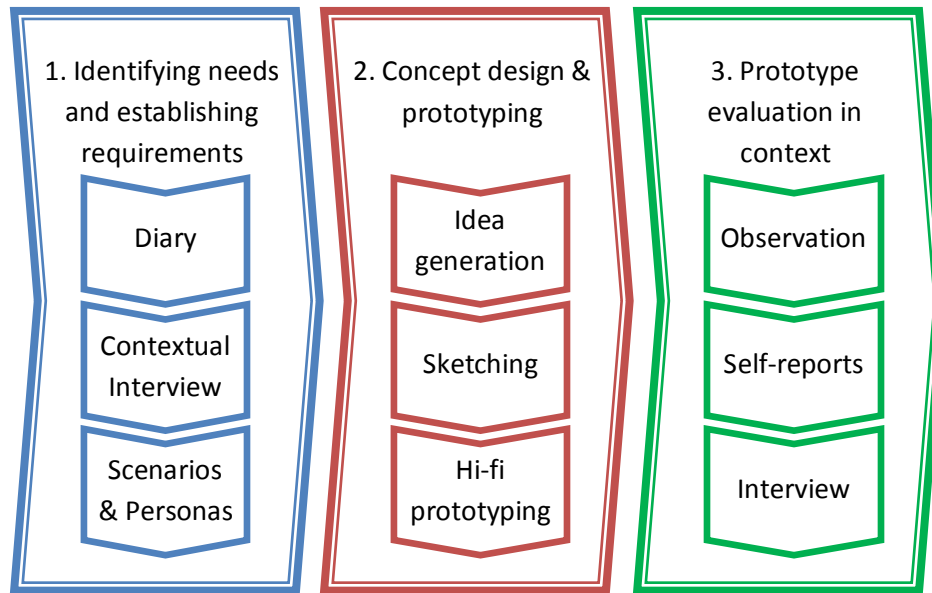


Figure 3.1 Overview of deployed methods

Note that normally a user-centered design process is carried out in an iterative fashion continuing to cycle until a final design has been found, however this project is limited to one full design cycle as shown in [Figure 3.1](#).

3.1 Identifying needs and establishing requirements

Qualitative as well as quantitative data gathering methods can be deployed to understand the target group, their context and relaxation behavior. However, a qualitative approach is common in the early design stage and tends to gain insights and ideas on a deeper level and gives richer information than quantitative methods (Boehner, Vertesi, Sengers, & Dourish, 2007; Sharp, Rogers, & Preece, 2007). There are several qualitative methods (e.g., observations and interviews) to collect sufficient, relevant data to identify user needs. A more recent approach for conducting contextual research with users is contextmapping. Contextmapping is a procedure for mapping the contexts of people’s interaction with products not just to identify user needs but, moreover to prompt inspiration for the design stage (Sleeswijk Visser, Stappers, Van der Lugt, & Sanders, 2005). Contextmapping elicits people’s memories of the past, present experiences and aspirations, dreams or ideas for future products, thereby supporting exploration of the context and inspiring the design of new product concepts. The strength of contextmapping is that this technique can reveal tacit knowledge and latent needs (Sleeswijk Visser, et al., 2005). In contrast, conventional user-centred methods only uncover explicit and observable knowledge about contexts. Conventional methods focus little on future needs of the user and do not provide rich and varied inspirational data for designers. Therefore, contextmapping was deployed as procedure to gain knowledge about the nature of multi-user relaxation at home during evenings of workdays as well as a source of inspiration to spark new ideas.

3.1.1 Contextmapping

Contextmapping is a procedure that follows a series of research steps: preparation, sensitization, generative session, analysis, and communication as shown in [Figure 3.2](#).



Figure 3.2 Overview of steps in contextmapping

Preparation consists of participant selection and creating a mind map. The mind map represents visually the researcher’s knowledge gained from the literature and facilitates in structuring and producing the sensitization package.

Sensitization prepares participants for the generative sessions by triggering, encouraging and motivating them with a number of artifacts (e.g. a diary) to reflect, think, wonder and explore aspects of their personal, daily context and experiences in their own free time and environment (Sleeswijk Visser, et al., 2005). Participants received a sensitizing package at home to unobtrusively confront them with provocative and inspiring tasks eliciting (emotional) responses about events, daily patterns, feelings, cultural environment and ideas in their life (Gaver, Dunne, & Pacenti, 1999). A sensitizing package can contain many artifacts such as a disposable camera, a diary or postcards. Herewith they have to tell their story of the day by filling in timelines, answering questions and doing small exercises. Since the diary is at the core of sensitization and due to time constraints, only a diary was included in the sensitization package.

The fragmented and multi-layered information in the diaries was analyzed with affinity diagrams to cluster topics and find underlying relations (Maguire, 2001; Sleeswijk Visser, et al., 2005). Impressions and insights were written down on small post-its to be arranged together based on similarity without using pre-set assumptions. The focus was on relaxation activities and its psychological effects, striking and emerging themes, product ideas and similar recurring patterns in participants’ daily routines by studying the timelines in the diaries. From this analysis key areas of interest were defined based on the fit with the research question and served as input for the generative sessions.

Generative sessions focus on the key areas of interest to explore thoughts, feelings and ideas of the participants on a deeper level to uncover tacit knowledge and latent needs. These sessions are generally conducted by following up interviews or make-and-discuss exercises. The latter approach was not chosen for this project for two reasons. First, participants’ reactions towards the cut-and-paste exercises in the diary were somewhat negative resulting in substantial return delay. In addition, Facey (2008) experienced in her generative session similar problems with some participants to express themselves creatively. Second, the researcher has no experience with this technique. Therefore, the researcher decided to conduct semi-structured interviews using open-questions about the key areas of interest, which is an excellent method to deeper explore directions of interest, to follow up on unexpected responses and provide contextual information to the researcher (Benyon, et al., 2005; Maguire, 2001; Sharp, et al., 2007).

Analysis of semi-structured interviews was deployed to organize the rich set of qualitative data to discover the contexts of product use and reveal unexpected directions. Interviews were recorded, reviewed at least one time and summarized in Dutch based on highlights, recurring themes, remarkable phenomena and future product ideas. The same technique was used by (Sleeswijk Visser, et al., 2005). These findings were combined with literature findings to pursue key area(s) of interest.

Communication, the final step, conveyed the results to the design process. Personal cardsets were used to communicate requirements and design directions to designers. The personal cardsets contain (conceptual) scenarios about the user's activities in context on the front side and user characteristics in the form of personas on the other side. Scenarios are (rough) informal narrative descriptions about the users' context, situation, objectives, actions and events and usage of tools or systems – a sketch of use (Carroll, 1995). Claims analysis are added to the scenarios to identify positive and negative key aspects related to the future product in the scenario, thereby making strengths and weaknesses explicit. Personas are fictitious, specific, concrete representations of target users to bring the user profiles to life (Sharp, et al., 2007). Scenarios and personas are key components in the early design stage that are often much more effective in communicating information to designers than formal user requirements documents, thereby evoking empathy by designers, inspiring the designers' imagination, raise usage questions about design trade-offs and identify problems and potential future solutions by means of claims analysis (Benyon, et al., 2005; Pruitt & Adlin, 2006).

3.2 Concept design and prototyping

The first part of this paragraph describes the methods used for the design and selection of one product concept and the second part discusses how to prototype the most promising concept.

3.2.1 Idea generation

An ideation workshop was organized to generate a large number of ideas. Two creative techniques using forced analogy (Cave, 1996) were deployed to stimulate out-of-the-box thinking and to spark original, unexpected ideas. The first technique deploys cards with a printed random word and picture (e.g. a photo of party animal and the word irrational) to spark ideas. In the second technique, called Pictionary, ideas are devised and sketched on paper and supplemented with keywords and subsequently passed on to other participants for interpretation and inspiration to make surprising additions or generate new ideas. For both techniques participants had to present their ideas to the rest of the group.

3.2.2 Assessment of concepts

Three techniques were deployed in logic order of a new product development process to evaluate product concepts prior to undertaking technical development.

Initial reactions is a rough early screening technique to eliminate worthless ideas based on judgments of attractiveness (Crawford & Di Benedetto, 2006).

A *scoring model* is a decision aid to rank the product concepts to their overall attractiveness and to identify the best ones (Crawford & Di Benedetto, 2006). The scoring model is an arrangement of checklist factors (criteria) with assigned (arbitrary) weights, i.e. the importance of the factor. Factors are divided in two categories: technical and commercial, and criteria are arbitrarily chosen based on their relevance to success for this project. Factors are divided in weight levels according to their relative

importance of each other through pair-wise comparison. Every concept is scored on each of these factors on a five point scale and each of these scores is multiplied by its weights. Product concepts with the highest total weighted score are most likely to succeed.

Value curves are graphic representations of a product's relative performance across its product competitors (Kim & Mauborgne, 2005). This strategic decision aid was used for comparing product concepts (generated within this project) through visualizing how certain concept attributes diverge from other ones and, so show the uniqueness of the concept.

3.2.3 Prototyping

A prototype demonstrates the product concept to stakeholders (e.g. management or end-users) and allows them to explore initial product concepts, interact with the product concepts and to gain some experience of using it in a realistic setting (Benyon, et al., 2005; Sharp, et al., 2007). A design process starts with building a low-fidelity (lo-fi) prototype (e.g. sketches and paper-based mock-ups) to explore, communicate and reflect on the design in an early phase. For this project a number of *sketches* were drawn to communicate the product concept in a concrete way to the supervisor. Later on in the design stage high-fidelity (hi-fi) *prototyping* including *Wizard of Oz* was applied to receive end-users feedback about the product concept's potential for relaxation and fostering social bonds, user experience and possible improvements. Hi-fi prototyping focused on rapid creation of basic functionality, appearance and behavior and less on system performance. For the initial prototype the content (i.e., objects and settings) was drawn simplistic to minimize details therewith intending to convey archetypes and avoiding end-users to focus and comment (too much) on details. Additionally, *Wizard of Oz* provided simulation of functionality hard to implement but necessary to approximate the 'real' system in terms of top-level functionality (Edwards, 2008). Going from *sketches* to *software prototyping* is a large leap in the design process, however, a main distinction feature between lo-fi and hi-fi prototypes is interactivity, which has a detrimental effect on bringing the design to 'live' (Benyon, et al., 2005) and on evaluating the user experience (Buxton, 2009).

3.3 Prototype evaluation

There are two main approaches to evaluate prototypes with users: controlled experiments and field studies (Sharp, et al., 2007). A controlled experiment is an evaluation approach in which users have to perform certain task with a prototype in a laboratory controlling for unwanted variance. That is, these kind of experiments typically provide an answer to one specific question by comparing a control condition and a treatment condition thereby controlling for confounding variables and error variance within-groups (Graziano & Raulin, 2003). In contrast, field studies evaluate prototypes in naturalistic settings (e.g., at home), whereby there are no interventions except the placement of the prototype in the social and physical context of use (Sharp, et al., 2007). The focus in field studies is on discovering how prototypes are learned and used by users and understanding how they interact with it. This approach is particularly suitable to evaluate children-product interactions such as collaborative toys or emotional satisfying products (Sharp, et al., 2007). Field studies are effective to evaluate how initial general prototypes are received and get early feedback, whereupon more specific questions can be addressed in controlled experiments. Therefore, a *field study* was carried out to evaluate the product

concept with respect to multi-user relaxation and user experience by gathering data through three supplementary methods: observations, questionnaires and interviews.

3.3.1 Observations

Direct observations were done to notice certain types of behavior that participants failed to report afterwards or could not verbalize during experiencing the prototype. Additionally, observations provided the researcher with context information about the place, users and interaction with the product.

3.3.2 Questionnaires

Three post questionnaires were administrated to measure the benefits of the prototype in terms of multi-user relaxation and user experience. However, no control or experimental condition was included to control for extraneous variance (from confounding variables). Therefore, interpretation of the information has to be done with caution, but serves to show tendencies in the data.

A questionnaire with closed questions was developed to measure the benefits on multi-user relaxation and the relaxation characteristics of the prototype. Multi-user relaxation was split up in two constructs: relaxation and social bonding, and four underlying factors on relaxation: work detachment, social activity, low-effort activity and play, were including for evaluating their effect on these two constructs. The questionnaire contains 12 items which are rated on a seven-point Likert scale.

User experience was assessed with the AttrakDiff™ questionnaire and Game Experience Questionnaire (GEQ). The AttrakDiff™ measures the overall attractiveness of an interactive product in terms of usability and appearance (User Interface Design & Hassenzahl, 2009). The AttrakDiff™ is an extended version of the AttracDiff2 (Hassenzahl, 2004a) consisting of four components: pragmatic quality, hedonic quality – stimulation, hedonic quality – identification and attractiveness. Pragmatic quality assesses the product attributes in terms of relevant functionality (i.e., utility) and ways to access this functionality (i.e., usability) (Hassenzahl, 2004b). Hedonic quality relates to potential for pleasure within the product. Stimulation as (intrinsic) hedonic quality represents the product's attributes for personal development i.e., help to indirectly fulfill user goals. Identification as (extrinsic) hedonic quality represents the degree to which individuals can communicate their identity with a product to other social beings. Attractiveness represents the symbolic value of a product i.e., memories, relationships or thoughts that are important to users. The questionnaire contains 28 word pairs of opposite semantic adjectives used to describe the user experience on seven-point Likert scale.

The GEQ measures the psychological impact of digital games (IJsselsteijn, Kort, & Poels, 2007) and was added to measure the emotional effects of the prototype experience. The questionnaire consists of seven components: competence, positive affect, negative affect, immersion, annoyance, flow and challenge, and is built up out of 28 items rated on a five-point Likert scale.

3.3.3 Interviews

Post semi-structured contextual interviews were conducted to evaluate the participants' overall impression of using the prototype and provide contextual information to the researcher. That is, open questions were posed to get rich qualitative feedback about the participants' opinions and attitudes towards the prototype and consequent behaviors and emotions. Interviews help in developing a deeper understanding of the phenomena under study and aids in interpreting the questionnaires.

3.4 Limitations & Assumptions

The aim of this research is described as exploratory, because it studies a specific group of individuals, seeking for novel ideas and insights with *tentative* findings. More specifically, this project does not yield objectively validated understandings of the data, because it was inherently incomplete, distorted, unclear and biased and there was little control over the situation. As a consequence, findings are often the result of subjective interpretations of the researcher (Boehner, et al., 2007) and alternative explanations cannot be ruled out due to threats of internal validity, low representativeness and poor replicability (Graziano & Raulin, 2003). Therefore, caution should be taken when using the findings of this study for other purposes. Instead, the low-constraint methods deployed in this case study are particularly valuable to initiate new research directions.

Further, the following assumptions are made:

- Generic theories about relaxation are applicable to this context-specific case study for designing a product concept for multi-user relaxation in a domestic environment for evenings of workdays
- Work stressors are the main source of acute and chronic stress
- The deployed low-constraints methods in the field study provide an indication about the contribution of the product concept to multi-user relaxation in context

4 Contextmapping

Contextmapping was applied to identify the needs of the target group by means of studying their relaxation activities, the context in which these activities happened and the artifacts they used when doing these activities and fancy in the future. This information should provide an answer to the first main research question: “What is the nature of relaxation in a multi-user, domestic context of *busy adults with young children* during evenings of workdays?” This chapter presents the procedure of contextmapping, the results of this approach and the conclusions drawn from these results.

4.1 Set-up of contextmapping

This section describes the participants, procedure and materials used in the contextmapping.

4.1.1 Participants

Contextmapping is normally conducted with a relatively small number of participants, thereby aiming on rich data to generate user insights and to inspire designers. Considering the limited time for this graduation project and intention to build a prototype afterwards, it was decided in consultation with a Philips expert on contextmapping to recruit six participants in total. Six Dutch natives (3 females and 3 males) aged between 36 and 44 (mean \approx 41) were recruited by email for the sensitization and generative sessions, see [Appendix D](#). Participants themselves indicated to satisfy the target group criteria (see paragraph [2.1.1](#)) and they were not affiliated with Philips. Participants were rewarded with a voucher of €10 for their participation. However, due to unknown reasons one participant dropped out. Further, two participants (A and E) are acquaintances of the researcher. In addition, for the generative sessions more interviews were conducted with two male Philips employees aged 39 and 40, see [Appendix D](#). However, the results of these two interviews did not provide any new information and, therefore no more participants were recruited for the generative sessions.

4.1.2 Procedure of contextmapping

For the sensitization participants received a diary (see [Appendix F](#)) at home by mail on different days to obtain diverse responses on the assignments. In the introduction of the diary participants got instructions how to complete the tasks, fill in timelines, do small exercises and answer the questions in the diary at home on a daily basis. They were instructed to fill in the diary (taking on average 15 minutes) at the end of the day for a week long.

In the generative session semi-structured contextual interviews (see [Appendix G](#)) were conducted to gain deeper insights on the key areas of interest found in the diaries. The interviews were conducted at the participants' home to comfort them and facilitate answering the questions and associative thinking. The interviews took between 45 and 90 minutes and were preceded by a brief explanation in which participants were informed about the set-up of the interview. During three interviews the partner of the participants joined the interview. Though this was out of control of the interviewer, their participation did not adversary affect the results. In contrast, partners were often supplementing their spouse.

4.1.3 Materials of Contextmapping

As first step in the contextmapping a mind map was created for visualizing the main objective *relaxation* and its related topics: activities, people, bodily state, location and tools, see [Appendix E](#).

The diary consisted of daily timelines, open-ended questions and small cut-and-paste exercises relating to relaxation activities, feelings and emotions about relaxation, daily routines, social context of relaxation and communication, domestic environment and products including TV used for relaxation (see [Appendix F](#)). The diary guided participants slowly on a day-to-day basis from their past memories and present experiences to desirable future situations with products related to TV. The diary allowed participants freedom to craft their personal story and included a set of word and photo stickers to make a collage and to supplement responses on other exercises in the diary. Before handing out the sensitization package to the participants, the materials were evaluated by a contextmapping expert from Philips and pilot-tested on clarity and structure of tasks. Thereupon small adjustments were made to the diary.

The first part of the contextual semi-structured interview (see [Appendix G](#)) consisted of general questions about the what, why, when and how of participants' relaxation activities. The main goal was to bring back to mind what participants had written down and thought during the sensitization. In the second part of the interview the focus was on digging deeper in the key areas of interest discovered in the sensitization. The final questions of the key areas of interest related to desirable future products participants fancied to have for the design directions defined in respect to multi-user relaxation at home during evenings at workdays. Herein participants were stimulated to step in the shoes of designers and come up with ideas to improve or enhance these directions with products related to TV. Note that during the interviews the diaries were not explicitly discussed with the participants, because these covered almost all areas of interest. From a pilot test with one Philips colleague it appeared that answering the questions about desirable future products was difficult. Therefore, participants received these questions per email one day prior to the interview to trigger them to think already about possible answers to these questions.

The findings from both the diaries and semi-structured contextual interviews were translated into personal cardsets – a combination of persona and conceptual scenario – specifying the requirements and serving as creative input for the design process, see [Appendix I](#). The personal cardsets present the users' current evening usage patterns and concerns with television. Since two archetypical users came forward out of the contextmapping, different personal cardsets were developed. These cards were evaluated by supervisor Dr. Hans Weda whereupon two minor modifications were made.

4.2 Contextmapping results

This chapter presents the results of the diary and the semi-structured contextual interviews.

4.2.1 Results of diaries

All participants enthusiastically filled in the diaries (see [Figure 4.1](#)) resulting in ample information about their ways of relaxation, home life, social activities and TV behavior. However, participants appreciated the cut-and-paste assignments in the diaries little and, as a consequence, the researcher received four of the five diaries four weeks later after dispatchment. Despite this small dislike all diaries were filled in completely and extensively, but generically. The affinity diagram for analysis of the diaries can be found in [Appendix H](#).

4.2.1.1 Evening pattern on workdays

Participants indicated on the timelines and reported to have busy, routine lives and all engaged in similar activities including ways to relax at home during evenings of workdays. Workdays are distinguished from weekends by a homely lifestyle without much contact with family and friends or outdoor activities except business meetings. Social contact during workdays was limited to one participant reporting to have made one phone call to a friend and another one went out for hockey training and to eat ice-cream with friends. The evening pattern (see [Figure 4.2](#)) visualizes the main thread of the lives of the busy adults with young children.



Figure 4.1 Example of filled in diary

Shortly, after coming home from work families are having dinner. After dinner parents mostly play for about 30 minutes with their child(ren). However, one family (with a 12 year old daughter) reported to linger at the table after dinner to discuss the day. Then, dependent on the age of the children and the evening agenda of the parents, mostly one of the parents puts the children to bed. In the meantime, the other one starts already doing 'work' related activities in the mid-evening. This period is characterized by many obligations, for example work, business meetings, household chores or sideline activities taking place either at home or outdoors. In general, these activities are done without companion of the partner.

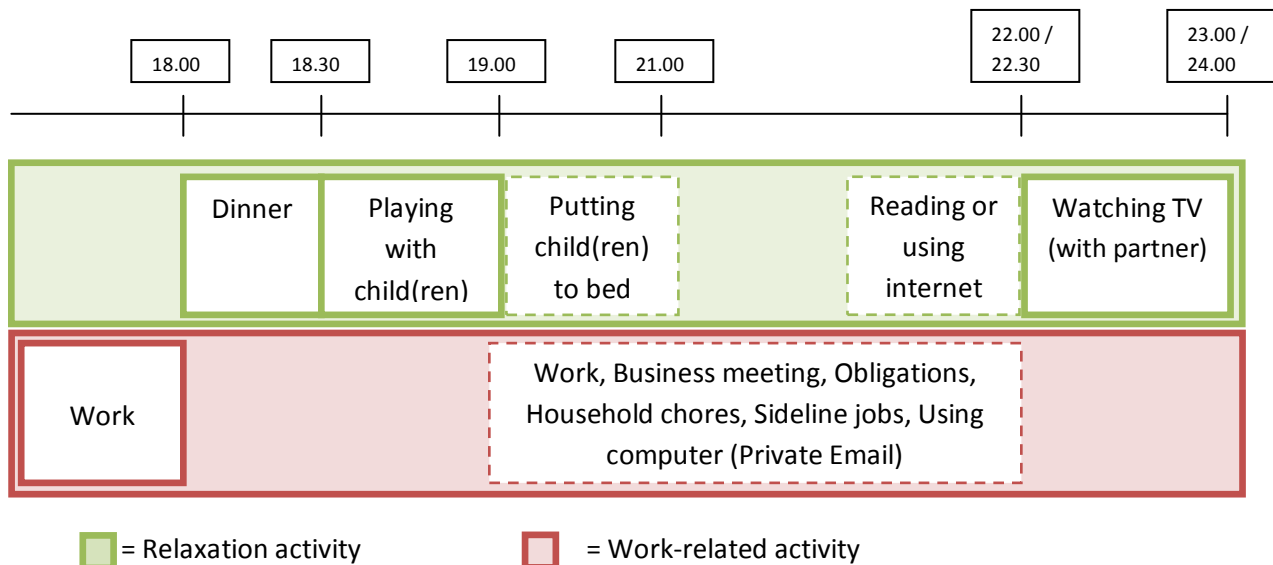


Figure 4.2 Timeline of typical evening pattern on workdays

Exceptionally, participants engaged in more favored activities such as using the desktop to read private email or to surf the internet or practicing sports outdoor in the mid-evening period. After a time of being

engaged in various, less pleasurable activities, all participants ended up the day unwinding in front of the television for about 30 minutes to two hours before going to bed. However, only three participants reported to watch TV with their partner on some days during the week. Three participants sometimes drink a glass of wine while watching television. Noticeably, for two subjects, who had less obligations and more free time, the late-evening period started about an hour earlier featured by reading a book or seeking information on the internet.

4.2.1.2 Participants' definition of relaxation

For all participants relaxation is a period without any obligations, doing the things they want to do and having a rest. During these periods participants are being or wanting to be together with their partner and child(ren), which are the most important persons around them. Participants engaged in various enjoyable activities that brought them together with family members and these are classified as followed:

- Food and beverages experiences ranging from having dinner to drinking coffee or wine together at home were reported most favorable to relax during workdays. According to the participants, these experiences provide an opportunity to talk to one another and have fun.
- Playing and doing games was a frequently reported activity to relax for the participants, in particular with their kids. Four of the five parents reported that playing with children was a recurring, (inter)active, pleasurable and fun activity. Participants reported to play cards, puzzle, romp, play soccer, go swimming and sing together with their child(ren). Details about playing in relation to TV are missing, because the focus of the diary was on watching TV and not other ways of television usage.
- Watching TV was a favorable reported activity for relaxing together with their partner. Remarkably, during workdays participants reported not often to watch TV together with their partner or children.

Likewise, participants expressed in their collage (by means of image and word stickers) relaxation as being together with family and friends through culinary experiences, playing and television. Three participants also reported listening to music and receiving information through the newspaper or internet as relaxing. Participants indicated with stickers to feel relaxed, enjoyed, calm and pleasant during relaxation and afterwards they experience happiness. Participants marked the dining table and the sitting room furnished with television as their favored spaces in the home for relaxation. However, two participants sometimes favored to relax in the bedroom where they could temporarily withdraw from family life.

4.2.1.3 Watching TV

Sitting on the couch and watching television was a frequently reported relaxation activity for all participants on evenings of workdays. Television is perceived by all participants as a device that brings them together with other family members at home. However, watching TV together on evenings of workdays was reported only a few times. Participants indicated to prefer to watch TV programs or movies together when they share the same or similar interest for the television content. For instance,

soccer is a category on television strongly disliked by female participants and also preferred to be watched alone by one male participant. Participants reported to use television as a medium for entertainment as well as an information provider about what happens in the world therewith making it highly favored by the participants. In addition, three participants also reported to use a desktop and/or smartphone to access news or information.

Participants associated watching television with positive features such as relaxation, social, entertaining, exciting and special, however, they also connected TV with negative feelings like boredom, frustration, emptiness and stress. After watching television participants report to feel relaxed, sleepy and tired and ready to go to bed. Additionally, two participants report to watch TV sometimes in bed.

4.2.1.4 Desirable future product

In the final section of the diary participants were steered indirectly to expose their desires for future products that fulfill their relaxation needs. However, participants experienced these questions as difficult to answer and one participant did not answer at all. They came up with answers such as having less or no workload anymore; wanting longer holidays to spend more time with the family or more vacation to completely relax. Despite these unsatisfying responses, three ideas for future products came forward: a meditation machine to calm down alone and quietly, but without losing time; synergy between an iPhone and television i.e., visualizing content of the mobile phone on the TV and; clean and ironing aid to gain more time. Although, the product suggestions are not directly relevant for this graduation project, these express a need for a more optimal way of spending free time.

4.2.1.5 Conclusions of diary

Relaxation concerns mostly activities with a social nature, however the time participants spent with family members on evenings of workdays was fairly limited. Two activities – watching television and playing with child(ren) – were identified as interesting areas to further explore for this project. All participants reported to unwind in front of the television later on in the evening, but couples tended not to watch television a lot together on workdays. Playing with children was by the majority of participants reported as recurring, (inter)active and relaxing activity, but details about playing were missing. Since playing is easily extended as relaxation activity to the television, it was decided to gain more information about various aspects of playing at home in the generative sessions. Further, participants provided no new product solution or interesting suggestions/directions for multi-user relaxation at home on evenings of workdays.

4.2.2 Results of semi-structured interviews

This chapter describes the life of busy adults on evenings of workdays and provides more information including ideas for future products about playing with child(ren) and watching television.

4.2.2.1 Evenings of workdays

Participants reported to have routine lives during evenings of workdays without many moments for relaxation. They have busy evenings that are family-focused as well as work-focused; they have to take care of the child(ren); do household chores; keep up with work and/or are engaged in sideline activities (e.g., teaching riding horse). The following citations illustrate the rushed life participants have on workdays:

"During the completion of the diary, I found out that I did not have much time to relax during the week" Male, 36 (B¹)

"A typical evening becomes at some point very routinely. You experience that when you have a family with children. [...] The youngest needs even more attention and guidance than the oldest and, therefore you do more in certain routines" Male, 41 years (C)

Although participants are quite busy with the household and/or work during evenings of workdays, none of them reported any signs of stress or lack of relaxation. All participants reported to be relaxed or without something on their mind prior to going to bed after being explicitly asked by the experimenter. In addition, three of them report to be completely recuperated in the morning from the day before, whereas the other four said at times not to be entirely refreshed for the day because of not being a morning person or lack of sleep. These four participants thought that this state could not be caused by the few relax moments they have had the day before. Thus, participants have few relaxation moments, but this seems not to negatively affect them.

4.2.2.2 Relaxation during evenings of workdays

Participants reported several relaxation activities they like to engage in at home during evenings of workdays as shown in [Figure 4.3](#).

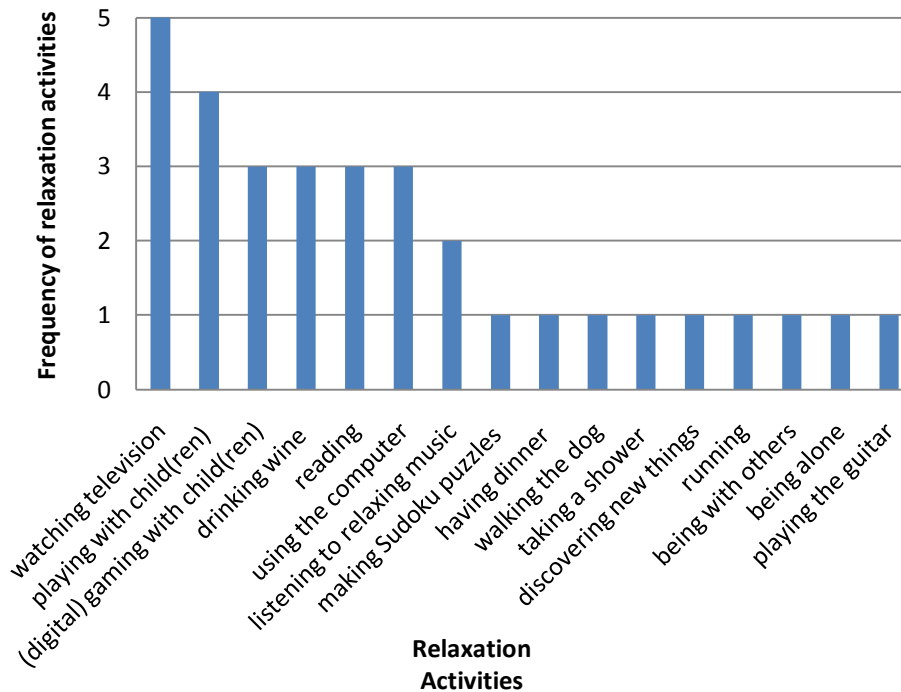


Figure 4.3 Overview of relaxation activities reported by each participant of the full contextmapping

Further, participants state not to practice any particular relaxation techniques (e.g. meditation or yoga) to calm down on evenings of workdays as illustrated by the following citation:

¹ The letter indicates the participant about who can be found more in [Appendix D](#).

"I have absolutely nothing with meditation. I feel nothing. Then you are supposed to feel relaxed, but I feel like an idiot. [...] I do not have the patience. I am also not going to sit for a quarter to monitor my breathing " Male, 36 (B)

In contrast, participants experience knowing new stuff and being active as relaxing as illustrated below.

"The detachment, relaxation, is something I really seek for in sports. I always say you can have a busy day and do two things: either crash on the couch and watch TV and nothing happens anymore that evening or I work out. I go running for an hour and take a shower and then I feel totally fit" Male, 44 (A)

As these two quotes indicate the target group exposes typical type A personality characteristics such as impatience, time-conscious, work-oriented and having difficulty relaxing. These personality traits are also reflected in the participants' evening routines during workdays, see [Figure 4.4](#).

4.2.2.3 Home routines during workdays

Although home life is dynamic, there seems to be a rough recurring pattern illustrated by the quote and [Figure 4.4](#)².

"An evening at home is eating around six o'clock, then after dinner I play until half past seven with X, say one hour, I have just brought him to bed, now a cup of coffee and then I work again for one and a half / two hours in combination with sitting on the couch and then we might watch some television and around eleven o'clock we go to bed" Male, 44 (A)

Participants come home from work around 6 o'clock and almost immediately have dinner with their family. Dinner time is highly valued by the participants and experienced as relaxing, because they like to indulge themselves with food and the whole family is together discussing the day or other topics.

Perceived Effort

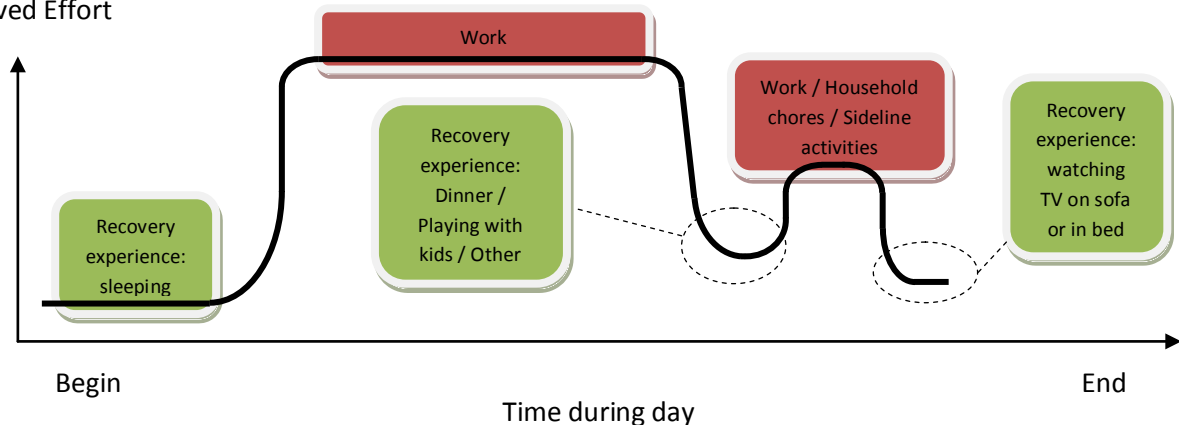


Figure 4.4 Graphical representation of typical evening behavior on workdays

After dinner (around 7 o'clock) one of the parents frequently plays with the child(ren) for about 30 minutes and the other one clears the table and does the dishes. Playing with the children is highly valued by the participants and coined as *quality time* by two participants. Then, the child(ren) is being

² Figure 4.4 is an interpretation of the results from the diaries and interviews by the researcher

brought to bed by one of the parents somewhere between 7 and 9 o'clock, depending on their age. Bringing the child(ren) to bed is experienced as a neutral to relaxing experience by the parents. They wash and dress the child(ren) and read a book together. Besides bringing the child(ren) to bed, the parents also have to take care of the household by doing chores such as clearing the house, vacuum cleaning, washing, ironing or folding the laundry and answering email. The following quote illustrates the mid-evening period.

"Cooking, cleaning, and then the youngest almost has to go to bed. [...] An hour later, the oldest has to go to bed. Usually, in this period I spend my time reading and answering mail, search on the internet, preparing things for the staff association, invitations for friends or something else. Then the oldest goes to bed. And then nine out of ten times I continue with that or upstairs there is laundry to iron. Or I crash on the couch with a Sudoku book" Female, 40 (D)

There is one group of four participants that structurally starts to work again for about 1½ to 2 hours between 8 and 11 o'clock. Work can either relate to their job or sideline activities, for example, having meetings at the tennis club, reading documents or answering emails. A fifth participant reported to take work home on a regular basis. Though working at home is not experienced as relaxing, participants make themselves comfortable by working in the living room, often in the presence of their partner, with music or television in the background. Three other participants have more relaxing evenings; starting around nine o'clock with reading, surfing the internet or sometimes watching television. Finally, from about ten o'clock all participants ended up the day unwinding in front of the television in the living room or in bed for about an hour to two hours as shown in the quote below.

"When I have had everything, crash on the couch, that is actually the first time I really try to switch off. [...] Then it is often ten o'clock and then I go zapping if there is something interesting on (the television). [...] If my wife is not busy with all kinds of things, we watch together. But watching television together is something we not do often. Anyway, television is not on often. We watch together maybe one time a week, maximally two times" Male, 36 (B)

Participants have two periods for relaxation during evenings of workdays to recover from negative, demanding tasks. First, families are having dinner together and afterwards mostly one of the parents plays with the child(ren). Second, participant end the day by crashing on the couch and engaging in a low-effort activity, often watching television. The following sections provide more information about playing with children and watching TV on the couch.

4.2.2.4 Playing with children

All participants reported to like and enjoy playing very much as relaxation activity, because it brings them together and enables them to interact with family members. Other aspects appreciated in playing are: excitement, being active, (friendly) competition, uncertainty of game outcome and educational. Participants play frequently with their children and it was even coined as *quality time* by two of them.

"One-on-one with the kids playing is relaxing, when they are together it is sometimes exhausting. It distracts from your daily hassles. It is very special to play with your kids" Male, 39 (I)

"Playing with the children is not conscious relaxation, but a phase of detaching after work. [...] I experience it as a relaxing moment, because my thoughts are only by the kids. You just letting everything go and thinking about nothing. And just do as if you are a child yourself" Male, 36 (B)

Playing is not just an enjoyable experience that disengages participants from their daily hassles, it also shows them the nature of their child(ren). Participants reported to like to see how their child(ren): progresses in the game; improves skills; shows creativity; develops itself; the opinions it has; acts in the game and; reacts to situations such as winning or losing a game. Thus, playing has many aspects that make it attractive for parents.

Playing happens in six of the seven households on workdays (± 3 times a week) after the child(ren) is back from school, parents are home after work or after dinner. Typically, playing at workdays takes mostly about 20 to 30 minutes depending on the time available of the parents. Mostly, one of parents plays with the child(ren) and the other one does something in the household. Only, one family mentioned not to play anymore with their daughter (except when on holiday), because of her age (12) and changed interest. Thus, playing occurred in almost all families on a frequent basis.

Households play a diversity of games both inside the home and outside including free play, board games (e.g. ludo), sports, word games and digital games such as Jungle party on the Sony Playstation. All families show a multitude of play rehearsal whereby choosing what to play is a dynamic and negotiable process between child(ren) and parents that depends on several factors: whether it fits in with the parent's schedule; amount of time the game takes; season of the year; popularity of the game at the moment and; educational capability of the game.

Participants reported to play at the dining table or coffee table in the living room, because of the social atmosphere. Five families owned a game console (i.e., Nintendo Wii or Sony Playstation) that was placed in proximity of the television in the living room. Remarkably, none of the participants reported to play games on a desktop, whereby one of them reported to experience this as uncomfortable and playing alone. Further, parents apply strict rules for usage of game console to stimulate their child(ren) to play traditional games or outdoors with other children. Although parents are sometimes worried about excessive use of digital games, they have a positive attitude towards these devices.

4.2.2.5 Digital versus traditional play

Besides traditional play in multi-user context, digital play occurred in five of seven households with the Nintendo Wii, Sony Playstation and/or a DVD-game. The following quote illustrates what one participant likes about digital games compared to traditional games:

"The fun thing about the Wii is that it is more competitive like playing tennis. Also, a game is shorter and faster. And because you are physically active it is more competitive. [...] I am than more absorbed in the game. During a traditional game you often get something to drink and you are doing other things probably because it takes longer "- Male, 39 (F)

However, not all participants were in favor of digital games. Therefore, participants' attitude towards a symbiosis of traditional play and a digital game for multi-user playing was probed. The following citations show their opinions about the proposition of a tangible user interface for playing on the TV:

"I am not so digital. And the kids are, so you cannot say I'm going to hinder that. [...] It adds nothing for me, maybe I am an old fashioned prick, but such a board on the table and those pawns, that is perfect for me. [...] However, I have seen the Wii a few times, and I think that is fun" Male, 44 (A)

"A digital version to play is always fun. Look how more things there are that make life comfortable, the better it is"- Female, 42 (E)

"With a digital play version, I am more inclined to play [...] and the kids like that too. If you have a sort of teletext function [...] hop, playing, that game and if you have more interaction it would be easier to play" Male, 36 (B)

In total five participants favored playing together on the television with a tangible user interface, whereas two inclined more to the traditional way of playing. Despite their enthusiasm about this proposition participants mentioned the following issues:

- When playing together on the television, other family members have to go to another space to watch TV or engage in another activity
- Playing on TV should be without start up costs i.e., reading manuals, inserting DVDs or installing a computer to a television
- Games should not be too childish for parents
- New features and updates for the game should be uploadable via internet

In sum, participants responded positively to play with a tangible user interface combined with television.

4.2.2.6 Ideas for future products related to playing

Participants were stimulated to devise a multi-player game related to TV for relaxation at home.

The first idea stimulates people to expose themselves in a funny way by doing a performance in front of others. The performance is inspired by a funny movie clip from Youtube or a home video that is displayed on the television. The participant thinks that this game is very playful and expressive.

The second idea is based on the principle of being transported psychologically to another place. This participant fancies the idea to drive with a taxi through New York to get an impression of the city. The participant emphasizes that such an application should have realistic graphics and the dynamics of the city to create the illusion of being there.

Although participants were sensitized by the previous questions about play, they found it difficult to devise a game related to TV. Instead, participants had several suggestions about which elements they would like to be implemented in the game such as educational, challenging, fun to play and stimulating team building and creativity of children. For parents it is important that play contributes to the general development of their kids.

4.2.2.7 Watching TV

Watching TV is a combination of sitting comfortable on the sofa and switching off from the daily hassles.

"What me really relaxes is [...] watching TV. That's what I like" Female, 42 (E)

However, three participants reported negative associations with TV as medium for relaxation.

"Aimlessly watching TV" Male, 42 (C)

Television is being watched later on in the evening between ten and twelve on workdays, frequently being the last activity participants engage in before going to bed. Four participants reported to drink a glass of wine when watching TV.

There is a difference between the extremely busy adults and busy adults regarding television consumption. The busy adults consume TV for longer periods and more consciously, for example, they browse TV guides and select films for the weekly evening. In contrast, the extremely busy adults are more opportunity watchers i.e., channel surfers using television more as the proverbial wallpaper in case TV content does not draw their attention as illustrated by the quote below.

"I can well turn on the television and when I think there is nothing on, I take myself a Sudoku book. Or X (husband) comes home and turns on the television and I think that is not interesting, I make a Sudoku or do something else or use the computer because on the computer I can always do something" Female, 40 (D)

Television serves both as medium to receive information and for relaxation, whereby TV content is a significant determinant in how relaxing a TV experience is. The appeal of the content determines whether participants decide to watch television and keep consuming it. Five participants complained about the quality and limited diversity of television content resulting in sub-optimal relaxation experiences. Further, none of participants have a regular schedule for watching TV or a particular program. In the absence of appealing TV content, participants reported to engage in other activities (e.g., chores or reading), whereby the television is on in the background functioning as muzak. Moreover, TV content plays a significant role in whether families watch television together or not as illustrated by the quotes below.

"Usually X (husband) watches somewhere else, because we watch completely different programs. So there are two TVs in our house. X (husband) always watches soccer, that is broadcasted every day" Female, 42 (E)

"Often when it is early in the evening we watch what the rest of the family prefers and with three women it is often Goede Tijden Slechte Tijden. Usually, I do not really watch that, I sit with them on the couch or I chat a bit or read a book or sit behind the computer" Male, 40 (F)

Watching television together occurs not often on evenings of workdays, because participants have often a strong preference for certain programs that are not of interest to their spouse. As a consequence, couples mostly watch television separately in different spaces or one of them engages in other activities. Surprisingly, four participants reported to experience watching TV alone as a negative experience after being explicitly asked by the researcher. To overcome this, one of the couple sometimes makes a concession with regards to the TV content being watched. In sum, TV content seems to a significant determinant in whether couples watching TV alone or together.

Participants watch informative as well as entertaining TV content. Half of them watch more informative, whereas the other half favors more entertaining content. Informative TV content, for example Paul en Witteman or news, is not experienced as relaxing, but fulfills the participants' need for cognition.

"In a soap I can really loose myself. In news not, than you can get angry about what happened"
Female, 42 (E)

Participants reported to relax best with entertaining TV content. Three participants reported to regularly watch quizzes (e.g. Weekend Miljonairs). Moreover, humorous movies and TV programs such as Gooische vrouwen or Mooi! Weer de leeuw are enjoyed a lot by all participants. Surprisingly, comedy is almost always watched together by couples. However, during this social TV experience most participants do not talk very much with their partner, particularly when watching movies. When partners talk, conversations are mostly about daily topics (e.g. work or gossip) and not so much about the television content. These findings imply that watching TV is more a moment of being together than an instant of social interaction.

4.2.2.8 Potential ideas for future products related to TV

Participants had several suggestions for TV-related products for multi-user relaxation.

Three participants would like to have amusing family shows on television (e.g., Ron's Honeymoon Show and Wie-kent-kwis) that contain live performances, interviews and music. According to them, these shows bring the whole family together in front of the television.

One participant reported that the Nintendo Wii is a perfect device for multi-user relaxation. The participant tells the anecdote that last weekend his friends came over for a visit and brought their two Wii controllers to play with four players against each other. For the participant this interactive style with television is a big advantage above the passive, traditional television.

Two other participants urge for more interactive TV quizzes in which they can be part of the show, but than from within their own living room. One participant wants to have a combination of Miljoenen Jacht and Deal or no Deal (competitive money games in which a quiz master poses questions), wherein, besides the players in the studio, the participant takes part in the quiz. In the other quiz concept, players have to remotely answer questions posed by a television presenter resulting in one winner at the end of the show. The participant would like to have the feeling to be 'live' in the studio, but play the game from within his living room. These participants like to be more active and involved in front of the TV and think that such an interactive quiz is an enjoyable, playful activity to do with the whole family.

Six participants want content on demand to watch the specific TV content i.e., programs and movies they desire at that particular moment. These participants want to choose TV content of certain themes or categories, past events or select content with a time indication. Three participants take this even a step further and propose an option to recommend TV content based on the users' interests and mood. They would like to relate recommendations to weather conditions, stress level, day and time, agenda and social context. In sum, participants had several suggestions to make TV more interactive, involving, comfortable and liberal in order to support multi-user relaxation.

4.3 Conclusions from contextmapping

Busy adults with young children have two periods during evenings of workdays for recovery of negative, demanding tasks. In the first period the whole family is having dinner together and afterwards mostly one of the parents plays with the child(ren). Sometimes bringing the children to bed is also experienced as relaxing. Participants indicate that this is a very relaxing two hour period in which they are together with their beloved ones and are distracted from their daily hassles. In the second period participants relax by ending the day on the couch and engaging in a low-effort activity, often watching television. Watching TV seems to be a way participants prepare themselves for bedtime, but is often not a social activity. However, participants experience watching TV often as sub-optimal for multi-user relaxation with TV content as a significant determinant.

Furthermore, participants experienced it as difficult to partake in the 'design' of TV-related product concepts for multi-user relaxation at home resulting in only one concrete, inspirational product suggestions. However, based on the results and participants' high-level suggestions four implicit needs were identified for the enhancement of multi-user relaxation at home during evenings of workdays.

First, participants do not want to be dependent on the TV programming, but desire liberty in choosing TV content. Surprisingly, participants had several good ideas how to improve content on demand systems including recommendations of TV content based on their mood.

Second, a number of participants have the desire for more interactive TV to become more involved and more active in front of the TV with shared entertainment. Interactive television satisfies needs for entertainment and communication (Livaditi, Vassilopoulou, Lougos, & Chorianopoulos, 2003), and TV viewers with high cognitive abilities prefer more interactive TV (Bryant, et al., 2003). Although participants are open to replace their current way of experiencing TV for a more interactive media, they had vague, incomplete descriptions how to envision this interaction.

Third, participants want to engage in TV-related activities that bring the family more regularly together at home. Also, Lee *et al.* (2008) found a need of dual-income families for opportunities in which family members can give their time and attention to each other and that support the construction of a family identity. In addition, the desire of families with young children to engage in joint family activities was also discovered as customer insight by Facey (2008). Participants gave existing examples such as family TV shows and Nintendo Wii as relaxing concepts to gather the family in front of the TV.

Fourth, parents want to learn more about the nature of their child(ren). Play and games are activities that disclose the personality of their kids and are relaxing at the same time. Dalsgaard, Skov, Stougaard & Thomassen (2006) found a parental need for self-disclosure of children, and (narrative) play was used by parents to reveal information and connect to their children (McCabe & Peterson, 1991). However, participants had no concrete ideas about how to reveal more about their child(ren) with artifacts. The identified needs: content liberty, interactive television, sociability through television and social play for relaxation and as personality discloser, are used as input for the design process described in the next chapter.

5 Concept design & prototyping

This chapter describes the creative and practical process of translating the results from the context mapping into a new product concept. First, a collection of ideas and concepts including those from an ideation workshop were stepwise adapted and refined to eventually select the best concept. Second, a review of existing technologies that support interactive storytelling and encourage collaborative play with tangibles is given. Third, a product concept supporting interactive storytelling on TV was worked out into a final design that was built as a working hi-fi prototype.

5.1 Concept design

This paragraph shows the creative process walked through to generate various conceptual products and eventually select the best one.

5.1.1 Ideation workshop

An ideation workshop was organized to embark on an iterative design process with as goal to generate as many new product concepts for multi-user relaxation at home in the living room during evenings of workdays, whereby the concepts had to relate to the design directions:

- playing games with children and/or partner with television as display medium
- watching television together with their partner

The participants – 4 Philips employees and 4 Philips interns – were carefully chosen to form a multi-disciplinary group in order to have input from different angles in the workshop. The program of the ideation workshop can be found in [Appendix J](#). In the ideation workshop personal cardsets (see [Appendix I](#)) were handed out to communicate requirements and the design directions to the designers. The workshop included two design rounds, each fitting one design direction, in which participants were put in teams of two and had to collaboratively generate ideas with one creative technique (see paragraph [3.2.1](#)) for each direction. For the evaluation participants had to write down their three favorite concepts fitting the goal of the workshop and the concepts' strongest and weakest point.

5.1.2 Design process

The ideation workshop yielded a wealth of concepts, which were put together with the ideas from the contextmapping and concepts that had come to mind by the designer during the entire project. This pool of over 50 ideas and concepts set in motion an iterative design process of devising, combining, refining and adapting new product concepts and ideas. The pool ranged from dull, simple and concise ideas to more worked out, innovative and promising new product concepts. Due to time constraints and to get more focus in the project, a pre-selection based on *initial reactions* was applied to this pool by the designer and P.D.Eng. Tim Tijs. As final step, eleven promising concepts that fitted the project goal were refined and worked out in more detail, a description of these concepts can be found in [Appendix K](#).

5.1.3 Concept selection

For the assessment of the remaining eleven concepts a multi-criteria matrix (see [Appendix L](#)) was used to rank concepts to their overall attractiveness and potential. The designer and P.D.Eng. Tim Tijs separately awarded each criterion of the eleven concepts on a 5-point scale. Criteria were based on the

literature, findings of contextmapping and Philips company information. Each criterion score was multiplied with its assigned weight and the cumulative sum of all criteria per concept was averaged over the number of assessors to calculate the average total score.

Three concepts – Show yourself to the family, Sketchpad: Everyday Art and Kids World – with the highest average total score and in close range of each other were reviewed with both Philips supervisors (experts on relaxation) to select a final concept being unique as well as having high potential. *Show yourself to the family* is a concept in which family members have to perform on a random basis a small act inspired on a Youtube movie clip in front of the family whereupon they have to rate the performance to eventually get a winner. *Sketchpad: Everyday Art* allows family members to communicate their day experiences or personal messages by means of digital sketches or multimedia messages on the television to each other. In *Kids World* children artistically create questions, riddles, stories or tasks with a basic set of tangible objects and pose these challenges on television to their parents, which have to displace themselves in the children's fantasy to guess the right answer. For comparison of the three concepts, their scores on each criterion were plotted in a value curve to better reflect on their relative strengths and weaknesses, see [Appendix M](#). The value curve visualizes that *Show yourself to the family* scores extremely low on the criteria: differentiation and duplicatibility of competitors and, therefore was not selected. There was no direct preference for the remaining two concepts, however the user experience with *Sketchpad: Everyday Art* relies on what family members experience on a day and, there were serious doubts about the frequency of sharing and the attractiveness of those experiences. Therefore, it was decided to work out Kids World in much more detail in regards to the content, user interface and user interaction, even though the realisability of the prototype in time was difficult.

5.2 Related work

Many projects deploy digital technology in combination with tangible user interfaces (TUIs) to support interactive storytelling and encourage collaborative play among children. This section provides an overview of these technologies in relation to (1) supportive storytelling, (2) how interactive styles of TUIs control play behavior and (3) collaborative play to facilitate social interaction.

5.2.1 Technology to support storytelling with tangibles

In Magic Story Cubes, a mixed reality prototype, 3D computer graphics visualized through a head mounted display are superimposed on physical cubes to support storytelling among children (Zhou, Cheok, Li, & Kato, 2005). Children can tell a story of different scenes by unfolding a cube whereby each side of the cube triggers audio and animated 3D video to show a part of the story. In StoryMat children get inspiration for telling their own story by listening to and looking at other children's stories (Cassell & Ryokai, 2001). A physical mat stores children's stories by recording their voices and the movements they make with their toys on the mat. These recorded stories are played back and projected onto other children's mat as they play with the same toys. Empirical evidence showed that disclosure of peer stories while playing supported children with storytelling. These systems provide children with tangibles to inspire storytelling, but do not offer a set of tools to use to build their own story.

PETS is a robotic storytelling environment that supports children to express themselves emotionally through self-created stories (Druin, et al., 1999). Children can build a robotic pet out of modular animal parts and act out their stories with an onscreen application by applying emotions and behaviors to the

robot throughout their stories. TOONS is an TV centric, interactive storytelling application for children in which they can manipulate streamed multimedia objects by means of tangible interaction toys (Janse, 2002). A dedicated interactive storyline along with possible object manipulation is broadcasted by a provider to the users' home through a media set-top-box. Children can interact with the onscreen objects and streams through tangible toys such as a magnetic board consisting of square tiles. However, the specific tangible toys were perceived as difficult to use by children, the manipulative actions appeared very confined and real-time user intervention with the TV content was very limited (Stienstra & Hoonhout, 2002). These systems offer children a set of tangibles objects to build and tell their own story, but the creative freedom is considerably constraint and limited to a single story perspective.

Having multiple perspectives during storytelling is an important feature for creating rich interactive stories. Tangible Viewpoints is character-driven story environment that provides storytellers with multiple wireless pawns to navigate through a multiple viewpoint story (Mazalek, Davenport, & Ishii, 2002). Each pawn embodies a viewpoint of a story character. When a pawn is placed on a tabletop surface, a story part is projected around it in the form of small pictures and text titles. With a small lens-like object users can view more multimedia information about that particular story part on a nearby screen and, so progress through the story. However, these system support storytelling with tangible objects to limited degrees of freedom with respect to story manipulation, creativity and self-express.

5.2.2 Affect of TUIs on play behavior

As illustrated by the previous examples, affects the TUI how users create and narrate a story. TUIs seamlessly couple physical artifacts to digital information therewith leveraging our physical manipulation abilities to directly control electronic or virtual objects (Ishii & Ullmer, 1997). Henceforth, TUIs are widely applied in digital games to improve usability, promote social interaction and to enhance the game experience (Lindley, et al., 2008). The first class of TUIs features physical artifacts that directly embody the digital information or media. For example, StoryToy is a storytelling environment based on a sensor network that consists of a tactile user interface i.e., a farm made out of cloth with multiple stuffed animals as actors, and an audio replay engine (Fontijn & Mendels, 2005). Children can pick up stuffed animals in the environment that trigger pre-existing audio supporting the child to play a pre-defined story. The affordances of the stuffed animals are directly associated with its functionality and, so facilitate the interaction. However, the specific purpose of tangible objects limits children to a particular style of interaction confining them in creativity and fantasy for storytelling.

The specific tangible interaction style is sometimes expanded with visual displays to enrich the user experience. Visual graphics are displayed in BattleBoard 3D where players use a webcam to detect physical blocks associated with 3D graphics that are animated through virtual reality goggles or on a large display to experience a battle in the virtual world (Andersen, Kristensen, & Nielsen, 2004). This type of interface is visually richer and provides users with two-handed control over the interaction, but gives users little manipulative freedom over the game content and obstructs social interaction.

More recently, there is a trend towards more generic (polymorphic) TUI input devices acting as tangible cursors on an overlaid graphical user interface. For example, Sensetable is an advanced system that electromagnetically tracks the positions and orientations of smart tangibles on a tabletop display surface and projects information onto the objects themselves (Patten, Ishii, Hines, & Pangaro, 2001). These TUIs have several advantages over conventional graphical user interfaces (GUI) including two-

handed input, reduced cognitive load, faster target acquisition, direct mapping between input and output (Merrill, Kalanithi, & Maes, 2007) and promote collaborative usage and social interaction. However, tabletop TUIs have several drawbacks with respect to storytelling such as that the artifacts occlude the visuals on the display and users have to align with the direction of content of the tabletop surface.

A new class of TUIs is a hybrid between the polymorphic tangibles associated with GUI overlays and purpose specific tangibles associated with direct interaction. Polymorphic tangible objects have integrated displays that communicate the implicit affordances normally provided by shape and features of specific tangible objects such as Magic Cubes (Zhou, et al., 2005). Siftables spatially expand this style of interaction by having a collection of compact tiles with integrated color displays that wirelessly communicate with each other via a sensor network (Merrill, et al., 2007). Users can, for example sort and group photos, produce music sequences or compose words with a set of tangible objects that directly output various forms of digital information and media. Although Siftables do not intend to use external displays one interactive application for children – a language learning tool, combines Siftables with a screen (Merrill, 2009). Children can manipulate the Siftables to bring pre-existing characters displayed on the Siftables into a scene or let characters interact on the screen. Every interaction triggers an animation on the screen that is auditory explained to children by the system. However, this application offers single interaction between the child and the system, which only presents pre-defined animations and recordings.

Based on the properties of the presented tangible interaction styles it was decided to apply a distributed TUI connected to a television for interactive storytelling that allows for more self-expression of children and promotes collaborative play.

5.2.3 Tangible systems that promote collaborative play

Ely, the explorer is an interactive, multi-player game with tangible objects in which children learn to collaborate on the exploration and manipulation of content in a classroom setting (Africano, Eriksson, Lindbergh, Lundholm, & Nilbrink, 2003). The tangible tools interconnected through RFID technology allow the children to manipulate virtual objects on a tabletop display surface. Results showed that the system is experienced as enjoyable and promotes natural collaboration among children. Another multi-player game, Playground Architect, was designed to help shy children gain social confidence by playing on an interactive tabletop surface in a classroom setting (Hendrix, Herk, Verhaegh, & Markopoulos, 2009). Evidence showed that children enjoyed the game and shy children were talkative during the game with some even notably more outgoing. Also, Philips' Entertaible, an electronic multi-touch tabletop, is designed to facilitate social interaction among players of digital board games in public settings (Hanlon, 2006). However, more applicable to multi-user storytelling is KidPad that encourages young children to collaboratively create their own stories with a set of tangible drawings tools on a shared screen in a classroom setting (Benford, et al., 2000). In general, social games with tangibles benefit heavily from its affordances to gather players, promote collaboration and facilitate social interaction resulting in enjoyment among players.

The presented designs focused to a large extent on systems with tangibles that support storytelling and promote social interaction exclusively for children, often in educational settings. However, these systems have limited capabilities for self-expression, do not deploy television and have not intentionally

designed for user experiences in relation to multi-user relaxation. Additionally, in many cases evidence is lacking about the (psychological) benefits of these systems for players. Therefore, this research proposes storytelling with tangibles to deliver a rich, creative and interactive user experience at home that accommodates relaxation and fosters social bonds between parents and children.

5.3 Design of product concept: Kids World

The final design of Kids World was the result of an iterative design process in which several sketches were drawn and brainstorming sessions were held. As a consequence, the final concept was thought to be a substantial improvement over the initial concept in terms of relaxation potential and interaction style. This section describes the high-level description of Kids World, story building, interactive storytelling and why Kids World is thought to be relaxing.

5.3.1 High-level description of Kids World

Kids World is best described as a social game-like TV application incorporating aspects of traditional toys as well as elements of digital games intended to bring families together in front of the TV for relaxation purpose and fostering social bonds. This new class of game consists of two parts: story building and interactive storytelling. *Story building* is the part in which children create their own fictitious story on the TV by using story content provided in a repository and a set of tangible intelligent objects. *Interactive storytelling* enables parents and children to collaboratively narrate a story on TV in which they are interactive participants – characters in the story world – and, at the same time, make decisions and perform actions that directly affect the course of the story. Interactive storytelling is believed to be a new, unconventional way to deeper relax parents after dinner and increase social interaction between parents and children. The following scenario gives an impression about the user experience with Kids World.

“On a rainy afternoon Josh, a 6 year old boy, starts building a story on the TV for his dad about cars that can talk with animals and dwarfs. He starts by choosing a Lord of the Rings background for the story on the TV and couples several cool and funny looking cars to wooden blocks. He also uses the microphone to attach a broom...broom...hello sound to a truck. Then, he decides to add one jumping dwarfs, two spinning dwarfs, a group of sirening elephants and a flying house to the narrative. During dinner Josh tells proudly that he made a really nice story for his dad about cars that talk with dwarfs and elephants. Though his dad has a full evening schedule he frees up 15 minutes after dinner. Josh starts with telling the story by moving the wooden blocks over a play board. Quickly his dad continues the story with an unexpected turn by narrating on the TV that the dwarfs have to carry a broken truck and sick elephant. While he is stacking the truck block upon the dwarf block, he accidentally triggers the “broom...broom...hello” sound and a big smile appears on his face. Then, Josh takes over the story with his flying house and surprises his father by how he is acting in it and what he is telling. For about 15 minutes father and son interactively engage in the telling the story and are completely absorbed in it. After the interactive storytelling Josh’s dad feels invigorated and positively mooded and ready for the upcoming meeting at the tennis club.”

As the scenario demonstrates the social game-like TV experience is a result of a combination of story content provided by the system, the creative story composition of the child and the fantasy of the parents and child used to narrate the story.

5.3.2 Story building with Kids World

In story building child(ren) produce in an artistic way their own story on TV for their parents by means of a basic set of standardized objects (like LEGO blocks) and a voice recorder, see [Figure 5.1](#). A story is built up scene by scene and each scene is created by composing it with story objects (e.g. a witch) provided in a repository. Each object (except the background) is coupled to a standardized object – a wooden block – that is placed on a surface i.e., the play board, to position and represent the story objects on the television. Thus, by coupling story objects to solitary wooden blocks users compose a static scene. To bring the scene alive, users can move wooden blocks on the play board to visualize motion of objects in the story on the television.

The main system components for story building are: a control panel including a microphone; a set of wooden blocks; a repository of story objects and; a television as shown in [Figure 5.1](#).

The control panel is the main element for building a story and allows users to browse through the repository. When the user places a wooden block on the upload station, the repository pops up on the television. Users need to use the joystick as input device to select story objects, modify attributes of these objects and/or attach audio files to them. By moving the joystick in any direction users can jump to other options on the graphical user interface (GUI). The red button on the joystick allows users to move one level down in the (sub)category hierarchy and to confirm the final composition of the story object. After the confirm step, the GUI switches back to the scene currently being in production and the story object is displayed on the LCD color display in the wooden block to provide users with feedback. The user repeats this process until the scene composition is completed



Figure 5.1 Kids World: Story building on television

and starts to compose a new scene with the control panel until the story is finished. The blocks wireless communicate via passive RFID their presence to the control panel and position on the play board . The control panel and play board are wireless connected with the television to offer the user with an easy to use and portable interface and, at the same time, provide sufficient flexibility to create a rich story.

Wooden blocks are literally the building blocks of the story and represent story objects on TV, see [Figure 5.2](#). The blocks look like traditional toys and are designed to be easy to use and intuitive, but offer a rich interactive experience. The blocks – made of wood – are robust and colorful to make them attractive for children. A block contains a LCD color display, four buttons on each side face and a battery

to power the electronics inside. Users have to place the wooden blocks in the middle part of the control panel to recharge the batteries inside the blocks. The LCD color screen displays the selected object from the repository. The buttons enable users to trigger pre-configured behaviors and/or audio files. As extension, placing two blocks in close proximity triggers an interaction between the story objects. For example, putting a block with a lion against a block with a truck prompts the lion to step in the truck. A story contains many blocks, however, only a few blocks belong to a certain scene. Therefore, the LCD color display lights up only when a particular block is linked to an active scene and the rest of the blocks are 'off'. In general, the intelligence in the blocks facilitates the user-system interaction providing the user with a versatile, but intuitive user interface.



Figure 5.2 Intelligent wooden block

The repository contains cartoon-like story objects based on the categories: people, animals, buildings, vehicles, nature, and story backgrounds (e.g. a village in the woods) to provide inspiration to children to build a story. Each category consists of subcategories to give more level of detail to story objects. For example, in the vehicle category users can choose out of a car, truck, train, plain, bicycle and so on and within the subcategory 'truck' they can choose between a sand loader, American truck and bulldozer. However, the deepness of the categorical hierarchy i.e., the level of detail depends on the age of the children. On the deepest level users can modify attributes of the story objects, for example, change colors or select pre-configured behaviors such as a jumping truck or digging bulldozer. Also, self-recorder (e.g. speech or singing) or pre-configured audio files can be added to story objects or to their behaviors. By providing story objects, in particular story backgrounds, the TV system aids children in developing fictitious and fantasy-like stories. Moreover, all story objects are cartoons to make story objects childish and not too specific and to stimulate the children's fantasy. Further, the repository contains no story elements that embody violence or are sexually loaded therewith aiming for more positive experiences.

5.3.3 Interactive storytelling with Kids World

For interactive storytelling the children and parents sit together in front of the TV to collaboratively narrate a story based on the produced tale by the child(ren). For each scene the parents and/or the child(ren) tell an imaginative story by means of the content on the television and the wooden blocks, whereby they take turns to follow up on each other's narrative. Since the story objects are cartoons and story building does not allow to fill up all details, the 'open' content invites users to interpret and fill in those incomplete parts with their own fantasy and/or supplement other users during storytelling. The main system components in the storytelling are the playboard and the television as shown in [Figure 5.3](#).

The play board is a tabletop surface on which users have to place and move on the wooden blocks and, at the same time, provides a reference frame for playing. The main function of the play board is to register placement and motion of blocks. When users place the wooden blocks on the play board, the blocks are represented on the television as media objects. The placement and motion of the wooden blocks on the play board map directly on the television, thereby making the user interface intuitively in use. Moreover, the spatial distribution of the wooden blocks on the play board informs users intuitively on which position the story object is represented on the TV. For example, the red block in [Figure](#)

5.3 Error! Reference source not found. – representing the wizard – is positioned on the board at the same location as where the media object is displayed on the TV. A main advantage of the user interfaces is that users can lay the accent on different aspects in a scene by simply placing or moving blocks to other story content on the TV. Further, the play board has the form of a rectangle corresponding to length-width ratio of the TV to establish a better mapping between the play board and the TV. Moreover, the user interface provide users with motion feedback by visualizing a red light trail (that fades out in time) on the stage of the play board when users move blocks over the board. Further, the control buttons on the side of the play board enable users to go backward and forward in the story, to jump back to the home screen and inform the user whether a wireless connection is established between the play board and the TV.



Figure 5.3 Kids World: Interactive storytelling on TV

5.3.3.1 Psychological mechanisms underlying Kids World

Kids World aims to relax parents after dinner on workdays by incorporating four psychological mechanisms – based on the literature and contextmapping – that are expected to diminish the need for recovery. Note that the parents are only involved in the storytelling part of Kids World.

- **Work detachment** - Parents have to temporarily displace themselves in the children’s imagination and use their fantasy to tell a story. Escaping temporarily in a fictitious ‘world’ likely contributes to relaxation.
- **Social activity** - Kids World provides an opportunity for families to be together and spend quality time. That is, the TV application facilitates social interaction between parents and children in a way parents have to pay full attention to their children. Intensive social interaction is expected to contribute to relaxation.
- **Play** - Interactive storytelling is a type of play. A playful experience probably contributes to relaxation.
- **Watching TV** - Kids World displays the fictitious story on a television. The perception of moving objects on the TV is presumed to contribute to relaxation (Kubey & Csikszentmihalyi, 2002).

Thus, Kids World provides a playful TV experience for parents together with their children, whereby they have to displace themselves in the child’s fantasy and get actively involved to narrate an entrancing story.

5.4 Prototype of Kids World

The prototype attempts to communicate the basic functionality, appearance and system behavior of Kids World to end-users with high fidelity. The core of the prototype is focused only on interactive storytelling since this part of the system intends to provide parents with a social, relaxing TV experience. The prototype contains two main components: dedicated story content and a tangible user interface, to demonstrate the interactive storytelling product concept and objective of the application.

5.4.1 Dedicated story content

Since the focus is on interactive storytelling and not on story building, a pre-defined story was developed in Adobe Flash CS4 as shown in [Figure 5.4](#). A small inquiry about what adults like about stories and storytelling was done with several acquaintances from the researcher including one female participant from the contextmapping. Fairy tales appeared to be a very much liked story style, because of its fictional character featuring talking animals and/or folkloric characters such as a princess, having often happy endings and involving far-fetched sequences of events. However, the story has to be coherent to facilitate storytelling for parents and children and have a meaningful and pleasant story line even though events might be far-fetched.



Figure 5.4 Three scenes from the pre-defined story

The pre-defined story is a fictitious narrative in which the main characters, a Japanese girl and a stupid donkey, are on their way to Icecreamland and encounter several adventures during their journey. Examples of scenes are a blue sheep that wants candies for passing by and an Arabic village head that invites them to enter his village inhabited by animals, see [Figure 5.4](#). The story consists of 13 scenes.

5.4.2 User-system interaction

Users interact with the system through two wooden blocks (representing the two main characters) on a tabletop, television (graphical user interface), mouse (simulating the control station) and keyboard (extending the functionality of the tabletop).

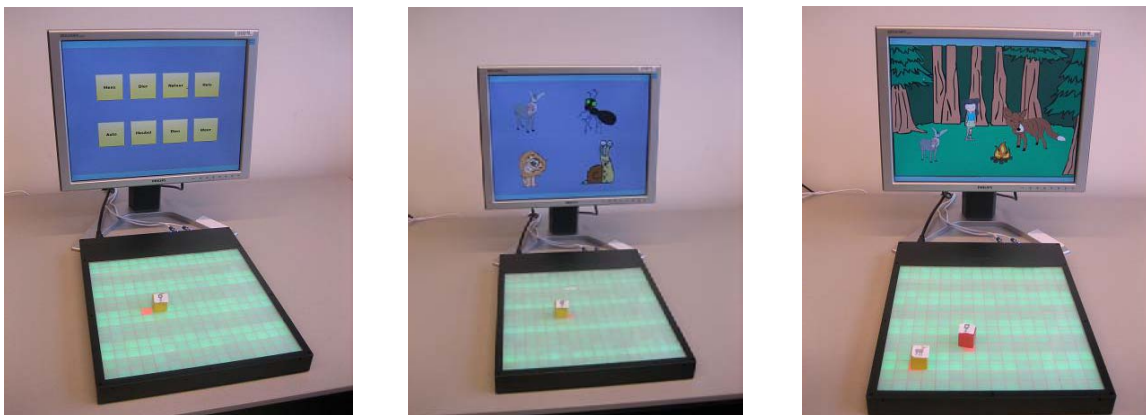


Figure 5.5 System configuration of Kids World

If users place a wooden block on the tabletop for the first time, a window with categories pops up to select and attribute a story object to a block. With the mouse users can click on a category and select a media object to connect to the block after which the window disappears and the story content is displayed on the TV again as shown in [Figure 5.5](#). This way the story building capabilities are conveyed to users for provoking their reactions on this functionality.

After a story object is coupled to a block, users can move the tangible object over the tabletop and see the story object moving on the TV correspondingly. For instance, if the red block represents the donkey and is moved to the upper left corner of the tabletop, the donkey moves correspondingly to the upper left corner of the TV. Thus, the blocks give users agency over media objects. Additionally, moving objects actuate red LEDs in the tabletop to provide users with motion feedback in the form of a light trail. By default the tabletop is green. To jump scenes users need to press the left and right arrow buttons on the keyboard to move forwards or backwards in the story. Further, *Wizard of Oz* technique was deployed to simulate additional wooden blocks (and coupled behavior) normally included in a story and to bring more interactivity and excitement in the narrative. Simulations consist of animations and audio files (e.g. a walking dog that barks) triggered by pressing the spacebar on the keyboard.

5.4.3 System architecture

The implementation of the prototype consists of three main parts: a computer, Edutainment Sensor Platform (ESP) and a TV as illustrated in [Figure 5.6](#). The computer is the central part of the prototype: running the story; depicting motion of media objects in real-time in the story; processing information coming from and going to ESP; handling user input (mouse and keyboard); and visualizing the story backgrounds on TV.

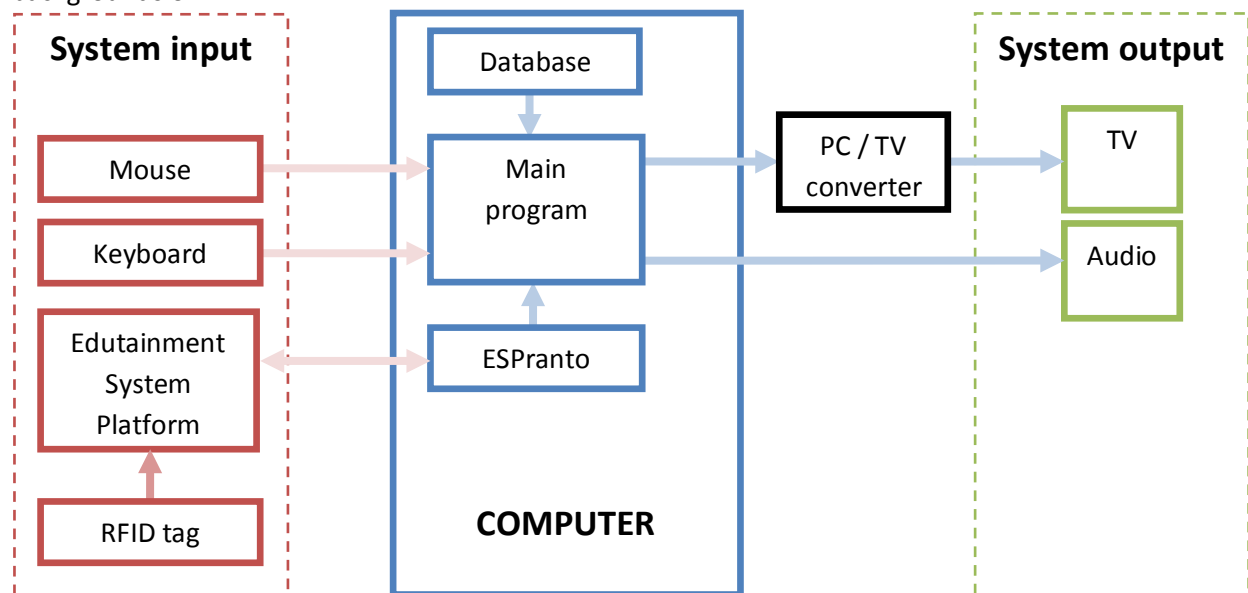


Figure 5.6 High-level overview of system architecture

ESP, developed by Philips Research, is an electronic tangible interface incorporating grid based (wireless) sensors, embedded computing, audio output, LEDs and ESPranto development language (Herk,

Verhaegh, & Fontijn, 2009). This tangible, interactive platform can register various inputs (e.g. object identification and object position) through RFID tag detection on the tabletop. If users place or move a RFID tag on the tabletop, the ESPranto software running on Linux reads the input and, consequently actuates the LED at the current position from green to red and, at the same time, communicates the object identity and object position to the main program. The main program, developed in Adobe Flash CS4, checks whether the object identity is registered yet by the system and dependently either pops-up the category window or moves the media object incrementally from the old to the new object position. Mouse and keyboard input is detected by the computer peripherals and processed as interrupts in the main program. Both the story objects selectable in the category window or new scenes (called by pressing the arrow keys) are loaded from a database. Additionally, a spacebar event activates animations and audio files if included in the scene. The computer is connected to a speaker set to playback audio files and a TV through a PC / TV converter to display the story. In the next chapter the evaluation of the prototype is discussed.

6 Evaluation of Kids World

A user study was conducted to get a first impression on the user experience in terms of accommodating relaxation, fostering social bonds and the reception of Kids World. These user insights should provide an answer to the second part of the research questions: “Will an innovative TV-related concept design contribute to the current way of multi-user relaxation?” This chapter describes the procedure of evaluation, the results and the conclusions, respectively.

6.1 Set-up of user study

This chapter describes the participants, procedure and analysis used in the user study.

6.1.1 Participants

Participants were 5 Dutch native families from across the Netherlands, see [Appendix N](#). Each family was represented by either the father or mother and their children (one or more). The children were between 3 and 7 years young (mean ≈ 4) and the parents (2 fathers and 3 mothers) were aged between 29 and 43 (mean ≈ 37) and their educational level ranged from vocational (MBO) to university. Participants indicated to be representative for the target group, except the age criterion was slightly lowered to quickly recruit participants due to time constraints. Participants were rewarded with a bag of cookies for their participation. Further, one of the participants was a Philips employee but none of them was affiliated with the researcher.

6.1.2 Procedure of user study

The user study was conducted at the families’ homes just after dinner. Upon arrival the researcher introduced himself to the families and started building up the prototype around the coffee table in the living room of the families. The installation of the prototype took approximately 15 minutes, which was a long enough period for children to lose most of their shyness. A schematic overview and picture of the installation can be found in



Figure 6.1 Schematic overview and photo of test set-up

After participants took place behind the play board and controls, the researcher described to them the steps according to which the user study was conducted (without revealing anything about the research question) and explained how to control the user interface. In addition, participants were explained that interactive storytelling was a dynamic process of turn taking between parent and child(ren), whereby the parent normally started with storytelling. Storytelling started with the researcher placing two blocks (one after another) on the play board and selecting two fixed actors – a donkey and Japanese girl – from a pop-up window. This was to simulate the function to select a random story character from a repository. Next, for each choice a sticker with the selected character was attached on top of the block to fake the LCD display. Subsequently, the researcher began to tell the first three scenes (according to a script) as start-up of the story after which the participants had to take over and finish the 8 remaining scenes (for approximately 10 minutes) by turn taking. For every new scene participants had to press the forward button on the keyboard and place the two wooden blocks back in the bottom left corner. When participants had reached a specific point in certain scenes, the researcher triggered an animation sometimes adjoined with an audio file to simulate other functionality of blocks. The entire procedure including the functionality of the prototype was piloted one time with two Philips colleagues and one minor modification was made to the prototype.

6.1.3 Data acquisition and analysis

During interactive storytelling by the participants the researcher made direct observations about how participants carried out the task and noticed their actions and reactions, which were written down after the user study. Afterwards the participants i.e., the parent filled in the Relaxation and Social Bonding Questionnaire (RSBQ), AttrakDiff and GEQ, respectively.

The RSBQ was a non-standardized questionnaire consisting of twelve 7-point Likert scale items with respect to *relaxation* (“Not thinking about work was an important factor to relax during the game”) and *social bonding* (“Telling a fictitious story was an important factor to foster the bond between me and my children during the game”), see [Appendix O](#).

The AttrakDiff contained 28 word pairs of opposite semantic adjectives rated on seven-point Likert scale to assess the overall attractiveness with respect to the constructs: *pragmatic quality* (“Technical vs. Human”), *Hedonic quality – Identity* (“Isolating – Connective”), *Hedonic quality – Stimulation* (“Unimaginative – Creative”) and attractiveness (“Pleasant – Unpleasant”) (User Interface Design & Hassenzahl, 2009). The AttrakDiff was translated from English to Dutch.

The GEQ consisted of 23 items including 5 out of 7 components of the GEO: *Competence* (“I was good at it”), *Positive affect* (“I felt content”), *Negative affect* (“I felt bored”), *Immersion* (“I felt imaginative”) and *Annoyance* (“I felt irritated”). The components *flow* and *challenge* were left out, because they were judged inappropriate for the collaborative game-like TV application. The obtained questionnaire data was analyzed using the statistical software package SPSS. Note that Kids World was not benchmarked with other products and, therefore there cannot be controlled for extraneous variance.

At the end of the user study an in depth semi-structured interview was conducted with regard to the user experience with Kids World, see [Appendix P](#). All interviews were recorded, transcribed in Dutch, reviewed at least two times and categorized per questions to reduce bias in further analysis of the interviews (Sharp, et al., 2007), see [Appendix Q](#).

6.2 Results of evaluation

This chapter presents the results of the observations, questionnaires and the semi-structured contextual interviews.

6.2.1 Observations

Television had a central position in the participants' living room and parents and children were sitting on the sofa or small chairs (for children) in front of the TV with the tabletop placed on a (coffee) table. Parents and children were enthusiastic about the concept and enjoyed playing with it. They were fully engaged in the storytelling, radiated positive body language, looked relaxed and showed no irritations. The user-system interaction happened smoothly; no difficulties were encountered, no questions posed to clarify the interaction and no bugs were experienced. Parents and children directly understood how to employ the TUI however, children moved the blocks somewhat carefully to accurately position the media objects on the TV. In addition, the coupling of the tangibles with the media objects on television and what happened on the TV was instantly clear for participants. The attention of parents and the more of children was mostly focused on the TV and less on the TUI. Furthermore, they reacted excitedly on the story content (e.g. positive intonation during storytelling and children were sometimes jumping scenes to discover what was coming next) and they were fully engaged in it, and children looked and listened concentrated to the story. Parents took the lead in telling the story and from the beginning provoked social interaction with their children by commenting on and posing open-ended questions about the story content (e.g. *Who are the animals in the village? And do they think about ice-cream?*). Children answered by responding shortly, pointing to the TV or shifting the blocks to move media objects. Parents were frequently seeking eye-contact and built in pauses during storytelling to elicit responses or allow the children to take over narrating. Though children withdrew in the beginning, they loosened up throughout the story and were more talkative, posed questions and had spontaneous and funny expressions. Storytelling happened enthusiastically (e.g. one mother was even imitating the sound of a barking dog) and parents were constantly reading their children's (facial) expressions to check whether the narrative kept their attention. Stories were rich in fantasy, and each story had a different storyline and duration. Afterwards, children requested to play again and parents and children continued talking about the story and concept. However, two children were a little bit too young (almost 4) to participate in the study. They had minimal story input and one lost attention at the end.

6.2.2 Questionnaire

This paragraph presents the collected quantitative data by means of three questionnaires.

6.2.2.1 Relaxation and social bonding questionnaire

The scores on each item of the RSBQ were calculated by averaging the participants' scores per questions and are graphically represented in [Figure 6.2](#) and [Figure 6.3](#), and the descriptive statistics can be found in [Appendix R](#).

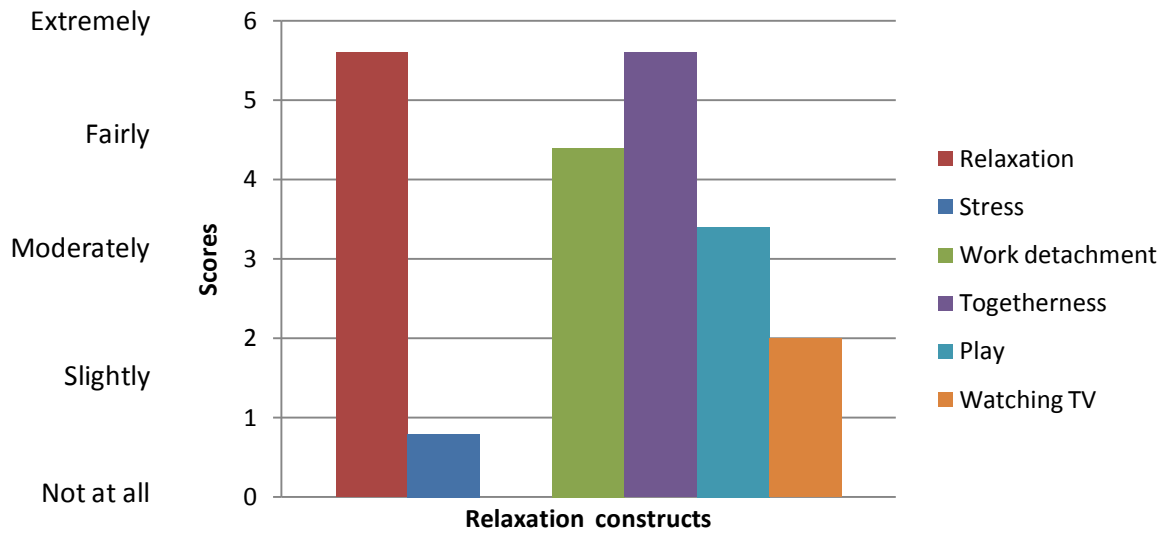


Figure 6.2 Scores on relaxation and its contributors

Participants reported to feel relaxed ($M = 5.6$, $S.D. = 0.5$) and not stressed ($M = 0.8$, $S.D. = 1.3$) during playing with work detachment ($M = 4.4$, $S.D. = 2.5$) and togetherness ($M = 5.6$, $S.D. = 0.5$) as important contributors.

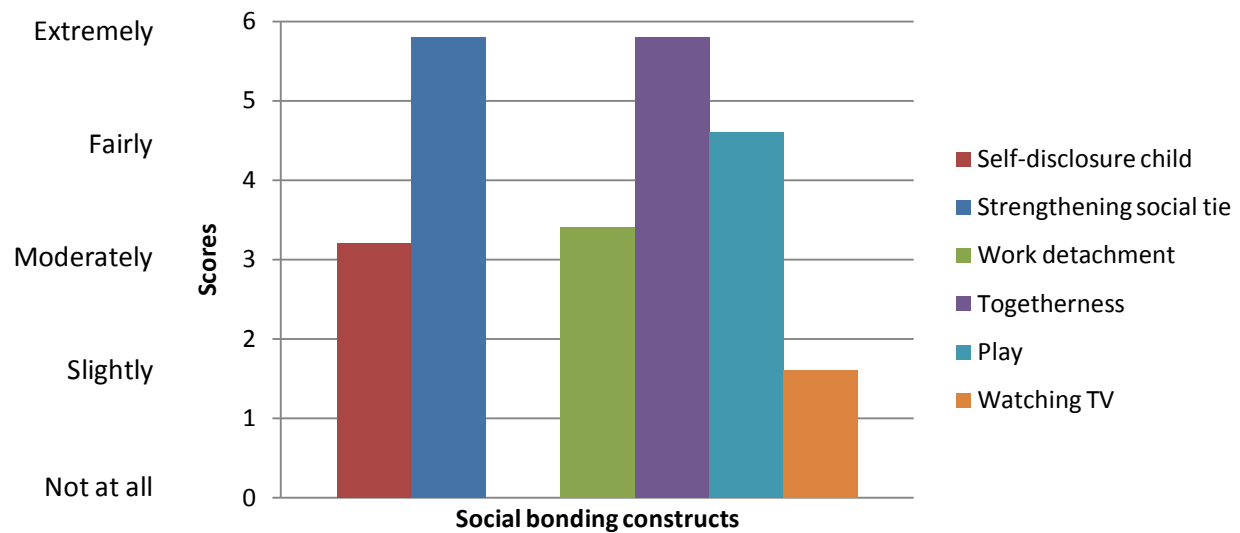


Figure 6.3 Scores on social bonding and its contributors

Participants reported to experience an increase in social tie ($M = 5.8$, $S.D. = 0.4$) and moderate levels of self-disclosure ($M = 3.2$, $S.D. = 2.5$) from their child(ren) during playing and togetherness ($M = 5.8$, $S.D. = 0.4$) and play ($M = 4.6$, $S.D. = 1.6$) were important contributors to fostering social bonds.

6.2.2.2 AttrakDiff

Scores on each construct of the AttrakDiff were calculated by averaging the respective item scores per participant, see [Figure 6.4](#) **Error! Reference source not found.** and [Appendix R](#) for the descriptive

statistics. Internal consistency of the three constructs scores was high, except pragmatic quality was moderate. Attractiveness (perceived symbolic value) ($M = 0.9$, $SS = 0.01$) and Hedonic quality – Identity (perceived capability to communicate identity to other social beings) ($M = 0.9$, $SS = 0.4$) scored above average, which is quite good for a first prototype. Hedonic quality – Stimulation ($M = 0.7$, $SS = 0.4$) scored minimally above average implying a moderate degree of novelty, stimulation and challenge. Last, pragmatic quality ($M = 0.4$, $SS = 0.5$) was average implying a moderate degree of usability of Kids World, which seems acceptable for a first prototype. Though all scores on the four constructs scored reasonably, there is room for improvement of the prototype. Scores on the individual items can be found in [Appendix R](#).

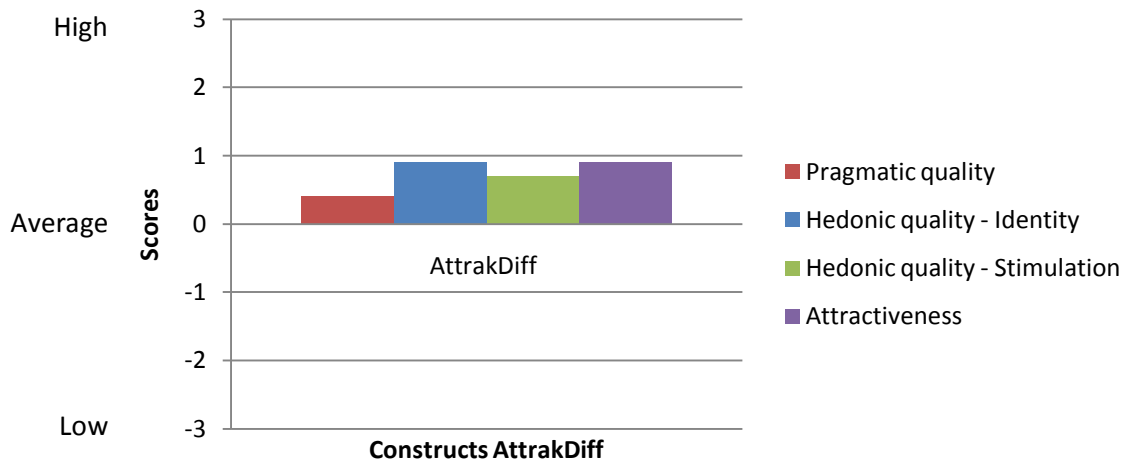


Figure 6.4 Scores on each construct of AttrakDiff

6.2.2.3 Game experience questionnaire

Scores on each construct of the GEQ were calculated by averaging the respective item scores per participant, see [Figure 6.5](#) and [Appendix R](#) for descriptive statistics.

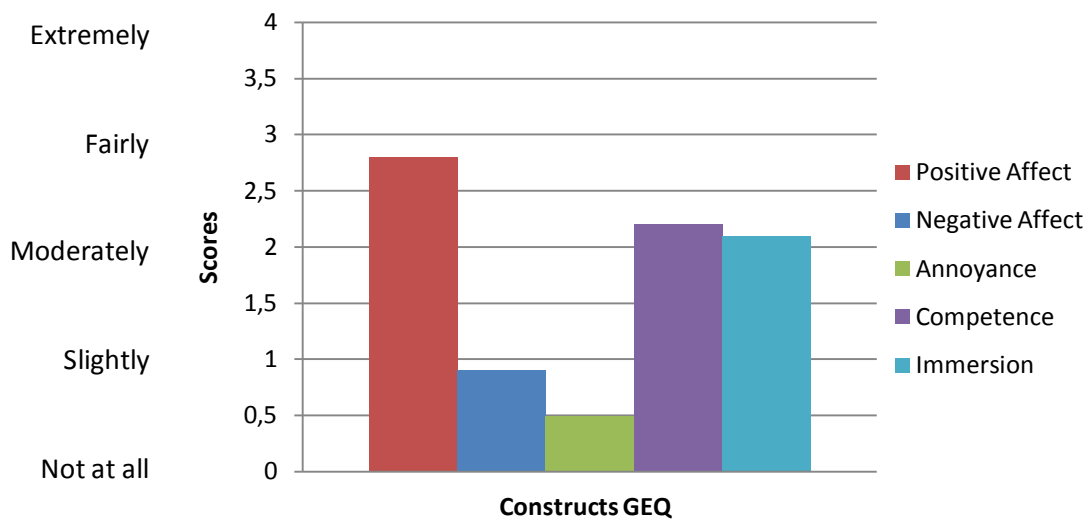


Figure 6.5 Scores on each construct of GEQ

Internal consistency of the five constructs scores was high, except annoyance was moderate. Positive affect (M = 2.8, SS = 0.1) scored fairly high indicating that it was an enjoyable experience for participants. Both negative affect (M = 0.9, SS = 0.1) and annoyance (M = 0.5, SS = 0.2) were rated low implying no noteworthy unpleasant feelings during playing. Competence (M = 2.2, SS = 0.05) and immersion (M = 2.1, SS = 0.1) scored moderately indicating that using Kids World was not easy for participants and they were also not completely absorbed in Kids World.

6.2.3 Semi-structured Interview

This section describes the various categories explored in the semi-structured interview and provides additional insight on the quantitative data.

6.2.3.1 Relaxation

Results from the RSBQ showed that participants felt relaxed during playing with Kids World. However, only one participant reported to be more relaxed after playing, whereas the other four reported to feel no significant effect on relaxation.

“Yes, because I had really the feeling that I was once making a story with him and that it was somewhat guided. Because sometimes he asks from mama do you want to tell a story, but then you do not have a clue about what you can make up a nice story. Here it is very nice to discover things”
Female, 29 (D³)

“Neutral. I did not feel more or less relaxed” Male, 43 (E)

Surprisingly, four participants thought to have a relaxing moment with Kids World in the evening of workdays despite they reported not to feel more relaxed.

“I know for sure, because you can empty your thoughts” Female, 36 (C)

“This can be a moment of rest, but that could also be with other things (games)” Female, 35 (A)

According to four participants, taking distance from worries and concerns and being together were two important factors that contributed to relaxation during playing.

“I can imagine that you...you are forced to take distance from the things you were doing [...] It is a way to quickly forget your daily worries” Male, 40 (B)

“I was actually doing something together and completely absorbed in the story and not thinking about anything else” Female, 29 (D)

Two participants reported to experience Kids World more as a device to be really together with their children in a fun way rather than an instrument for relaxation, though they expressed that the result of playing was relaxing.

³ The letter indicates the participant about who can be found more in [Appendix N](#)

“Not so much a moment of relaxation, but a moment with your children. That you really brings together. I can imagine, especially in our busy lives, whereby the children doing other things at day time or day care. We experience so much separately. And if you do this, that in this way you come to know something about their experience world and what they do. Because when I directly ask them what they have done today, not much comes out” Male, 40 (B)

Based on these findings it seems that Kids World has the potential for (multi-user) relaxation with work detachment and togetherness as important contributors, however the degree of relaxation through interactive storytelling seems somewhat debatable with these contradicting expressions.

6.2.3.2 Fostering Social Bonds

Storytelling was a dynamic process between parent and children, whereby the input of the children depended on their age and the situation.

“You have to give your child room to say something. Just collaborative play. If they take more time to tell something they do and are more involved. And if they do not take the lead, you take over” Male, 43 (E)

Four participants thought that playing Kids World would result in increased social interaction in the family and one was not sure.

“Yes, that’s what I try anyhow...now you can refer back on it. X has very much fantasy and will refer back to the story, that’s where you can talk about then. Yes, that’s really fun. Then you have social connection so to say. And then you say do you still remember from yesterday we did this and that. I think you have advantage from that” Female, 29 (D)

According to all participants, Kids World is a device that provides an opportunity to bring the family together for the following reasons:

“...about strengthening the bond, that you think by your own child wow how do come up with that. That’s how children are” Female, 35 (A)

“You build together a story and get a very special look into the experience world of your child. It is as if you via a door, that wasn’t there before, get a view on your child” Male, 40 (B)

“This is actually back to the basics. Just for what are we doing it all and the quality with your child” Male, 43 (E)

These quotes illustrate that Kids World has the capability to trigger funny expressions in the child that can dazzle parents, let parent and child(ren) communicate in a non-standardized, enriching way and makes (busy) parents aware to spend time with their children in a high qualitative way.

6.2.3.3 User experience with concept

All participants were very enthusiastic about the concept.

“I absolutely belief in the fundamentals self being creative and filling in the story together with your child is good. [...] That is an enormous awareness when you are with your children...to ensure you are there for them” Male, 43 (E)

“It is very intriguing. [...] The whole core principle...you have captured something” Male, 40 (B)

Participants reported the following aspects in Kids World as positive:

- Fun to do
- Collaborative telling your own story with your child(ren)
- Creative – filling in the story whereby the pre-defined story provides an easy start
- Actively being involved in producing a fictitious story and not just passively consuming information
- Educative – stimulates fantasy of child
- Draws attention of the child and awareness of parents
- Simplistic and childish cartoon appearance of story objects and settings

One negative aspect of the concept was that three participants experienced storytelling as a reasonably difficult activity requiring full attention and mental effort. Further, one participant remarked that Kids World requires a lot of interactivity for which she might not be always in the mood. Another participant mentioned to put a time limit on TV usage to restrain children from watching too long. Nonetheless, the positive aspects of Kids World outweigh the negative aspects both in number and value.

6.2.3.4 User acceptance

The positive feedback about Kids World was also reflected in the participants’ desire to own Kids World. All participants reported to want to have Kids World for playing with their children. Moreover, four participants confirmed that they would purchase Kids World and one participant was not sure.

“If you could make a story yourself that would be superb. Than I would buy it directly” Female, 29 (D)

Thus, Kids World scores fairly high on user acceptance.

6.2.3.5 User Interface

In general, all participants were positive about the user interface and experienced it as easy to use and clear.

“I like the combination of actively engaging with physical blocks and TV” Male, 43 (E)

“It was very clear and very easy. Not challenging, rather a bit boring, but very easy” Female, 35 (A)

More specifically, all participants had positive responses about the usage of blocks.

“Very funny. By means of the blocks you walk through the story and constantly change that story” Female, 36 (C)

“Those blocks have certain functionality, because for each scene you can by what is visible on the TV, you can bring attention to that by moving the characters towards there” Male, 40 (B)

However, four of the participants suggested real tangible puppets as an alternative for the blocks and three participants would have liked more blocks to tell the story as illustrated by the following quote:

“Very fun, but I had not really options, but I think that when there are more blocks on that thing that it gets much more fun, because you can move them crosswise. [...] Because than you act more interactively on the thing (the play board) instead of watching the story on TV and see it as a kind of mouse that walks forward. For the same matter you could have a mouse that you click along, but that is less fun, because with those stickers on top (of the blocks) it is more fun. And maybe that those could get figures...like real animals...that you have a real character. That you do not have those square stickers on it, but that you saw them like a figure. That you have that girl...like a chess piece...for example the horse...that you have the form” Female, 29 (D)

Though all participants were satisfied with the play board, they perceived the play board more as a means to tell the story with.

“The play board is further little inviting. It is a functional board. I would make it more exciting” Male, 43 (E)

Further, the lights were experienced somewhat controversial; two participants experienced them as attractive, whereas two participants thought that the green lights were superfluous.

All participants responded positive to the usage of TV and did not see any drawbacks of using TV as display medium for the story.

“I wouldn’t do this on a desktop. Particularly on TV, because that is just the place children watch DVDs and that gives other feelings. I would also not connect it to a separate display. TV is recognizable, makes them feel comfortable and is more exciting” Male, 43 (E)

“It utilizes the TV...the TV stands at a family place in the living room and makes use of TV in a family friendly way. I think that’s logically” Male, 40 (B)

The perceived value of TV in a storytelling context was high, whereby only one somewhat negative association was made with television. One participant noted that she would put a time limit for her children to engage in storytelling to constrain TV usage. In addition, none of the participants reported any switching cost between paying attention to the play board and gazing to the TV.

Participants liked the childish and simplistic cartoon graphics of Kids World and experienced no difficulty with the semantic order of the scenes implying good story coherence. Though the story about a girl and donkey that travel to Icrecreamland was reported as fun, two participants experienced the story content as too simplistic without enough excitement and insufficient environmental diversity.

“I had to think more about how to make up the story, because I saw so little different things on the screen. It looked all similar” Female, 35 (A)

Further, two participants wanted to have the possibility to choose their own story characters. Overall, the mixed reality user interface was experienced as easy to use and intuitive with no problems except the simple and somewhat boring story content.

6.2.3.6 Usability and Functionality

Participants reported or experienced no serious start-up problems or breakdowns during playing Kids World, however the following usability problems with the prototype were reported.

“I thought the whole time why do I have to go back to the bottom left corner. Every time these characters had to be brought back for every scene. You have to walk the way down and you had drawn it 3D from bottom left to the top right corner. For the rest was everything clear” Male, 40 (B)

“You do not know how long to make the story and I experienced that the longer I made the story the more the attention of the child decreased. If I would have to do it a second time, I would make it a lot shorter” Female, 36 (C)

Beginning every scene at the bottom left corner and having no indication how long to talk about a scene were disadvantageous for the user experience. In contrast, animations and audio files had a positive affect on the user experience.

“I liked that the dog was barking and in the beginning was there something else...a fox came on the screen (animation), but for the rest I had to do a lot without being able to start talking about things that happened in the story. I can do that, but I noticed about her...that when the dog began barking, she directly got involved and looked to it” Female, 35 (A)

Although participants liked the animations and audio files, they wanted to have more of this functionality to facilitate storytelling and to increase excitement. This notion was also reflected in the high expectations (in terms of technology) three participants had about Kids World.

“It implies a bit more depth or somewhat more innovation. More out-of-the-box. It was a relative simple game, so it implied something more. I think that was a drawback. [...] at certain moment the captivating factor decreased somewhat” Male, 43 (E)

Participants had several suggestions for improvements and extension of the functionality:

- 1) Automatically jump to the next scene when you are almost at the end of the scene instead of pressing a button
- 2) A scene indicator (e.g. page numbers) to control the length of the story

These two ideas help to overcome the above mentioned usability problems. Moreover, all participants wanted to have more freedom in the story and control over storyline.

“...the lion did not say anything and I thought come down, but stayed in the tree. I said come with me. That you can press something and that the lion comes with you or that he says something” Female, 36 (C)

“...and in certain way that you have more control over the storyline and length of the story. That I can say at certain moment Icecreamland is not to the left here, but first I go over the hills and wonder what there for an enormous animal flies. That you can add more things to the story” Male, 40 (B)

Further, four participants wanted to have more unexpected, unpredicted, crazy and surprising occurrences and events.

“More unexpected things built in. Things that really stimulate the fantasy of the child. Thus, that you really have to think about what to do with it. Then you get the most fun interactions with each other” Female, 35 (A)

These improvements would make storytelling much easier and result in more engagement, challenge and excitement according to the participants. More specifically, participants had the following propositions for the user-system interaction:

- Play with multiple players each having their own block
- Own selection of media objects and settings out of the repository
- Story content related to topics for educational purpose
- Exchange of story objects among stories
- Attach story objects in the background to a wooden block to take along to the next scene
- Surprise button or surprise block for surprising events or jump to completely different scene
- Advanced control of story objects instead of the static main story characters
 - ❖ Interaction between wooden blocks resulting in an event in the story
 - ❖ Gesture recognition of blocks (e.g. jumping or spinning of story objects)
 - ❖ Response to audio input from users

These propositions show a lot of overlap with the story building part of Kids World and not surprisingly all participants were in favor of such functionality.

“That’s awesome...if they could make that for you and that they can tell that to you. That you can ask specific questions to get their story...that would be an enormous stimulation for their creativity and I would be super proud on him if he could make such a story. Then I don’t have to make my own story so much. I prefer that I see what they build and what for story comes out of that [...] And then I wouldn’t mind if they are longer engaged with it, because I just said that I don’t want them to watch too long to the TV. But that is than just play...a play form...and then is it creative play” Female, 29 (E)

According to this participant, story building is also a means to discover more about your children and parents have the opportunity to learn to know more about the experience world of the children by asking specific questions about the story the children have built. This notion is also in line with a proposed record function to continue and play back the story another time. Besides that all participants are in favor of such a record function to continue playing the next time and to have a record for later, two participants perceived the record function as a tool to register the development of their children.

“Where it is nice for is to see the progress of your child. How she partakes with storytelling in the beginning and how she does it all on her own at the end. A history to follow the development of your child” Female, 36 (C)

In general, Kids World was easy to learn and easy to use with two minor encountered usability problems. However, participants had various (interesting) suggestions to improve the user experience with the prototype that strongly match with the initial design of Kids World.

6.2.3.7 Where, when and with whom to use Kids World

All participants reported to wanting to use Kids World in front of the TV in the living room.

“In the living room, because it a central place is in the home” Male, 40 (B)

Three moments were identified to play with Kids World: after school by three participants and after dinner on workdays by all participants and on weekends by three participants.

Furthermore, participants had the following players in mind to play Kids World with: the whole household, their partner, siblings of the children, grandmother, grandfather and school friends of the children. Based on these findings Kids World seems to fit in with the routines and habits of the participants.

6.2.3.8 Perceived comparable products and activities

Participants had difficulty to mention comparable products/applications or similar activities alike Kids World.

“I am thinking. No, the interactivity I know a bit from the Wii, but...there it is all given, there you do not have to make your own story line or whatever. [...] In that sense is it unique” Female, 35 (A)

Three participants compared Kids World with the Nintendo Wii, but only with respect to the interactivity. Two other participants described Kids World as similar to VTech Baby toys (Smartridge Teletubbies and V-Smile TV learning system) in which children have to engage (alone) in educational tasks on the TV. Notable, no relations or negative associations were made between Kids World and digital games. Note that three participants had almost an aversion against digital games.

“Well...I am glad that for a change there’s another concept than the Wii to be honest” Male, 40 (B)

Another participant perceived Kids World as almost exactly like Dora the Explorer (an animated children play along computer-style TV adventure), but Kids World was experienced as much more enriching and interactive. Further, no comparisons were made between Kids World and TV programs or movies even though one family was watching Shrek before the user test. Another participant made a similarity between Kids World and ACTIVboard on which children digitally make their own drawing with a stylus and story library. Most interesting, four participants made a spontaneous link between Kids World and reading a book to their children.

“We also read...if we have little time or are exhausted, than you read a book differently than the text. Then you are going to make your own story of it. That’s where I draw the parallel” Male, 43 (E)

“With a picture book is everything filled in and here (in Kids World) you can fill in the picture yourself. It is a live interactive picture book” Female, 29 (D)

Participants could list relatively little products comparable to Kids World that seems to have more alike with traditional and tangible products than digital games or TV.

6.3 Conclusions from prototype evaluation

Tentative findings suggest that Kids World facilitates multi-user relaxation after dinner on workdays with work detachment and togetherness as important contributors. In addition, Kids World seems to foster social bonds between family members with storytelling and togetherness as main contributors. More specifically, Kids World provided families with an opportunity to socially interact in a very rich and high qualitative way.

Participants had a positive user experience with Kids World perceiving it as a unique, enriching and creative social play concept that was very fun to play with. The constructs on the AttrakDiff and GEQ also support this finding. The only negative aspect was that telling a story required relatively a lot of cognitive effort for some participants. The positive user experience was also reflected in the high user acceptance. However, participants had several suggestions for improvement of the usability and expansion of the concept that would make storytelling easier and more exciting. Most of these proposed extensions are in line with the initial design of Kids World.

The mixed-reality user interface and user-system interaction were easy to learn and easy to use with two minor problems. However, the story content was experienced as too simple and not exciting enough and the story needs to encompass more surprising occurrences to overcome this.

Kids World was mostly linked to reading books, the Nintendo Wii with respect to the interactivity, but not related to watching TV. Apparently, participants connected Kids World to a traditional way of spending leisure time, which might explain why no negative associations with television and/or digital games were made.

7 Final conclusion & discussion

The final chapter presents the main conclusions of this explorative research study. Subsequently, answers to both research questions are provided in the discussion. Finally, this chapter concludes with the theoretical implications, limitations and directions for future work.

7.1 Final conclusion

This graduation project contributed to a better understanding of the nature of multi-user relaxation at home on evenings of workdays and used this knowledge to develop one design for relaxation in a social, domestic context. The nature of relaxation at home appeared to be mainly familial and social play was 'discovered' as new way for multi-user relaxation.

By applying several user-centred design methods a TV-related product was successfully implemented to demonstrate social play as facilitator of multi-user relaxation. The social play concept empowered busy adults and young children to be both an author and spectator of an interactive story therewith providing an intense, unique and fun social TV experience. The evaluation of Kids World showed the positive effects of good parent-child interaction on relaxation and relationships. Kids World turned television into a 'lean-forward' experience abating the negative effects associated with television and providing busy adults with opportunities to pay more attention to their children and to spend more time together as family.

By designing a social game-like TV application with which parents can discover the nature of their children and that promotes social interaction, the needs of busy adults with young children are fulfilled successfully. This graduation project initiated *social play* as new ideology for multi-user relaxation in the ExperienceTV project that was originally aiming to connect traditional ways of relaxation with television.

7.2 Discussion

The discussion consists of three parts; the first two parts answer each one research questions by answering the related sub-questions and the last part reflects on the deployed user-centred design methods.

7.2.1 Nature of multi-user relaxation

The first part of the discussion provides an answer to the first research question: "*What is the nature of relaxation in a multi-user, domestic context of busy adults with young children during evenings of workdays?*" A contextmapping was conducted in which participants had to fill in a diary and were interviewed at home to gain knowledge about the nature of multi-user relaxation. Current results suggest that relaxation on evenings of workdays means having temporarily no obligations and nothing on your mind for the target group. Participants routinely and frequently engage in a set of typical activities: watching television; drinking and eating; playing (with children); being physically active; listening to music; using the desktop; and; reading, for relaxation on evenings of workdays. These relaxation activities match with those found in other studies (Beute, 2009; Facey, 2008; Vries, 2008).

Moreover, the target group shows a typical pattern of relaxation activities to decrease the need for recovery on evenings of workdays. That is, they have two fixed evening periods in which they engage in low perceived effort activities indicated by them as relaxing. The early evening period has a social nature in which busy adults typically have dinner with the whole family, play with their child(ren) and bring the

child(ren) to bed. This period is characterized by being together with beloved ones and being temporarily distracted from daily hassles, which are important contributors for relaxation (Sonnentag, et al., 2008). However, Beech *et al.* (2004) found that working parents experienced bringing the children to bed as stressful. This might as well be true for the target group, but parents of dual-income families find it hard to spend time with their children (Lee, et al., 2008) and actually spending time with them might take away the guilty feeling of bad parenting. However, it might have been that participants gave social desirable answers in the contextmapping. In the other period, at the end of the evening, participants round off the day by crashing on the couch and engaging in low effort activities – often watching television – before going to bed. Likewise, Beech *et al.* (2004) found that most working parents reported to end the day in front of the TV as a low effort way to relax before going to bed. This typical pattern of activities seems to map with the pre-stressor homeostatic regulation discussed earlier. More specifically, the target group seems to engage in pleasant, relaxing activities to return to their pre-stressor level in order to relief from stress and negative symptoms and to anticipate upcoming work demands.

Although the homeostatic regulation seems to reflect the recovery potential of ordinary activities, these activities are not specifically tailored to relaxation. Despite the fact that these ordinary activities are not instantly recognized (except practicing sports) as relaxing in the literature, the target group seems not to suffer from stress symptoms or lack of relaxation even though they acknowledge having few moments for relaxation on evenings of workdays. This might imply that the recovery potential of ordinary relaxation activities is sufficient for the target group to replenish their internal resources. However, Beech *et al.* (2004) found that working parents with young children were exposed to high amounts of stress and had little free time for relaxation on workdays. It may have been that participants in this study were in fact stressed, but did not acknowledge that since stress can be associated with weakness and, therefore is a social undesirable answer. An alternative explanation might be that the target group classifies sideline activities and/or work at home as the so called mastery experiences. Mastery experiences are challenging off-job experiences (e.g. volunteer work) that require some degree of effort therewith providing opportunities for self-efficacy, competence and proficiency (Sonnentag, et al., 2008). Sonnentag *et al.* (2008) found that mastery experiences contribute, but not significantly, to the recovery process by improving positive affect and well-being and achieving morning serenity. A more plausible explanation for the recovery potential of ordinary activities is that these (like biofeedback relaxation techniques) encompass a physiological component and a psychological component for relaxation (Bucks & Boucsein, 2000; Schwartz & Andrasik, 2003). For the physiological component to contribute to relaxation an activity (e.g. social support) has to bring the body into a rest state to quiescent bodily processes. The psychological component of a relaxation activity needs to divert attention away from stressing thoughts to temporarily reduce anxiety. If so, any activity that restores the body's equilibrium and/or cognitively diverts may be capable to relax individuals, but activities that naturally and more effectively encompass both components are likely to be more powerful relaxation activities. As mentioned before, technology used during relaxation activities plays an important role in facilitating this process and, therefore is discussed in more detail.

7.2.1.1 Technology as a means to facilitate multi-user relaxation

The target group controls for the desire of relaxing, familial events by selecting relaxation activities that promote social contact among family members. The need for multi-user relaxation is frequently fulfilled

by means of domestic technology that brings the family together and yields pleasure. Two multi-user relaxation activities enabled through technology were identified: *watching TV* and *playing with child(ren) on TV*. Likewise, other studies found that television was used for watching as well as gaming together (Bernhaupt, et al., 2008; Facey, 2008). It appeared that the target group often used television as a means to bring family members together for entertainment or to socialize with the family. This implies that the living room becomes an entertainment or communication center where the technology is the core (Crabtree & Rodden, 2004; Venkatesh, et al., 2003). However, a discrepancy was found between the designers' intention with the television i.e., to provide entertainment and the actual usage of TV as social binder and relaxation device. Norman (2006) identifies this as socio-pleasure where pleasurable social interaction is enabled through products or as byproducts of usage. Products that play an important social role combine both aspects of behavioral design (i.e., pleasure and effectiveness of use) and reflective design (i.e., self-image, personal satisfaction and memories). This implies that television for relaxation used in domestic environments not only matters in terms of utility, but also in its capability to enable people to socialize. The degree to which sociality matters for *watching TV* and *playing with child(ren)* might be different and, therefore these multi-user relaxation activities are discussed separately.

7.2.1.2 *Watching TV*

This study found that watching TV in combination with sitting on the couch was a favorable activity for relaxation on evenings of workdays. This finding is consistent with other studies on relaxation with TV (Bernhaupt, et al., 2008; Horstra, 2009). In addition, current results suggest that watching television facilitated participants to prepare them for bedtime by lowering arousal, distracting, relaxing and making them sleepy. Likewise, other studies found that viewers turn on TV for relaxation and distraction, because they were tired from work (Taylor & Harper, 2003), want to stop worrying about threats (Mills, Reiss, & Dombeck, 2009) and desire to temporarily escape from reality (Bryant, et al., 2003). However, the target group associated watching TV with positive features (e.g. relaxation and entertainment) as well with negative feelings such as boredom, passivity and aimlessly spending time. Consistently, Kubey & Csikszentmihalyi (2002) found that viewers felt relaxed while watching TV, but as soon as the TV was switched off the sense of relaxation ended and was replaced by feelings of uneasiness or guilt due to prolonged periods of unproductivity. Related to the negative effects of TV is the target group's need to enhance the television experience by being more active and interactive with television. Bryant *et al.* (2003) found that TV viewers with high cognitive abilities prefer more interactive television. In addition, the target group desires freedom of choice over the TV content, however content on demand systems are associated with individualization of TV watching (Svensson & Sokoler, 2008).

Another motivation for the target group to watch TV is to be together with their partner. Bernhaupt *et al.* (2008) found that viewers engaged in socializing, discussing and sharing information with other family members while watching TV. Though the target group perceived TV as a medium that brings them together with their partner, watching TV together occurred not often on workdays. It appeared that television content plays a significant role in whether partners watch television together or not. More specifically, partners tended only to structurally watch comedy together. Nonetheless, the target group expressed a desire to watch TV together, but they reported to talk little with each other while watching television. This might imply that watching TV is more a moment of being together than an

instant of direct social interaction or that television distraction hinders direct social interaction. Kubey *et al.* (1990) found that viewing together is a positive familial experience, but leads to significantly less direct social interaction compared to other family activities. In line with these results is the target group's need to enhance the socialization around television, so family members can devote more attention to each other (Facey, 2008; Lee, et al., 2008). Thus, watching television is an inactive experience in which viewers use an entertainment device as a means for multi-user relaxation, but the television (content) seems to have an unfavorable effect on the socialization of partners. The target group wants to profit more from TV-related technologies that promote direct social interaction and enable them to engage in more active and challenging activities together.

7.2.1.3 Playing with children

Playing with children was identified as a frequent, enjoyable activity for relaxation on evenings of workdays, whereby mostly one of the parents plays with the child(ren) after dinner for about 20 minutes. Busy adults play various games ranging from traditional board games to highly advanced digital games in social context. Irrespective of the type of play, playing is a common activity in many households including dual-income families (Beech, et al., 2004; Bernhaupt, et al., 2008). Poels, de Kort & IJsselsteijn (2007) found that relaxation, fun and amusement are prominent aspects of the (digital) game experience. Moreover, Brown (2009) argues that play is not just joyful, refreshing and energizing, but on a deeper level involved with human development and intelligence. According to Brown, poor well-being including stress related diseases can be linked to the prolonged deprivation of play. Also, Huizinga (1955) describes play as a relaxing and pleasant activity that can captivate players completely and relief them from daily worries. However, in this study it was found that the primary goal for parents to play was to be together in a high qualitative way with their child(ren). Intensive social interaction and in-game behavior shows the target group the nature of their child(ren). Hence, social play classifies for quality time since it is a temporary, shared experience that intensely connects family members and simultaneously invigorates them (Marchena, 2004). However, to date only a few studies acknowledge the importance of social context in digital play (Gajadhar, et al., 2008; Kort & IJsselsteijn, 2008; Lally, 2002; Venkatesh & Mukherjee, 2006; Voids & Greenberg, 2009). Nevertheless, social play related to television can fulfill the target group's needs to relax them, disclose the personality of their child(ren) and serve as a meeting place for the sake of social interaction (Voids & Greenberg, 2009). In addition, social play can stimulate intensive action and interaction with television therewith enhancing the TV experience.

This section discussed the nature of multi-user relaxation at home encompassing domestic spaces, social actors, rituals, motivations and positive as well as negative aspects of current relaxation activities related to television. The target group implicitly expressed four needs to enhance the multi-user relaxation experience with television. This information was harvested in building a successful TV-related product concept that seems to fulfill the target group's needs.

7.2.2 Kids World as contributor of multi-user relaxation

The second part of the discussion provides an answer to the second research questions: *"Will an innovative TV-related product design contribute to the current way of multi-user relaxation?"* The designed product concept, called Kids World, is social game-like TV application incorporating aspects of

traditional toys as well as elements of digital games to (collaboratively) generate narratives and fulfill the needs of the target group. Kids World was evaluated in a contextual user study to verify whether it has the capability to bring families together in front of the TV for relaxation purpose and fostering social bonds.

Tentative results suggest that Kids World facilitates relaxation of the target group. Participants felt relaxed during playing and stated that Kids World could provide an opportunity for relaxation on evenings of workdays. However, participants reported to feel no effect of playing with Kids World on their state of relaxation afterwards. This might have been caused by the experimental setup i.e., the presence of the researcher or the immature prototype. Another plausible explanation for this paradox might be that participants have a too narrow understanding of relaxation conceiving it as low-effort activity such as lying on the beach, whereas the concept of relaxation is much broader encompassing numerous activities that help individuals recover. The core mechanism of a relaxation product should support the “process during which individuals functional systems that have been called upon during a stressful experience return to their pre-stressor level” (Sonnetag & Fritz, 2007, p. 205). Two important predictors supporting this process are: work detachment and togetherness and these seem to contribute to relaxation with Kids World. Likewise, Sonnetag *et al.* (2008; 2006) found that social activity and work detachment are predictors of relaxation. Work detachment might contribute by that play is situated in its own space and time disconnecting individuals from reality (Huizinga, 1955). In addition, video games offer escape and distraction, facilitating players to feel better (Kubey & Csikszentmihalyi, 2002).

This study suggests further that Kids World seems to foster social bonds between parents and children with togetherness and play as important contributors. Kids World helped users in creating a social experience that was the results of a seamless blend of an enjoyable and rich social interaction and a compelling user experience. Battarbee (2003) argues that social experiences are “driven by social needs of communication and maintaining relationships as well as creativity in collaboration” (p. 112). Likewise, Venkatesh & Mukherjee (2006) state that digital games are mediators of playful interactions and fostering social bonds among parents and children. Social play concepts such as Kids World that enable pleasant, shared experiences between parents and children with positive, frequent and high quality interaction are likely to lead to increased belongingness and secure parental attachments (Baumeister & Leary, 1995; Kenrick, et al., 2007).

Interactive storytelling on television seems to fulfill the target group’s needs by providing an opportunity: 1) for multi-user relaxation by disclosing the nature of their children, 2) to accommodate intimate, close relationships with frequent positive interaction that are likely to foster social bonds and 3) to become more active and interactive in front of the television. However, Kids World is just one example of social play to fulfill the target groups’ needs, but its characteristics might be more apt to attain multi-user relaxation.

7.2.2.1 Effect of game characteristics on multi-user relaxation

Every game that promotes a social experience can have a positive effect on relaxation and social bonding whereby the degree of this effect depends on the game type, game properties and interaction style. A game type should not only provide an incentive to gather with family members but also promote direct social interaction. Additionally, a game type that is non-competitive (i.e. players share a

common goal) and non-violent is likely to contribute to the game experience of families (Volda & Greenberg, 2009). Kids World might differentiate on these aspects from other types of games because at the core it is intrinsically social, user friendly and ended on user-generated narratives. In addition, artifacts that help users to collaboratively compose and intensively tell a fictitious story by sharing mediated content are an important instrument for facilitating social play (Fono & Counts, 2006). More specifically, interactive storytelling allows users to be both spectators and authors at the same time, creating a unique social experience. In contrast, the social affordances of other play types such as building a LEGO castle together or playing a competitive tennis game on the Nintendo Wii are lower, because these artifacts have lower intensity levels of direct social interaction. In addition, digital games for TV provide players with prefabricated experiences rather than opportunities for self-expression.

Media richness and game interface characteristics are properties that powerfully impact the social experience (Kort & IJsselsteijn, 2008). The relative high media richness of Kids World (e.g. animations and audio) facilitated to some extent self-disclosure by children, which was experienced as socially rewarding by parents. Experiences or feelings that children associated and shared with a story object might have created a more meaningful experience for parents. The principle of role playing is also applied in play therapy to understand children with problems (British Association of Play Therapy, 2009). In this respect, storytelling might help children in expressing their experiences and feelings through metaphorical story characters. However, children could associate experiences and share information with many rich story characters such as Nintendo's Donkey Kong or soft animals, but these play concepts tend not provoke children to verbally express themselves in presence of their parents. In any case, self-disclosure is an important aspect to build-up intimate relationships (Kenrick, et al., 2007), is linked to social connectedness and positively impacts the game experience.

Tangible user interfaces positively impact the game experience (Lindley, et al., 2008) and make play more social and accessible for groups (Volda & Greenberg, 2009). However, interactive storytelling is not constrained to a specific TUI such as polymorphic tangibles connected to a television but the characteristics of the TUI affect the user experience. The target group suggested to deploy traditional, digital toys (e.g. soft animals) having the physical form and features of media objects to tell the story instead of interacting with wooden blocks with integrated displays. Physical artifacts are directly associated with its functionality and so facilitate the interaction (Merrill, et al., 2007). However, specific purpose objects constrain users to a particular style of interaction in a specific environment therewith limiting creative freedom and self-expression.

Distributed TUIs were deployed to approximate interaction with traditional toys but, at the same time, stimulate creativity, fantasy and self-expression and enrich the (social) experience. Siftables, one example of distributed TUIs, are a collection of tangible objects with integrated displays, sensing and embedded wireless communication that form a single user interface (Merrill, et al., 2007). This user interface allows for interactive storytelling too when each tangible object of the collection represents one story character. This spatial interaction style allows users to collaboratively narrate a story too, have more tangible characters in the story (not limited to the tabletop surface), frees them using a tabletop and delimits them from particular spaces equipped with television. However, from a technical standpoint the technology in the Tagtile tabletop does not function with batteries, whereas Siftables do and need to be recharged relatively frequent. In addition, distributed TUIs that do not use external, shared displays uncouple media objects from contexts resulting in less meaningful and immersive

experiences (Vaida & Greenberg, 2009). Moreover, the main objective against using distributed TUIs without external display is that it becomes extremely difficult for children to creatively build their own story with a set of building blocks and proudly narrate their own production with their parents.

7.2.3 Methods deployed in user-centred design

In this project several user-centred design methods were deployed to design for a user-oriented product. The information and user insights yielded from the contextmapping were translated into one design that appeared to fit well within the current habits of multi-user relaxation at home. More specifically, the contextmapping provided rich information about contexts, but yielded only a few concrete suggestions for future products. This finding might indicate that participants are no good designers as suggested by Buxton (2007). Further, the implementation of a hi-fi prototype proved to be successful in that participants had an interactive and rich user experience during the user test even though some of them had too high expectations. In other words, the implementation of these qualitative methods proved to be successful for this design process and might be suitable for other studies.

7.3 Theoretical implications

This research suggests that social play in particular interactive storytelling is an important predictor for relaxation and fostering social bonds between parents and children. This in turn might result in a better understanding of the child and improved health, well-being and work performance of the parents. However, more research is necessary to measure the impact of interactive storytelling on these aspects.

This graduation project focused on busy adults disregarding effects on children, but they are also likely to benefit from storytelling in terms of relaxation and general development (Garzotto, Paolini, & Sabiescu, 2010). Interactive storytelling is likely to relax children too, because of the intensive social interaction with parents and certain story situations might prepare them for stressful events. In turn, intensive social interaction can lead to stronger bonds (Baumeister & Leary, 1995) and secure attachments with parents (Kenrick, et al., 2007) resulting in stress reduction (Mills, et al., 2005b) and better stress handling in later life. However, long-term research is necessary to study the effects of social play on relationships and stress resistance.

The benefits of Kids World are a result of the complex interplay of an intrinsic social game type, high media richness and a distributed TUI connected to television. This blend of game characteristics was successful in approximating traditional ways of spending leisure time and, as a result, no negative associations were made with television and gaming. This is an interesting finding, however it is unknown to which game characteristics or behaviors (enabled by these characteristics) this can be attributed. Therefore, more research is necessary to understand which aspects contributed to the positive perception of television.

One interesting aspect of the interactive storytelling concept is that people first have to invest energy before being rewarded such as with exercise. However, the main difference of exercise and interactive storytelling is that players have to invest mental energy instead of physical energy. This way of relaxation is in strong contrast with the general conception of relaxation frequently associated with low-effort activities such as watching television. For example, Sonnentag *et al.* (2007) states that activities

that require little physical or intellectual effort, are not socially demanding and do not challenge individuals are often experienced as relaxing. More research is necessary to resolve this paradox.

This study tentatively found that the relaxation patterns on evenings of workdays corroborate to a homeostatic regulation of bodily and attention resources. Based on such a homeostasis predictions and interventions could be done to prevent people from health complaints such as burnouts.

7.4 Limitations

There are several limitations of this study that have different origins.

The first limitation of this graduation project is its exploratory nature having as main objective to discover ideas and new insights. Further descriptive research is necessary to verify the indicative and tentative findings from this graduation project to come to more conclusive findings.

The second limitation comes from the scope of the study in that one specific group was targeted. Therefore, more research needs to be done to see whether this particular information can be applied to other groups in society. Related to this limitation is the fact that a small group of participants was recruited that was not always entirely representative for the target group and so may have affected the validity and reliability of this research.

The last limitation stems from the fact that only one design has been investigated and, as a result, might not provide the most effective of way for relaxation. Future work should shed light on this matter including which attributes of products contribute to relaxation.

7.5 Future work

Improvements of Kids World are necessary to enhance the user experience and compete with other multi-user products for relaxation. The main improvements are to make the interface independent of keyboard and mouse, implement a repository of story objects and settings and incorporate surprising occurrences in the story to facilitate storytelling. Computer models could support non-linear storytelling by introducing unexpected characters or events in the story based on in-story behavior of players. Additionally, software agents could help children design stories by building story frameworks, constructing different styles of narratives or selecting story content based on their age. Furthermore, Kids World could be expanded with bio-sensors and computer models to provide storytellers with biofeedback or to create relaxing story environments to sooth them. Additionally, computer models could be used to teach children narrative, creative and social skills, measure these capabilities and adapt the level of system intervention to the performance level of children for example, by increasing the level of guidance. Moreover, measurements of capabilities could be used to diagnose development disorders such as autism in (young) children. Furthermore, Kids World could be used to improve social connectedness between children and adults at distance such as divorced parents.

Irrespective of the suggested implementations, the most logic subsequent step is to benchmark how Kids World differentiates from other multi-user relaxation products with respect to: work detachment, relaxation and its contributing factors and social bonding. Typical competitive multi-user relaxation activities are reading a picture book, watching an animated movie or playing with the Nintendo Wii. Further, evaluations should be conducted with other target groups such as the Classics and in other settings such as classrooms to target for a larger audience.

References

- Africano, D., Eriksson, S., Lindbergh, K., Lundholm, P., & Nilbrink, F. (2003). *Ely the explorer: a multi-user interactive play system to promote collaborative learning*. Paper presented at the Proc. IDC.
- Alonso, M. B., Keyson, D. V., & Hummels, C. C. M. (2008). *Squeeze, rock, and roll; can tangible interaction with affective products support stress reduction?* Paper presented at the Proceedings of the 2nd international conference on Tangible and embedded interaction.
- Alvarez, A. (2009). Expert interview on relaxation with Philips employee
- Andersen, T. L., Kristensen, S., & Nielsen, W. (2004). *Designing an augmented reality board game with children: the battleboard 3D experience*. Paper presented at the Proceedings of the 2004 conference on Interaction design and children: building a community.
- Backs, R. W., & Boucsein, W. (2000). *Engineering psychophysiology : issues and applications*. Mahwah, NJ: Lawrence Erlbaum.
- Battarbee, K. (2003). *Defining co-experience*. Paper presented at the Proceedings of the 2003 international conference on Designing pleasurable products and interfaces.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497-529.
- Beaumont, L. R. (2009). Stress Resisting Loss. Retrieved 25-05-2009: <http://www.emotionalcompetency.com/stress.htm>
- Beech, S., Geelhoed, E., Murphy, R., Parker, J., Sellen, A., & Shaw, K. (2004). Lifestyles of working parents: Implications and opportunities for new technologies: Technical Report HPL-2003-88R1.
- Benford, S., Bederson, B. B., Akesson, K.-P., Bayon, V., Druin, A., Hansson, P., et al. (2000). *Designing storytelling technologies to encouraging collaboration between young children*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.
- Benyon, D., Turner, P., & Turner, S. (2005). *Designing interactive systems : people, activities, contexts, technologies*. Harlow, England; New York: Addison-Wesley.
- Bernhaupt, R., Obrist, M., Weiss, A., Beck, E., & Tscheligi, M. (2008). Trends in the living room and beyond: results from ethnographic studies using creative and playful probing. *Comput. Entertain.*, 6(1), 1-23.
- Beute, F. (2009). Relaxation behavior at home: Femke Beute.
- Blythe, M. A. (2003). *Funology from usability to enjoyment*. Dordrecht; Boston: Kluwer Academic Publishers.
- Bodlaender, M. (2008). Global segmentation overview: Philips Research
- Bodlaender, M. (2009). Expert interview on relaxation with Philips employee
- Boehner, K., Vertesi, J., Sengers, P., & Dourish, P. (2007). *How HCI interprets the probes*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.
- British Association of Play Therapy. (2009). Play Therapy. Retrieved 16-12-2009: <http://www.bapt.info/whatispt.htm>
- Brown, S. (Producer). (2009) Stuart Brown says play is more than fun it is vital. retrieved from http://www.ted.com/talks/stuart_brown_says_play_is_more_than_fun_it_s_vital.html
- Bryant, J., Roskos-Ewoldsen, D. R., & Cantor, J. (2003). *Communication and emotion : essays in honor of Dolf Zillmann*. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Bryant, J., & Zillmann, D. (1991). *Responding to the screen : reception and reaction processes*. Hillsdale, N.J.: L. Erlbaum Associates.
- Buxton, B. (Writer). (2009). Return on experience by design, *Keynote on MIX09: Web Design and Development Conference*.
- Buxton, W. (2007). *Sketching user experiences : getting the design right and the right design*. Amsterdam; Boston: Elsevier/Morgan Kaufmann.

- Byrd, S. E. (2006). *Life Happens: Understanding Specialization and Adaptation of Women Transitioning between Traditional and Dual-Career Families*. Paper presented at the American Sociological Association.
- Cambridge. (Ed.) (2009) Cambridge dictionary online. Cambridge University Press.
- Carroll, D., & Seers, K. (1998). Relaxation for the relief of chronic pain: a systematic review. [doi: DOI: 10.1016/S1361-3111(98)80014-9]. *Journal of Orthopaedic Nursing*, 2(1), 55-55.
- Carroll, J. M. (Ed.). (1995). *Scenario-based design: envisioning work and technology in system development*: John Wiley & Sons, Inc.
- Cassell, J., & Ryokai, K. (2001). Making Space for Voice: Technologies to Support Children's Fantasy and Storytelling. *Personal Ubiquitous Comput.*, 5(3), 169-190.
- Cave, C. (1996). Forced Analogy. Retrieved 18-12-2009: http://members.optusnet.com.au/charles57/Creative/Techniques/forced_analogy.htm
- Childre, D. L., & Rozman, D. (2005). *Transforming stress : the HeartMath solution for relieving worry, fatigue, and tension*. Oakland, CA: New Harbinger Publications.
- Coppens, T., Handekyn, K. and Vanparijs, F. (2005). AmigoTV: A Social TV Experience Through Triple-Play Convergence.
- Cox, T. (1993). *Stress Research and Stress Management: Putting Theory to Work* (No. 61/1993): Centre for Organizational Health and Development.
- Crabtree, A., & Rodden, T. (2004). Domestic Routines and Design for the Home. *Computer Supported Cooperative Work (CSCW)*, 13(2), 191-220.
- Crawford, M., & Di Benedetto, A. (2006). *New products management*: Mcgraw Hill- Pod.
- Dalsgaard, T., Skov, M. B., Stougaard, M., & Thomassen, B. (2006). *Mediated intimacy in families: understanding the relation between children and parents*. Paper presented at the Proceedings of the 2006 conference on Interaction design and children.
- Davis, M., McKay, M., & Eshelman, E. R. (2000). *The relaxation and stress reduction workbook*. Oakland, Calif.; Enfield: New Harbinger ; Airlift.
- Donohew, L., Sypher, H. E., & Higgins, E. T. (1988). *Communication, social cognition, and affect*, Hillsdale, N.J.
- Druin, A., Montemayor, J., Hendler, J., McAlister, B., Boltman, A., Fiterman, E., et al. (1999). *Designing PETS: a personal electronic teller of stories*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems: the CHI is the limit.
- Edwards, K. (2008). Lectures sheets: Interactive system prototyping: Keith Edwards.
- Edwards, W., & Grinter, R. (2001). At Home with Ubiquitous Computing: Seven Challenges *Ubicomp 2001: Ubiquitous Computing* (pp. 256-272).
- Facey, J. (2008). *New web-enabled product concepts for the home*.
- Fono, D., & Counts, S. (2006). *Sandboxes: supporting social play through collaborative multimedia composition on mobile phones*. Paper presented at the Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work.
- Fontijn, W., & Mendels, P. (2005). *StoryToy the interactive Storytelling Toy*. Paper presented at the PerGames workshop: International Conference on Pervasive Computing.
- Fredrickson, B. L., & Levenson, R. W. (1998). Positive Emotions Speed Recovery from the Cardiovascular Sequelae of Negative Emotions. *Cognition and Emotion*, 12, 191-220.
- G. H. Brody, Z. Stoneman, & Sanders, A. K. (1980). Effects of Television Viewing on Family Interactions: An Observational Study. *Family Relations*, 29(2), 216-220.
- Gajadhar, B., Kort, Y. d., & IJsselsteijn, W. (2008). *Influence of social setting on player experience of digital games*. Paper presented at the CHI '08 extended abstracts on Human factors in computing systems.

- Garzotto, F., Paolini, P., & Sabiescu, A. (2010). *Interactive Storytelling for Children*. Paper presented at the Interaction Design and Children, Barcelona, Spain.
- Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *interactions*, 6(1), 21-29.
- Graziano, A. M., & Raulin, M. L. (2003). *Research methods : a process of inquiry (with student CD-ROM)*. Boston: Pearson/Allyn and Bacon.
- Hanlon, M. (2006). Philips Entertaible - Electronic Multi-Touch Tabletop Gaming Platform. Retrieved 28-03-2010, from <http://www.gizmag.com/go/6093/>
- Hassenzahl, M. (2004a). The interplay of beauty, goodness, and usability in interactive products. *Hum.-Comput. Interact.*, 19(4), 319-349.
- Hassenzahl, M. (2004b). The thing and I: understanding the relationship between user and product *Funology: from usability to enjoyment* (pp. 31-42): Kluwer Academic Publishers.
- Hendrix, K., Herk, R. v., Verhaegh, J., & Markopoulos, P. (2009). *Increasing children's social competence through games, an exploratory study*. Paper presented at the Proceedings of the 8th International Conference on Interaction Design and Children.
- Herk, R. v., Verhaegh, J., & Fontijn, W. F. J. (2009). *ESPranto SDK: an adaptive programming environment for tangible applications*. Paper presented at the Proceedings of the 27th international conference on Human factors in computing systems.
- Horstra, N. (2009). *Enhancing the way people exchange experiences in the living room* (Master graduation report): Philips Research Eindhoven.
- Hughes, J., O'Brien, J., Rodden, T., Rouncefield, M., & Viller, S. (2000). Patterns of home life: Informing design for domestic environments. *Personal and Ubiquitous Computing*, 4(1), 25-38.
- Huizinga, J. (1955). *Homo ludens; a study of the play-element in culture*. Boston: Beacon Press.
- IJsselsteijn, W. A., Kort, Y. A. W. D., & Poels, K. (2007). The Game Experience Questionnaire: Development of a self-report measure to assess the psychological impact of digital games. *In preparation*.
- Ishii, H., & Ullmer, B. (1997). *Tangible bits: towards seamless interfaces between people, bits and atoms*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.
- Janse, M. D. (2002). *NexTV Final Report*. Eindhoven.
- Kenrick, D. T., Neuberg, S. L., & Cialdini, R. B. (2007). *Social psychology : goals in interaction*. Boston: Pearson.
- Kim, W. C., & Mauborgne, R. (2005). *Blue ocean strategy : how to create uncontested market space and make the competition irrelevant*. Boston, Mass.: Harvard Business School Press.
- Kort, Y. A. W. D., & IJsselsteijn, W. A. (2008). People, places, and play: player experience in a socio-spatial context. *Comput. Entertain.*, 6(2), 1-11.
- Krans, M. (2009). Expert interview on relaxation with Philips employee
- Kubey, R., & Csikszentmihalyi, M. (2002). Television addiction is no mere metaphor. *Scientific American*, 2, 74-80.
- Kubey, R. W., & Csikszentmihalyi, M. (1990). *Television and the quality of life : how viewing shapes everyday experience*. Hillsdale, N.J.: L. Erlbaum Associates.
- Lally, E. (2002). *At home with computers*. Oxford; New York: Berg.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer Pub. Co.
- Lee, M. K., Davidoff, S., Zimmerman, J., & Dey, A. (2008). Smart Homes, Families, and Control.
- Lindley, S. E., Couteur, J. L., & Berthouze, N. L. (2008). *Stirring up experience through movement in game play: effects on engagement and social behaviour*. Paper presented at the Proceeding of the twenty-sixth annual SIGCHI conference on Human factors in computing systems.
- Livaditi, J., Vassilopoulou, K., Lougos, C., & Chorianopoulos, K. (2003). *Needs and Gratifications for Interactive TV Applications: Implications for Designers*. Paper presented at the Proceedings of

the 36th Annual Hawaii International Conference on System Sciences (HICSS'03) - Track 4 - Volume 4.

- Maguire, M. (2001). Methods to support human-centred design. *Int. J. Hum.-Comput. Stud.*, 55(4), 587-634.
- Manzoni, G. M., Pagnini, F., Gorini, A., Preziosa, A., Castelnuovo, G., Molinari, E., et al. (2009). Can Relaxation Training Reduce Emotional Eating in Women with Obesity? An Exploratory Study with 3 Months of Follow-Up. *Journal of the American Dietetic Association*, 109(8), 1427-1432.
- Marchena, E. (2004). *Silent Exchanges: Quality Time in Dual-Earner Families* (Working paper 37). Atlanta: Center for myth and ritual in American Life at Emory University.
- Marchena, E. (2005). *Silent Exchanges: Quality Time in Dual-Earner Families* (Working paper 37). Atlanta: Center for myth and ritual in American Life at Emory University.
- Mason, J. L. (2010). Executive Stress - Why We Are More Stressed Out Now Than Ever Before. Retrieved 20-03-2010, from <http://ezinearticles.com/?Executive-Stress---Why-We-Are-More-Stressed-Out-Now-Than-Ever-Before&id=88284>
- Mateas, M., Salvador, T., Scholtz, J., & Sorensen, D. (1996). *Engineering ethnography in the home*. Paper presented at the Conference companion on Human factors in computing systems: common ground.
- Mazalek, A., Davenport, G., & Ishii, H. (2002). *Tangible viewpoints: a physical approach to multimedia stories*. Paper presented at the Proceedings of the tenth ACM international conference on Multimedia.
- McCabe, A., & Peterson, C. (1991). *Developing narrative structure*. Hillsdale, N.J.: L. Erlbaum Associates.
- Merrill, D. (2009). Siftables, the toy blocks that think. from http://blog.ted.com/2009/02/siftables_the_t.php
- Merrill, D., Kalanithi, J., & Maes, P. (2007). *Siftables: towards sensor network user interfaces*. Paper presented at the Proceedings of the 1st international conference on Tangible and embedded interaction.
- Mills, H., Reiss, N., & Dombek, M. (2005a). Distraction and Humor in Stress Reduction. Retrieved 27/10/2009, from http://resources.atcmhmr.com/poc/view_doc.php?type=doc&id=15671&cn=117
- Mills, H., Reiss, N., & Dombek, M. (2005b). Socialization and Altruistic Acts as Stress Relief. Retrieved 27/10/2009, from http://resources.atcmhmr.com/poc/view_doc.php?type=doc&id=15677&cn=117
- Mills, H., Reiss, N., & Dombek, M. (2009). Distraction and Humor in Stress Reduction. Retrieved 27/10/2009, from http://resources.atcmhmr.com/poc/view_doc.php?type=doc&id=15671&cn=117
- Mind Tools. (2009a). Meditation - Relaxing with sustained concentration. <http://www.mindtools.com/stress/RelaxationTechniques/Meditation.htm>
- Mind Tools. (2009b). Self-Hypnosis: Relaxation Techniques from Mind Tools. Retrieved 27-05-2009: <http://www.mindtools.com/stress/RelaxationTechniques/SelfHypnosis.htm>
- Mitchell, E. (1985). The Dynamics of Family Interaction Around Home Video Games. *Marriage & Family Review*, 8(1), 121 - 135.
- Morley, D., & Silverstone, R. (1990). Domestic communication -- technologies and meanings. *Media Culture Society*, 12(1), 31-55.
- NIOSH. (2009). Stress at work. Retrieved 25-05-2009: <http://www.cdc.gov/niosh/docs/99-101/>
- Norman, D. A. (2006). *Emotional Design : why we love (or hate) everyday things*. New York, NY: Basic Books.
- O'Brien, J., Rodden, T., Rouncefield, M., & Hughes, J. (1999). At home with the technology: an ethnographic study of a set-top-box trial. *ACM Trans. Comput.-Hum. Interact.*, 6(3), 282-308.

- Patten, J., Ishii, H., Hines, J., & Pangaro, G. (2001). *Sensetable: a wireless object tracking platform for tangible user interfaces*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.
- Philips Global Marketing Management. (2004). Collective profiles of the Philips core target audience in Asia, USA and Europe.
- Poels, K., Kort, Y. d., & IJsselsteijn, W. (2007). *"It is always a lot of fun!" : exploring dimensions of digital game experience using focus group methodology*. Paper presented at the Proceedings of the 2007 conference on Future Play.
- Pruitt, J., & Adlin, T. (2006). *The persona lifecycle : keeping people in mind throughout product design*. Amsterdam; Boston: Elsevier : Morgan Kaufmann Publishers, an imprint of Elsevier.
- Schwartz, M., & Andrasik, F. (Eds.). (2003). *Biofeedback: A Practitioner's Guide*. New York: Guilford Press.
- Sharp, H., Rogers, Y., & Preece, J. (2007). *Interaction design : beyond human-computer interaction*. Chichester; Hoboken, NJ: Wiley.
- Sleeswijk Visser, F., Stappers, P. J., Van der Lugt, R., & Sanders, E. B.-N. (2005). Contextmapping: Experiences from practice.
- Smith, E., Dow-Nelson, P., & Hilgard, E. R. (2003). *Atkinson & Hilgard's introduction to psychology*. Australia ; United Kingdom: Thomson/Wadsworth.
- Sonnentag, S. (2001). Work, recovery activities, and individual well-being : a diary study. *Journal of Occupational Health Psychology, 6*(3), 196-210.
- Sonnentag, S., & Bayer, U.-V. (2005). Switching off mentally : predictors and consequences of psychological detachment from work during off-job time. *Journal of Occupational Health Psychology, 10*(4), 393-414.
- Sonnentag, S., Binnewies, C., & Mojza, E. J. (2008). "Did You Have A Nice Evening?" : A Day-Level Study on Recovery Experiences, Sleep, and Affect. *Journal of Applied Psychology, 3*(93), 674-684.
- Sonnentag, S., & Fritz, C. (2007). The Recovery Experience Questionnaire : Development and Validation of a Measure for Assessing Recuperation and Unwinding From Work. *Journal of Occupational Health Psychology, 3*(12), 204-221.
- Sonnentag, S., & Krueger, U. (2006). Psychological detachment from work during off-job time : the role of job stressors, job involvement, and recovery-related self-efficacy. *European Journal of Work and Organizational Psychology, 2*(15), 197-217.
- Sonnentag, S., & Krueger, U. (2008). Psychological detachment from work during off-job time : the role of job stressors, job involvement, and recovery-related self-efficacy.
- Sonnentag, S., & Zijlstra, F. R. H. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology, 2*(19), 330-350.
- Squire, K. (2003). Video games in education. *International Journal of Intelligent Simulations and Gaming, 2*(1), 49-62.
- TOONS Toys. Interaction toys as means to create a fun experience (2002).
- Stress, T. A. I. o. (2010). Job stress. Retrieved 20-03-2010, from <http://www.stress.org/job.htm>
- Sussman, M. B. (1985). *Personal computers and the family*. New York: Haworth Press.
- Svensson, M. S., & Sokoler, T. (2008). *Ticket-to-talk-television: designing for the circumstantial nature of everyday social interaction*. Paper presented at the Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges.
- Taylor, A., & Harper, R. (2003). Switching On to Switch Off *Inside the Smart Home* (pp. 115-126).
- Taylor, A. S., & Cohen, K. A. (2003). *Recovering the Social Life of Things*. Paper presented at the CHI 2003 Workshop: Designing Culturally Situated Technologies for the Home Workshop.
- Taylor, A. S., & Swan, L. (2005). *Artful systems in the home*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.

- Thayer, R. E., Newman, J. R., & McClain, T. M. (1994). Self-regulation of mood: Strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology*, 67(5), 910-925.
- TNS. (2008). Wii are family. Retrieved 28-03-2010, from <http://www.tnsglobal.com/news/news-185D8B66AE3F44C3B60E79E03A469E24.aspx>
- Tolmie, P., Pycock, J., Diggins, T., MacLean, A., & Karsenty, A. (2002). *Unremarkable computing*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems: Changing our world, changing ourselves.
- User Interface Design, & Hassenzahl, M. (2009). Retrieved 29/11/2009, from <http://www.attrakdiff.de/>
- Van den Broek, A., Breedveld, K., De Haan, J., De Hart, J., & Huysmans, F. (2004). *Trends in Time. The Use and Organization of Time in the Netherlands, 1975-2000*. The Hague: Social and Cultural Planning Office.
- Van Niekerk, P., & Jacquemijns, B. (2008). *Televisierapport 2008: SPOT*.
- Venkatesh, A., Kruse, & Shih, E. C. (2003). The networked home: an analysis of current developments and future trends. *Cognition, Technology & Work*, 5(1), 23-32.
- Venkatesh, A., & Mukherjee, S. (2006). *Video Games as Nurturing Technology: Relational and Bonding Issues*. Paper presented at the UbiComp 2006.
- Voida, A., & Greenberg, S. (2009). *Wii all play: the console game as a computational meeting place*. Paper presented at the Proceedings of the 27th international conference on Human factors in computing systems.
- Vorderer, P., Klimmt, C., & Ritterfeld, U. (2004). Enjoyment: At the Heart of Media Entertainment. *Communication Theory*, 14(4), 388-408.
- Vries, D. (2008). *Relaxation needs and concepts*: Philips Technical Note PR-TN 2008/00920.
- www.mediaonderzoek.nl. (2009). Bellen en praten irriteren tijdens televisiekijken. Retrieved 05-06-2009: <http://www.mediaonderzoek.nl/1105/bellen-en-praten-irriteren-tijdens-televisiekijken/#more-1105>
- Zalaquett, C. P. (2000). About relaxation. http://www.coedu.usf.edu/zalaquett/relax/About_Relaxation.htm
- Zhou, Z., Cheok, A. D., Li, Y., & Kato, H. (2005). *Magic cubes for social and physical family entertainment*. Paper presented at the CHI '05 extended abstracts on Human factors in computing systems.
- Zillmann, D., & Vorderer, P. (2000). Media entertainment the psychology of its appeal.

Appendix A. Target groups Philips

Trendsetters:

- Teens to mid 20s, single
- Students or starting their jobs
- Lives in or near a big city
- Social and looked up to by others
- Willing to take risks, always curious
- Young (or young at heart), fun, and carefree
- Life is 'just beginning' and s/he will choose its course
- Easily bored
- Out of the house all day, has a few gadgets (iPhone/Sony PSP) always with him/her.
- Lives somewhat of a nomadic lifestyle; crashes a friends' home, goes away on weekends
- The laptop is the biggest source of 'entertainment'
- TV is retro; it's now more the big screen for gaming
- Downloading everything: music, movies, TV shows
- Internet lifestyle; active on YouTube, people's blogs and virtual networks
- Internet is top source of information
- Many still living with parents (If on their own, renting a place with friends)
- Love innovation
- Product design is of key importance



Frontrunners:

- Early to mid thirties
- Single or living with partner
- Urban lifestyle
- Owns an apartment
- Works 60+ hours per week
- Well educated and high income
- Successful, driven, confident
- Social, enjoys the finer things in life, constantly busy
- Likes to be the expert and leader
- Appearance & style conscious
- Commutes an hour per day, uses this time to catch up on work
- Travels for work 5 days a month.
- Owns consumer electronics such as 60GB Video iPod, Blackberry Pearl, 40' LCD TV, Laptop, xBox 360
- Wireless connected to Internet
- Downloads all music and movies
- Knows what's happening in technology through magazines, blogs and technology websites
- They prefer mobile products and extra features even if less user friendly, and would spend for technology that would improve their efficiency



Selectives:

- 30s-50s, coupled, likely to have kids living at home.
- Affluent suburban lifestyle; owns a 3-brm home in new community
- Holds senior management position or may have gone into business on own.
- Sophisticated, established, well-off but not showy.
- Open-minded, humanitarian.
- Seeks balance in life: family, work, friends, and the global community
- Thorough planner, not dull but not spontaneous.
- Travels 2-3 times per month for work
- Takes 2 big holidays a year
- Buys only high-tech electronics, e.g. Plasma TV, Hi-Fi audio set, laptops, Nintendo Wii
- Pays close attention to current events; reads newspapers and checks latest headlines online.
- Listens to Internet Radio and downloads music occasionally.
- Buys DVDs of favorite movies and TV series. Has movie night once a month with family and friends.
- Does a lot of homework before making a purchase: online via all sources, with friends and magazines.
- A purchase is a family purchase, and everyone is involved



Appendix B. Recovery of resources through homeostatic regulation

When the human brain appraises a stressor as a threat or danger, the stress response mechanism activates rapidly the autonomic nervous system and hormone system. This is commonly known as the “fight-or-flight” response (Childre & Rozman, 2005; Davis, McKay, & Eshelman, 2000). The autonomic nervous system stimulates the body for change of the situation by activating the sympathetic nervous system and suppressing the parasympathetic nervous system. As a result, the heart rate, breathing rate, muscle tension, metabolism and blood pressure are all increased resulting in high levels of arousal in the body and mind. As soon as the stimulus or situation is appraised as safe or secure the stress response ceases and the bodily processes return to normal, called the relaxation response. Thus, stress is the bodies and minds effort required to restore equilibrium through the homeostatic regulation of the body (Beaumont, 2009). However, the attention and physiological resources the body provides for coping are finite and can be exhausted. For example, a burnout is an exhaustion of the bodily resources as a result of chronic stress and/or insufficient recovery and coping.

The notion of recovery of internal resources through homeostatic regulation is supported by the Effect-Recovery model and Conservation of Resources theory. The Effect-Recovery Model states that recovery occurs if individuals (1) refrain from effort expenditure at work and (2) “avoid activities that call upon the same functional systems or internal resources as those required as work (Sonnentag & Fritz, 2007, p. 205). In addition, the Conservation of Resources theory states that people strive to obtain, retain and protect their internal resources, for example, mood and energy (Sonnentag & Fritz, 2007). Work stress depletes these resources and, therefore, people have to gain new internal resources to restore lost and threatened resources. Thus, conservation of resources might be a core function of the recovery process for repairing, for instance, impaired mood often caused by stressful work conditions (Sonnentag & Fritz, 2007). However, if regular demands on internal resources sustain for a longer period, fatigue builds up and individuals long for relief and for having time to do low baseline activity. Being temporarily relieved from work demands is an opportunity to recuperate and to replenish internal resources (Sonnentag & Fritz, 2007).

Appendix C. Products for dedicated relaxation

Head Refresher Is 234 Points of Scalp Massaging Crazy

The Head Refresher, acupressure related gadget, is a device that lets you massage your own scalp, allegedly increasing blood circulation throughout your body, while making it look like an inverted sea urchin is trying to swallow your skull.



It has 234 stimulating points, an ergonomic handle, and the ability to give your head a full rubdown without ever disturbing your hair. And it's available for the price of \$34 off of Japan Trend Shop.



Source: <http://gizmodo.com/5098428/head-refresher-is-234-points-of-scalp-massaging-crazy>

Head Kenzan: Massage Away Stress, Torture Prisoners With One Handy Device

The Head Kenzan is inspired by a traditional Japanese tool called "kenzan" that is used in Japanese flower arranging to hold plants in place. The device is designed to massage the scalp using 92 plastic bristles that are described as "not-too-hard and not-too-soft." Available for \$47.



Source: <http://gizmodo.com/5059463/head-kenzan-massage-away-stress-torture-prisoners-with-one-handy-device>

Pump-Action Relief... From Stiff Necks

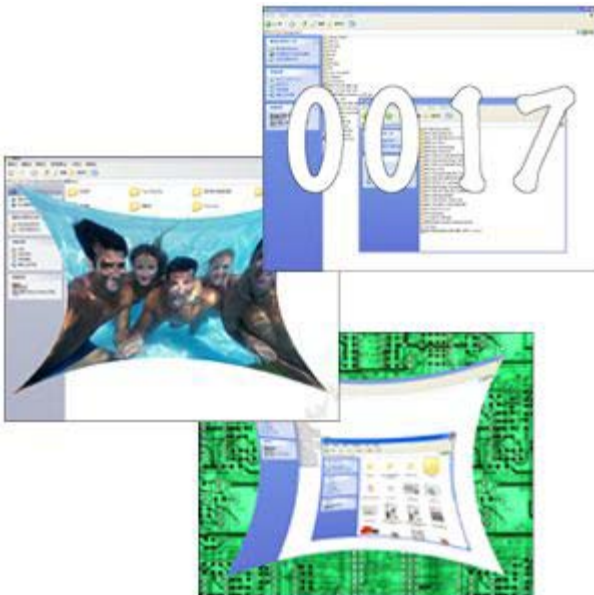
The portable neck traction device helps to relieve tight muscles and "joint and nerve pressure." Simply place around your neck and "pump the inflation bulb until you feel a comfortable stretch." Available now in three neck sizes for \$69.



Source: <http://gizmodo.com/388873/pump+action-relief-from-stiff-necks>

USB Stress Ball Allows You To Virtually Strangle Your Enemies

There have been other USB devices designed to combat stress, but this version is the only one that allows you to virtually punch and strangle your enemies. Squeezing, twisting and punching this oddly shaped "ball" will transfer the action to your computer screen. In other words, if you squeeze the ball, a photo of your boss on the screen will also be temporarily "squeezed." The same goes for any work you might be doing—like an unwelcome email or



spreadsheet. It also features strength and squeeze games to help you pass the time at the office.

Source: <http://cache.gawker.com/assets/images/gizmodo/2009/01/usb-stress-ball.jpg>

Relieve Stress With The Sound of Cracking Knuckles

This gadget simulates a mundane but strangely satisfying experience in order to relieve stress. Every time you bend it you are treated to the sound of cracking knuckles. The gadget also features various spikes that can be used to stimulate pressure points. That's all well and good, but isn't cracking knuckles really about how good it feels?



Source: <http://gizmodo.com/5272256/relieve-stress-with-the-sound-of-cracking-knuckles>

Rejuvenate your body and soul in the Balance Bathtub

The Energy Cocoon Balance Bathtub: This spa features an infrared sauna, steam sauna, aromatherapy and light therapy functions, hydromassage, airbubble massage and a hand shower in an extremely compact design.



The Energy Balance Cocoon is a mini spa with multi-functional and compact whirlpool with sauna functions. This device features an infrared sauna and steam sauna including the Hydro massager or the Air bubble massager to de-stress your mind and loosen up your stiff muscles. It also includes aroma therapy or light therapy. All you have to do is to soak in the tub and enclose yourself keeping your head out through the small aperture while your body and soul gets rejuvenated in the mini cocoon.

Source: <http://www.neoqi.com/index.php?s=37>

Massage Pants

The manufacturer claims that these pants have multiple massage modes and an automatic temperature control.

Product Features

- * Built-in 7 group of super vibration massage, a scientific and rational allocation
- * Ring far infrared heaters, automatic temperature control, safe and reliable
- * A variety of massage
- * Automatic mode
- * Automatic regularly work 20 minutes
- * High-performance rechargeable batteries for exclusive use, energy, security



Source: http://www.tradekey.com/product_view/id/492783.htm

Pain In The Back?

The VertaBrate focuses on areas where the spinal nerves begin to permeate through the back and aims at diminishing the amount of discomfort that spawns at the beginning of these spinal nerves. It bends over the shoulders and clings to the body using sticky pads. The sticky arms embed four vibrating nodes that facilitate deep massage. Sometimes doctors advice compresses to alleviate the pain, so depending upon what you have been advised, the VerteBrate can be popped into the freezer or microwave for temperature therapy.



Source: <http://www.yankodesign.com/2009/04/09/pain-in-the-back/>

Airo Massaging Backpack Soothes Sore Muscles

The Airo is a backpack that can apply massage, vibration, and relaxing heat to sore shoulder and back muscles. Unfortunately, it appears that they failed to make the device into a functional backpack, which seems like a missed opportunity. After all, if I am going to walk I should at least be able to store my books in the thing.



Source: <http://gizmodo.com/374315/airo-massaging-backpack-soothes-sore-muscles-doubles-as-a-turtle-costume>

Head Spa headmassanger

This helmet is a newfangled head massager. The Head Spa claims to reduce stress and tension by increasing blood circulation and stimulating your scalp through acupressure. According to the product description: "The patented design is lightweight and easy to use while at your office desk, on the morning commute, or while enjoying your evening television program." Available at Edmund Scientific for \$49.95.



Source: <http://technabob.com/blog/2007/09/14/are-you-looking-at-my-headgear/>

AlphaSphere - Multi-sensory Relaxation Furniture by Sha

Power Napping - this piece of relaxation furniture from Vienna Artist and perception researcher, sha, which has now become a cult object, offers pure enjoyment all the way. In addition to the clear form and design style, this exceptional item of relaxation furniture also has many inner values to offer: the multi-sensory experience of the various perception levels, color, lighting, sound, warmth or vibration, ensures stress reduction, increased creativity and relaxation all at the same time.



Source: <http://www.yankodesign.com/2007/06/06/alphasphere-multi-sensory-relaxation-furniture-by-sha/>

Scientists Create "The World's Most Relaxing Room"

The credit crunch and the hectic pace of modern life has inspired Professor Richard Wiseman to create what he believes is "the world's most relaxing room" at the University of Hertfordshire in Hatfield, just north of London. His research led him to invite visitors to lie down on soft matting with lavender scented pillows in a darkened room lit only with "a calming glade-like green light." A simulated blue sky is projected onto the ceiling above while a soundtrack specifically composed for the project by resident Professor of Music, Tim Blinko plays softly in the background.

Visitors to the exhibit were examined before and after their 15-minute stay in the room with heart monitors. Not surprisingly, most experienced a significant reduction in their heart rate. Wiseman hopes that similar facilities will be set up by organizations to combat stress related problems.



Source: <http://gizmodo.com/5068354/scientists-create-the-worlds-most-relaxing-room>

RelaxStyle Lamp: Like Tripping at the Bottom of the Sea

The RelaxStyle Room Palette Effect lamp can transport you to a tranquil undersea world at the push of a button. The lamp projects light onto walls or ceilings that resemble undulating waves—giving users the feeling of being submerged in shallow water, looking up into the sunlight. You can even set a timer that will automatically shut the light show down after 120 minutes. That way you can blissfully set adrift into sleep. Available for \$69.



Source:

<http://gizmodo.com/362636/relaxstyle-lamp-like-tripping-at-the-bottom-of-the-sea>

Umine projector

The Healing Theater Umine projects watery blue and green moving images on your ceiling as it plays back digitally recorded sounds of the islands. In addition to a beach setting, the Umine can transport you deep into the rainforest along with chirping birds and a green, leafy light show, or under the sea, swimming with the fishes and a deep blue visual effect.

The mood projector reportedly beams images of beach scenes, waterscapes, and various other soothing atmospheres onto your ceiling or wall, which apparently helps you to divert your attention from the demands of reality (or yearn for a vacation).

In addition to the built-in nature sounds, you can hook up your favorite media player and listen to your music as the images play. It also comes with a removable frosted dome that lets keeps the images from reaching the ceiling, instead creating a brighter, point lighting source. As is always the case with the LED projectors, the effect requires a totally dark room. The Umine projector is available for pre-order now from HimeyaShop for \$84.



Source: <http://technabob.com/blog/2007/07/26/the-sights-and-sounds-of-the-islands/>

Yogis Are Now Hi-Tech

Imagine a yoga mat you unfurl from a metal tube that's actually a stereo. It can take in memory cards or play content off an MP3 player. The real tech candy here is the mat which is made of an electronic paper screen. The idea is you can attend yoga classes from anywhere since streaming video plays right on the mat. You can even "conference" in friends so they can get in the group fun. It's just a concept but the technologies do exist in some form now.



Source: <http://www.yankodesign.com/2007/08/17/yogis-are-now-hi-tech/>

Sweety is Color-Changing, Squeezable Interactive Stress Gizmo

Designer Haishu Zhang has created the Sweety concept gadget to help soothe away people's stresses. Sweety is a virtual character who helps people understand where their stress is coming from and what they can do to conquer it in a friendly and cuddly way.

Sweety is your 24 hours a day listener. It listens to you and helps you analyze your stress with visible calm and beautiful graphic patterns. By exposing the cause of your stress it is easier to find a way to relieve it. Depending on the growth of the graphic patterns, Sweety will also invite you to play interactive games by manipulating its soft body. When the pressure is on and the stress is too much, just squeeze and beat the hell out of it.



Source: <http://www.yankodesign.com/2008/06/24/squeeze-me-and-beat-me/>

LTK-2000 Therapy Station Tries to Soothe Your Senses All At Once

There're plenty of gadgets to soothe your troubled soul with smells, lights and sounds— but why buy a bunch of these, when the LTK2000 does it all in one? Once the Therapy Station has calmed your ears with 24 relaxing sound options, a pop-up ring of bright LEDs tries to banish those SAD blues. Aromatherapy scents will waft around you from its built-in heater, while an anion generator cleans up the air. Available for around \$395 in Korea.



Source: <http://technabob.com/blog/2008/03/09/relaxation-station-will-find-a-way-to-make-you-chill-out/>

MC Square brain booster

The MC Square (Daeyang) brain booster will help take care of all your brainwave management needs. It's a small, Walkman-sized control unit programmed with software that regulates the intensity and frequency of light and sound in combinations designed to generate changes in your brainwaves for relaxation purposes. In fact, you can tune in to several different presets and dial in any number of mental states to help increase concentration, manage stress.



Source: <http://www.engadget.com/2005/10/13/mc-square-brain-booster/>

Philips 'Relax to Win' game

A mobile game developed by Philips Design for major UK cellphone provider Orange have designed a device that measures your galvanic skin response and sends it wirelessly to a PC or cellphone. To play, you've got to slide the device between your fingers and relax. Your character is a friendly dragon on the PC or cell screen, and the more you chill out, the more your dragon will fly.



Source: <http://www.engadget.com/2005/05/09/philips-designs-relax-to-win-game/>

HIMS Brain HUBI biofeedback

The HIMS Brain HUBI biofeedback device plugs into your computer, and interactively monitors electrical impulses from your fingertips to help you control your brain into the proper state of mind to accomplish nearly anything. This little USB gadget from Korea makes some pretty lofty claims: to relax your mind, improve your memory, help you concentrate and end hunger. The included software lets you choose from a variety of profiles including relaxation, creativity, memory and concentration. You do your darnedest to coordinate your brain waves with the graphs displayed on the screen. Available for about \$206 from Korea.



Source: <http://technabob.com/blog/2009/02/15/brain-hubi-relaxation-device/>

Vyro Games' Personal Input Pod to relieve your stress

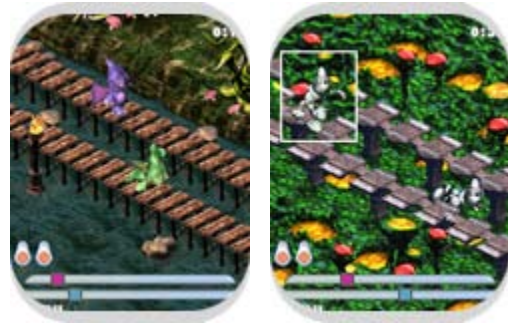
Vyro Games' PIP (Personal Input Pod) is a teardrop-shaped biofeedback sensor that relays your stress levels (measured in electrodermal activity, or sweat production) via Bluetooth to software on a mobile phone, where it's used to control a simple game. The outcome of the game is dependent on how relaxed the user can get, and the program continuously monitors the player's stress levels and reacts accordingly, helping them develop control over the relaxation process. It is a device for a way to have fun and relieve stress and for people having trouble finding the time or place to relax.



Source: <http://www.engadget.com/2007/09/26/vyro-games-pip-wants-to-relieve-your-stress/>

Relax & Race for PIP

Relax & Race is the racing game where victory is achieved only by out-relaxing your opponent. Competitive games normally predispose the player to a state of increased tension, but in Relax & Race, you must discover how to override this tendency, and learn not only to relax, but to relax in a stressful environment.



The game takes the form of a race between two characters. Your stress level is used to determine your speed in the race - the more you relax, the faster you go. In a race against stress, the winner is the player who manages to relax the most during the course of the game. Relax & Race provides a fun and constructive way of learning how to manage stress - a valuable skill in today's increasingly hectic world!

Source: <http://www.vyro-games.com/products/relaxandrace.php>

Storm Chaser for PIP

Bring out the sun in this unique mood-based game. The weather responds to your stress level, encouraging you to find your inner calm and tame the storm. As you relax, the wind slackens, the rain eases and the clouds clear until you are basking in warm sunshine.



Source: <http://www.vyro-games.com/products/stormchaser.php>

Simmer Down Sprinter: compete to relax

If you want to win the Simmer Down game, you have to calm down. Ironically, the game's objective is to make your sprinter outrun your opponent's, but getting frantic won't help those legs move any quicker. The game senses the level of stress in your body -- better known as bio-feedback -- and converts your calmness into speed, while heightened stress will slow you down. So if you need a more entertaining way to get your blood pressure down from the stratosphere, just try to chill out during a high-paced, winner takes all game of competitive relaxation.



Source: <http://www.engadget.com/2006/07/27/simmer-down-sprinter-compete-to-relax/>

Pong 3.0: Mindball

In another rendition of games where the calmest mind wins, Steve Lambert has designed a two-player arcade-style version where participants sit down and do their very best to relax. Mindball is a tabletop game that rewards you for being relaxed. Players put on headbands that track Alpha- and Theta waves, the kind that occur during deep relaxation. The EEG readings correspond to the ball's movement, and the most-relaxed player will make the ball move to the other player's goal. The game is available from Interactive Productline for a slim \$20,000.



Source: <http://www.engadget.com/2004/10/21/pong-3-0-mindball/>

emWave Personal Stress Reliever Gauges, Reduces Your Stress

This stress reliever from emWave monitors your heart rhythms and "confirms when you are in the coherence mode". The levels of "coherence" detected by this range from red for low coherence, to blue for medium, to green for high coherence (the feeling that you are relaxed). The point is to exhale and inhale and think of something positive. When the device detects you into the green area, you're set to get back to work. Available now for \$199.



Source: <http://gizmodo.com/201455/emwave-personal-stress-reliever-gauges-reduces-your-stress-supposedly>

StressEraser - Breathe With Me

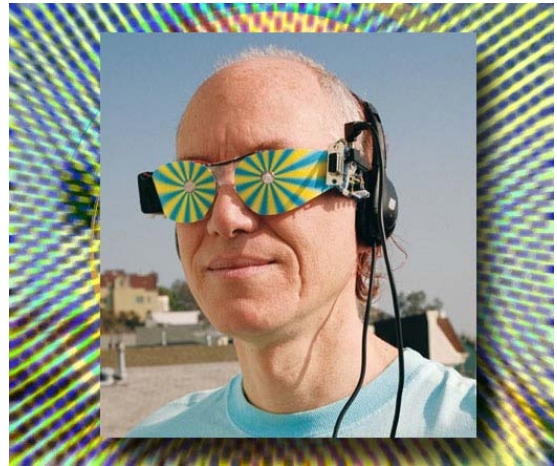
The StressEraser by Helicor is a standalone device that reduces stress through yogic breathing. The StressEraser is a portable biofeedback device that helps you learn to activate your body's natural relaxation response in minutes -- without the use of medication. The pocket-size device uses a harmless finger sensor to convert your pulse into an HRV-wave. This wave guides you to synchronize your breathing with your heart rate cycle.



Source: <http://stresseraser.com/>

The brain machine

The “Brain Machine” is a device which reaches into your mind and helps you to chill out. Get comfortable, put on the glasses and headphones, close your eyes (the LEDs are bright), and flick the power switch. Enjoy the hallucinations as you drift into deep meditation, ponder your inner world, and then come out after the 14-minute program feeling fabulous. Sound and Light Machines (SLMs) produce sound and light pulses at brain wave frequencies, which help people sleep, wake up, meditate, or experience whatever state of consciousness the machine is programmed for.



With this kit you will build an SLM for much cheaper than you can buy one. You'll do it the easy way, by hacking a microcontroller project that already exists: Adafruit's Mini-POV kit (included) which you can transform into an SLM simply by changing the firmware and some minor hardware. The hacked version of Adafruit's Mini-POV microcontroller kit pulses the Brain Machine's LEDs and sound generators to sync your noggin up with beta, alpha, theta, and delta brainwaves.



The Brain Machine Kit comes from the mind of Mitch Altman. The Brain Machine Kit is now available from the MakerSHED for \$34.99.

Source: <http://technabob.com/blog/2008/07/13/the-brain-machine/>

Nintendo Wii Fit

Wii Fit is a game based exercise device developed by Nintendo for the Wii Console. Basically, all 40 games focus on helping to improve the balance and posture, change the Body Mass Index (BMI) and relax (e.g. yoga exercises) by using the Wii Balance Board peripheral.



Source: <http://ms2.nintendo-europe.com/wiifit/enGB/index.html>

MC Square X1 Stimulates Brain Waves

The [MC Square X1](#)—a get-smart-quick device—is already huge in Korea. Its makers say it helps you relax, reduces anxiety and concentrate by targeting your brain's sensory preceptors with light and sound. It looks like a little MP3 player with an accompanying set of video glasses, but instead of displaying video, the glasses transmit pulsing red dots that are synchronized to music or soothing nature sounds. The X1 also includes a voice recorder plus a miniSD slot for your photos and music. Unfortunately, the X1's DAP capabilities are decidedly run-of-the-mill, with only 512MB of internal memory and a miniSD slot to add up to 2GB more, along with an FM radio and a squint-inducing 1.3-inch OLED display.



The device can take you through six different regimens for better sleep, improved concentration, memory improvement and relaxation, each running at about 15 minutes. The inventors say that doctors at University of Pennsylvania and Thomas Jefferson University—both in Philadelphia—have put the MC Square through real clinical tests. Some studies have shown a 14% increase in memorization after about a week. However, since it is a device that emanates light pulses, MC Square says those who have suffered from seizures in the past should stay away. Ditto for kids under 13. Price is \$400.

Source: <http://gizmodo.com/322779/mc-square-x1-stimulates-brain-waves-makes-you-smarter>

Appendix D. Overview participants of contextmapping

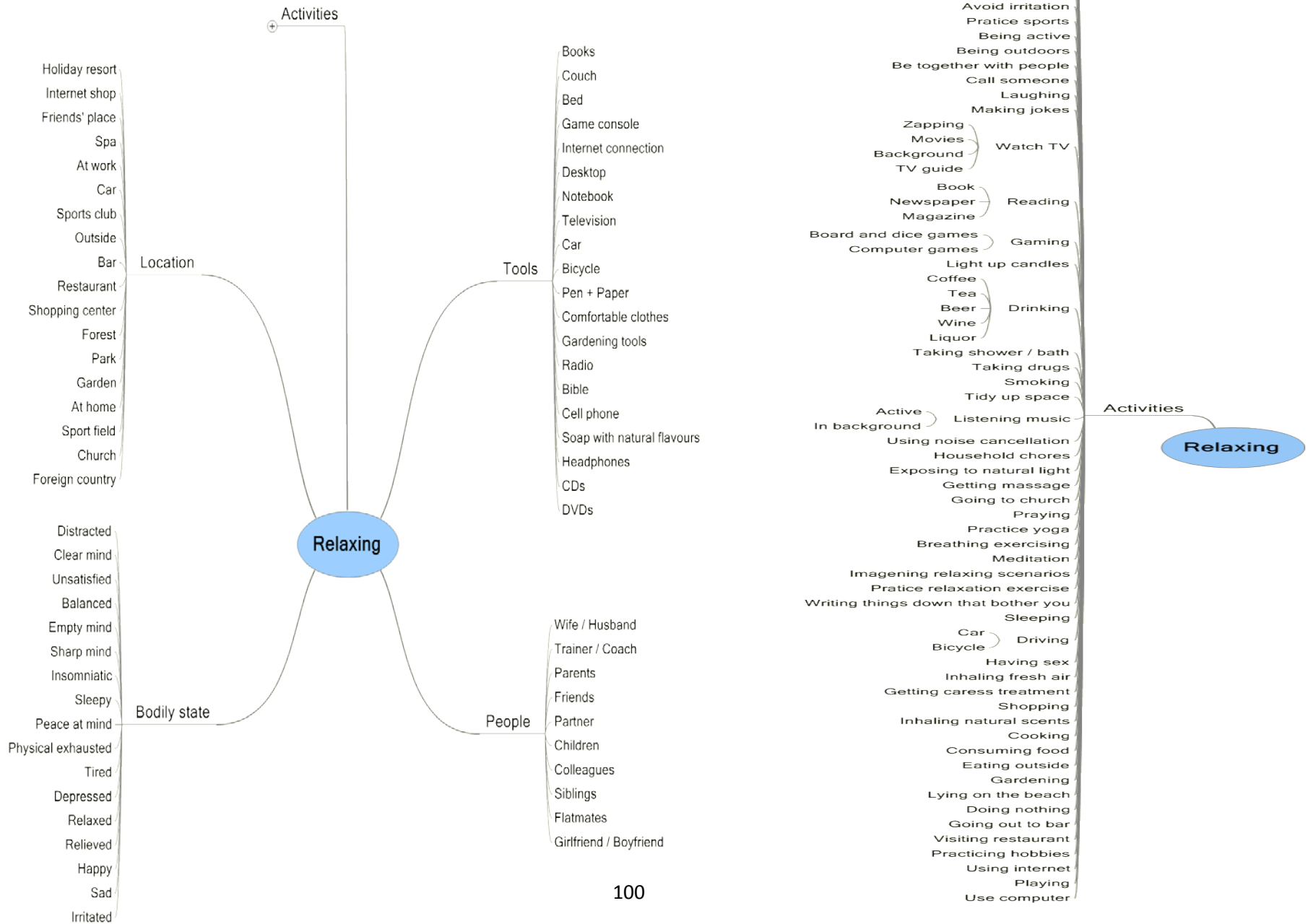
Table 1. Participants of diary and semi-structured interviews

Name/Features	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
Sex	Male	Male	Male	Female	Female
Age	44	36	41	40	42
Education	University	HBO	University	Schoevers	MBO
Profession	Tax consultant / Entrepreneur	Entrepreneur	Human resource consultant	Commercial employee	Internal Sales
Children (Age)	1 Boy (7)	3 Girls (1,2,5)	2 Boys (4, 11)	1 Boy (8), 1 Girl (6)	1 Girl (12)
City	Venlo	Venlo	The Hague	Hout-Blerick	Venlo
Hobbies	Sports, traveling, eating and drinking wine together	Entrepreneurship, Being busy, enjoying the family	Cities, Architecture, politics, Society, Galleries, Interior/Design	Swimming, puzzles (Sudoku), eating icecream	Reading, Art/Culture, Horse riding, walking, holidays

Table 2. Participants of semi-structured interviews

Name/Features	<u>F</u>	<u>G</u>
Sex	Male	Male
Age	40	39
Education	PhD	PhD
Profession	Researcher	Scientist
Children (Age)	2 Girls (10,13)	2 Boys (4,7)
City	Nuenen	's Hertogenbosch
Hobbies	Music, Film, Computers, (Round) Games, Volleyball, Reading, Bonsai	Tennis, Golf

Appendix E. Mind map about multi-user relaxation for contextmapping



Mijn

dagboekje

Over hoe jij relaxt!

Gemaakt door: _____

Email: _____

Telefoon: _____

Lees mij eerst...

Hallo!!

Dit is jouw dagboekje! Versier jouw dagboekje met teksten en tekeningen om te laten zien hoe je ontspant, hoe je dag er uit ziet, wie je bent, wat je leuk vindt, en wat je belangrijk vindt. Maak daarbij ook gebruik van de inspiratie woorden en plaatjes achter in het dagboekje bij het invullen. Kortom, het is jouw creatie!

Alles is goed! Goede of foute antwoorden bestaan niet, alleen jouw antwoorden. Jij bent de enige die weet hoe je leeft, wat je voelt en denkt. Dus doe de opdrachten op een manier die het beste bij jou past!

Met het invullen van dit boekje beïnvloed jij hoe de nieuwe producten van Philips er uit zien in de toekomst. Het is belangrijk dat je elke dag jouw dagboek invult. Het invullen duurt niet meer dan een kwartiertje per dag gedurende een week en een weekend.

Als je klaar bent met invullen, kom ik je boekje weer ophalen. Daar na wil ik graag het boekje met jou en je partner snel een keertje bespreken. Dit interview zal ongeveer een uurtje duren.

Heel véél plezier met jouw dagboekje,

Roel

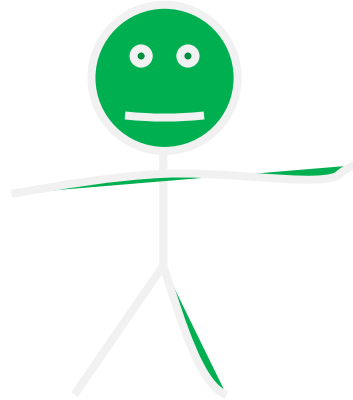
Voor eventuele vragen:

Email: roel.hendrikx@philips.com of rjhhendrikx@gmail.com

Telefoon: 0628048964

Dit ben ik...

Vul deze pagina in om te laten zien wie je bent.



Geslacht: M V

Leeftijd:

Aantal kids:

Opleiding: ...

Beroep:

Ik vind het leuk om / interesses ...

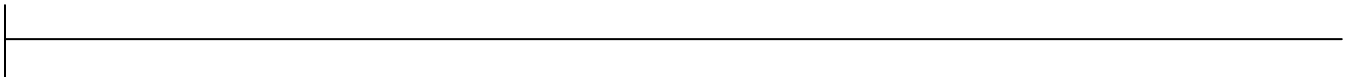
DAG 1

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /
Omcirkel wat van toepassing is of vul aan

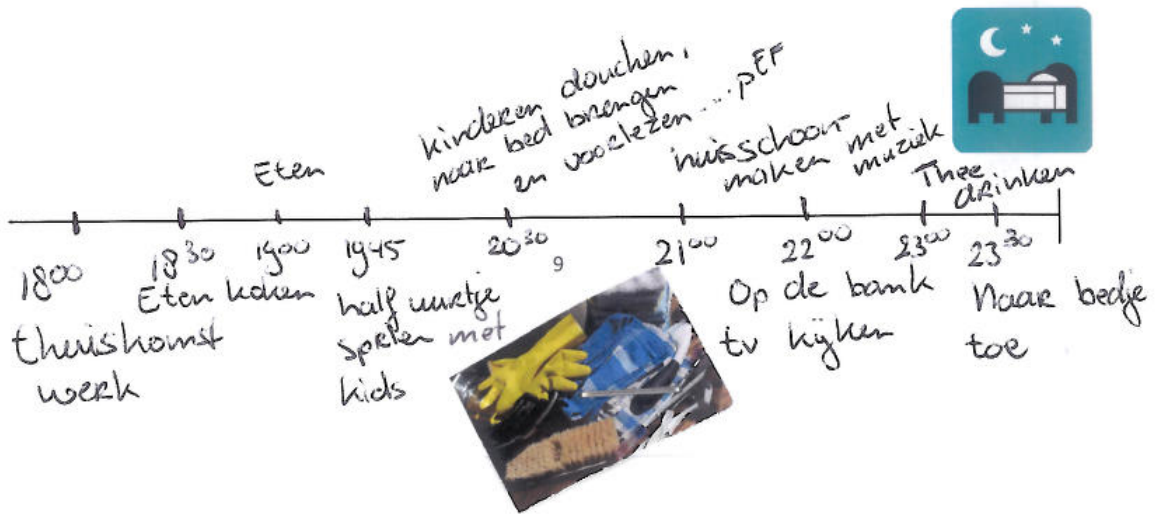
Wat heb jij vandaag gedaan?

Schrijf bij de tijdbalk welke activiteit je
vandaag gedaan hebt zoals strijken,
koken of voetballen en ook wanneer je
deze hebt gedaan.

De verschillende dingen, die je allemaal op je werk hebt gedaan, kun je
gewoon als één ding opschrijven.



Voorbeeld tijdbalk:



DAG 1

Welke van deze activiteiten doe je regelmatig, of keren dagelijks of wekelijks terug?

.....

.....

.....

.....

.....

.....

.....

.....

Mijn relaxte en minder relaxte momenten

Plak de groene stickers op de tijdbalk en terugkerende activiteiten om te illustreren wanneer jij je **relaxt** voelde gedurende de dag. En plak de rode stickers bij **stressvolle** momenten of activiteiten.

Leg ook uit waarom...

1.



2.





3.

4.

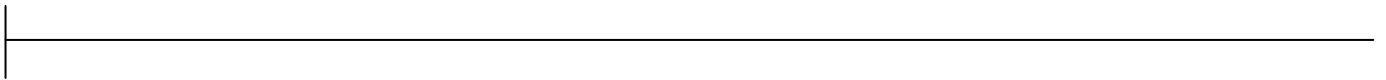


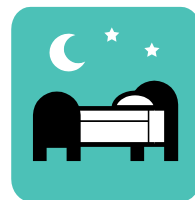
DAG 2

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /

Omcirkel wat van toepassing is of vul aan

Hoe zag jou dag er uit vandaag? En zet er ook bij met wie je deze dingen deed.
Vul a.u.b op de tijdbalk in...

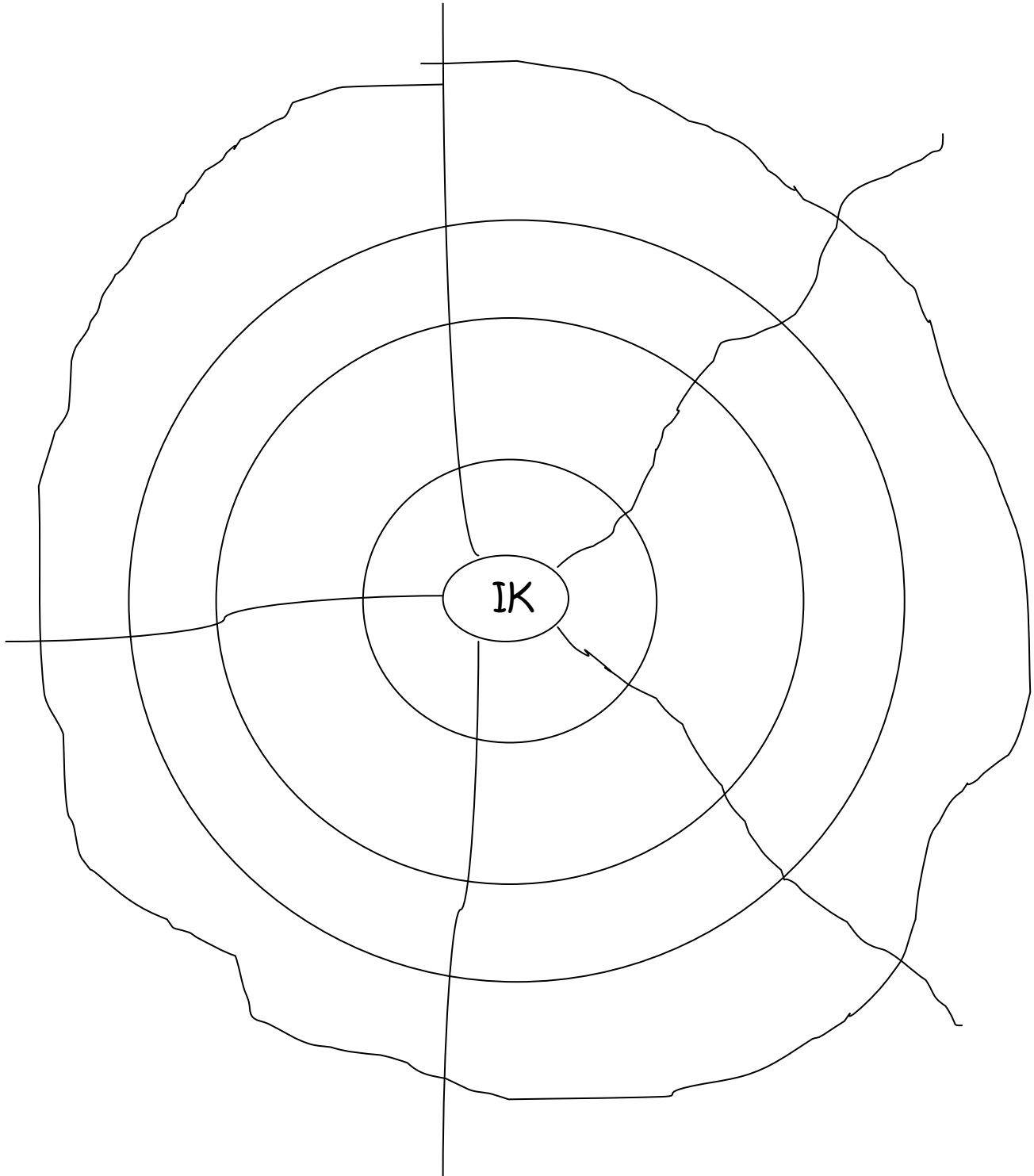




DAG 2

Wie zijn de mensen om je heen, waarmee jij vrije tijd doorbrengt?

Plaats de mensen die belangrijk voor jou zijn, dicht bij jezelf in het diagram.



Welke relaxte dingen doe je met deze mensen bij jouw thuis, bijvoorbeeld koffie drinken, met de kids spelen of televisie kijken?

.....

.....

.....

.....

.....



Beschrijf een typische huiselijke activiteit met het gezin, die relaxerend is? Schrijf er ook bij waarom je dit zo ervaart.

.....

.....

.....

.....

.....

.....

.....

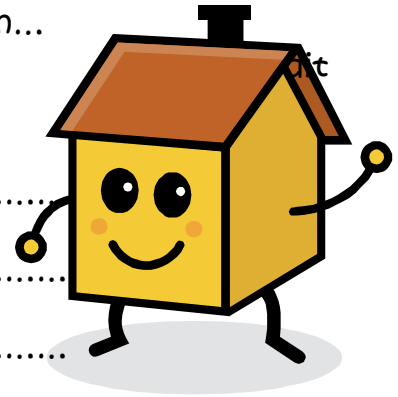
DAG 3

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /
Omcirkel wat van toepassing is of vul aan

Teken in het kader een plattegrond van de begane vloer van jouw huis. Gebruik de groene stickers om aan te geven wat de beste plekken zijn om te relaxen en de rode stickers voor de minder betere plekken.

A large, empty rectangular box with a black border, intended for drawing a floor plan of the ground floor.

Welke relaxte dingen heb jij vandaag allemaal thuis gedaan...
Met wie was je? En waar en wanneer in jouw huis heb jij
gedaan?



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Mijn lievelings plekje in huis is...

.....

, omdat.....

.....

.....

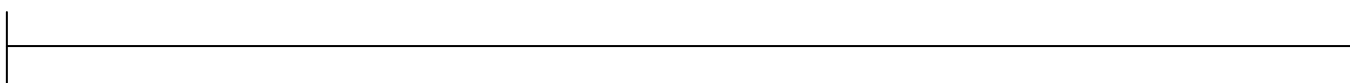
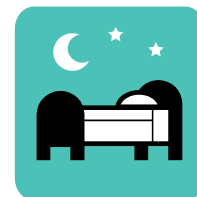
Dag 4

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /

Omcirkel wat van toepassing is of vul aan

Vertel mij hoe je avond er uit ziet, na een dag werken??? Als je vandaag niet hebt gewerkt, beschrijf dan de avond van je laatste werkdag.

Vul a.u.b in op de tijdbalk...



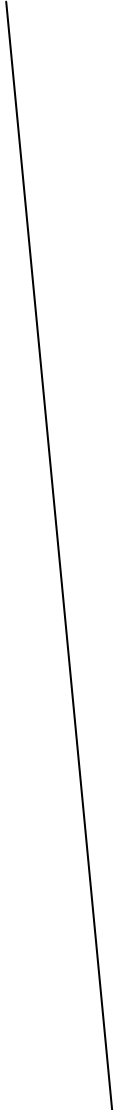
Plak de groene stickers op de tijdbalk om te illustreren bij welke activiteiten jij je **relaxt** voelde gedurende de avond. En plak de rode stickers bij **minder relaxte** momenten of activiteiten.

Kun jij je een avond herinneren na thuiskomst van een dag werken, die heel relaxed was? En ook eentje die absoluut niet relaxed was?

Gebruik de inspiratie woorden en plaatjes.

Relaxte avond

Niet relaxte avond



Wat vond jij eigenlijk van je avond vandaag?

.....

.....

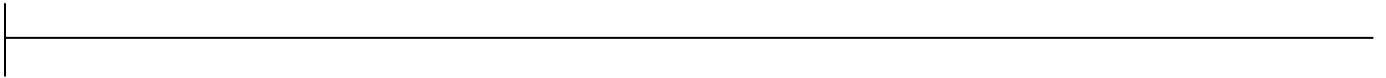
.....

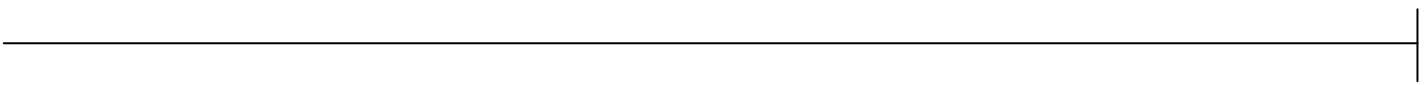
DAG 5

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /
Omcirkel wat van toepassing is of vul aan

Geef op de tijdbalk aan wanneer jij gedurende de dag behoefte hebt om te relaxen en op welke manier. Vertel ook waarom dit wel of niet mogelijk was.

Bijvoorbeeld: Om 15.00 wilde ik eigenlijk even een rondje wandelen, maar ik moest werken.





DAG 5

Relaxen betekent voor mij...

Maak een collage met o.a. de woorden en plaatjes achter in dit boekje van wat relaxen voor jou betekent. Vul eventueel plaatjes aan met woorden. Denk er ook aan met wie jij relaxt.

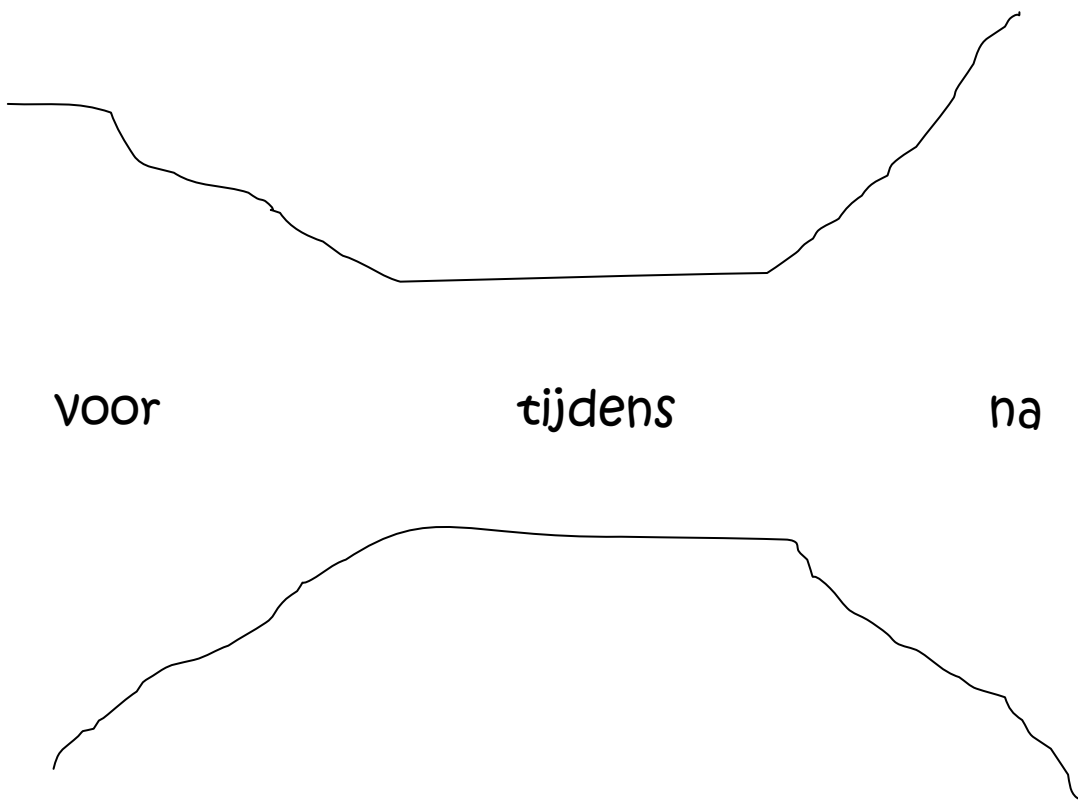
Collage



Wat is jou favoriete manier om te relaxen met anderen...

.....
.....

Gebruik de plaatjes en/of woorden om te beschrijven hoe jij je voelt voor, tijdens en na jou favoriete manier om te relaxen met anderen.



Relax jij ook wel eens voor de televisie? Beschrijf hoe jij je voelt na het televisie kijken...
woorden. Gebruik de inspiratie

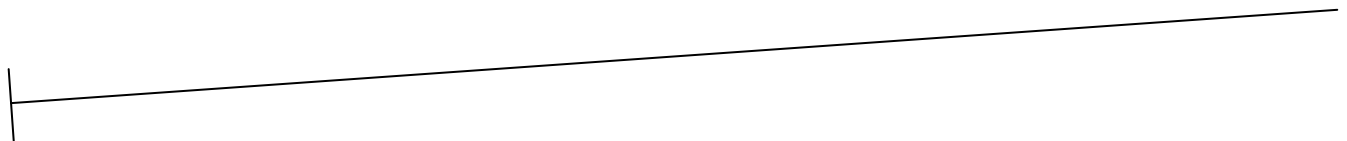
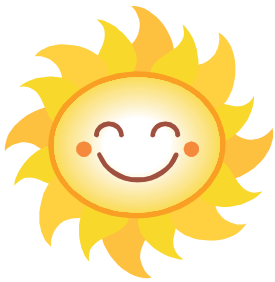
.....
.....
.....

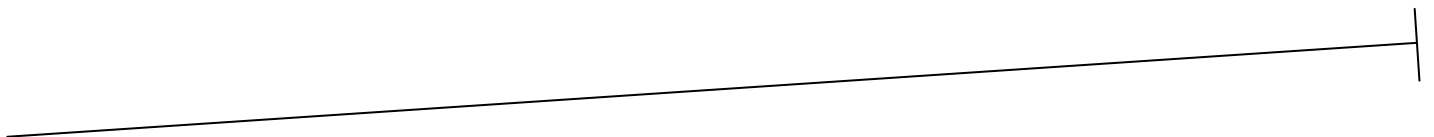
DAG 6

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /
Omcirkel wat van toepassing is of vul aan

Mediagebruik – lezen, televisie kijken, muziek luisteren, computeren

Als je vandaag media hebt gebruikt, kun jij dan aangeven op de tijdbalk welke en wanneer jij deze hebt gebruikt en met wie?





Plak de groene stickers op de tijdbalk om te illustreren wanneer jij je **relaxt** voelde tijdens het mediagebruik. En plak de rode stickers bij **niet relaxte** media activiteiten en momenten.

DAG 6

Televisie kijken

Beschrijf jouw positieve en negatieve ervaringen met televisie kijken...

Gebruik de inspiratie woorden en plaatjes.

Positief

Negatief

Ik kijk liever samen televisie, dan alleen, als ik...

.....
.....
, omdat.....
.....
.....



Soms kijk ik liever alleen televisie, wanneer...

.....
.....
, omdat.....
.....
.....

Dag 7

Het is dag, en vandaag heb ik / gewerkt / was ik vrij /
Omcirkel wat van toepassing is of vul aan

Vandaag heb je allerlei apparaten of hulpmiddelen gebruikt voor het creëren van relaxte activiteiten en/of momenten, bijvoorbeeld de koffiezetter, gameboy, mobiele telefoon of zonnebank.

Vertel hoe elk van deze momenten jou een relaxt gevoel gaven en met wie je deze beleeft hebt:

Gebreek de inspiratie woorden en plaatjes.

Apparaat / Hulpmiddel

Omschrijving relaxende gevoel

1.

2.

3.

4.

5.

6.

Het apparaat dat ik het liefste gebruik in mijn vrije tijd is...

.....
.....
, omdat.....
.....
.....

Het apparaat dat mij samen brengt met anderen in mijn huis, is...

.....
.....
, omdat.....
.....
.....

Dag 7

Mijn vrije tijd zou nog relaxter zijn als...

.....

.....

, omdat.....

.....

.....

Als ik een ding mocht wensen om optimaal te relaxen, dan wenste ik...

.....

.....

, omdat.....

.....

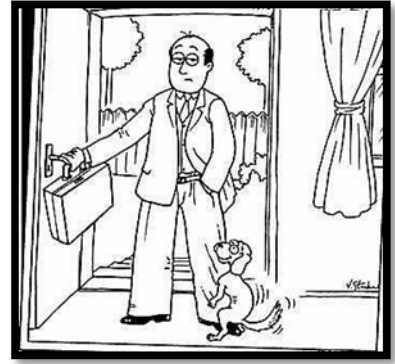
.....

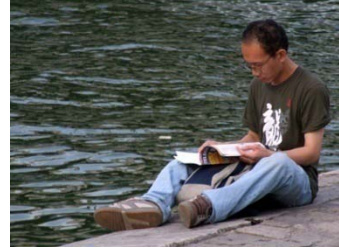
Bedankt!

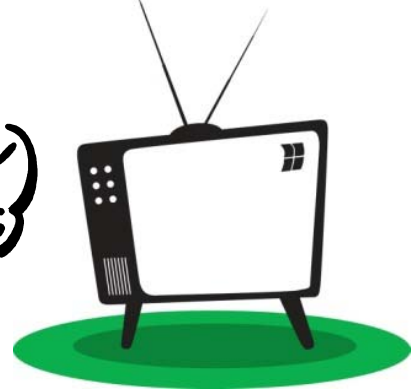
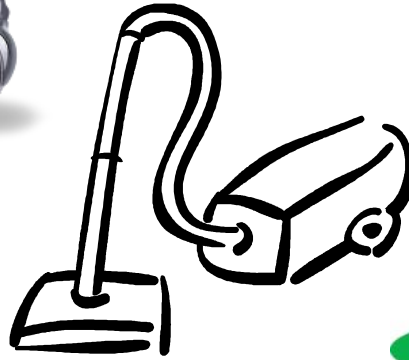
Opmerkingen:

sympathiek kil ongeïnteresseerd intelligent
 verveeld sociaal **bevrijdend** eenzaam
vermakelijk kort chaotisch verliefd
 hoopvol **troosteloos** vastgelegd
afwachtend *nerveus* muzikaal teer boos
 opbouwend rommelig fris onzeker
dankbaar *gul* druk dynamisch zwak reislustig
 opeengepakt snel super stil *sacri*
ongeduldig nieuwsgierig koppig
 verbaasd onbehaaglijk gezellig glad
geroutineerd uitgerekt onder druk warm
 gesloten *geïnspireerd* wijs **geheimzinnig**
 bewerkbaar **ontspannen** wijs **geheimzinnig**
 bewerkbaar *star* onaardig duidelijk
 langdradig **rusteloos** heerlijk af slaperig
 of e: m: e: e: m: **hardleers** *vertrouwd* sneels

ontsnapping **kriebelig** gesluiterd
 gevaarlijk opgewonden feestelijk
spannend lichamelijk sportief geordend
traag rust *licht* stinkend
overzichtelijk **RUW** uitbundig **kalm**
 gestrest *zweverig* persoonlijk gebroken
 gelukkig versnipperd droog zacht gebonden
 diffuus samen *verwannerij* flexibel
afstandelijk slaperig versleten huiselijk
 dwangmatig attent **sprankelend**
 overbodig natuurlijk Relax
 vanzelfsprekend geruisloos ontspannend
 vleierend **ijzig** leeg scherp **VLUCHTIG**
 verwaterd **bijzonder** uitbundig
 technisch genoeg hartstochtelijk organisch
 elektrisch gespannen *beweglijk* frustrerend
 leuk **droevig** **LIEF** creatief open
 hartelijk behulpzaam *Welwillend*







Appendix G. Interview questions of contextmapping

Ik probeer meer te weten te komen over hoe jij in het dagelijkse leven relaxt met anderen thuis. Probeer daarom zo uitgebreid mogelijk antwoord te geven op de vragen. Geef daar ook voorbeelden bij. Vertel alles dat in je opkomt, ook al denk je dat het nergens op slaat, geef je fantasie de vrije loop. Vertel mij ook dingen die je graag zou willen, maar die er nog niet zijn.

Eerst vraag ik een aantal algemene dingen over je doordeweekse avond en dan licht ik SPELEN en TELEVISIE KIJKEN uit.

Introductie

1. Kun je een doorsnee doordeweekse avond beschrijven?
2. Welke dingen, die je doordeweeks tijdens de avond doet, doen jou ontspannen?
3. Doe jij ook wel eens meditatie of yoga om te relaxen?
4. Noem een aantal activiteiten / dingen die je met je echtgenoot doet om op een doordeweekse avond te relaxen?
 - a. Wanneer doe je deze dingen?
5. Wat vind je thuis het leukste om te doen met je kinderen?
 - a. Hoe vaak komt dit voor?
 - b. Doet je echtgenoot ook mee dan?
 - c. Zijn er nog andere dingen die je erg leuk vindt om te doen met je kind(eren)?

Het volgende gedeelte van het interview heeft betrekking op het spelen van spellen en TV kijken met je echtgenoot en kind(eren).

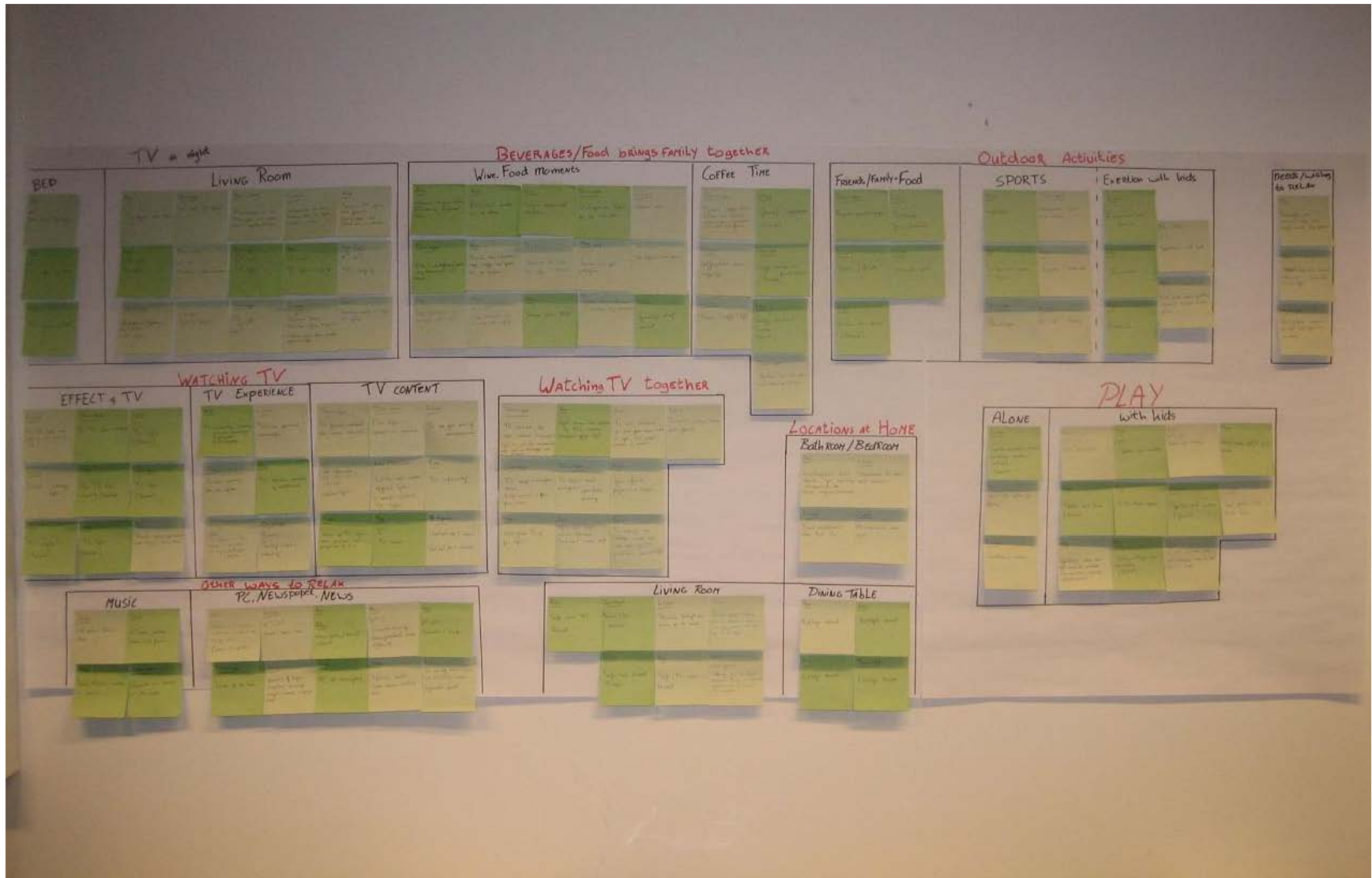
Spelen

6. Spelen jullie ook weleens alleen/samen met de kinderen op een doordeweekse avond?
 - a. Ervaar je dit als ontspannend / relaxed?
 - b. Welke spellen spelen jullie dan?
 - c. Wie beslist welke spellen jullie spelen?
 - d. Wanneer doen jullie dit? Kun je een tijd aangeven?
7. Spelen jullie ook weleens gezelschap spellen met het gezin?
 - a. Wanneer? En hoe vaak ongeveer?
 - b. Welke spellen spelen jullie dan?
8. Als jij een spel mocht verzinnen op met je kind(eren) thuis te spelen, hoe zou dat spel zijn? Het spel mag een verandering zijn van een bestaand spel of iets totaal nieuws.
 - a. Waar moet een spel aan voldoen om leuk en ontspannen te zijn?
 - b. Welke thema's/onderwerpen zijn belangrijk in een dergelijk spel?
 - c. Is een digitale variant om te spelen een toevoeging aan je avond?
 - d. Stel je nog verdere eisen aan een digital vorm van spel?

TV kijken

9. Kijk je op een doordeweekse avond TV om te relaxen?
 - a. Brengt jouw dat ook echt tot rust of zijn er andere activiteiten die jou echt relaxt maken?
 - b. Wat doet je besluiten TV te gaan kijken?
 - c. Met wie doe je dit?
 - d. Waar kijken jullie naar dan? Wordt daar bewust voor gekozen? En op welk tijdstip?
 - e. Wat trekt jullie aan in deze programma's? Wat vinden jullie daar nou leuk aan?
 - f. Wat is jullie lievelingsprogramma?
 - g. Wordt er tijdens het televisie kijken gepraat? En hebben de onderwerpen van het gesprek betrekking op de zaken op televisie of dagelijkse dingen?
 - i. Kun je daar iets meer over vertellen?
 - h. Kom je tot rust door deze programma's? Of zijn het meer de gesprekken, die voor rust zorgen?
 - i. En geven dit soort ervaringen (TV kijken en praten) een negatief of positief gevoel? Indien positief, hoort praten dus bij het TV kijken? Wat nou als je niet mocht praten?
 - j. Voel jij je relaxed voordat je naar bed gaat? Of zijn er nog zaken die je bezighouden in je hoofd?
 - i. Heb je 's morgens het gevoel helemaal uitgerust te zijn?
10. Vind je de programma's tegenwoordig op TV beter dan die van vroeger of waren vroeger bepaalde programma's leuker?
11. Als jij een televisie programma mag maken voor een doordeweekse avond om samen met je echtgenoot (en kinderen indien van toepassing) te kijken, hoe zou dat er uit zien? Het programma mag een verandering zijn van een bestaand programma of iets totaal nieuws.
 - a. Welk doel wil je bereiken met dit programma?
 - b. Welke onderdelen vind jij daarin belangrijk? (Rust, ontspanning, vermakelijkheid, actie, drama, sport, lachen, etc.)
12. Wat zou jij aan de huidige TV veranderen om een meer relaxte ervaring met TV te krijgen?
13. Stel je voor morgen ben je ineens TV ontwerper. Als opdracht moet je iets vervangends bedenken voor de huidige vorm van televisie kijken. Hiermee kun je de televisie precies maken zoals jij wilt. Vervelende en negatieve dingen aan televisie kun je vervangen of positieve dingen kun je nog beter benadrukken. Jouw ontwerp moet een positieve, relaxte ervaring leveren voor jou en je partner? Wat ga jij verzinnen?

Appendix H. Affinity diagram of diaries



Appendix I. Personal Cardsets

Ben

Ben (44) is happily married and has two sons of 7 and 9. They live in a comfortable house in Venlo. As entrepreneur he runs a successful consultancy company in finance. Besides being a fanatic runner, he is also committee member of the regional running club. Ben is an extremely busy person. But he tries to find a healthy balance between work and family. He enjoys being at home with his family. At home he likes to play with his kids and talk with his wife. Ben is also fond of good wine and delicious food. Food brings him together with the family. Relaxing means for him being active and socializing or using his brains rather than crashing on the sofa in front of the television. Ben favors products that enhance life and are exciting to use. Recently, he has bought an iPhone to be up-to-date about the latest news facts.



“Playing with my children is quality time and distracts me from my daily hassles”

“I am not watching TV to unwind. But it makes me feel relaxed”

“I don’t have so many relaxing moments, especially not with my wife”

Evening Scenario

Ben comes home from work around 6 o'clock. Today, his wife Anne has cooked dinner. Ben calls his boys, because dinner is ready. During dinner they discuss the day; the new employee at Anne's work, the funny joke from Ben's colleague and the boys tell what they learned in school today. Ben enjoys having dinner together, because it is the only time the whole family is together during the day. After dinner his wife clears the table and does the dishes.

Almost every evening Ben plays with the children in the living room for about 30 minutes. Ben experiences having dinner and playing with the kids as relaxing, temporarily distracting his mind. Today, his oldest son challenges him for a game of tennis on the Wii. Actually, he is more in for monopoly tonight, but he still has to answer some important emails and read a report for work tomorrow. Therefore, he decides to play a short, but active tennis game on the Wii. He manages to win from the youngest, but his oldest beats him in the last set. He likes to see his kids growing in playing games. Yesterday, he was astonished by his youngest son, who had built a really cool House from Lego. Before starting to work, he first brings the youngest to bed. Washing, pyjamas and no reading today, because it is already late. Playing tennis was so exciting that Ben completely lost track of time.

Now his batteries are recharged he start to answer some important emails on the desktop in the living room. After about an hour he joins Anne on the sofa. She just brought the oldest to bed and is now watching TV. While she is watching Desperate Housewives, he is reading a report for a meeting tomorrow. In the commercials Anne gets for the two of them a glass of wine. Though Ben is still working, he enjoys sitting on the couch with his wife and sipping wine. But this doesn't happen so often because he has a lot of outdoor meetings. As normally he stops working around ten o'clock. Ben likes to unwind the last hour of the evening in front of the television. It makes him sleepy. Tonight, they watch Nova, because Ben and Anne like to know what's going on in the world. During Nova Anne tells Ben about her colleague being pregnant, but Ben is more interested in the topic on TV. Around eleven they decide to go to bed.

Claims

- + Playing with the kids is having fun and distracting the mind
- + TV is a good medium to unwind and sit comfortable on the sofa
- Games and TV do not motivate users to take more rest during the evening
- Watching TV does not stimulate social interaction between couples

Esther



Esther (41) is married and has a daughter (10) and a son (12). They are a middle class family living in 's Hertogenbosch. There she works as a PR-manager at a medium-sized company. She likes her job, but family is most important to her. Esther always looks forward to be with the kids and chat with her husband about everything. For Esther relaxing means being together with her family or sometimes having a moment for herself. At home the kids always ask her to play board games or hide-and-seek. She enjoys seeing how creative her kids sometimes are. When the household chores are done, she surfs on the internet to look for music from back in the old days and reads private email. Esther also likes to read books or magazines. She always ends her evenings watching TV on the couch, sometimes together with her husband. But he doesn't like the womanish or informative TV programs. They only watch comedy together. Esther loves television, but doesn't want to depend on the TV programming. Like on the internet.

"I and my husband mostly watch different TV programs"

"When you play games you really learn to know the people and conversations are different. Playing is having fun!"

"I like TV programs that make me laugh a lot"

Evening Scenario

Today, Esther is back home early from work. Hence, she takes the kids from school and cooks dinner. Around six the family is having dinner. Dinner time is a relaxing time for the family, because they're all together. She enjoys the food and conversations at the table. While her husband is clearing the table and doing the dishes, she is looking in the cabinet for a game. Esther and the kids have the ritual to play a game after dinner about two times a week. The kids want to play the DVD game Disney in which they have to answer questions about film snippets, sounds and pictures of Disney movies on a board. But Esther has still a lot to do tonight and, therefore, proposes to play a quick game of Ludo. But Ludo is too simple for her son and he decides to do something else. Mother and daughter built up Ludo and play for about 20 minutes. Esther enjoys playing games with her kids, because playing shows her how her kids make decisions and react to winning and losing.

After the game is finished, she has to vacuum upstairs and iron the laundry. She doesn't like that. Usually, she switches on the TV when doing chores. Not that she really watches what's on, but it is not so silent. After vacuuming, she brings her daughter to bed and continues ironing. Around 9 o'clock she is finished and crashes on the couch to read a book for about an hour. Every evening at 10 she has the ritual to watch TV. Not that she has a fixed schedule for any particular program, but she really likes to watch TV. That makes her relax. Usually, she and her husband don't watch TV together, because they both like different TV programs. Tonight, her husband is again watching soccer. Fortunately, after the match he joins her on the couch and together they watch the end of Bridget Jones's diary. They laugh about some stupid things in the movie. Esther and her husband like to watch comedy together, but that doesn't happen a lot. After the movie they feel relaxed and tired and decide to go to bed.

Claims

- + Laughing together makes you feel relaxed
- + Playing games tell the parents something about the behavior/creativity of their kids
- TV programs determine whether couples watch television together
- Children often want to play longer than the parents have time available

Appendix J. Program ideation workshop

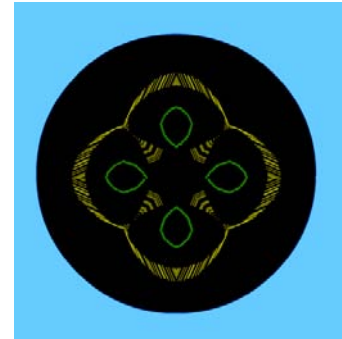
Duur	Stap	Techniek	Aandachtspunten
Start 10.00 uur			
10 min	1. Inleiden	<ul style="list-style-type: none"> ✓ Heet deelnemers welkom. ✓ Bespreek het doel / criteria van de brainstorm. ✓ Bespreek het programma van de gehele new product brainstorm. ✓ Neem spelregels en afspraken door. ✓ Voorstellen / Icebreaker: Naam + meest en minst relaxte in de woonkamer tijdens doordeweekse avond. 	<ul style="list-style-type: none"> ✓ Zorg voor een relaxte sfeer met grappige video. ✓ Naam en meest en minst manier van relaxen in woonkamer. ✓ 1 minuut per persoon voor het voorstellen ✓ Maak groepen van 2 en plaats deze bij elkaar.
Duur	Stap	Techniek	Aandachtspunten
12 min	2. Inspireren	<ul style="list-style-type: none"> ✓ Bespreek belangrijkste customer insights (en het ontstaan ervan): spelen met partner+kinderen / televisie later op de avond. ✓ Sluit inspiratieronde af met de belangrijkste dingen die zijn opgevallen. 	<ul style="list-style-type: none"> ✓ Deel personal cardsets (persona / scenario) uit.
Duur	Stap	Techniek	Aandachtspunten
10 min	3. Ideeën genereren (Warm-up)	<ul style="list-style-type: none"> ✓ Doe een creatieve warming-up. ✓ Prikkel 1: stel de vraagstelling uit de innovatieopdracht centraal voor een spontane braindump. 	<ul style="list-style-type: none"> ✓ Inspireer de deelnemers over creativiteit en gebruik van personal cardsets. ✓ Elevator pitch.
Duur	Stap	Techniek	Aandachtspunten
30 min	3. Ideeën genereren (Ronde 1)	<ul style="list-style-type: none"> ✓ Word and picture game: bedenk concepten als team gerelateerd aan spelen met televisie als display medium. ✓ Prikkel 1: faciliteer customer insights. ✓ Elke groep presenteert concept aan de andere. Indien tijd over, anderen geven feedback. 	<ul style="list-style-type: none"> ✓ Zorg dat customer insights 'groots' aanwezig zijn op powerpoint slide. ✓ Deel kaarten met woord en plaatje uit. ✓ Game duurt max. 15 minuten. ✓ Presentatie max. 3 minuten.

5 min	Pauze	Verlaat brainstorm ruimte voor koffie/thee.	
30 min	3. Ideeën genereren (Ronde 2)	<ul style="list-style-type: none"> ✓ Pictionary: Bedenk een concept als team gerelateerd aan televisie kijken met partner later op de avond. Schets dit en vul aan met steekwoorden. ✓ Prikkel 1: faciliteer customer insights. ✓ Schets wordt doorgegeven aan andere groep en die presenteert concept aan de rest. Indien tijd over, anderen geven feedback. 	<ul style="list-style-type: none"> ✓ Zorg dat customer insights 'groots' aanwezig zijn op powerpoint slide. ✓ Game duurt max. 12 minuten. ✓ 6 minuten voor interpretatie concepten ✓ Presentatie max. 3 minuten.
Duur	Stap	Techniek	Aandachtspunten
25 min	4. Evaluatie ideeën	<ul style="list-style-type: none"> ✓ Vraag de deelnemers hun favoriete drie ideeën te noemen, die het beste aansluiten bij het doel en met meeste potentie. ✓ Noem bij elk idee het sterkste en zwakste punt. ✓ Presenteer de rangschikking aan de groep van minst goede to beste concept. ✓ Hang de drie beste ideeën op aan de muur. ✓ Vraag de deelnemers om een eerste reactie over de rangschikking. Check het (WAUW) gevoel over productconcepten. 	<ul style="list-style-type: none"> ✓ Schrijf de zwakste en beste punten op post-its en plak ze bij het concept op flip-overvellen. ✓ Plak groene 'post-its' op conceptboard bij waardevolle suggesties.
Duur	Stap	Techniek	Aandachtspunten
2 min	5. Afronden	<ul style="list-style-type: none"> ✓ Bedank deelnemers voor aanwezigheid. ✓ Vertel wat de volgende stappen zijn in het project. ✓ Slotwoord. 	<ul style="list-style-type: none"> ✓ Kijk of deelnemers betrokken willen blijven bij dit project.
Afsluiting			

Appendix K. Conceptual new product designs

Hear and see your own heart beat

Giving a user continuous biofeedback about his or her heart beat on the TV makes him or her aware about how stressed or in which relaxing state they are. Subsequent interventions (e.g. taking a rest) show the user directly the effects on their heart beat. On television the user can perceive his or her heart beat by means of audio and visual information. From this information they learn how to better unwind in the future. The visual information is represented on the TV as a kaleidoscope, which is in itself a soothing experience. The colored, changing shapes (see image) of the kaleidoscope vary depending on the heart beat, whereby a faster heart beat illustrates faster moving shapes on TV and vice versa. The audio biofeedback is represented as the sound of a normal beating heart. Hearing and seeing your own heart beating and the effects of interventions aids you to better and deeper relax.



Floating through the galaxy – ultimate freedom

Experiencing the illusion to float freely through the galaxy without any attachments might relax users. In this metaphorical based concept users lie down on a vibrating mattress and see themselves flying through the air on the television. This mattress can also be placed on the sofa. They depart up from the ground with lots of vibrations and climb all the way up to the stars, where vibrations are minimal. In the journey, displayed on the TV, they see first see streets and houses, and then go up through the clouds to eventually end up among the flickering stars. In the meantime, the mattress gives vibrations in certain patterns that stimulate relaxing states. Because users attribute higher probability to what they see than to what they feel, they think they are flying in the air. Temporarily, users have the feeling to be completely free and their muscles are stimulated with vibrations that relax them even more.



Show yourself to the family

Youtube is enormously popular among adults and children with all its funny, amusing, bizarre and entertaining videos. In this game parents and kids have to do all sorts of tasks and tricks based on Youtube movies that are played back on the TV. For example, one of the kids has to do Michael Jackson's moonwalk that was just shown on the TV. Or the mother has to sing the refrain of the song 'Laura' from Jan Smit for the rest of the family. The rest of the family has to assess whether you were successful or not. When users are successful they collect scores. The user with the highest score wins the game. Users can select the Youtube movies they like or add their own ones to a database and invent their own tasks to do. This game is hilarious to play, relaxing, increases the family feeling and stimulates kids and parents to show their creativity in front of the rest.

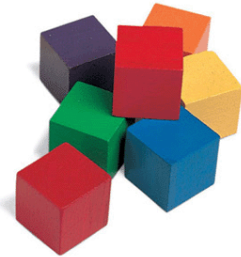


The more relax, the bigger the screen size

Couples do not watch TV often together due to an interest in different TV content. To counteract this, a split screen on the TV shows both programs partners like. However, the level of relaxation determines the size of the content. The one who is most relaxed gets the most surface / biggest area on the TV where he or she can see the program, while the one who is less relaxed gets a smaller area. In sum, couples will try to be as relax as possible in order to get a bigger program size on the television.

Kids world

In this concept the parents have to displace themselves in the kids' imagination or fantasy. The kids create in an artistic way their own questions, riddles or tasks for the parents, which they have to guess correctly. If they do, the parents win, otherwise the kids win. However, the kids try to make guessing correctly difficult in order to win from their parents. The kids create with a basic set of objects (like LEGO blocks), digital pen and paper, photos or voice recorder an image or story (e.g. small movie) that is displayed on the TV. For example, the kids can draw in cartoon form about what they learned in school today and add some spoken words to the cartoon about what the teacher said during the lecture. Now, the parents have to guess what is expressed in the cartoon. They have to ask themselves a lot of where, who and what questions on the kids level to come to a correct answer. At this part there is a lot of interaction between parents and kids, where parents guess and the kids give small hints. The fun part of this game is to see the creativity of the kids, where they can think off, to make the parents loose in the game. Also, increased family interaction is a strong point of this concept.

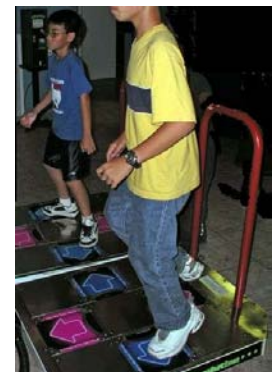


WHY? game

Kids ask always a lot of why questions and parents might not be able to answer them always, because the questions are too difficult or do not have the time. Television or media can be used to answer these why questions for the kids and parents. The kids can pose the question to the TV, where the TV seeks for an answer to the question. The TV makes an understanding of the question through speech recognition / analysis and utilizes several sources such as internet to find an answer. For example, an answer can be given by a Youtube movie. The WHY? Game is an easy and funny experience for the kids and parents.

Multi-user Packman Game

In the packman game there are multiple players in one field, who have to work together to capture the monsters. Players have to come from both sides to capture the monsters. When players win they go to the next level with harder mazes and questions. The control of the packman is done with a foot patch with arrows, where you can jump on to press the buttons to make the packman move. On a Philips TV with ambi-light certain foot movements or capturing monsters is coupled to light effects of the ambi-light.



Bedtime Story TV

Bedtime stories are a way to increase connectedness between parent(s) and child, a way to improve concentration/listening/reading skills of child and (according to diary) a way to relax for parents. Bedtime story books can be made more interactive; audio books are already successful, TV books may be even more fun. Reading from TV screen is possible, or from e-reader and further animations in TV sounds/ambient light (e.g. ambient light turns green when story is in the forest).

Mantra fun

Mantras (the art of repetition) are often associated with relaxation. One could think of doing repetitive movements or making repetitive sounds together in front of the TV. The TV does the gesture/voice analysis. The TV assigns a “mantra score” to these sounds and movements (e.g. low-pitch, repetitive sound is preferred over high-pitch changing sound, and slow, fluent, repetitive movements are preferred over fast, short, non-repetitive ones). Optionally, more voices/bodies result in higher scores. Optionally, the TV can provide rewards such as visual- and audio-effects:

- 3 voices saying “blablabla” for a long time and well-synchronized. The TV starts adding an echo-effect to this.
- 2 people in front of the TV are shown as profiles (body outlines). They make a fluent movement, well-repetitive and synchronous (e.g. sequentially touching their knee and forehead). The TV starts adding an effect such as a sound effect when the forehead is touched (“donggg”) and a visual effect (e.g. flowing water on the background)

Results of these video/audio sculptures can be uploaded on Youtube, just like e.g. Guitar Hero results.

Sketchpad: Everyday art

During daytime, children at school (or parents at work, during break) can add a drawing to Sketchpad by accessing it on their PC or mobile. When coming home, they see the Sketchpad results as the startup screen of their TV. They can e.g. comment to it, start adding to it or play a “guess what I’ve drawn game” around it. Parents can also share (funny/caring) positive experiences and moments they experience during the day by means of multimedia messages (e.g. Youtube movies, hilarious internet articles / photos, or a flash animation ‘I love you’) to each other on Sketchpad, to be viewed at 23.00 when turning off the TV (shutdown screen).

Story/mood recap function

After a hard day's work, busy adults (e.g. parents with children) sometimes only have 1 hour for themselves, before they themselves need to go to sleep. They like watching movies but don't have enough time to see a full movie. The “continue yesterday's movie” experience can be improved by a Recap function: Instead of pressing Stop/Pause when going to bed, they press the Recap key. When continuing the movie the next day, the Recap function does more than simply continue the movie; it plays some relevant scenes that were shown the day before, to get the parents back into story/mood of the movie and next starts just before the point where the parents stopped watching. This way, busy adults may be motivated to watch more movies at night during weekdays.

Appendix L. Multi-criteria matrix for concept selection

Concept name	High					Medium										low			Total Score	Average total score	Ranking	
	Mental Effect	Social	Realisability of Hi-Fi prototype in time	Gut feeling about concept	Innovativeness	Voluntary Product Interaction	Humorous	Mental distraction from work	Tailored To Target Group	Relevance to TV	Enjoyment	Easy to communicate as relaxing product	Fits N = 1 Experience	Technical Feasibility as final product	Differentiation	Duplicability of competitors	Robustness of system	Physical Effort				Fit Philips product portfolio
1. Hear and see your own heart beat	1	-2	0	-1	-2	-1	-2	1	-2	2	0	1	0	2	-1	-2	1	-2	0	-5.25	-4.38	11
	1	-2	0	-2	-2	0	-2	1	0	1	0	1	0	2	2	-2	2	-1	-1	-3.50		
2. Floating through the galaxy	2	0	-1	1	2	-1	-2	2	-1	1	1	0	0	2	2	-1	0	-2	-1	4.75	3.38	5
	2	-1	-2	-1	1	1	-1	1	0	1	1	0	2	0	2	0	0	0	-2	2.00		
3. Show yourself to the family	1	2	2	1	0	1	2	1	2	1	2	-2	2	2	-2	-2	2	1	-1	10.00	7.50	2
	0	2	2	-2	0	1	2	2	0	0	2	-1	2	2	-2	-2	0	1	-1	5.00		
4. The more relax, the bigger the screen size	0	1	0	-2	0	0	0	0	1	2	0	1	0	2	-1	-2	1	-2	1	0.50	2.50	6
	0	1	0	-1	2	1	1	0	0	0	0	0	1	2	2	0	-1	-2	-1	4.50		
5. Kids world	1	2	-2	0	2	0	1	2	2	1	1	-2	1	1	1	0	2	-1	-2	6.75	7.25	3
	0	2	0	1	1	2	1	1	1	1	1	-2	1	1	1	0	0	-1	0	7.75		
6. WHY? Game	0	1	-2	-1	1	0	-1	0	-2	0	1	-2	2	0	2	2	-2	-1	2	-0.25	-0.75	10
	-1	2	0	-2	1	1	0	1	0	-1	0	-2	1	1	0	-2	0	-1	-2	-1.25		
7. Multi-user Packman Game	0	1	1	-1	-1	2	1	1	0	1	1	-2	-1	2	-2	-2	1	2	-1	1.00	-0.38	9
	-1	1	-1	-2	-1	1	1	1	0	1	1	-2	0	2	0	-1	1	2	-2	-1.75		
8. Bedtime Story TV	1	1	1	-2	1	1	0	0	-2	-2	1	-1	0	2	1	-2	2	-2	0	1.00	4.75	4
	1	2	0	2	1	1	0	1	0	1	1	-1	0	1	1	0	0	-1	1	8.50		
9. Mantra fun	1	1	-2	-2	2	0	0	-1	-2	1	-2	1	1	-1	2	2	-2	1	1	0.50	2.50	6
	0	1	-1	0	1	2	2	0	1	1	1	-1	0	-1	1	1	-1	1	0	4.50		
10. Sketchpad: Everyday art	1	2	1	2	1	2	1	1	1	1	1	0	2	2	1	-1	2	-1	0	12.75	10.00	1
	0	1	0	2	1	1	1	0	1	1	1	-2	1	1	1	0	1	-1	1	7.25		
11. Story/mood recap function	0	0	-1	-2	2	0	0	1	2	2	0	-1	2	-2	2	-1	-2	-2	1	0.75	1.50	8
	0	0	-1	0	1	-1	0	0	0	2	0	-1	1	1	1	1	1	-2	2	2.25		

Description of selection criteria:

1. Mental Effect: Will the product have a relaxing effect on the users' mental state?
Scale (Very Stressed - Very Relaxed)
Based on: results contextmapping
2. Social: Does the product enable users to use the product together?
Scale (Single-user - Multi-user)
Based on: results contextmapping
3. Realisability of hi-fi prototype in time: Is the prototype realizable in the reserved time?
Scale (Impossible - feasible)
Based on: Philips criteria
4. Gut feeling about concept: Is there a strong belief about the success of the product based on emotions, judgment, expectations and intuition?
Scale (Fail - Successful)
Based on: <http://www.nieuweproductenbedenken.nl/default.asp?pid=842>
5. Innovativeness: Is the product original and novel embodying a radical change?
Scale (Not innovative - Very innovative)
Based on: <http://www.nieuweproductenbedenken.nl/default.asp?pid=814>
6. Voluntary Product Interaction: Is there a lot of interaction between the product and the user?
Scale (Not interactive - highly interactive)
Based on: Interactivity was an important aspect for participants in the contextmapping and high levels of interactivity hold the user's attention (Kubey & Csikszentmihalyi, 2002).
7. Humorous: Does the product provide opportunity to laugh?
Scale (Serious - Hilarious)
Based on: Comedy and humor are associated with inducing and enhancing positive affective states accompanied by feelings of relaxation, decreasing levels of stress-linked hormones, a more positive outlook and greater tolerance to adversity (Mills, et al., 2009; Zillmann & Vorderer, 2000).
8. Mental distraction from work: Does the product detach users from ruminating about work.
Scale (very engaging - very engaging)
Based on: Sonnentag & Bayer (2005)
9. Tailored To Target Group: Does the product fit the behavior of the target group?
Scale (One size fits all - User-centred)
Based on: Benyon *et al.* (2005)
10. Relevance to TV: Does the product somehow connect to television?
Scale (Unrelated - Related)
Based on: project goal from Philips
11. Enjoyment: Does the product provide a positive, pleasurable experience to the user?
Scale (Boring - Fun)
Based on: Blythe (2003)
12. Easy to communicate as relaxing product: Can Philips effectively communicate the relaxing benefits of the product to its customers?

Scale (Low allure - High Allure)

Based on: <http://www.nieuweproductenbedenken.nl/default.asp?pid=814>

13. Fits N = 1 Experience:

Scale (Fixed functionality - Adjustable to preference)

Based on: recommendation to construct technologies in a habitual way to create private meanings (Morley & Silverstone, 1990)

14. Technical Feasibility as final product: Does Philips have the resources/capability to produce the product in technical terms?

Scale (Impossible - Possible)

Based on: http://www.bnet.com/2439-13241_23-174979.html

15. Differentiation: Is control of the resource/capability in the hands of a relative few?

Scale (Concurrence - Uniqueness)

Based on: Crawford & Di Benedetto (2006)

16. Duplicability of competitors: Do competitors have difficulty in copying the product, and will there be significant cost disadvantage to a firm trying to obtain, develop, or duplicate the product?

Scale (Easy - Difficult)

Based on : http://www.bnet.com/2439-13241_23-174979.html

17. Robustness of system: Does the product deploy technology that is unlikely to break or fail, i.e. its error proneness?

Scale (Weak - Strong)

Based on: Philips criteria

18. Physical Effort: Does the product require physical effort when in use?

Scale (Inactive - Active)

Based on: being physical active had a positive effect on the need for recovery (Sonntag, 2001)

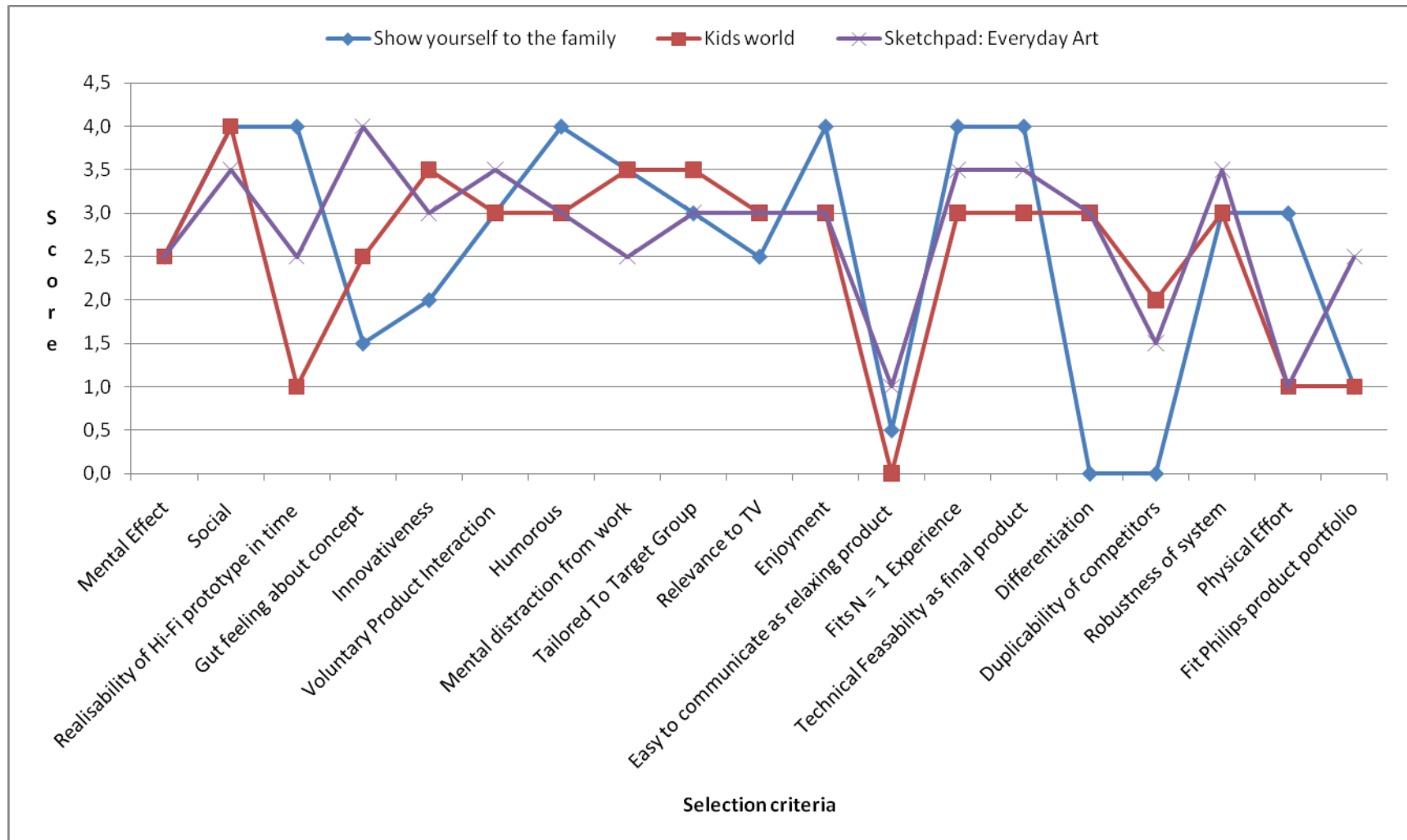
19. Fit Philips product portfolio: Does the product fit in with the Philips product portfolio? (new products management)

Scale (Not at all – Completely)

Based on: <http://www.nieuweproductenbedenken.nl/default.asp?pid=814>

The above list is a mixture of project based criteria and Philips based criteria. The project based criteria came forward out of the project goal as defined by Philips, literature sources and results of context mapping. Philips based criteria came forward out of the literature and from supervisor P.D.Eng Tim Tijss. However, note that in the list the criteria investments, price, sales and profit are not included, because they are beyond the knowledge of the researcher and are irrelevant for the goal of this project.

Appendix M. Value curve of best three concepts



Appendix N. Overview participants of user study

Name/Features	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
Sex	Female	Male	Female	Female	Male
Age	35	40	36	29	43
Education	University	PhD	MBO	HBO	University
Profession	Entrepreneur	Researcher	Chemist assistant	Hotel employee	Director ING limburg
Children (Age)	1 Girl (3)	2 Boys (5,7)	1 Girl (3)	1 Boy (4), 1 Girl (2)	1 Boy (2), 1 Girl (4)
City	Venlo	's Hertogenbosch	Tegelen	Vlissingen	Venlo
Number of times per week playing with child	4x	2x	5x	0x	1x
Easily relax at home during workdays	Extremely	Moderately	Fairly	Moderately	Moderately

Appendix O. Relaxation and social bonding questionnaire

Duid voor elk van de items aan hoe jij je voelde tijdens het spelen op onderstaande schaal.

0 1 2 3 4 5 6

Helemaal niet mee eens Helemaal mee eens

1. Niet aan werk denken was een belangrijke oorzaak om te relaxen tijdens het spelen.
2. Tijdens het spelen van Kids World voelde ik een verzwakte band tussen mij en mijn kinderen.
3. Het vertellen van een fictief verhaal was een belangrijke oorzaak om te relaxen tijdens het spelen.
4. Samen zijn met mijn kinderen was een belangrijke oorzaak voor het versterken van mijn band tussen mij en mijn kinderen tijdens het spelen.
5. Tijdens het spelen van Kids World voelde ik mij gestresst.
6. TV kijken was een belangrijke oorzaak voor het versterken van mijn band tussen mij en mijn kinderen tijdens het spelen.
7. Samen zijn met mijn kinderen was een belangrijke oorzaak om te relaxen tijdens het spelen.
8. Door het spelen van Kids World kwam ik meer te weten over mijn kinderen.
9. Niet aan werk denken was een belangrijke oorzaak voor het versterken van mijn band tussen mij en mijn kinderen tijdens het spelen.
10. TV kijken was een belangrijke oorzaak om te relaxen tijdens het spelen.
11. Tijdens het spelen van Kids World voelde ik mij relaxed.
12. Het vertellen van een fictief verhaal was een belangrijke oorzaak voor het versterken van mijn band tussen mij en mijn kinderen tijdens het spelen.

Appendix P. Semi-structured interview questions of user study

1. Wat is jouw eerste impressie van Kids World? En geef aan waarom?
- 2a. Noem twee positieve dingen van Kids World? En geef aan waarom?
- 2b. Welke twee aspecten vond je nadelig of minder goed vond? En geef aan waarom
3. Voel je jezelf meer relaxed na het gebruik van Kids World? En geef aan waarom wel of waarom niet?
 - a. Wat in Kids World maakte jouw relaxed?
 - b. Denk je dat je met het spelen van Kids World een relaxed moment in de avond hebt na een werkdag?
4. Denk je dat Kids World het gezin dichter bij elkaar brengt tijdens werkdagen? En geef aan waarom?
 - a. Denk je dat dit resulteert in meer praten en onderling contact in het gezin?
 - b. Zie je nog meer voordelen voor jullie gezin?
5. Denk je dat je kind(eren) het leuk vinden om met Kids World een verhaal te maken en dan samen met de ouders het verhaal te vertellen?
 - a. Welke manier van vertellen lijkt jou het leukste: Om-en-om, alleen het kind of alleen ouder
 - b. Wat vond je van het verhaal in Kids World?
- 6a. Wat was niet duidelijk tijdens het gebruik van Kids World? En geef aan waarom?
- 6b. Was het moeilijk om het verhaal verder te vertellen in Kids World d.m.v. de blokjes? Waarom?
- 6c. Stel dat je iets kunt veranderen in Kids World: Hoe zou jij Kids World verbeteren? Welke functies zou jij nog meer willen hebben? Welke bestaande functies zou je niet willen hebben?
 - a. Zou je een opname functie willen om het verhaal later af te maken?
 - b. Zou je een opname functie willen om het verhaal later terug te kijken en luisteren?
7. Kids World bestaat uit een lichtgevend speelbord en blokjes verbonden met een TV:
 - a. Wat vond je van het afbeelden van het verhaal op de TV?
 - I. Zie je nadelen?
 - II. Hoe ervaarde je het afwisselend kijken naar de TV en het speelbord?
 - b. Wat vond je van het gebruik van een (lichtgevend) speelbord op de tafel?
 - c. Wat vond je van het gebruik van de blokjes om het verhaal te vertellen? En zou je iets willen veranderen of toevoegen aan de blokjes?
 - d. Welke speelstukken en/of elementen zou je nog meer willen toevoegen aan het bord, blokjes of TV?
8. Zou je Kids World thuis willen hebben om te spelen met het gezin? En zou je het ook willen kopen?
 - a. Stel dat je Kids World heeft gekocht, waar in huis zou U Kids World dan willen spelen? Geef aan waarom daar?
 - b. Op welk tijdstip van de dag denkt je het dan te gaan gebruiken? En op welke dagen?
 - c. Met wie zou je dan allemaal spelen?
9. Kent U nog andere soortgelijke spellen/toepassingen, waar Kids World mee te vergelijken is?
 - a. Kun je een voordeel en een nadeel opnoemen dat Kids World heeft ten opzichte van deze toepassing?

Appendix Q. Categorization of interview from user study

	Family 1	Family 2	Family 3	Family 4	Family 5
Goal fulfillment: Relaxation					
More relaxed after playing Kids World?	No, I am always relaxed when I come home from work.	No, I did not feel more relaxed. It was just a very fun way to play with my children.	I felt as relaxed as normally.	Yes, because I actually could set time aside to tell a story to my son based on the provided content.	Neutral, I did not feel more or less relaxed. The link between this game and relaxation is not automatically triggered. That is the result of playing, but you play to do something with your children. In general is playing relaxing. Kids World blocks out work occupation more.
Contributing factors to relaxation	Doing things is always relaxing. Kids world is moment of 'togetherness', which makes it relaxing. Unexpected, funny responses from children on situations in the story.	You are forced to quickly take distance from daily worries and concerns that keep your mind busy.	Telling the story together.	I was actually doing something (telling the story) together and completely absorbed in the story and not thinking about anything else. All attention for the child. You consciously reserve time for your child and takes away guilty feeling. The fantasy of the children pulls you in the story and makes me relax.	Creativity and filling in the story co-operatively with your child helps to detach from work. Doing something together helps to detach from work.
Relaxing moment with Kids World during evenings of workdays?	Yes, but could also be another game. In order to make Kids World more relaxing, more has to happen.	Not so much a relaxing moment, but a moment with your children to be really together.	Yes, I know for sure, because you can empty your thoughts.	Yes.	Yes, but that is inherently on what you do together.
Goal fulfillment: Social bonding					
Opportunity to bring family closer together during workdays?	Yes, Kids World can be a moment of rest, but other games could give that too. Kids World has the potential	Yes, the primary goal is to strengthen the bond with your children. Building a story co-operatively is a way	Yes, because you have one-on-one interaction with your child in a very active way. Strong	Yes, you pay full attention to the child. It is much more intensive than reading a story for the child and you	Yes, it is an instrument to do something together, but it also could be another device. However, if children can

	to trigger unexpected fantasies in the child that dazzle the parents and, so strengthen the bond between child and mother.	of interaction that informs parents about what goes on in the children's life and experience. If I directly ask what they experience, they tell little. I can discover things about my child that are not exchanged in standard communication.	point is storytelling and playing together.	are an active storyteller. Making up things/events in the story makes it fun for me.	make their own story in a fun way, it motivates more than other tools to do something together, i.e. to tell a story.
Increase of social interaction in family?	Yes, storytelling is an interactive process, whereby the mother narrates in an exciting way to draw and keep the attention, i.e. to get a response from the child.	Could be, but I am not sure.	Yes, I am sure. The bond between the parent and child will improve.	Yes, the occurrences / events in the story provide a topic to start on talking about later on. That creates social bonding. That's an advantage.	Yes, if you do it actively. This is co-operatively (not competitive), seeking together for creativity and quality to maintain the bonding with your children. Through playing you can bring up specific topics / themes. Then, children will exchange information, they would normally not reveal (self-disclosure). That's surprising. It happens when the situations triggers associations with previous experiences of the child. That's the power of Kids World.
Preference for turn taking in story?	Dynamic process between mother and child that depends on the situation.	Yes, dynamically whereby the children narrate mostly and the parents supplement them and, in turn, they respond on the additions.	Yes, turn-by-turn I like the most, but the child shouldn't lose attention.	Yes, turn-by-turn because telling the story together is what makes it fun. When he is older he will tell more. Or the mother starts and children take over and supplement each other.	Interactive, giving your child room to say something. When the story is exciting they will tell more, otherwise you will take over.

User Experience

Reception of concept to tell a story on TV with blocks	Very fun to do, especially this combination to draw the attention of children.	Unique. Enriching. Creative. Interactive. Consciously doing an activity with children. Adding something special. Proactive. Interesting	Educative – fantasy development of child. Intensive interaction with child.	Very fun and creative. The story on TV immediately draws a lot of attention and it very exciting to watch what is coming.	The idea is very good – the creativity, filling in the story together with your child. Quickly expect game-like occurrences, but this is
--	--	---	---	---	--

		and funny idea.			different – back to the basics.
Positive aspects	1. To tell stories based on fantasy and not to provide a complete story on TV. 2. Interactive characters that move on the TV	1. New way to discover and interact with your children. 2. Do, make up and produce a story co-operatively. 3. Putting time aside and taking the rest to play Kids World.	1. The appearance of Kids World, i.e. the cartoons and colors, is made for children. 2. Not too difficult and easy to understand. 3. Activates the user to actually get involved in the production of fantasies and not to just consume information.	1. The fact you tell a story with your fantasy together with your child instead of reading a predefined story. 2. You do not have make up the story completely. So, when you are tired from a workday, you still can be creative with your child without sticking strictly to the story.	1. Quality time with your children. Being together and interacting - doing. By doing building a nest. 2. Creativity, filling in the story is a lot of fun. 3. Interaction with the blocks and the TV. 4. Creates awareness by the parents to be there for your child.
Negative aspects	1. Boring. High expectations, but too little action in Kids World, which did not facilitate storytelling and was not captivating. 2. Playing requires putting time aside and paying full attention to the story resulting in high cognitive load. Therefore, it does not allow combining it with other activities.	1. For each participant a wooden block. 2. Lights in the play board were double, because on the TV appears an image already. 3. Telling the story is intensive and requires mental effort.	1. No clue about how long to make the story. As a result, the child lost attention in the story. 2. Due to the young age of the child, the focus was on the wooden blocks and the lights in the play board than on the story on TV. As a result, the parents have to make up too much of the story.	1. I will put a maximum in terms of minutes to the story otherwise they spend too much time in front of the TV.	1. High expectancy (reference to games) from technology perspective. Kids World implied more deepness, out-of-the-box and innovation, though now everything was fairly simplistic. At some point, I lost interest in the story somewhat.
Responses to content and storyline	Too simplistic. Not exciting and diverse - only forest environments in which not much happened, this made storytelling very difficult.	Ok, but I did not have a lot of freedom to tell the story in my own way, but constantly had to react what appeared on the screen. Telling the story was difficult. Story has 2D simplicity I prefer above advanced 3D computer environments.	Telling a story based on the objects was difficult. Storyline was simple, understandable and fun.	Fun, but I did not see the link between the donkey and ice cream. I would have preferred another character. Story was partly defined, but I would have liked more freedom.	Neutral, not exciting. A bit too much of the same, which diminished the excitement. I did not know the purpose of the girl and donkey. I wanted to choose myself the main characters

Usability

Ease of learning	Everything was very clear from the beginning.	Everything was clear, except that I did not understand why I had to start in the left corner for every scene.	I had no clue how long to talk about each scene. A visual aid (number of scenes)	The interaction is all straightforward. What the mother tells about an object or event inspires the	From the start it was clear to fill in the story and see how your child reacts thereon.
------------------	---	---	--	---	---

			about story duration each scene would come in handy. After you have done it one time, it is easier.	child to continue on another time.	
Ease of use	Everything was very clear and easy. Except: No indication how long the story took or to talk about a scene.	Interaction with the wooden blocks was clear.	It was difficult to stick to the role of the donkey when other characters appeared on the screen. It was confusing, because I wanted to take over their role. At certain point I was focused on the story and forgot to use the blocks. Also, because I did not know how many scene were to come yet and the attention of the child was gradually going away.	Telling the story with the blocks on the TV was not difficult, but fun. Only the extra handling of bringing the blocks back to the left corner for every new scene while you are still in the old scene. I want to go forward in the story. And whether I could jump to the next page / I had told enough. A story preview for the parent might be handy or how many scenes have past from the total, so you can adjust the story length.	Telling the story with the blocks was not difficult.

User interface

Story displayed on TV	Yes, that is very nice. The idea is great. The audio and animations were exciting and made storytelling easier. Disadvantages: Storytelling on TV requires very much interactivity and I am not always in the mood for this degree of interactivity.	Ok. It uses the TV and in a family friendly way on a family place in the living room. That's logical. Disadvantages: None, I was watching more the boys than to the TV, but the boys were focused on the TV.	Excellent, not too difficult and made for children. Disadvantages: No	Very funny. Disadvantage: Requires apparatus to play.	Fine. Children are familiar with TV. Television is a central apparatus at home with which children are familiar, is recognizable, know how to operate TV, makes them feel comfortable and is more exciting. I would not connect it to a PC or separate display.
Switching cost between TV and play board	None	None, I mostly watched to the TV and sometimes to the play board to know where the block was.	None. But sometimes it was difficult to focus attention between the TV and her, because the child was distracted.	Not disturbing. In fact, it prevents users from constantly staring to the TV.	None.
Play board	Easy to use and the lights are attractive.	The green lights in the play board are superfluous. And I	Fine and the lights are fun.	The color lights are nice, but the play board is more	Fine, but is too functional. I would use it more efficient –

		am not sure about the feedback from the red lights, because the TV shows where you go. The play board needs more extensions.		a means to tell the story. Through peripheral perception of red light informs users in which direction the block is going and allows you to correct child.	make it more inviting. And responded a bit slow that should be real-time.
Wooden blocks	Telling the story by means of the blocks was very clear and easy.	The blocks have a certain function, because for every scene content, you can shift attention by moving the media object to another part on the display. The subtle control of the blocks allow you to shift the accent of the story on the screen. The blocks do not bring the association with a game console. Observation: Users moved the blocks in the air to jump over a character. Might implement gesture recognition.	Easy to use, but motion precision of media objects could be finer tuned. More blocks to play with more people.	Very funny. By means of the blocks you walk through the story and constantly change that story. Thus, at different positions of the block, there is a focus on other content in the scene allowing the user to tell another story around the phenomena. However, positioning the object precisely (not occluding other objects) on the display is a bit difficult by means of the blocks. More blocks is more fun and result in more interactivity on the play board instead of watching the on TV. I liked the stickers on the blocks. LCD screen as alternative generates positive reaction.	Nice to tell the story. I like the combination of actively engaging with physical blocks and TV. Equipping blocks with LCD screen is fine.
Alternative for blocks	In case of same objects that you have a real donkey and girl instead of wooden block.	N/A	Real, tangible puppets in the shape of the puppet on TV.	Real puppets, abstract shape of the media object.	Could also be a real puppets or shape the blocks according to the puppets.

Functionality

Story building for Kids	Yes, they would like it, but need to be between 5 and 7 - the age of role playing.	Yes, they would really like it. Especially with the parents.	Yes. She has another TV app - V-tech baby - that she likes a lot.	Yes, very stimulating for their creativity and I would be very proud on the children (extrinsic motivator). I wouldn't mind than that they spend more	Yes, she can tell stories by what she sees.
-------------------------	--	--	---	---	---

				time in front of the TV as long as it is creative play.	
Record function to continue story at another moment	Yes, that could be really functional.	Yes, that is fun. Your partner can continue the next day.	Yes, I like that very much. You can play back what you have done yesterday.	Yes. Handy when a player has to go to the toilet. Then you can continue the next day. The children have time to think about the story and built in further out.	Yes.
Record function to play back the story at another moment	Yes, but I want to watch the story only with my family.	Yes, it is nice to play back your own cartoon.	It is nice to see the progression of the child over time. A history of the child's development.	Yes, I think the kids would like that.	Yes, than you can store the record.
Extension of functions	<ol style="list-style-type: none"> 1. Composition of child's own story to really draw child's attention 2. Unexpected occurrences or combination of occurrences that challenge users to come up with a story at the 'spot'. 3. Exchange media objects among various storylines to trigger fantasy of child and, so surprise parents. 4. Surprise button to jump to another scene. Unexpected occurrences that challenge parents to narrate the story and stimulate the fantasy of the child to get funny interactions. 5. A random block that appears as an unexpected (surprise) media objects or animation on the screen to challenge parents, when users move it. 	<ol style="list-style-type: none"> 1. More media objects and stories to get unpredicted occurrences or events. That makes it more exciting. 2. Interaction among blocks to couple to media objects to each other. Very cool and fun to really create your own story. 3. Play with multiple players 4. More characters and settings to choose and build. 5. In certain way to give more direction to the story. 6. Control the length of the story. 7. More unexpected things in the story. 8. More advanced control of the puppets (now there are too static). 9. Play board response to words users speak. 	<ol style="list-style-type: none"> 1. I wanted to attach a block to characters on the screen to move them as well (make them an actor in the story) and take them to another scene. 2. At the end of the road/scene, jump automatically to the following scene instead of pressing the button on the keyboard. 	<ol style="list-style-type: none"> 1. Freedom in choosing objects in the scene as user. That you can attach objects in the scene to a block and move them in the scene. So, have multiple blocks on the play board. Adding new story elements completely changes the story. 2. More funny, crazy objects/events in the scenes. 3. Much more (environmental) audio files in the story. However, the shouldn't scare the user. 4. Possibility to modify the setting / background. 5. Extension of extra handlings with blocks to make story more engaging: Gesture recognition of wooden block to make it more interactive. 6. Exchange of media objects between different stories. It increases social bond. 	<ol style="list-style-type: none"> 1. Add more surprising, unexpected things / events that allow you to make your own story. More psychological parts that come into the story. 2. Topics that relate to the real world. Introduce themes (e.g school) and daily experiences (e.g. visiting granny). 3. Differentiate per age category. 4. More excitement for older ages. 5. Implement electronics to create interaction between two blocks. The static pictures change to something more imaginative.

Usage

Location in home	Table in front of TV in the living room, because you cannot sit in vicinity of the TV.	In front of the TV, because it is the family place in the living room.	In front of the TV in the living room.	Living room is only suitable space.	Living room, because it is the central place at home.
Time and day	After school or dinner during workdays. Not weekends, because they are already full.	After dinner during workdays.	At mornings in the weekend or after dinner during workdays, but it depends on how tired the child is.	End of afternoon or beginning of evening. Weekend and workdays depends on work schedule.	Just before or after dinner on weekends and workdays.
Players	Only with partner and my children or more children together.	Children, partner, grandmother and grandfather.	Parent and child. Also fun to do with the entire family, grandmother, uncles, aunts or baby-sitter. Two children together.	Me, partner, both children, grandmother, sister or children from school.	Parents, children and friends from child.

User acceptance

Wanting Kids World to play at home	Yes.	Yes.	Yes, especially for the evening.	Yes.	Yes
Purchase Kids World	Not sure, depends on the implementation, increase of excitement level and price.	Yes.	Yes.	Yes.	Yes, but depends on the price quality ratio.

Competitive products

Any other product comparable to Kids World	1. Nintendo Wii, but only in respect to the interactivity, but the content is already defined. That's what makes this application unique.	1. Nijntje Viltschilderijen to make your own paintings on different settings and tell a story about the painting to the each other. Kids World is much richer. Parents sometimes like it when children play as basically as possible. 2. Dora the Explorer is an animated children's in a play-along, computer-style TV adventure. In each episode, Dora invites young viewers	1. V Tech - V.Smile Baby Smartridge Teletubbies teaches matching, colors, motion, shapes, actions and opposites. Child plays alone, but you want to do something together and the content leads the user instead of developing a fantasy. Disadvantage: You need to use a table to play on, but in fact you want to	ACTIV board at school on which children can compose their own drawings with pen-based input and repository. Only you do not tell a story by the drawing, which makes it less interactive. Nintendo Wii is interactive as well and played with the family, but just doing and not actively involved in the creation of the game	V.Smile TV Learning System that teach age appropriate curriculum through fantastic games on TV. Game without a story that you play alone. Computer games, but they are often competitive and not co-operative. Little bit Nintendo Wii. http://www.zappelin.nl/ where you make digital drawings, read digital books and play games.
--	---	--	--	---	---

		to join her on an adventure in which Dora and the viewer must solve problems and overcome obstacles along the way to their goal. The interaction with the children is faked. Kids World is much more interactive.	sit on the sofa. Should not take too long.	content. Picture book, but there's everything filled in. Kids World allows you to fill in information yourself – 'live' interactive picture book.	Healthy opponent of computer games to consciously do something different. Kids World is something you play together and other games you play alone. Predecessor of learning to work with digital tools – building up feeling for computers.
Similar activities	Every evening we tell a story in bed, whereby the child gives a few keywords and the mother narrates a story with those words.	N/A	I really like to read to her before putting her to bed.	Reading Winnie de Poeh books with pictures and text. Passively consuming information. The book leaves no room to fill up the 'blank' spaces.	Reading books together in the evening, but if we have little time or are exhausted from the day, we make up our own story out of the pictures and text.

Miscellaneous

Educative	N/A	Play variant that stimulates the fantasy and 'forces' them to narrate the story themselves instead of passively receiving information.	Kids World improves the communication skills of the child.	Storytelling is a creative process in which the children are stimulated to think and come up with a story themselves and not just consume information. He is an actor that moves the blocks and makes up his own story. Language development.	Kids World is educative. Provides a platform for many creative extensions to make it educative.
Age of children	She is a little too young (age 3). Playing with children of 5 and 6 would have made playing more interactive and less boring.	N/A	She is a little too young (age 3) for Kids World.	N/A	She was at the edge in terms of age. Young children play more physically. Bring degrees of excitement and categories per age into the application.

Appendix R. Descriptive Statistics of RSBQ, AttrakDiff and GEQ

Table 1. Descriptive statistics RSBQ

	Min	Max	Mean	S. D.
Relaxation	5	6	5,60	0,55
Stress	0	3	0,80	1,30
Work detachment → Relaxation	0	6	4,40	2,51
Togetherness → Relaxation	5	6	5,60	0,55
Play → Relaxation	2	5	3,40	1,14
Watching TV → Relaxation	1	3	2,00	0,71
Self-disclosure children	0	6	3,20	2,59
Weakening social ties	5	6	5,80	0,45
Work detachment → Social bonding	0	6	3,40	2,61
Togetherness → Social bonding	5	6	5,80	0,45
Play → Social bonding	2	6	4,60	1,67
Watching TV → Social bonding	0	3	1,60	1,14

Table 2. Descriptive statistics AttrakDiff

	Mean	Variance	Cronbach's Alpha
Pragmatic quality⁴	0,37	0,54	0,60
Hedonic quality - Identity	0,86	0,36	0,90
Hedonic quality - Stimulation	0,69	0,53	0,87
Attractiveness	0,89	0,01	0,93

⁴ Word pair *unpredictable – predictable* was deleted due to the unpredictable nature of the concept

Table 3. Descriptive statistics GEQ

	Mean	Variance	Cronbach's Alpha
Positive Affect	2,8	0,1	0,88
Negative Affect	0,9	0,1	0,92
Annoyance	0,5	0,2	0,70
Competence	2,2	0,05	0,97
Immersion	2,1	0,1	0,78

Table 4. Individual items scores AttrakDiff

