

PLEXQ: Towards a Playful Experiences Questionnaire

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ABSTRACT

Playfulness is an important, but often neglected, design quality for interactive products. This paper presents a first step towards a validated questionnaire called PLEXQ, which measures 17 different facets of playful user experiences. We describe the development and validation of the questionnaire, from the generation of 231 items, to the current questionnaire consisting of 17 constructs of playfulness, each measured through three items. Using PLEXQ we discuss the nature of playfulness by looking at the role of age, gender, and product type in one's proclivity to experience playfulness differently. Finally, we reveal a four-factor structure of playfulness and discuss the implications for further theory development.

Author Keywords

Playful experiences; scale development; user experience.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Playfulness is an important, but often neglected, design quality for all kinds of products. Features that make games and play engaging can also make other kinds of products more enjoyable, elicit more meaningful experiences from them, and ultimately increase the quality of the overall user experience and, respectively, the market value of a product. Playfulness, in other words, can be a positive feature in products that goes beyond pure entertainment.

The Playful Experiences (PLEX) framework [20] is a categorization of 22 playful experiences based on previous theoretical work on pleasurable experiences, game experiences, emotions, elements of play, and the reasons why people play. Through its fine-grained understanding of playful experiences, it advances our inquiry into what makes for pleasurable experiences with interactive products.

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The PLEX framework has been put to practical use in design- and evaluation-related activities. From a design perspective, the PLEX Cards [22,23] and the PLEX Design Patterns [3] were created to communicate the 22 PLEX categories to people who wish to design for playfulness and to let them ponder the implications of their design choices, respectively. From an evaluation point of view, Lucero et al. [25] used PLEX as a checklist when assessing different aspects of playfulness in the context of expert evaluations. One important missing piece in the PLEX work has been the lack of a validated questionnaire to measure the experience of playfulness. Measurement is essential in advancing both theory development as well as product evaluation practices [21].

In this paper, we describe a first step towards developing and validating a PLEXQ questionnaire. A total of 231 items relating to playfulness and game experiences were initially collected based on a review of qualitative studies and existing scales (i.e., 83 items), interviews with videogame players (i.e., 85 items), UX reports with products (i.e., 19 items), and brainstorming sessions with experts (i.e., 44 items). Two experts in scale development then reviewed all 231 items to eliminate redundancies and check their clarity, with 176 of the items meeting the quality requirements. Next, an internal pre-testing was conducted in two separate rounds; four researchers familiar with PLEX and three other researchers who were not exposed to PLEX reviewed the scales independently, resulting in a further reduction from 176 to 104 items. Finally, the 104-item questionnaire was deployed online and completed by a total of 172 participants with the goal of evaluating the reliability of the subscales constructed for each of the categories. In this process, five scales were deleted (i.e., *Eroticism*, *Fantasy*, *Simulation*, *Submission* and *Sympathy*), reducing the number of scales to a total of 17 out of the 22 PLEX categories formed with three items each, bringing us down to a total of 51 items.

The main contribution of this paper is an initial version of the PLEXQ questionnaire that reliably measures 17 playful experiences. We also discuss the nature of playfulness by looking into how age, gender, and product type induce different experiences. Finally, we reveal four dimensions of playfulness that our data suggest.

The rest of this paper is structured as follows. We begin with an overview of the PLEX framework. Then, we describe the PLEXQ scale construction and scale evaluation processes. Finally, we present the current PLEXQ questionnaire, followed by a discussion on playful

experiences and conclusions. The appended auxiliary material provides the full list of 231 items along with their source.

THE PLAYFUL EXPERIENCES FRAMEWORK

Costello and Edmonds [9] have published one of the most comprehensive theoretical frameworks of pleasurable experiences. The framework was created in an attempt to make interactive art more pleasurable and playful. They cross-referenced the views of philosophers, researchers and game designers to obtain a ‘*pleasure framework*’ consisting of 13 pleasure categories. Based on their results, Costello and Edmonds argue that their framework could be used beyond interactive art to make user interfaces more pleasurable.

In an attempt to study more specific playful experiences, Korhonen et al. [20] adjusted and expanded the ‘*pleasure framework*.’ The Playful Experiences (PLEX) framework is a categorization of playful experiences based on previous theoretical work on pleasurable experiences, game experiences, emotions, elements of play, and the reasons why people play. The definitions presented by Costello and Edmonds to their pleasure categories were also taken into account when defining the PLEX categories. As a result of this analysis, the authors examined the wide range of experiences elicited by interactive products when they are used in a playful manner. The overall focus was shifted from pleasures to experiences to indicate that not all such experiences are always pleasurable in the context of play. To validate the initial PLEX framework, the authors looked into video games to check which of the categories were elicited by interactive products, as well as to identify potential gaps in the framework. They conducted interviews with 13 players of three popular videogame titles representing different game genres (i.e., *The Sims 2*, *Grand Theft Auto IV* and *Spore*). Their results showed that all categories were mentioned on numerous occasions in the interviews and in the context of at least two different games. Thus, the different ways in which players experienced the games could partly be explained through the PLEX categories. On basis of the findings, Arrasvuori et al. added new categories to PLEX (i.e., *Humor* and *Submission*), resulting in a total of 22 categories [1] (Table 1). Part of the PLEX framework validation efforts also included a study of everyday gadget use, including digital cameras, mobile phones, and music players, to see what experiences those devices prompted in users [2]. Participants wrote experience reports for 10 days as they interacted with their gadgets, mentioning 19 of the 22 PLEX categories. These reports described interaction between a user and a product, therefore the experiences of *Challenge*, *Cruelty* and *Eroticism* did not naturally occur in this study. No new playful experiences emerged from this study and thus the current 22-category PLEX framework was considered comprehensive. The findings from this study also suggested that the PLEX categories could be

used to describe user experiences elicited by products other than videogames.

Table 1. PLEX framework consisting of 22 categories.

Experience	Description
Captivation	Forgetting one’s surroundings
Challenge	Testing abilities in a demanding task
Competition	Contest with oneself or an opponent
Completion	Finishing a major task, closure
Control	Dominating, commanding, regulating
Cruelty	Causing mental or physical pain
Discovery	Finding something new or unknown
Eroticism	A sexually arousing experience
Exploration	Investigating an object or situation
Expression	Manifesting oneself creatively
Fantasy	An imagined experience
Fellowship	Friendship, communality or intimacy
Humor	Fun, joy, amusement, jokes, gags
Nurture	Taking care of oneself or others
Relaxation	Relief from bodily or mental work
Sensation	Excitement by stimulating senses
Simulation	An imitation of everyday life
Submission	Being part of a larger structure
Subversion	Breaking social rules and norms
Suffering	Experience of loss, frustration, anger
Sympathy	Sharing emotional feelings
Thrill	Excitement derived from risk, danger

The PLEX framework was then put to practical use in design- and evaluation-related activities. From a design point of view, different authors have explored whether the PLEX framework could be used to design for playfulness beyond video games [14,24,27,36]. Lucero and Arrasvuori [22,23] created (and evaluated) the PLEX Cards as a means to succinctly communicate the 22 PLEX framework categories to designers and other stakeholders who wish to design for playfulness. Two associated idea generation techniques—namely PLEX Brainstorming and PLEX Scenario—were also devised to guide and provide structure when using the PLEX Cards. Another practical tool developed in the context of design activities is the PLEX Design Patterns [3]. The patterns are an example of a design language that lets those involved in the design process ponder and consider the implications of their design choices towards obtaining a final design. The PLEX Design Patterns consist of causes-consequences pairs describing the occurrence of a given pattern in interaction design and how it affects the overall user experience.

More recently, Lucero et al. [25] investigated the use of the PLEX framework in the evaluation of interactive products and services. Their aim was to study whether PLEX could both help conduct expert evaluations and be ultimately used as a checklist when assessing different aspects of playfulness. They conducted three interrelated studies of two mobile phone games called *Snow* and *Veggie*. In the first study, researchers actively used the PLEX framework to conduct an expert evaluation of the two aforementioned games. The second and third studies were conducted without using the PLEX framework to verify the findings

from the previous expert evaluations. These two last studies consisted of interviews with professional game designers from Rovio, the makers of Angry Birds, and with the developers of the aforementioned Snow and Veggie games from the Finnish gaming company Kuuasema, respectively. The authors identified strengths (e.g., its simplicity) and weaknesses (e.g., its rigidity) of the PLEX framework as a tool for evaluation. The authors proposed further specifying each PLEX category into sub items or attributes so that the different components of a category can be more easily identified.

One important missing piece in the PLEX work has been the lack of a validated questionnaire. In this paper, we present a first step towards a validated questionnaire based on the PLEX framework called PLEXQ. In the context of this work, playfulness is defined as a state of mind whereby people approach everyday activities [20] with a frivolous, purposeless and frisky attitude. Playfulness can be designed into (interactive) products and services to elicit more meaningful user experiences [25]. Therefore, what PLEXQ specifically aims to measure is the degree to which a given (interactive) product or service embodies different attributes of playfulness.

SCALE CONSTRUCTION

Item Generation

In order to increase the content validity of the measurement scales, we followed a multi-pronged item generation process as described in O'Brien & Toms [31,32], consisting of three steps: a) a review of qualitative studies and existing scales, b) an analysis of interview transcripts and experience reports of users' interactions with games and products, and c) a brainstorming session involving experts on playfulness. This process resulted to a total of 231 items.

Review of Qualitative Studies and Existing Scales

A total of 83 items were collected through a literature review of qualitative studies as well as existing psychometric scales relating to the 22 categories of playfulness. Some of the items elicited during the literature review were mapped to more than one of the playful categories. For instance, different facets of the sensory and imaginative experience of immersion and flow were collected from a study of Poels et al. [34] as they tapped to the categories *Captivation*, *Challenge*, *Exploration*, *Sensation* and *Suffering*. Different items relating to distortion, narrative engagement and focused immersion were collected from a study of game experience by Tychsen et al. [39] as they were judged relevant to the categories *Captivation* and *Fantasy*. Items relating to the sense of presence during video games, and more specifically to the experience of spatial presence, engagement and self-forgetfulness were collected from a study by Ravaja et al. [35] as judged relevant to the categories *Captivation* and *Suffering*. Items relating to the level of engagement and the perception of control were elicited from the questionnaire

by O'Brien et al. [31] as judged relevant for the categories *Challenge* and *Control*. Items relating to the experience of discovery in game experiences were collected from Yee [40] as judged relevant to the categories *Discovery*, *Exploration* and *Expression*.

Other items from existing scales and literature were used only for one specific category. For instance, some items related to measuring the concept of experience economy, and educational aspects of playfulness, were found in Oh et al. [33] and used for the category *Challenge*. Items measuring competitiveness as a trait were taken from the Revised Competitiveness Index (RCI) from Houston et al. [16] and used to measure *Competition*. Items aiming at measuring achievement as a motivation were used from Byrne et al. [7] for the category *Completion*. Items aimed at measuring curiosity as part of the level of optimal experience during online game play, as proposed by Choi and Kim [8], were selected for the category *Exploration*. Insights from the studies of Blom and Monk [5,28] as well as Boberg et al. [4] on the *motives and behavioral practices of personalization* were used to create items tapping on the personalization aspect of the category *Expression*. Items from psychological research on cheerfulness assessing humor as a temperament [37] and from the multidimensional concept of sense of humor [38] were used to create several items for the PLEX category *Humor*. The Impulsive Sensation Seeking Scale (ISS) based on the work on risk taking as a trait from Zuckerman [41] was used to create items for the category *Thrill*. In total out of 22 categories of the playfulness experiences framework, 13 were inspired partially by one or more studies or psychometric scales identified in our literature review.

Interviews and Reports of UX With Games and Products

A total of 85 items were collected from the transcripts of the interviews of 13 videogame players on their experiences and triggers for playing computer games, published by Korhonen et al. [20]. Items elicited from the interview transcripts of game experiences related primarily to the categories of *Completion*, *Control*, *Eroticism*, *Exploration*, *Fantasy*, *Fellowship*, *Relaxation*, *Sensation*, *Submission*, *Suffering*, *Sympathy* and *Thrill*. A total of 19 items were collected from users' experience reports with consumer electronics products collected in a study published by Arrasvuori et al. [2], where 21 participants reported on their experiences over a period of ten days. Items elicited from these experience reports related primarily to the categories of *Discovery*, *Expression*, *Fellowship*, *Relaxation* and *Simulation*.

Overall, the first two steps – the literature review, and the analysis of interview and experience report data – resulted to a total of 187 items. While some categories were adequately covered, certain categories, such as *Cruelty*, *Humor*, *Nurture*, *Subversion*, and *Thrill* were only partially covered. To expand these missing facets of playfulness, we proceeded with a brainstorming session.

Brainstorming Session With Experts on Playfulness

The brainstorming session aimed at expanding the categories that were only partially covered after the first two steps of item generation. These were *Competition, Control, Cruelty, Discovery, Exploration, Expression, Nurture, Subversion*, and primarily *Thrill*.

The brainstorming session took place at Nokia Research Center and lasted approximately two hours. A total of five researchers participated in the session. All were familiar with the PLEX framework and had substantial exposure to all the categories, through applying them in the design and evaluation case studies.

The procedure was the following. Initially, each participant was provided with a number of keywords and was asked to write down statements, related to each keyword, in an open format, following their inspiration. Each statement was written down on a sticky note, and the process was limited in time (maximum 10 min each). Following this process, the team reviewed the total pool of statements, presented and motivated by their contributor, and mapped them to one of the nine categories of playfulness. The brainstorming session resulted to a total of 44 statements, thus creating a total pool of 231 items (See the appended auxiliary material for the total pool of 231 items).

Redundancy and Clarity Check

The full list of 231 items was reported in a table listing the category, source, context and purpose for which the item was selected, and submitted to two non-affiliated researchers – experts in scale development – for review. Their task was to eliminate redundancies, remove items with poor language and unclear meaning, and remove items that focus on playfulness as a personality trait rather than as an experience. Based on their comments the number of items was reduced to 176. These were then submitted to a language editing process, whereby the compiled items were reformatted to turn them into statements rather than adjectives or phrases, following similar rules as described by O'Brien & Toms [32] and DeVellis [11]. For more elaboration on this process see the appended auxiliary material.

Pre-Testing

To increase the clarity and coherence in meaning among the items, we carried out a pre-testing of the final 176 items, in two rounds. During the first round of pre-testing, four researchers from Nokia, all familiar with the PLEX framework, reviewed the items independently. They were asked to first read the full questionnaire without responding to it, and then to respond to the questionnaire on the basis of a recent experience with a technological product, putting themselves in the situation of the participants. During this process, they were asked to report on paper the items or instruction that seemed incorrect or unclear. At the end, the first author went through the full reports together with them and made comments for improvement, such as removing or

reiterating unclear statements. Following this revision, the iterated questionnaire was sent to three pre-testers, again researchers from Nokia, but this time not exposed to the PLEX framework. The procedure was exactly the same as in the first round. The final list of items was then submitted to a professional, native in English, for language editing.

Overall, this process reduced the number of items from 176 to 104, which constituted the final version used in the PLEXQ version 1 questionnaire (see the appended auxiliary material for the list of 104 items). The 104 items corresponding to specific categories were randomized prior to deploying the survey so that items related to a same category were scattered throughout the seven pages of the survey.

SCALE EVALUATION

Finally, the questionnaire containing the full 104 items was deployed online with the goal of establishing a structure of the playful experiences instrument, to ensure the instrument contained only the most parsimonious set of items, and to evaluate the reliability of the subscales constructed for each of the categories.

Online Survey

A web survey was posted online for three weeks. Direct invitations were sent out to Nokia employees in Finland using a company-wide mailing list. The Webropol tool was used to design the online questionnaire.

Participants were invited to recall a recent pleasurable, enjoyable or fun experience, that took place over the past three weeks and that concerned one of the following product categories: portable MP3 Players, applications and services used on mobile or desktop devices, ranging from social media to mobile apps for activity tracking, and finally, any form of gaming, ranging from casual games such as Farmville to RPG and action games.

To help them focus and recall the details of the particular experiential episode, we first asked them to freely describe the main aspects and situation of the reported experience, then specify the product they had in mind including the brand, and model, and finally attempt to recall and describe what triggered this event.

Following the experience recall phase, participants were invited to respond to 104 5-point Likert scales of our PLEXQ version 1 questionnaire, ranging from “totally disagree” to “totally agree” and there was also a category for “non applicable” items. The number of scales employed, while high for a typical survey is within recommended guidelines for scale evaluation [11] and in line with prior work [e.g., 32]. To minimize scrolling, we split the survey into seven consecutive pages. The full survey required on average 20-30 minutes to complete. All pages of the survey contained instructions at the top and a progress bar along the bottom to provide adequate feedback to people about the remaining task. About 15% of the people that visited the

landing page of the page successfully completed and submitted their responses.

Participants and Product Selection

A total of 172 individuals completed the online survey. Forty (23%) were females, while the majority (132, 78%) were males. Their ages ranged from 27 to 54 years old with an average age of 37 years old (SD= 6 years). They were all Nokia employees, but their backgrounds ranged from engineers and researchers, to sales, marketing and other professions.

About two thirds of the respondents selected a product that they use on a daily basis. About half of them selected a device they mainly used at home, 29% a device they used in multiple physical contexts, 19% outdoor and 3% devices for dedicate in-car use. Both game and non-game products, such as music players, mobile apps for wellness and activity tracking as well as map services, were selected.

Scale Composition

Because of the large number of items (N=104) and the relatively low number of participants (N=172), we applied the following procedure. The 104 items were first grouped into the 22 categories of playfulness merely on the basis of the semantics of the items. Each of the emerging scales, comprised of four to seven items each, were submitted to a Principal Factor Analysis (PFA) with the goal of testing the convergent validity of each scale (22 different Principal Factor Analyses were carried out). The overall fitness of the items within a Principal Factor was measured with the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. When $KMO < .500$, the item with the smallest loading on the principal factor was deleted. This was repeated until KMO reached the minimum threshold value of .500 and all the items had a minimum loading of .40 to the principal factor. All but one construct (i.e., *Submission*, $KMO=.442$) met this criterion. This construct was removed from any further analysis.

Items combined explained 46-73% of the total variance in the Principal Factor and in all but two cases the second highest factor in the solution had an eigenvalue less than 1.0. In both cases the second factor did not meet the minimum threshold value of KMO. Overall, this process resulted in a total of 21 factors (i.e., uni-dimensional scales) with a total of 87 Items.

Scale Reliability

The internal reliability of the 21 formed scales was measured by using the Cronbach's alpha. We used the guidelines of DeVellis [11] in judging the internal reliability with values below 0.60 being unacceptable, between 0.60 and 0.65 undesirable, between 0.65 and 0.70: minimally acceptable, between 0.70 and 0.80 respectable, between 0.80 and 0.90 very good, and above 0.90 representing optimally reliable scales.

In order to produce a lightweight measurement tool we attempted to reduce the number of items in the scales to a maximum of three items per scale (see Table 3). In the course of this procedure, four subscales, *Eroticism*, *Fantasy*, *Simulation* and *Sympathy*, displayed undesirable reliability with $\alpha < .70$. These scales were deleted, reducing the number of scales to a total of 17 formed with three items each, bringing us to a total of 51 items. Table 2 presents the Mean, Standard Deviation and Internal Reliability (Cronbach's α) for the 17 playfulness constructs. Table 4 presents the pair-wise correlations of the 17 constructs.

THE PLEXQ QUESTIONNAIRE

In this section we provide a brief description for the 17 categories of playful experiences along with the three items of the questionnaire for each category. For a more elaborate description of the playfulness categories, please refer to [1].

Captivation is the experience of forgetting one's surroundings and the sense of passing time while using a product or while involved in an activity. Examples of captivation include watching television or reading a good old book. It is measured through the items: "I forgot about my surroundings", "I felt completely absorbed" and "I lost track of time and space."

Challenge involves developing and exercising skills in a demanding task or situation. Challenge is highly related to the notion of *flow* [10]: make it too easy and there may be little fun in doing it; make it too difficult and the person will lose interest. Challenge is measured through the items: "It stimulated me to learn new things", "It was a true learning experience" and "I enjoyed learning new things."

Table 2. Mean, Standard Deviation and Internal Reliability (Cronbach's α) for the 17 playfulness constructs.

	Mean	SD	α
Captivation	2.89	1.05	.827
Challenge	3.22	1.12	.832
Competition	2.98	1.17	.781
Completion	3.55	0.85	.709
Control	3.22	0.98	.782
Cruelty	2.02	0.94	.720
Discovery	3.39	1.10	.754
Exploration	3.59	1.06	.828
Expression	2.94	1.07	.747
Fellowship	3.28	1.08	.722
Humor	3.33	1.00	.759
Nurture	2.44	1.04	.703
Relaxation	3.42	0.94	.755
Sensation	3.12	0.91	.752
Subversion	1.89	1.00	.798
Suffering	1.70	0.92	.880
Thrill	2.81	0.95	.744

Table 3. The PLEXQ Questionnaire.

Category	Related items
Captivation	I forgot about my surroundings. I felt completely absorbed. I lost track of time and space.
Challenge	It stimulated me to learn new things. It was a true learning experience. I enjoyed learning new things.
Competition	I felt competitive. I enjoyed competing against it. I enjoyed competing with myself
Completion	I managed to master a task. I got rid of a burden. I enjoyed succeeding.
Control	I had the capability to influence what was happening. I felt powerful. I enjoyed being in control.
Cruelty	I felt satisfied as if beating an opponent. I felt malicious towards others. I enjoyed manipulating others.
Discovery	I enjoyed discovering new things. I enjoyed finding useful new ways of using it. I enjoyed finding something unexpected.
Exploration	I felt curious. I enjoyed experimenting. I enjoyed trying out new things.
Expression	It supported my identity. I felt special. I enjoyed creating things.
Fellowship	I enjoyed sharing my experience with others. I felt a great need to share my experience with my friends. It felt like friendship.
Humor	It made me laugh. I had fun. I experienced funny situations.
Nurture	I enjoyed nurturing it I felt it was taking care of me. I enjoyed following its development.
Relaxation	I felt relaxed. I enjoyed passing time with it. I felt relieved from stress.
Sensation	I felt pleased by its aesthetics. I enjoyed the visuals. I felt pleased by the quality of it.
Subversion	I enjoyed doing things with it that others might disapprove of. I enjoyed breaking the rules. I enjoyed doing socially unacceptable things.
Suffering	I was wasting my time. I felt angry. I felt stressed.
Thrill	I enjoyed the suspense. I had an adrenaline rush. I felt excited.

Competition occurs when trying to achieve a defined goal while on a contest with oneself, an opponent or a computer. For instance, fitness-related products that allow people to keep track of their activities provide opportunities for competition both personally and within an online community. It is measured through the items: “I felt competitive”, “I enjoyed competing against it” and “I enjoyed competing with myself.”

Completion relates to finishing a major task or obtaining closure to an earlier tension. Completion may come from finishing a game, reading the last chapter of a book, or obtaining the final card of a set. In videogames, achievement systems provide ways to show progress [29]. It is measured through the items: “I managed to master a task”, “I got rid of a burden”, “I enjoyed succeeding.”

Control involves dominating, commanding and regulating others, an activity, or a system. The feeling of control is achieved when a skilled person is working with a moderately challenging task [10]. In sports, skill gives rise to virtuosity, which can be highly pleasurable. Control is measured through the items: “I had the capability to influence what was happening”, “I felt powerful”, and “I enjoyed being in control.”

Cruelty is the pleasure derived from causing mental or physical pain to others. Experiences of cruelty range from malice or bullying (e.g., at school), deliberate destruction and inflicting harm in multi-player videogames, or ill doing towards virtual characters (e.g., letting them starve). It is measured through the items: “I felt satisfied as if beating an opponent”, “I felt malicious towards others”, “I enjoyed manipulating others.”

Discovery involves finding something hidden or uncovering a new property of a product. Discovery is sometimes preceded by conscious exploration and is often associated with a degree of surprise, for example when finding an Easter egg feature in a product or DVD. It is measured through the items: “I enjoyed discovering new things”, “I enjoyed finding useful new ways of using it” and “I enjoyed finding something unexpected.”

Exploration involves investigating an environment, object or situation. It relates to curiosity and our human thirst for knowledge. Exploration in videogames consists of relatively free movement within certain external bounds, which often, but not always, leads to discovery. It is measured through the items: “I felt curious”, “I enjoyed experimenting” and “I enjoyed trying out new things.”

Expression is the experience derived from manifesting oneself creatively. Expression comes from dynamics that facilitate individuals to leave their mark – permanently or just for a moment – for example through designing, constructing, modifying and personalizing. It is measured through the items: “It supported my identity”, “I felt special” and “I enjoyed creating things.”

Fellowship emerges from forms of social interaction that relate to feelings of friendship, communality, and intimacy. Fellowship can be witnessed in applications that allow sharing information between participants (e.g., Facebook) or that create a team spirit (e.g., multiplayer online games). It is measured through the items: “I enjoyed sharing my experience with others”, “I felt a great need to share my experience with my friends”, “It felt like friendship.”

Table 4. Pair-wise correlations for the 17 categories of playfulness measured by the PLEXQ Instrument

Captivation	1																
Challenge	.21	1															
Competition	.26	.33	1														
Completion	.19	.35	.39	1													
Control	.32	.38	.51	.59	1												
Cruelty	.21	.25	.55	.28	.37	1											
Discovery	.26	.69	.31	.38	.45	.23	1										
Exploration	.31	.65	.35	.24	.37	.21	.75	1									
Expression	.18	.52	.39	.38	.47	.28	.58	.49	1								
Fellowship	.05	.36	.24	.33	.35	.23	.43	.35	.52	1							
Humor	.30	.38	.32	.31	.39	.25	.53	.44	.37	.47	1						
Nurture	.32	.44	.51	.40	.52	.41	.48	.48	.54	.47	.42	1					
Relaxation	.39	.25	.34	.34	.47	.33	.37	.26	.37	.21	.64	.40	1				
Sensation	.21	.44	.42	.46	.72	.29	.58	.45	.46	.47	.48	.46	.42	1			
Subversion	.23	.24	.35	.21	.22	.57	.28	.29	.18	.10	.27	.39	.19	.24	1		
Suffering	.28	.02	.05	-.20	-.12	.23	-.09	.04	.01	-.06	-.08	-.01	-.30	-.25	.21	1	
Thrill	.29	.48	.57	.40	.58	.52	.52	.49	.39	.37	.56	.51	.43	.51	.45	.10	1

Humor involves fun, joy, amusement, jokes, pranks and gags. Humor flourishes in the interactions between users of social media and networking sites. Products can elicit humor by doing things in surprising ways, e.g., a toaster that burns a figure. Humor can be culturally dependent. It is measured through the items: “It made me laugh”, “I had fun” and “I experienced funny situations.”

Nurture relates to taking care of oneself or others. Nurture is an elemental form of interaction that happens when we take care of a child, an animal or a plant. In the digital domain, nurture can happen when caring for virtual beings or tutoring novice players. It is measured through the items: “I enjoyed nurturing it”, “I felt it was taking care of me”, and “I enjoyed following its development.”

Relaxation comes from bodily or mental unwinding as result of being engaged in a playful activity. Examples of products that help release stress from work range from aromatherapy to miniature water fountains. In games it may manifest as calmness when in mastery of the situation. It is measured through the items: “I felt relaxed”, “I enjoyed passing time with it” and “I felt relieved from stress.”

Sensation is excitement elicited by stimulating the senses. Sensation can be the pleasure derived from contemplating a work of art, listening to music, or feeling the wind blow through your hair. Through their interactivity, video games can be seen as providers of sense-pleasure. It is measured through the items: “I felt pleased by its aesthetics”, “I enjoyed the visuals” and “I felt pleased by the quality of it.”

Subversion is elicited by breaking social rules or norms, or witnessing someone else doing that. Subversion can manifest itself when twisting the meaning of something, cheating in videogames, or when a streaker runs naked onto a pitch. It is measured through the items: “I enjoyed doing

things with it that others might disapprove of”, “I enjoyed breaking the rules” and “I enjoyed doing socially unacceptable things.”

Suffering is associated with several unpleasant but necessary experiences of play, such as boredom, stress, anxiety, anger, frustration, loss and even humiliation. In order for *flow* [10] to emerge, unpleasant pressure in the form of non-trivial challenges is sometimes required. It is measured through the items: “I was wasting my time”, “I felt angry” and “I felt stressed.”

Thrill is the excitement derived from risk-taking behavior, feeling scared, and being in danger. The risk of losing money in gambling, and the excitement derived from roller coaster rides are two examples of thrill experiences. Thrill is measured through the items: “I enjoyed the suspense”, “I had an adrenaline rush” and “I felt excited.”

UNDERSTANDING PLAYFUL EXPERIENCES

In this section we employ the PLEXQ instrument to inquire into the nature of playfulness and the kinds of playful experiences interactive products provide. We perform three different analyses. First we look at the experience of playfulness by different user groups. More specifically, we look at the extent to which users of different *age* and *gender* experience different forms of playfulness. Secondly, we look at different product categories. We identify four product categories that showed prominence in our sample – *Games* (PC or console), *Mobile Games*, *Mobile Apps* and *Social Networking Services (SNS)* – and analyze the different forms of playful experiences they provide to their users. Third, we employ the PLEXQ instrument to inquire quantitatively into the latent structure of playfulness. More specifically, we perform a Principal Components Analysis and find a four-factor structure of playfulness.

Playfulness, Gender and Age

Our sample consisted of 40 (23%) females and 132 (78%) males. Their ages ranged between 27 to 54 years old (Mean=37 years, SD=6 years). No significant differences existed across the male and female participants with respect to their ages.

Gender had no significant impact on the experience of playfulness with respect to most of the categories, except for *Relaxation* where a marginally significant difference was found between male and female participants. Female participants tended to experience higher levels of relaxation in the reported episodes (Mean=3.7, SD=0.7) than male participants (Mean=3.4, SD=1.0, $t(166)=1.7$, $p=0.09$). This may be partially explained by the different products male and female participants selected to report on as particular playful technologies. Female participants had a tendency to select Social Networking Services (SNS) more frequently (20%) than male participants, who in turn selected Mobile Apps more frequently (64%) than female participants (43%). Contrary to what we expected, Games and Mobile Games were selected more frequently by female participants (13% and 13% respectively) than by male participants (7% and 9% respectively). These variations in product selection across the two gender groups may hint at some subtle differences in what female and male users consider being playful in interactive technologies.

Age, on the other hand, seemed to have a consistent effect on the experience of playfulness, with five categories of playfulness displaying a negative correlation with age while no playfulness category displayed a positive correlation with age. More specifically, the playfulness categories that correlated negatively with age are: *Competition* ($r=-0.2$, $p<0.01$), *Nurture* ($r=-0.19$, $p<0.01$), *Cruelty* ($r=-0.19$, $p<0.01$), *Thrill* ($r=-0.17$, $p<0.01$) and *Exploration* ($r=-0.17$, $p<0.01$). Moreover, we found that older participants had a tendency to use the selected product less frequently than younger participants ($r=-0.16$, $p<0.01$).

Table 5. Playful experiences supported by different products

	Games	Mobile Games	Mobile Apps	SNS
Completion	4.0	3.6	3.4	3.6
Control	4.0	3.4	3.1	2.8
Exploration	3.9	3.3	3.6	3.7
Humor	3.9	3.3	3.3	3.5
Relaxation	3.9	3.8	3.4	3.4
Competition	3.8	3.9	3.0	2.8
Thrill	3.6	3.1	2.8	2.7
Sensation	3.7	3.2	3.1	3.0
Captivation	3.6	3.2	2.7	2.5
Discovery	3.6	3.1	3.4	3.5
Fellowship	3.1	2.5	3.3	3.9

Playfulness in Different Product Categories

Out of the 172 experience reports, we identified four product categories that displayed high prominence in our sample. The majority of them concerned *Mobile Apps* (N=98, 57%), followed by *Social Networking Services* (N=19, 11%), *Mobile Games* (N=17, 10%) and *Computer or Console Games* (N=14, 8%).

As expected, Computer and Console Games displayed the highest mean scores on most of the playfulness categories (see Table 5). Participants reported experiencing high levels of *Completion* and *Control*, followed by *Exploration*, *Humor*, *Relaxation* and *Competition*, followed by *Thrill*, *Sensation* and *Captivation*. On the contrary, Mobile Game experiences were dominated by *Relaxation* and *Competition*, followed by *Completion* and by *Control*. These results highlight the differences in the nature of computer and console to mobile games: while the former are much more about task accomplishment (i.e., *Completion* and *Control*), the latter are more likely to induce experiences of *Relaxation* and *Competition*. One should also note the superiority of Computer and Console Games in inducing more facets and higher levels of playfulness.

On the other hand, Mobile Apps are dominated by the experience of *Exploration*, followed by *Completion* and *Relaxation*, while Social Networking Services support the experience of *Fellowship*, followed by experiences of *Completion* and *Exploration*, and ones of *Humor* and *Discovery*.

Four Dimensions of Playfulness

In order to inquire into the latent structure of playful experiences, we performed a Principal Components Analysis with Varimax rotation, following the same procedure as O'Brien and Toms [31,32] in the development of the user engagement questionnaire. Item loadings were then interpreted using Comrey and Lee's criteria. Thus allowing us to distinguish a four-factor structure of playfulness: a) *stimulation*, b), *pragmatic* c), *momentary* and d) *negative* experiences (Table 6).

The first factor taps into *stimulation* experiences. By looking closely into the first three categories in this factor (i.e., *Discovery*, *Exploration* and *Challenge*), we see that they strongly relate to pleasure-seeking behaviors. These experiences fall both into what Hassenzahl calls *stimulation* [13], the product's ability to stimulate and enable personal growth, and Jordan's *psycho-pleasure* [18], the type of pleasure gained from accomplishing a task. Furthermore, the *Exploration* and *Discovery* categories rely on an *action-consequence* dimension (i.e., exploration often leads to discovery) [22].

The second factor is connected to *pragmatic* experiences. Especially *Completion*, *Control* and *Competition* share their goal-oriented nature. They are about achieving results and maintaining control is the means towards that. This is what Hassenzahl calls *pragmatic quality*, the product's ability to

Table 6. Principal Components Analysis with Varimax rotation. Four playfulness factors were found: A) stimulation, B) pragmatic, C) momentary, and D) negative experiences.

Category	Component			
	1	2	3	4
Discovery	,872	,124	,163	,115
Exploration	,845	,055	,250	,153
A Challenge	,809	,219	,096	,130
Expression	,663	,374	,140	,147
Fellowship	,526	,308	,211	,047
Nurture	,479	,373	,297	,381
Completion	,206	,774	-,002	-,037
Control	,326	,720	,191	,138
B Competition	,150	,589	,256	,497
Sensation	,555	,557	,157	-,032
Thrill	,358	,480	,424	,424
Relaxation	,103	,284	,853	-,026
C Humor	,431	,088	,756	,049
Captivation	,176	-,006	,655	,255
Suffering	,148	-,248	-,066	,749
D Cruelty	-,013	,387	,189	,703
Subversion	,133	,103	,103	,687

support the achievement of behavioral goals (i.e., usability). *Completion* can also be seen as a motivation to reach an end state, rather than being something you can design for [21]. The distinction between these two first factors, i.e., *stimulation* and *pragmatic* experiences nicely maps to Hassenzahl's notion of motivation orientation [13].

The third factor is associated with *momentary* experiences [26]. *Captivation*, *Humor* and *Relaxation* all relate to ephemeral pleasurable states where people lose track of time, are having a laugh, and release stress. These categories all relate to reaching a state of mind while engaged in a playful activity. These categories also somehow relate to Jordan's notion of *psycho-pleasure* [18].

The fourth factor relates to *negative* playful experiences. Early studies on PLEX [1,2,20] had identified the existence of negative experiences whose function was to make the subsequent experience feel stronger [1]. Similarly, in their studies with the PLEX Cards, Lucero and Arrasvuori [22,23] found that people could feel blocked by odd or controversial cards (e.g., *Cruelty*) when designing for playfulness, and would often discard them as a result. More specifically, Lucero et al. [26] identified three categories that explore negative aspects of playfulness: *Cruelty*, *Subversion* and *Suffering*. Our factor analysis confirms the similarity between these three *negative experience* categories and that make them distinct from the rest of the PLEX categories.

DISCUSSION AND CONCLUSIONS

In this paper we described early efforts to develop and validate a Playful Experiences Questionnaire (PLEXQ). Seventeen out of the 22 categories of playfulness proposed in the PLEX framework showed adequate reliability and were included in this initial version of PLEXQ. We believe PLEXQ can advance our evaluation practices, being a lightweight tool, with only three items measuring each facet of playfulness, yet offering a fine-grained understanding of playfulness, capturing 17 distinct facets of playful experiences. Our exploratory analysis using the PLEXQ questionnaire revealed interesting insights with regard to the role of gender, age and product type on one's proclivity to experience playfulness, and revealed a four-factor latent structure of playfulness. Future work should look at the dynamics of playful experiences over time [19]: while certain facets of playfulness may be more salient during initial use, others may be more prominent in users' prolonged experiences with interactive products. Uncovering which aspects of playfulness drive users' long-term engagement with products and services will further advance our understanding of and ability to design successful and engaging products.

Next, we should further inquire into the differentiated impact of playfulness categories on users' behaviors. This will shed light as to the practical implications of playfulness, be it in the form of sustaining users' engagement with technology, or achieving external outcomes such as changes people's behavior in certain social contexts. Our primary interest was to develop a questionnaire that is appropriate for the measurement of playfulness inherent in and experienced by users in their interactions with interactive technologies. To expand this instrument to non-HCI domains, further validation and evidence for its validity and reliability are required. Finally, PLEXQ was found to reliably measure all but four facets of playfulness from the original PLEX framework: *Eroticism*, *Fantasy*, *Simulation* and *Sympathy*. This does not mean that these facets are not relevant and valid constructs of playfulness in our interactions with technology. It is rather that our study, with the limited sample of participants (n=172) and technologies under consideration, as well as the current version of the questionnaire revealed weak internal reliability. One should also note that participant bias might exist in our limited sample due to the recruitment process, as all participants were employees of the same company and thus may be susceptible to systematic biases with respect to company culture and income levels, albeit having different academic backgrounds. Future work should attempt to further validate the PLEX questionnaire with a larger (i.e., 1500-2000 participants) and more diverse sample.

One has to note that some overlaps exist between PLEXQ and other questionnaires in the area of user experience such as the Game Experience Questionnaire [17], the Game Engagement Questionnaire [6], the product attachment

scale [30] as well as AttrakDiff ([12], see also www.attrakdiff.de). For instance, our *Captivation* and *Challenge* are similar to the Immersion and Challenge scales of the Game Experience Questionnaire, and our *Fellowship* scale displays certain overlap with a construct termed ‘Group affiliation’ on the product attachment scale. We would like to note, however, that PLEXQ presents the first comprehensive set of scales for measuring playfulness with a wide range of interactive products. While PLEXQ may be effectively employed for the evaluation of play and playfulness within computer games [15], it provides a fine-grained characterization of playfulness with a wider range of interactive products, and as such makes a strong contribution to the broader field of user experience.

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