

# Attitudes to new technology and experiential dimensions of two different digital games

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## ABSTRACT

This paper describes the effect of attitudes to new technology on user experience in two different digital games. User experience is measured by using a framework which includes perceptual-attentive, cognitive-emotional and motivational constructs. They form four experiential dimensions; Physical presence, Emotional involvement, Situational involvement and Performance competence. Attitudes to new technology were measured by asking from the subjects how interested in new technology they were. Two types of computer games were played in two different displays. The results show the dependence of experiential dimensions on subjects attitudes towards new technology. Attitudes to new technology modify the expectations and beliefs, hence the motivation of the user. The results have relevance especially when considering the optimal target group of marketing computer games.

## Author Keywords

attitudes, experience, presence, involvement, computer games

## ACM Classification Keywords

H.5.m Computer games and experience

## INTRODUCTION

Human experience is subjective by nature making it difficult for other people to fully comprehend the content of others subjective experience. Hence it is a reasonable approach to examine it through subjective judgement of the experience. To understand the holistic human experience one should consider both bottom-up processes, such as direct perception [1], and top-down processes, which affect the way we experience the surrounding world [2]. For example, playing a computer game is essentially different

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for someone who plays it on a daily basis as contrasted to someone who experiences a computer game for the first time. Furthermore, playing a computer game with head mounted display (HMD) is experienced differently if one is generally interested in novel technology when compared to people who do not value such gadgets at all. The aim of this study was to examine these differences.

## Presence

Recent advances in technology have brought us new devices, such as HMDs and virtual environments (VEs) which enable us to experience sense of presence more easily than traditional media. Sense of presence has significant effects on the experience which makes it important concept when trying to develop products that people would be eager to use.

Presence can be defined as a perceptual illusion of non-mediation, which means a state in which a person fails to notice the devices from which the actual stimuli originates [3]. The person feels that instead of e.g. playing a computer game with a gamepad, he/she is actually driving a car, as if he/she would be inside the game world. Presence has two main elements that determine it: 1) the characteristics of the user and 2) the characteristics of the media [4].

Presence has been studied extensively but very little attention has been paid to the background variables which affect it. It is not clear which user characteristics are essential in producing the sense of presence and how susceptible presence is to variation of background variables.

## Attitudes to new technology

Great deal of research has been done on explaining what makes new technology appealing and causes people to adopt it. A main finding is that beliefs about usefulness of new technology have a mediating role on attitudes and behavioral intentions to use new technology [5]. Furthermore, attitudes on new technology seem to modify the overall user experience. In this study, the effect was seen especially on presence, as described below. Naturally, attitudes on new technology affect mainly the motivation of the user, through which it modulates the user experience.

## **Involvement**

Concepts of particular interest in this study are the dimensions of emotional involvement and situational involvement. Emotional involvement describes the intensity and quality of the experience. Emotional involvement is dependent on the content provided by the gameworld, that is, did it evoke positive feelings and was it experienced as interesting. Situational involvement describes the smoothness and intuitiveness of interactivity, which depends on the perceived goals and available opportunities provided by the gameworld [8]. Involvement as a whole reflects a person's perception of relevance and interest of the object and thus it is a good predictor of consumer behavior [6]. Hence, it is imperative to identify variables that affect the involvement in order to understand what makes novel technology appealing.

## **METHODS**

### **Subjects**

80 users participated the experiment. They were mainly university students from the faculty of behavioral sciences and the department of computer science. There were 40 males (50 %) and 40 females (50 %). The mean age of the subjects was 24.7 years. The subjects were divided into four equal groups (20 subjects each) and a 2x2 (two games, two displays) test design was used.

The subjects were selected by applying a background questionnaire. Based on the background questionnaire answers we excluded subjects who did not like driving games, did not have any computer game playing experience or who reported playing computer games for six hours or more every day.

### **Technology**

All four experimental groups used the same computer (Pentium4 CPU at 3.00 GHz – Total memory 512 MB DDR-SDRAM). The display adapter used was Sapphire ATI Radeon 9600 - 256MB (8 x AGP) and Sound card Realtek AC97 Audio. There were two different display conditions: 1) Olympus Eye-Trek FMD-700 near-eye display (VR-condition).

2) 21 inch Sony Trinitron GDM-F520 CRT monitor (CRT-condition).

### **Task**

The first half of the subjects played Need for Speed Underground (NFS), which is a 1st person 3D – driving game with lots of camera movement, horizontal changes and intensive flux. Microsoft Sidewinder Gamepad was used to play NFS. The other half played Slicks n' Slide 1.30d (Slicks), which is a 3rd person, 2D – driving game with no camera movement and otherwise static environment. The subjects used keyboard to play Slicks.

The subject was instructed to proceed in his or her own pace and not to ask instructions during the game play, if possible. However, they were assisted if insurmountable problems (i.e. technical or otherwise immediate) occurred.

The task lasted for 40 minutes after which the subjects filled in the EVEQ questionnaire.

## **EVEQ**

To measure user experience the EVEQ questionnaire was used. EVEQ is a developmental tool, which includes 152 items, which have been mainly collected from the previous presence and flow i.e. optimal experience studies [7]. These items can be further summed into 26 scales to measure different experiential constructs (e.g., presence and flow components). These scales have been used in two different studies n=68 [8] and n=164 [9] in which three dimensions of Presence-Flow framework have been extracted in factor analysis and later extended to four dimensions of Presence-involvement-flow framework as used in this study.

Because of the nature of the current data (four distinct treatments) the structure of the framework rests on the inspection of the Cronbach's alfa of each dimension. Next we give a short description of the 26 scales that form the four main dimensions. To read more about the scales and items forming the scales the reader is referred to Takatalo [10].

## **Dimensions**

### **1. Physical presence ( $\alpha=.93$ )**

**Action** (Objects and things could almost touch me, game induced real motion feelings)

**Attention** (Concentration on the game instead of the real world, time distortion)

**Real** (Gameworld was natural, live and vivid)

**Spatial** (Spatial awareness, inside a place, being part of the gameworld)

**Being there** (Visited a virtual place instead of being in a lab, journey to the gameworld)

**Drama** (Perceived a plot in game, plot affected user's behavior)

**Enclosed** (How much did the media support the different senses e.g. vision, hearing)

### **2. Emotional involvement ( $\alpha=.93$ )**

**Mediarichness** (e.g., how warm, close and sensitive the media is experienced)

**Valence** (Was the experience negative or positive)

**Pleasant** (Enjoyment, gameworld was pleasant, time flew)

**Impressed** (Strong experience, game was like magic, exciting)

**Interest of the played game** (The game was appealing, interesting and fun)

**Interest of the test situation** (The test was appealing, interesting and fun)

**Playful** (Free, flexible, natural, live)

**Innovative** (Creative, innovative, learning new skills)

**Flow** (Feedback, concentration, enjoying using skills, clear goals)

**3. Situational involvement ( $\alpha=.70$ )**

**Bored** (playing the game evoked boredom, anxiety and frustration)

**Challenge** (Perceived challenges provided by the game)

**Arousal** (Level of arousal evoked by the situation)

**Interaction SMR** (Evaluation of the interaction speed, mapping and range)

**Personal relevance of the game** (The game was important, meaningful and relevant)

**Personal relevance of the test situation** (The test was important, meaningful and relevant)

**4. Performance competence ( $\alpha=.62$ )**

**Social presence** (Acting/ competing with others, other actors were aware of the user)

**Skill** (Experienced game playing skill)

**Control** (Sense of control over situation)

**Exploration** (Ability to explore the environmental limits of the gameworld)

**RESULTS**

For the data-analysis, the subjects were grouped into two categories depending on their subjectively reported attitudes to new technology. Two subjects were rejected from analysis because they didn't fit into the groups created on basis of attitudes. Table 1 summarizes the distribution of subjects with regard to experimental conditions. The differences between the experimental conditions were measured with a one-way ANOVA.

**Subjects with high interest in new technology**

Comparing the groups who played either NFS or Slicks with Olympus glasses showed a significant difference in the Physical presence scores ( $F(1,23)=5.49, p=0.029$ ). NFS provided more real motion feelings, it was experienced more natural, live and vivid and offered the users a stronger spatial sense of space. To summarize, NFS provided more complete transfer to the game world.

NFS was also emotionally more involving than Slicks

Attitudes to new technology	NFS VR	Slicks VR	NFS with CRT	Slicks with CRT
Low interest	8	6	13	7
High interest	11	13	7	13

**Table 1. Distribution of the subjects with regard to their attitudes to new technology in four experimental conditions**

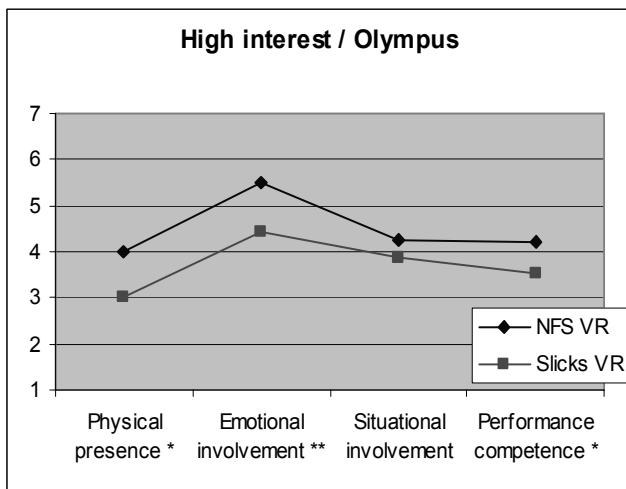
( $F(1,23)=7.38, p=0.013$ ). It was experienced warmer, more sensitive and more pleasant than Slicks. NFS was also felt as more impressing than Slicks and to play it felt more free and flexible. In sum, NFS provided emotionally more intensive playing experience.

Finally, the games differed also in performance competence dimension ( $F(1,23)=5.18, p=0.033$ ). NFS evoked more social feelings towards the computer opponents. There was no significant difference between the two games in Situational involvement dimension, although Slicks was considered more boring.

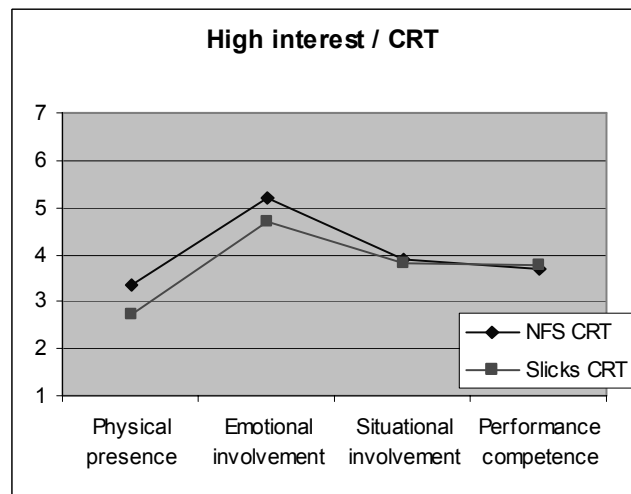
Interestingly, the games did not differ on any of the dimensions when comparing groups who played either NFS or Slicks with normal CRT-display. The difference of dimension scores between Olympus and CRT condition is illustrated in figures 1 and 2.

**Subjects with low interest in new technology**

Comparing groups who played NFS or Slicks with Olympus glasses, the NFS players were more involved in the game than Slicks players. There was a significant difference in both Emotional involvement ( $F(1,13)=5.46, p=0.038$ ) and Situational involvement ( $F(1,13)=6.06, p=0.030$ ). NFS was experienced more pleasant and interesting than Slicks. Slicks was considered rather boring, whereas NFS increased the level of arousal. NFS also provided more interaction speed. Its interaction was better mapped to the real world action and the range of its interaction was wider than that provided by Slicks. NFS



**Figure 1. Dimension scores of high interest subjects on Olympus condition in both games**



**Figure 2. Dimension scores of high interest subjects on CRT condition in both games**

was experienced more as a place visited than Slicks, but contrary to high interest subjects, no significant difference in presence dimension was shown.

Contrary to the subjects with high interest in new technology, the low interest group differed also when comparing groups who played NFS or Slicks with normal CRT display. There was a significant difference in Physical presence dimension ( $F(1,19)=4.86$ ,  $p=0.041$ ). NFS provided more real motion feelings, it was experienced more natural, live and vivid and provided the users more spatial sense of space. It also enclosed the user better to the visual and auditive environment. NFS had higher interactivity and enabled the user to explore the environmental limits of the gameworld.

## CONCLUSIONS

This paper presents a study in which user experience was measured and profiled in four different experimental conditions. User experience was evaluated in these conditions with a four dimensional Presence-involvement-flow framework (PIFF). PIFF is an explorative framework, which has been developed in previous studies [8, 9].

The difference between the two games studied is obvious. Need for Speed is a fast paced three-dimensional 1st person racing game and Slicks is a simple two-dimensional 3rd person racing game that resembles simple electronic or mobile games. However the experiential differences between the games are more complex.

The subjects with high interest in new technology had a higher subjectively reported presence than subjects with a low interest in new technology, when playing with Olympus glasses. This implicates that the glasses enriched the user experience more for those who value new technology. The heightened performance/competence scores in high interest group can be partly explained by gender differences, but it is out of the scope of this paper to further analyze the effects of gender to these results. The low interest subjects had a significant difference in situational involvement which is because they considered Slicks less interactive and arousing than subjects in other conditions. For high interest subjects who played Slicks, the Olympus glasses prevented the drop of interaction and arousal scores. The results did not implicate clear modulation by level of interest on emotional involvement, although high interest subjects reported slightly higher emotional involvement than low interest subjects.

In the CRT condition, the two games did not differ significantly in high interest group, which is a further prove that the effects in Olympus condition were due to the high appreciation of novel technology. Comparing figures 1 and 2, one can see clearly the elevating effect which Olympus glasses have on user experience. The low interest subjects' difference in physical presence in the CRT condition is explained most likely by inferiority of Slicks. The low interest subjects considered the difference between the two

games greater than in other conditions, especially on realness of the gameworld and spatial awareness.

To summarize, interest in new technology seems to have a modulating effect on physical presence and thus its role on overall user experience is rather strong. The Olympus condition enhanced the difference between games for high interest group as well as for low interest group, which is expected. However, playing with Olympus glasses was more emotionally involving and evoked more presence for those with high interest in new technology. Due to the small sample size the results of this study must be seen as tendencies and there is a need for further research.

## ACKNOWLEDGMENTS

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