Playability and Player Experience Research

Lennart E. Nacke
Blekinge Institute of Technology, Sweden
lennart.nacke@acm.org

Anders Drachen
IT University of Copenhagen, Denmark
drachen@itu.dk

Kai Kuikkaniemi
Helsinki Institute for Information Technology, Finland
kai.kuikkaniemi@hiit.fi

Joerg Niesenhaus
University of Duisburg-Essen, Germany
niesenhaus@interactivesystems.info

Hannu J. Korhonen
Nokia Research, Finland
hannu.j.korhonen@nokia.com

Wouter M. van den Hoogen
Eindhoven University of Technology, The Netherlands
W.M.v.d.Hoogen@tue.nl

Karolien Poels
Eindhoven University of Technology, The Netherlands
K.Poels@tue.nl

Wijnand A. IJsselsteijn
Eindhoven University of Technology, The Netherlands
W.A.IJsselsteijn@tue.nl

Yvonne A. W. de Kort
Eindhoven University of Technology, The Netherlands
Y.A.W.d.Kort@tue.nl

ABSTRACT
As the game industry matures and games become more and more complex, there is an increasing need to develop scientific methodologies for analyzing and measuring player experience, in order to develop a better understanding of the relationship and interactions between players and games. This panel gathers distinguished European playability and user experience experts to discuss current findings and methodological advancements within player experience and playability research.

Author Keywords
Playability, game experience, user experience, techniques, methodology, experimentation, usability

INTRODUCTION
Games are artifacts that unfold their full potential in the interaction with human players, allowing them to craft their experience individually. With recent advancements in the field of human-computer interaction [6, 34] and user experience [14], new tools, techniques, and methods become available for measuring how people interact with entertainment technology [18, 22]. Player experience research benefits from this development as it is now possible to approach scientific, empirical assessment of computer gameplay. By combining insights gained from numerical recording of parameters (physically from players as well as technically within entertainment software) and approaches toward qualitative assessments of experience (including behavioral observations), it is gradually becoming possible to render a high-resolution image of the complex interactions driving gameplay and player experience. Gameplay here is seen as the gaming process of the player with the game.

We argue that playability is the evaluative process directed toward games, whereas player experience is directed toward players. More precisely, playability methods evaluate games to improve design, whereas player experience methods evaluate players to improve gaming. Figure 1 shows that this separation of terms becomes important in the game design process, especially within a user research team for deciding, which methods to deploy at which stage of the process.

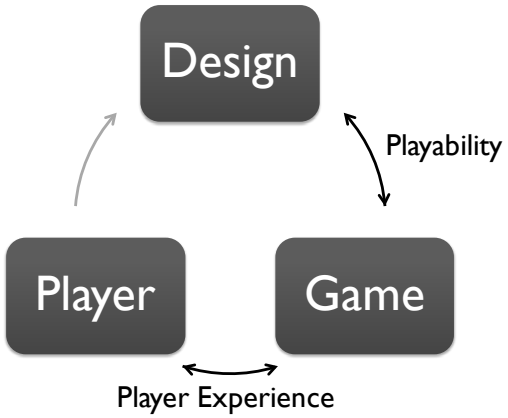

Figure 1: The interfaces between player, game and game designer show that playability is directed toward evaluating game design, whereas player experience has to be analyzed in the player-game interaction process.

Since research in this direction is currently in a developmental stage [19], this panel aims at giving an overview of current state-of-the-art methodologies, paving the way for future research with the goal of establishing empirical standards and progressing toward definitions of player experience and playability. After presenting

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individual perspectives, the benefits of current methods and challenges faced by research and industry will be discussed.

PERSPECTIVES ON PLAYABILITY RESEARCH

Good playability of a game should be a prerequisite for evaluating game experience. A game design should not contain any problems that could get in the way of an individual game experience. One method of evaluating playability is expert review or heuristics, which is a cost-efficient and effective technique to identify playability problems. It can be used iteratively at any point during the game development process. The method has been used successfully to evaluate traditional software, but for it to be applicable in game evaluations specifically designed heuristics are needed [15]. There are some playability heuristic sets currently available [4, 7, 12-13], which can guide and help experts to evaluate user interface, gameplay and many other aspects of a game.

Next to general heuristics, which cover different aspects of a game, usability heuristics with a special focus on technical [25] or learning aspects of games [16] are also available. However, the development of playability heuristics is still ongoing and more research is needed to create a coherent set of playability heuristics that can be used to evaluate all kinds of digital games in all kinds of different settings and environments, in players' homes or on mobile devices. This presentation will investigate the benefits and challenges of applying playability heuristics for gaming in different contexts.

BIOMETRICS AND PLAYER EXPERIENCE

One way of understanding playability is using biometrics or psychophysiological measures. There are two ways to measure game experience within psychophysiology: tonic and phasic. Tonic refers to an analysis of aggregate signal levels during a long period of play. Phasic refers to event-based analysis of player experience (for a psychophysiological data acquisition framework see [20]). There are several different biometric signals that can be used for measuring playability [17, 21, 27]. According to a study on facial muscle activity and skin conductance level during death events of the player character pointed to positive player emotions during death events [27].

Electromyography (EMG) is a measurement technology for recording the electrical activation of muscles. Together with electrodermal activity (EDA), facial EMG allows mapping of player emotions in the circumflex model of emotions [28]. In addition, brain waves (EEG) are usually described in terms of frequency bands which allow inferences to be made about mental idleness, cognitive processing, emotions, and sensations of players [8, 29]. Finally, eye trackers measure the saccades (fast movements) and fixations (dwell times) of human gaze, which also allows assessment of cognitive processes. The great benefit of using biometrics is that they covertly record information during gameplay without disturbing the player.

GAMEPLAY METRICS AND PLAYER EXPERIENCE

Game testing during and after production has been performed for decades, however traditionally using informal methods. Recently, a variety of methodologies have been adapted from human-computer interaction (HCI) to assist with this process [23-24]. One of the more promising methods considers integrating gameplay metrics with traditional attitudinal data [11, 30]. Gameplay metrics are numerical data obtained from the user interaction with the game software. Metrics are objective; can be collected in large numbers from many users, and map to specific points in a game (for example game events [20, 27]). In comparison, player-based feedback has lower resolution and is inherently biased due to individual preferences [5]. However, while gameplay metrics analysis is excellent for addressing the *"what"* of player behavior, the data are not always able to answer *"why"* the behavior emerges. This is one of the primary reasons for why the integration with qualitative methods is essential [11, 23].

Gameplay metrics form a valuable objective data source to user experience research and design, because these data offer quantitative, time-stamped information about the specific behavior of players of computer games (for an example see Figure 2) [3, 11, 31]. By combining metrical game data with other user experience measures – biofeedback, surveys and usability methods – it is now possible to directly link game experience with game design elements.

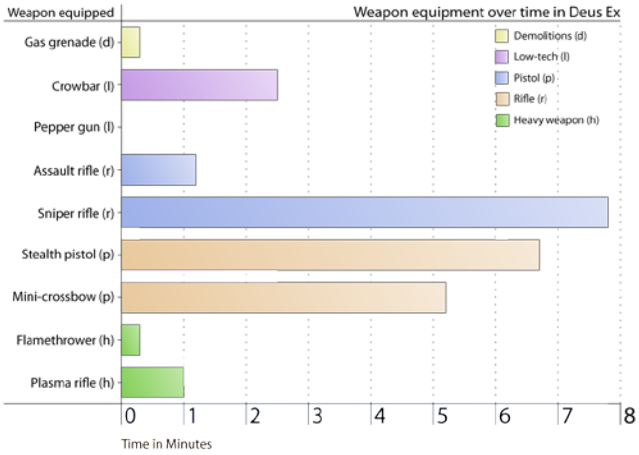

Figure 2: A simple example of a gameplay metrics analysis. The diagram details a time-spent analysis of the choice of weapons equipment for a single player during 25 minutes of *Deus Ex* gameplay.

A MULTI METHOD APPROACH ON MEASURING PLAYER EXPERIENCE

Player experience can be measured with a broad range of variables, observing and investigating both reflective (subjectively controllable) and reflexive (objective and uncontrollable) responses. Assessing basic psychometric properties (sensitivity, reliability, validity) of these

measures is a defining characteristic of our recent work on measuring and understanding player experience [1, 9, 26].

As a significant first step, we developed and validated the Game Experience Questionnaire (GEQ), which reliably distinguishes between seven different dimensions of player experience: *Sensory and Imaginative Immersion*, *Tension*, *Competence*, *Flow*, *Negative Affect*, *Positive Affect*, and *Challenge* [2, 10, 26]. In addition to self-report measures, we have observed a number of objective behavioral measures of player experience. The potential of overt (e.g. facial expressions) and covert (e.g. pressure exerted on an interaction device) expressions of behavior is being investigated to validly and reliably assess dimensions of player experience, such as boredom, flow and frustration.

Results using these objective measures are encouraging, showing a positive correlation between pressure exerted on the left button of the computer mouse (generally used for 'firing' a weapon in a game), the amount of bodily movement a player exhibits, and several player experiences, including frustration [32-33]. To conclude, we believe that a multi-measure approach enables a fuller characterization of game experience than any single isolated measure, thus sensitizing us to the rich gamut of experiences associated with digital games.

PRESENTERS

Lennart Nacke is a PhD candidate in Digital Game Development at Blekinge Institute of Technology. His research interests are biometric/psychophysiological player evaluation and quantification of gameplay experience in player-game interaction, technology driven innovation (e.g. playability metrics, physiological computing) and innovative interaction design with digital entertainment technologies.

Dr. *Anders Drachen* is a post-doctoral research fellow at the Center for Computer Games Research at IT University of Copenhagen. His research is focused on empirical and theoretical studies of tabletop games and games on digital platforms, user experience, interactive storytelling, usability/playability and related game evaluation methodologies. He collaborates with a range of game industry companies, including IO Interactive and EIDOS.

Kai Kuikkaniemi is a researcher in the Helsinki Institute for Information Technology, Network Society research program. His research focuses mainly on developing and analyzing experimental games. Currently he is working with game-based design methods, service-based game business models, cinema gaming and biofeedback gaming.

Joerg Niesenhaus is a research associate at the chair of Interactive Systems and Interaction Design, University of Duisburg-Essen, Germany. His research focuses on interactive storytelling, knowledge management in creative and agile development environments, game interfaces and game usability. After working several years as a game developer for Blue Byte and Ubisoft, he still supports development teams in the areas of game design and usability as a consultant.

Hannu Korhonen is a senior researcher at Nokia Research, Finland. His research interests include playful experiences and game evaluation methods. He is one of the developers of playability heuristics, which are used to evaluate playability of mobile games on Nokia's N-Gage platform. He is also a PhD student at the University of Tampere and his research topic is playability evaluations of mobile games with an expert review method.

Dr. *Wouter van den Hoogen* is a post-doctoral research fellow in the Human Technology group at Eindhoven University of Technology. His research focuses on measuring player experience through self report measures, people's behavior during gameplay, and their physiological responses, ideally doing this in real time. Currently, he is working on applying these measures and on digital game mechanics in general for revalidation purposes. He thankfully acknowledges the contributions of Karolien Poels, Wijnand IJsselsteijn, and Yvonne de Kort to the work presented here.

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