

Games User Research and Gamification in Human-Computer Interaction

Video games inspire new tools for creating engaging user experiences.

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Video games have become the focus of attention in the field of human-computer interaction (HCI), a focus that looks beyond the study of video games as mere testbeds for interaction studies, or investigations of a game's user interface.

For example, some games have moved to free-to-play business models, where a small number of players pay for premium game content. In these games, user behavior is predicted through the collection of telemetry data, which is also used on mobile phones to provide information about a user's location. This data is then analyzed with machine learning techniques to create personalized experiences. Another example is the use of immersive feedback technology for determining the optimal content and playtime of

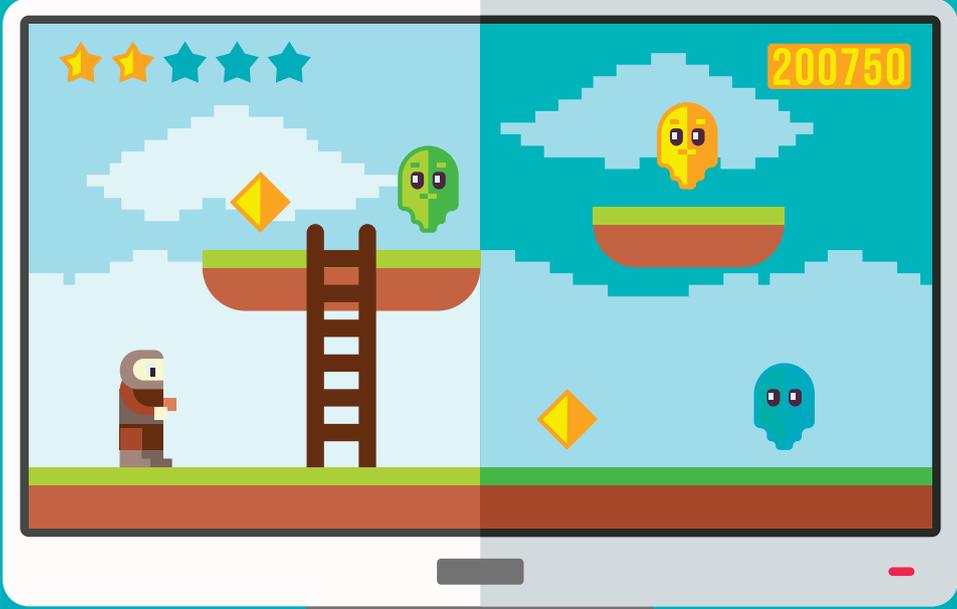
virtual reality applications (currently around 15 minutes before most users report the need to vomit).

A constant challenge for researchers remains the scientific assessment of the “fun” part of a user experience. Most often, this is assessed with surveys, such as the under-development player experience inventory [1]. Many of these new methods for studying user experiences—commonly summarized in a field called “games user research”—have been adopted by the video games industry. Today, scientific evaluations of players are common at large, industrial developers like Blizzard, Electronic Arts, and Ubisoft.

RESEARCH AND DESIGN: HAPPILY MARRIED SINCE 1992

Interestingly, the countless hours spent observing players and seeing them struggle with features that seemed to work so well in prototypes has allowed games user researchers to develop a critical eye for design flaws. I can speak from experience: While games have long fascinated me for their engaging nature, I never considered myself an actual game designer. It was not until I started studying their immersive qualities that I gained a better understanding of what works, and what doesn't, when it comes to game design. For ex-

ample, we once tested a side-scrolling space shooter game with a levitation mechanism that was throttled by mouse interaction. After testing with a couple of players, observing their behavior, and interviewing them, we discovered the mouse interaction was too cumbersome for controlling the main character and decided to switch to keyboard input. In another study, we asked players what objects they collect and why they value certain objects over others. It turned out people collected gear and critters the most, and they valued objects that provided utility and enjoyment to them [2]. Consequently, now when we design



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for object collection in games, we consider mechanics that enable curation and sharing of game objects and build objects that preserve the play context. User research and design go hand-in-hand like an old, married couple who harbor a deep love for each other despite the vast knowledge of mutual differences and shortcomings.

Unfortunately, user experience research is often an ill-defined field, and in the past some companies have failed to acknowledge the large part that research plays in informing designers. This has now changed, and large companies like Electronic Arts are using user research to inform their design decisions. For example, in our upcoming book on games user research (to be published by Oxford University Press), James Berg of Electronic Arts Canada reports on the user research involved in creating the game “Dragon Age: Inquisition.” Among other methods, his team used eye tracking on the crafting interface of the game, through which they found players were deciding what materials to use for crafting weapons based on how the appearance of the weapon changed. A vital statistic for the game’s design—damage per second—presented on this screen, was not considered by players. In the final version of the game, the overall damage and damage-per-second values are displayed in a large, bright orange font against a dark background, making it more likely to draw players’ attention. It is, no doubt, true good design is large parts skill, talent, and intuition. But the best designers also have a knack for research.

In HCI research on digital games, these two interests—studying users and designing engaging experiences—met in the mid-2000s. The compelling mechanics of games fascinated many designers and researchers. As user research shifted its focus from functionality and usability to the more experiential aspects of a user’s interaction and user experience, many designers began to think about transferring the mechanics that make games engaging and delightful experiences to applications that were not games, but which needed an infusion of positive user experience.

GAMIFICATION: MORE THAN JUST WINDOW DRESSING

Between 2006 and 2011, a team of researchers, including my research group that is now at the University of Waterloo, started investigating a phenomenon we dubbed “gamification” [3]. At the time, many HCI researchers were interested in user experience but also wanted to investigate the design opportunities that games provided to motivate people in all sorts of interactive technology applications. Games, after all, were known to be fun and engaging by nature, a quality most software applications were still struggling with. The rise of digital businesses, location-based mobile gaming, and web technologies helped take gamification beyond academia, and consolidate it as an important driving factor of many online and mobile businesses. These web businesses began borrowing design elements from video games: point systems, badges, and leaderboards. In addition, traditional video game publishers expanded their meta-game systems, most notably Xbox Live and Steam, which were driving user activity around their digital stores and user communities. For example, the Steam community introduced an online trading card system around the activities of buying and playing games. Improving user experience through games became a common theme among the many emerging software-as-a-service companies. Since 2011, it has become a highly studied area, with thousands of publications over the past couple of years alone. Video games today are already generating more revenue than other entertainment industries, and gamification is estimated to grow into a billion-dollar business.

As HCI embraced intelligent sensors in many of its main technologies, like mobile phones, the world witnessed the rise of new systems that enabled users to track their own behavior and environmental context in ways they could not do in the past. These technologies proved the primary facilitators of gamification, and increased tracking capabilities allowed people to turn their entire digital lives into a game with point-and-reward systems for their actions.

The ability to measure every aspect of one's activities led to many good things—not least the many opportunities people now had to track their fitness and health. However, the rise of gamification also brought the risk of a hollow and frustrated world, with users made to do tasks that did not contribute to self-improvement or personal learning. Points and badges were used for meaningless progression in a digital system; leaderboards provided a “digital whip” for employees not performing at a high level. We saw the dangers of gamification. In many instances, digital marketing became synonymous with gamification, leading designers astray from core concepts of self-determination like personal competence, autonomy, and relatedness to others.

HIT THE RESTART BUTTON!

Gamification should serve the purpose of improving peoples' lives, and not tie them to some proprietary technology as consumers. Fortunately, we are seeing many good—and successful—approaches within HCI, where gamification is being used to create enjoyable personalized user experiences that lead to positive behavioral changes and self-improvement.

Providing customized interfaces to cater to new and experienced users has long been a popular approach in interface design. But often the onboarding process has been overlooked. Onboarding is particularly important in games since their compelling nature stems from the learning opportunities they provide. Good gamification personalizes this learning to the individual skills of each user, assisting them in the best possible way. Gamification must draw on many core HCI fields, such as psychology, crowdsourcing, interface design, logging and tracking technologies, and intelligent machine algorithms.

A new breed of designers is working on “gameful” design: Developing non-trivial, but achievable, goals that users are motivated to pursue under an arbitrary set of behavioral rules. The user experience is guided by these goals and rules. Another important factor in gameful design is

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that users consider their motivation to engage with an application in the first place as voluntary. Designing technologies this way is challenging because of the careful onboarding and initial impressions required to build successful gameful applications. However, as motivation, engagement, and user experience have become important drivers of public policy goals in health, education, and civic engagement, gameful experiences are becoming the primary outcomes of gamification.

The gameful design paradigm is quite different from “playful” design, which has been a common approach to creating better user experiences in the context of HCI. The latter is more fluid and lacks the goal orientation so essential to the former. The rules and goals that are afforded by games, and thus included in gameful design, better lend themselves to building engaging products focused on behavioral improvements and changes. Indeed, the motivation and engagement gameful design promises to deliver are founded on this goal-and-rule structure. In practice, however, the lines can blur, and gameful applications often include playful elements to provide a richer frame of interaction. Nevertheless, it is important for user experience designers to know the difference between designing play and designing a game, even if both interactions are present in the final product.

As this new design area is emerging in HCI, gamification will remain an important field of study for years to come, partially because we still lack a body of rigorous studies investigating the long-term effects of

these motivational applications and partially because many new application areas are building their own best practices for supporting gameful designs. Particularly, the challenge of engaging in a gameful activity willfully and voluntarily remains an important factor in a space where people have to engage in virtual simulations and “serious games” because they need training on specific methods or tools. In gamification, the activities we are designing must not only be goal-oriented and rule-driven but also be meaningful for our users. In the spirit of HCI-for-good, gameful designers must be willing to build applications that work to improve people's lives and their physical and mental states. If play is at the heart of learning, games are the frameworks that help us understand and better ourselves as we gather more knowledge of who we are.

As we reach a stage where humans are struggling to keep up with technological innovation, we can expect many exciting new applications of gameful design that will facilitate the use of emerging technologies in the future. If we are mindful of the humans we are designing for, gameful design will provide limitless opportunities.

References

- [1] Abeeel, V. V., Nacke, L. E., Mekler, E. D., and Johnson, D. Design and preliminary validation of the player experience inventory. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts* [CHI PLAY Companion '16]. ACM, New York, 2016, 335-341. DOI: <https://doi.org/10.1145/2968120.2987744>
- [2] Toups, Z. D., Crenshaw, N. K., Wehbe, R. R., Tondello, G. F., and Nacke, L. E. 'The collecting itself feels good': Towards collection interfaces for digital game objects. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play* [CHI PLAY '16]. ACM, New York, 2016, 276-290. DOI: <https://doi.org/10.1145/2967934.2968088>
- [3] Deterding, S., Dixon, D., Khaled, R., and Nacke, L. E. From game design elements to gamefulness: Defining “gamification.” In *Proceedings of MindTrek 2011* [Tampere, Finland]. ACM, New York, 2011, 9-15. doi:10.1145/2181037.2181040

Biography

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