Chapter 13
Codebook Co-Development to Understand Fidelity and Initiate Artificial Intelligence in Serious Games

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ABSTRACT

This study aimed to identify and rank the serious game fidelity themes that should be considered for retaining both the learning potential and predicted market growth of serious games. The authors also investigated existing links between fidelity and AI. The methodology unraveled serious game fidelity through the co-development of a theory- and data-driven codebook, applying the constant comparison method for data analysis. The theory-driven codes stemmed from literature while the data-driven codes emerged from a heuristic user interface evaluation of a comic book style game, named ExMan. This article identifies five fidelity themes, with functional fidelity as most important, and postulates that functional fidelity is most suited to AI integration. This study delivers a fidelity-for-serious-games codebook and concludes that observing the suggested fidelity hierarchy could safeguard that neither digital game-based learning is watered down, nor the lustre of digital gameplay dulled. Furthermore, the authors hold that AI for serious games should be given a high design priority.

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INTRODUCTION

Digital entertainment games can be divided into a genre spectrum comprising of action, adventure, fighting, puzzle, roleplaying, simulation, sport or strategy (Herz, 1997). This division awards game studios the opportunity to appeal to the diverse ludic demands of playing audiences. Although game studios use this genre-based market entry to drive their sales figures, there are some general facets (e.g., graphics, animation, sound, interaction, etc.) common to all game genres that elevate the overall popularity of digital gameplay. Many of these facets are influenced by the entertainment game sector's push for high fidelity gaming and search for cutting-edge artificial intelligence (AI) (REF). Directly pushing high-fidelity onto serious games; however, may result in distractions that are detrimental to digital game-based learning (DGBL) (Ke & Abras, 2013). While adaptivity and user-modelling are popular AI serious game additives, there exists little conclusive evidence on the effects of more entertainment-centric AI in DGBL. In this study, the authors present an empirical investigation with a codebook as the tool toward in-depth understanding of game fidelity, and the role AI plays in this and how these may provide the required insight to preserve the learning potential of DGBL while propagating fidelity's entertainment game appeal to serious games. The authors aim to: (a) determine what the fidelity entry points for initiating AI in serious games are; and (b) establish each identified entry point's relative importance. This study addresses these questions by developing a serious games fidelity codebook underpinned by theory- and data-driven codes, where the latter stem from a heuristic evaluation of a business simulation game the authors designed and developed for a higher education course on food services management. The authors envision that the codebook would serve as a basis for continued qualitative studies in this area and invite other researchers to adapt the codebook's entries as they uncover further truths about serious game fidelity and AI. This study investigates, among inexperienced gamers, what the barebones fidelity characteristics of a serious game should be and identifies the fidelity characteristics that can be used to initiate AI integration to possibly boost learning with serious games. It should be noted that the authors view serious games as an artefact for digital game-based learning (DGBL) and in this study use the term serious game as the noun for the action (or verb) of DGBL.

FIDELITY

Fidelity, in a gaming context, is often affirmed as the accuracy with which a virtual world approximates reality (Alexander, Brunyé, Sidman, & Weil, 2005). This definition is broad with reason. Petridis et al. (2012) unravels fidelity for their engine selection framework into two categories, namely audiovisual and functional fidelity. Petridis et al. (2012) respectively explain these categories under the activities of: (a) rendering, animation, and sound; and (b) scripting, supported AI techniques and physics. Alexander et al. (2005) confirm this categorisation, summarising the three functional fidelity activities as simulation accuracy; and add a psychological fidelity category, with emotional content, noise, and time pressure as its properties. Alexander et al. (2005) further elaborate on psychological fidelity as the extent to which the game is able to elicit similar psychological responses a player would experience when confronted with a similar real-world environment. In a systematic literature review on the success factors of serious games (Ravyse, Blignaut, Leendertz, & Woolner, 2017), the authors note that non-player character (NPC) response can be placed alongside simulation accuracy as an added property of functional fidelity. McMahan, Bowman, Zielinski, and Brady (2012) propose that, with the widespread accessibility of