Chapter 61
Serious Gaming for User Centered Innovation and Adoption of Disaster Response Information Systems

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ABSTRACT

Global profusion of information technology has spawned a large and varied number of tools and systems to aid disaster responders in managing disaster-related information. To adequately study the conception, development and deployment of such tools and systems, the user and the operational context in which user tasks are performed play a central role. As natural disasters however happen unexpectedly, often occur in remote areas and always impose working conditions of high time pressure and high situational volatility, user involvement is difficult to achieve for adequately studying tools and systems in disaster conditions. Current approaches for adoption in disaster conditions are therefore either resource intensive or lack realism, or both. This paper proposes the use of serious games to balance the realism of a disaster situation with an efficient and effective study setup and execution. Building on existing literature for serious gaming, it presents a serious game that focuses on the information management and decision making processes in an urban search and rescue setting. Through several game instances that have been played in the past three years, it examines the usefulness of serious games as a method to conduct research, to facilitate user centered development and to support dissemination activities.

1. INTRODUCTION

The importance of decision making and information management during crisis response and disaster management has been extensively studied (Comfort, Ko, & Zagorecki, 2004; Fiedrich, Gehbauer, & Rickers, 2000; Van de Walle & Turoff, 2008). While this importance has been established for quite some years, ongoing innovation and developments continue to present new opportunities for innovations to support disaster responders and crisis managers. Due to an ever

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more connected world, the development of mobile technology and technological advances in the field of computer science and software engineering, new opportunities for information gathering, analysis and dissemination continue to emerge. These innovations emerge through a three-step process of innovation: (1) conception: generating new ideas and possibilities for innovation, (2) development: maturing the innovation from the conception stage to a workable solution and (3) deployment: delivering the innovation to the end users (Pavitt, 2005).

Depending on the specific application, the resulting innovations aim to introduce an improvement in the field of information management, decision support or other disaster management processes. The specific aim or objective differs between innovations, for example new technology may be introduced to improve efficiency of an assessment process, or allow the affected population to communicate, so they can request and offer help to each other. While an innovation has often been designed with a specific aim in mind, the innovation in itself is not sufficient to reach that objective. In order to achieve the intended objectives and leverage the potential, innovations have to be adopted by the user (Damanpour, 1987). Adoption of an innovation, follows according to Rogers (2010) a 5-step process: (1) *knowledge*: the user is exposed to the innovation, (2) *persuasion*: the user's interest is piqued and actively searches out more information, (3) *decision*: the user weighs the advantages and disadvantages and reaches a decision about acceptance or rejection, (4) *implementation*, where the user actively deploys and employs an innovation while continuing to determine its usefulness and (5) *confirmation*: the user finalizes the decisions for continued use of the innovation.

The processes of innovation development and innovation adoption are not disconnected, and innovation processes are increasingly a collaborative effort between developers and (potential) users (Aldrich, 2003; Rogers, 2010). Research, amongst others by Abrahamson (1991), illustrates the importance of user involvement in the development of innovations to increase the likelihood of adoption. In these cases the adoption process does not start after the innovation process but happens simultaneously.

Combining the innovation development and user adoption processes, we can identify different possibilities for a connection between the innovation process and the user adoption stages. As shown in Figure 1, involving the user in the innovation development process can be realized through the organization of specific *user centered activities*. Depending on the specific stage in the innovation development and user adoption process, we can distinguish different types of activities that support collaboration and alignment between the two processes.

As shown in Figure 1, we distinguish three different categories of activities: research, development and testing, and dissemination. *Research* activities play an important role in the conception stage: involving the user improves the understanding of the challenges and aid in the identification of new opportunities. Research activities also aid in exposing the user to new opportunities and providing more information to the user, thus supporting the knowledge and persuasion stage in the user adoption process. During *development and testing* the user can provide valuable feedback to the developers and alignment with the requirement can be ensured. These activities aid in providing information (persuasion), demonstrating the added value (decision) and testing the innovation in a context relevant to the user (implementation). In the *dissemination* phase, user involvement helps in the integration of innovation in the existing processes of the user and facilitates training and internalization of knowledge. These activities are also beneficial for the user and support the implementation and confirmation stages of the adoption process.