

Chapter 8

Towards Virtual Reality Crisis Simulation as a Tool for Usability Testing of Crisis Related Interactive Systems

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ABSTRACT

Usability testing is expensive in some domains due to the resource requirements that go hand in hand with taking a complex context of use into account. Crisis-related research is one such domain, typically requiring the reenactment of an extensive crisis scenario. To lessen the resource requirements and provide a more flexible setup geared towards testing, crisis scenarios can be reconstructed as virtual reality simulations. This paper outlines the development of an initial prototype of such a simulation following the design science method. The prototype is used to test if injecting an item that will be tested into the simulation affects the realism of the virtual reality crisis simulation. The realism was measured in a within-subject experiment and equivalence tests showed that injecting a representation of a simple app had no significant influence on the realism of the simulation.

1. INTRODUCTION AND METHOD

This paper outlines the development of a virtual reality crisis simulation (VRCS) prototype to enable a novel form of usability testing for crisis-related interactive systems. The nature of the research, namely the development of an artifact (instantiation) that solves a previously unsolved problem, suggests a design science (DS) approach (Hevner, March, Park, & Ram, 2004). While DS has mostly been discussed in

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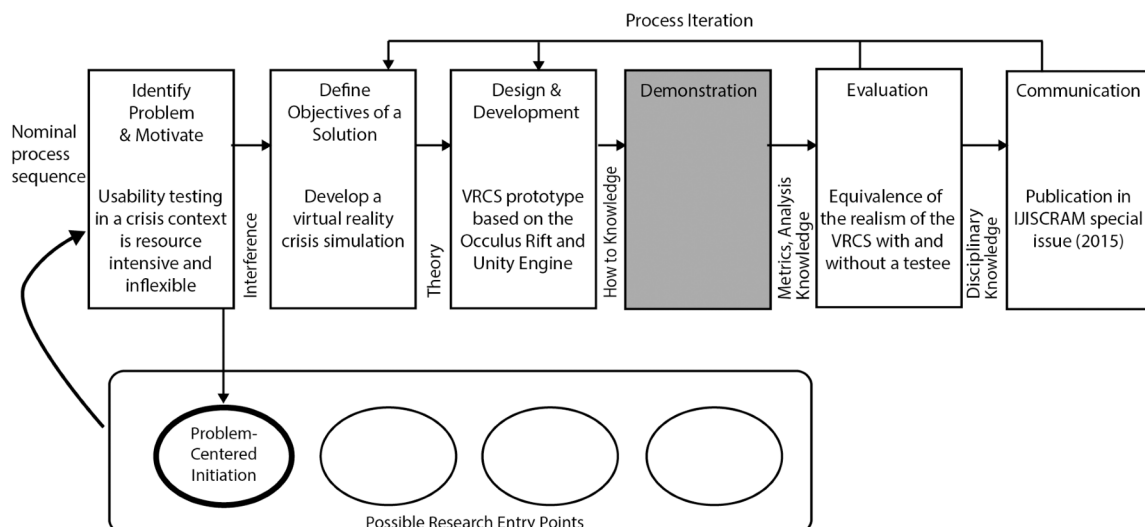
general information systems research during the last ten years (Hevner et al., 2004; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007; Offermann, Levina, Schönherr, & Bub, 2009; Österle et al., 2011) it is equally applicable for human-computer interaction research projects (Hevner & Zhang, 2011; Tarantino & Spagnoletti, 2013) and in crisis contexts (Schryen & Wex, 2015). The design science process model (DSPM) suggested by Peffers et al. was chosen because it synthesizes different previous models and “defines a mental model for presenting and evaluating DS research” (2007). The remainder of this paper is structured according to the DSPM. Figure 1 shows the adapted process.

The research can be classified as a *problem-centered initiation* because the construction of the artifact was motivated by an identified problem, namely that usability testing based on real crisis simulations is resource intensive and inflexible. The activities *problem identification and motivation*, *definition of objectives of a solution* and *design and development* were conducted in sequential order. While a general problem and general objectives for a solution were identified the research question of this paper relates to the identified sub-problem that injecting an item into the VRCS for testing purposes can influence the realism of the VRCS. Accordingly, the *evaluation* activity is not aimed at the identified general problem but rather at advancing the prototype to a stage where that problem can eventually be tackled. To reach that stage the evaluation conducted in this paper is aimed at the identified sub-problem. The *demonstration* activity was not conducted because the prototype is still at an early stage and cannot be used to solve concrete problems yet. The publication of this paper and the anticipated discussions serve as the beginning of the *communication* activity.

2. PROBLEM IDENTIFICATION AND MOTIVATION

Professionals (emergency medical services, fire and rescue service, police) use crisis-related interactive systems during their work processes. Citizens can use crisis-related interactive systems like apps or web applications to help them prepare for crises or in case a crisis breaks out. However, crisis situations

Figure 1. Adapted design science process model according to Peffers et al. (2007)



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