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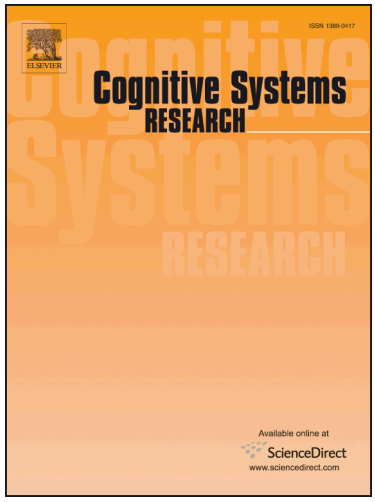

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ACCEPTED MANUSCRIPT

Low-Literates' Support Needs for Societal Participation Learning: Empirical Grounding of Theory- and Model-Based Design

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Abstract. Specialized learning support software can address the low societal participation of low-literate Dutch citizens. We use the situated Cognitive Engineering method to iteratively create a design specification for the envisioned system VESSEL: a Virtual Environment to Support the Societal participation Education of Low-literates. An initial high-level specification for this system is refined by incorporating the societal participation experiences of low-literate citizens into the design. In two series of user studies, the participant workshop and cultural probe methods were used with 23 low-literate participants. The Grounded Theory method was used to process the rich user data from these studies into the Societal Participation Experience of Low-Literates (SPELL) model. Using this experience model, the existing VESSEL specification was refined: requirements were empirically situated in the daily practice of low-literate societal participation, and new claims were written to explicate the learning effectiveness of the proposed VESSEL system. In conclusion, this study provides a comprehensive, theoretically and empirically grounded set of requirements and claims for the proposed VESSEL system, as well as the underlying SPELL model, which captures the societal participation experiences of low-literates citizens. The research methods used in this study are shown to be effective for requirements engineering with low-literate users.

Keywords: Societal participation · Low-literacy · Virtual Learning Environment · Situated Cognitive Engineering · Requirements Engineering · Qualitative Methods

1 Introduction

Low-literate citizens of The Netherlands participate in society relatively little (De Greef, 2009; De Greef, Segers, Nijhuis, & Lam, 2014; Mertens & Van Het Zwet, 2009). 1.3 million people aged 16-65 (10% of the Dutch labor force, cf. De Greef, Segers, & Nijhuis, 2014), both native citizens (65%) and non-native citizens (35%), are classified as low-literate; many people in this group struggle with participating, resulting in isolation, unemployment, and low socio-economic status (Hoeymans et al., 2005; Pauwels & Pickery, 2007). Societal participation means acting in society to reach certain goals (De Greef, 2009). In The Netherlands, the term 'crucial practical situations' describes those behaviors that are seen as vital for participating independently (Kurvers & Van De Craats, 2007; Van De Craats, 2007). Particular *skills* ('core skills of participating in an information society', cf. Buisman & Houtkoop, 2014) are the basis for these behaviors. Reading, writing, speaking, and listening are core skills for getting access to *information*, and for *communicating* with others. These information and

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