Chapter 25

The QUARTIC Process Model to Support Serious Games Development for Contextualized Competence-Based Learning and Assessment

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ABSTRACT

This chapter presents the QUARTIC process model for developing contextualized, competence-based educational games. Parallel streams of pedagogy and game development have been married to streamline the process of deriving appropriate educational games from client requirements. Furthermore, the authors describe two methodologies to improve the complementarity of the streams: one for building contextualised narrative, and one for describing competences applied in context. This increases the applicability of learning outcomes and allows the simultaneous assessment of learning while gaming. The work presented is a part of the European research project TARGET aimed at rapid competence development for knowledge workers.

INTRODUCTION

Development for Technology Enhanced Learning (TEL) products such as educational games often has the *ad hoc* quality of very novel areas, which leads to uncertainty in specifying simulations and lack of repeatability of success. A significant hurdle to the successful marriage of game play and education arises from the sheer complexity of integrating a game design with pedagogical theory, or integrating pedagogy design with a game's mechanics. For instance, in a sub-set of this overall problem, building a 'lesson plan' which adapts to the learner as does a good tutor would require player modelling[1]. Attempting to model players in a pre-existing game is a process whose difficulty and error rate rise non-linearly with the complexity of the game mechanics, because those mechanics must be analysed in order to build the model of play. However, it should be possible to synchronise the pedagogical and game design aspects, since both are focused on the same domain – player/learner interaction with the educational game. When learning through playing educational games, the learner goes through an engaging experience that contributes to the development of her competences (Kolb, 1984). This is the ideal case; however in order to achieve this case, the game must be designed, from the ground up, to harmonise the entertainment and education around the specifics of contextual competences. Additionally, an important feature of an automated learning system is the means to understand the activity of the player, which can be done by player modelling – in this case, player competence modelling.

With this chapter, we explain a process model to develop a client-focused educational game where game design happens in concert and in recursive dependency with a particular novel form of player modelling aimed at competence assessment and training. Within our process model development is guided and repeatable, requirements are a central factor and competences-in-practice are treated as a product of organizational, knowledge-related, environmental and individual (OKEI) factor interaction (Petersen & Heikura, 2010).

Thus we illustrate a process for building serious games which integrates coherent competence modelling. The aim is to enable TEL of those competences. We elicit a state of the art definition of competences from the field of project management and innovation, and show a methodology for how they can be described contextually. Further, the contextualized competence descriptions facilitate the process of identifying observable behavioural indicators that deliver evidence if a person is able to apply the competence through the mechanics of an educational game. The behavioural indicators deliver valuable input for the educational game`s narrative structure and help to 'close the loop' for the pedagogical design of the game – allowing teaching and assessment of competences in the same experience. In the following section our first step is to define the process model which guides the interrelated stages.

This work is a part of the European project TARGET (Transformative, Adaptive, Responsive and enGaging EnvironmenT, http://www. reachyourtarget.org/), which aims to reduce *time to competence* by providing life-like learning experiences through educational games.

QUARTIC Process Model

The QUality Assuring Recursive TEL Instruction co-Creation process model shown in Figure 1 is a spiral model of game design, incorporating best practice for competence assessment.

The central concept is this: a non-prescriptive TEL game experience can be built using an iterative cross-correlation between goals (competences to be learned) and means (scenarios and game mechanics for teaching). Starting from a given requirement of the client[2], formulated either as a non-empty set of competences[3] or a use case, the developers begin to develop one of the parallel streams. Streams of development are composed

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