

Addressing Research Fragmentation in Serious Gaming for Manufacturing

Jannicke Baalsrud Hauge¹, Johann C. Riedel, Manuel Fradinho³, Wim Westra⁴

¹Bremer Institut für Produktion und Logistik GmbH ² University of Nottingham ³ Cyntelix, ⁴ Open University Netherlands ,

baa@biba.uni-bremen.de ; ² Johann.C.Riedel@nottingham.ac.uk; ³ mfradinho@cyntelix.com ; ⁴ Wim.Westera@ou.nl

ABSTRACT

The term Serious Gaming was coined by David Rejeski and Ben Sawyer in their white paper *Serious Games Initiative* (2002). Serious games have been defined as entertaining games with non-entertainment goals (Serious Game Initiative, 2002; Raybourn, 2007). Serious games are games that educate, train and inform (Michael & Chen, 2006). Boosted by the success of the video games industry, games are little by little being recognised as valuable cognitive tools for learning and professional development. The potential of serious games is beyond any doubt. Various authors anticipate the great opportunities of games (and simulations) in education, because of their positive effects on learning outcomes (e.g. Amory, 2007; Prensky, 2006; Quinn, 2005). Games have been demonstrated to provoke active learner involvement through exploration, experimentation, competition and co-operation. They support learning because of increased visualisation and challenged creativity. They also address the changing competences needed in the information age: self-regulation, information skills, networked cooperation, problem solving strategies, critical thinking and creativity. Hence, games are an effective tool for mediating learning. Computer games not only convey hard skills such as the understanding of how complex systems operate, production networks being one of them, but also mediate soft skills like collaboration and communication (Scholz-Reiter et al., 2002).

Dynamic systems such as manufacturing networks confront their workforce with ever-changing working environments (Baalsrud Hauge et al., 2006). This environment stresses the need of continuous learning, which constitutes the true competitive advantage for organizations (Senge, 1990, p. 17). Moreover, the learning rate of the organization must be higher than that of competition so that the former can survive (de Geus, 1988). Without knowing the term Serious Gaming, several research institutes started in the mid 90s of last century to develop games to be applied in the domain of manufacturing. Most of these games have been developed either at one single institution or as a part of multi- national research projects. Even though the developers have been organised in multidisciplinary teams, knowing the field quite well, each developer team has developed their own game. So far, the effort and momentum on serious games for manufacturing have been fragmented and isolated – small teams and pockets of excellence exist, but they do not consciously work together to advance the field, with many challenges left unaddressed. This is not limited to the area of serious games for manufacturing. Far more, according to Björk the domain of game design is considered semi-formalised, fuzzy and incoherent (Björk et al., 2004). This is partly linked with the multi-disciplinary nature of serious game development and partly because serious gaming lacks a well-established research community that would bring together the various parties and develop a shared strategy, roadmap or methodological framework. According to our experience,

the impact the fragmentation has on the design and application of SG for manufacturing is depending of which element of fragmentation we are looking at. The spider diagram below shows the first prioritization according to the view of the authors. Those scoring 3 are where we would concentrate the first work, because we expect that this will have a positive impact on the application and design of new serious games within reasonable time.

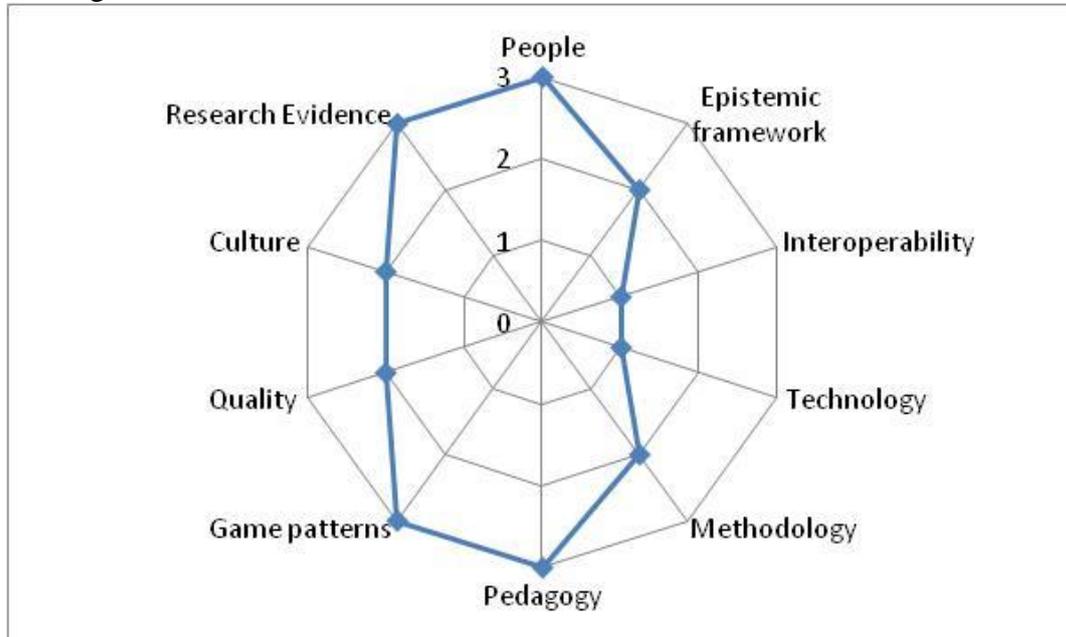


Figure 1: Prioritisation of different thematic area of fragmentation

The intention of this paper is to start a discussion on how to reduce the fragmentation existing in the field of application and development of Serious Games for manufacturing. As part of this effort the authors review the progress made in the development and application of serious games over the last decade. The authors then make some propositions for what such a defragmentation strategy could be, and where future activities seem necessary.

References

1. Armory, A. (2007) *Game Object Model Version II: a Theoretical Framework for Educational*
2. Baalsrud Hauge, J., Duin, H. Thoben, K.D. (2006). *Increasing the resiliency of manufacturing networks through gaming. Proceedings of the international workshop on multidisciplinary research on simulation methods and educational games in industrial management. Trondheim, Norway.*
3. Björk, S., Holopainen, J.(2004): *Pattern of game design*, Charles River Media, Inc. Rockland, MA, USA
4. de Geus, A. P. (1988). *Planning as learning. Harvard Business Review*, 66(2), 70-74.
5. Michael, D. and Chen, S. (2006). *Serious games: games that educate, train and inform*. Thomson Course Technology, Boston, MA.
6. Prensky, M. (2006) *Digital Natives. Learning in the Digital Age* 63(4), 8-13.
7. Quinn, C.N. (2005) *Engaging learning. Designing E-Learning Simulation Games*. Pfeiffer, John Wiley and Sons, Inc., San Francisco.

8. Raybourn, E.M. (2007) *Interacting with Computers* 19, 206–214.
9. Scholz-Reiter, B., Gavirey, S., Echelmeyer, W., Hamann, T., Doberenz, R. (2002). *Developing a virtual tutorial system for online simulation games. Proceedings of the 30th SEFI annual conference. Firenze, Italy.*
10. Senge, P.M. (1990) *The Fifth Discipline: The Art & Practice of the Learning Organization*, Doubleday.
11. *Serious Game Initiative* (2002) <http://www.seriousgames.org/> (last accessed October 21, 2009).