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THE ATTRIBUTES AND ADVANTAGES OF VIRTUAL WORLDS FOR REAL WORLD TRAINING

by

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Abstract

While the economic importance of Europe's small and medium-sized enterprises (SME) is widely recognized, their owners and managers lack specific management training and education, which hampers their ability to succeed and develop. The potential of current virtual world technology is interesting in this regard, and

we provide a contextual overview of it regarding simulations and apprenticeship training. Afterwards, a reflection is made on which features of this technology are different and innovative, and their potential to cause significant changes in training and education of SME managers.

Keywords

Environments, Training, Second Life, VITA, Management Education, SME

Introduction

Professional and personal lives often go head-to-head. Training and education often get crushed amidst this conflict, and professionals facing serious time and location constraints in terms of availability for attending training and education is an all too typical situation. For this reason, e-learning approaches (in the sense of distance learning) have long been used to help overcome those constraints.

However, the detached and autonomous nature of traditional e-learning is not entirely comfortable for many learners, particularly those with decision-making responsibilities. For instance, heads of small and medium enterprises (SMEs) "exhibit activist and pragmatist learning styles, prefer learning by doing and favour problem-centred approaches that offer flexibility" (NJM European, 2000, p. 3). We thus envision and analyse the opportunity of using new e-learning approaches with virtual worlds in support of active and pragmatist learners, as a way to better provide real world training and education to professionals.

Researching The Effectiveness Of Virtual Worlds For Training And Education

Traditional web-based on-line environments for e-learning have some allowances for active, pragmatist learning, but typically simply focus on providing learners with information and assignments, and are quite limited regarding simultaneous interaction with teachers/trainers and co-learners. Virtual worlds offer interesting potential in this regard, since they are increasingly being used for learning contexts where students and teachers interact cooperatively, immersed in context-rich situations (e.g., De Lucia et al., 2008; Hetherington et al., 2008).

We are not simply referring to the use of 3D simulations. Virtual simulations have long been used in a large array of education and training scenarios, from flight simulators to surgery practice, and many fields use such tools in support of teaching and learning. A deluge of research work has looked into this kind of tools, by:

- analysing their effects (at the cognitive and behavioural levels, or across other dimensions);
- studying the content of simulations and simulators from various perspectives;
- dissecting the technological and human development methods;
- watching and acting upon pedagogical practices;
- combining several of these perspectives on research and knowledge acquisition.

These various research approaches have provided significant information regarding the full technological-cognitive process of the use of virtual environment simulations for educational purposes. There is now a consensus that the use of simulations within virtual environments is, generally, beneficial to learning procedural

knowledge and various theoretical and practical concepts. However, such benefits are not something that is automatically attained or ensured by the plain act of using a simulation for educational purposes: all of the previously-mentioned research approaches have contributed with insights and data on how various factors can negatively impact the educational results of using this kind of tools. Recently, for instance, a group of Austrian researchers (Holzinger, Kickmeier-Rust, Wassertheurer & Hessinger, 2009) compared the learning outcomes of medical students in specific subject matters, between a group that studied with traditional text-based tools, and a group that studied by using a simulator (of the traditional, non-immersive kind), and found no significant differences. However, they have also compared these two groups with a third group of students. This third group used not just the simulator, but also other study materials and had some support in the use of the simulator. The learning outcomes of this third group were significantly higher than those of the two previous groups, showing that small parallel issues can have a large impact on overall results (ibid.).

This situation is recurrent whenever we look upon the educational use of technology. Indeed, many research efforts analyse technology itself, focusing on its features and potential; but if we seek out research efforts wishing to analyse the educational impact of technology, we typically must navigate across an ocean of studies and efforts that do not take into account the complexity of the different factors in play, and frequently provide contradictory or inconclusive results. It is by looking at research efforts that take different factors into account that we usually find significant advances in the understanding of the educational use of technology.

Focusing specifically on virtual worlds, this is yet another case where one must attend to various distinct internal, external, and procedural factors impacting the use of such these tools, if one wishes to provide a useful contribution to understanding their impact on the educational process.

We don't mean to suggest that research should be all-encompassing or panoramic, quite the contrary: the very fact that these are novel technological platforms recommends that a rich variety of research approaches and strategies is followed, from the more panoramic to those focusing on specific issues; from qualitative to quantitative research, from observational to interventional. Only such a richness and diversity of approaches can increase knowledge broadly. What we mean is that research efforts must not ignore how strongly their results may depend on factors that they may not be directly analysing. That is, we cannot analyse a virtual world in a vacuum if we want to ascertain something about its educational impact: one must take into account the actual content of the virtual world (at the pedagogic and technological levels), the context within which the technology is being used, the constraints of the computer hardware, software and networking, the pedagogical strategy being used, the social and educational context, including cognitive, experiential and emotional dimensions (Castello et al., 2009).

Learning Management Competences In Virtual Worlds: Simulation Or Reality?

In the previous section, we've mentioned the use of simulations in support of learning; after all, it is the simulation perspective that most readily springs to mind when thinking about the educational use of virtual worlds. And this perspective can be interpreted by resorting to the significant body of research literature on the use and development of educational simulations . However, this is not the single option: in many cases we may experience real situations in virtual worlds, not just simulated ones – and in such cases the simulation perspective gives way to alternatives, such as service-learning, on-the-job learning, learning traineeship, or apprenticeship learning (henceforth, we'll simply mention "apprenticeship learning" as a shorthand version of these different approaches).

How can one experience a real situation through a virtual world? Firstly, we must clarify which virtual worlds we're talking about. In fact, we could consider a plain text adventure game – where the player plays a role as if present within the game, regularly receives textual descriptions of the places where he or she "is," and uses textual or iconic commands to cause changes in the game state – as a virtual world. We can think of any classical game, such as PacMan and many others (where the player controls a virtual character inside a virtual space created by the computer) as being a virtual world. But using this concept in such fashion is confusing, not enlightening. Therefore we add the concepts of multi-users and inter-user communication, thus limiting the concept of virtual world to specific software platforms involving games or social environments where several players and/or users can be "present" and able to communicate amongst themselves. We add the concept of avatar and avatar-mediated interaction, in which the user-controlled avatar interacts with the environment and is affected by it. In this sense, multi-player text adventures are virtual worlds, as would be a multi-player PacMan, as long as players can communicate with each other; but social platforms such as MySpace or Facebook – where several users interact without using avatars to interact with the environment – are not.

This aspect of inter-user, avatar-mediated communication is essential for an understanding of the novel potential of virtual worlds for apprenticeship learning. By using inter-user communication and being aware of the "presence" of avatars at a virtual "location", users can establish common or opposing strategies, and develop efforts – that is, pursue a huge diversity of social endeavours.

Let's suppose that a group of military service people is simultaneously playing a war game. They can go beyond the experience of the game's simulated situations, and experience issues such as communication misunderstandings (and thus realize firsthand the

importance of group communication protocols under operational circumstances); the complexities of holding a tactical formation in a context where each person comes across different obstacles, communication issues, constant distractions, visibility issues, etc. This is not a plain simulation, since each member of such a military team is there, active of their own accord. The simulation is providing the contextual aspects, but the reactions and behaviours of siblings in arms are real reactions by real people. This perspective gained wide popularity in the wake of the scientific work of James Gee and his colleagues performing educational research on videogames (e.g., Shaffer, Squire, Halverson & Gee, 2004), and is also studied by several other researchers (for a complementary viewpoint to Gee, see Kirriemuir & McFarlane, 2004).

But it is not only multi-user games in a controlled environment, seen as virtual worlds, that allow one to experience real-life learning situations. That is also possible in more unstructured situations, and a growing number of reports and scientific research efforts have been looking into such situations. For instance, Kurniawan (2008) describes the intergenerational learning occurring between players of World of Warcraft (an aspect that is entirely unrelated to the game elements); Bryant (2006), describes the use of virtual worlds in learning foreign languages live.

But regarding the teaching and learning of competences, are we limited, regarding apprenticeship learning, to leadership and team coordination, as in military situations? Current accounts focus on these cases, (e.g., Reeves & Malone, 2007, for an example related to management) but we will explain how in many situations it is possible, as part of numerous day-to-day activities, to use virtual worlds as a component of those activities, rather than a replacement for them.

A Sample Application Case: SME Management

Across the 27 members states of the European Union (EU), there are about 19.6 million small and medium-sized enterprises (SME), firms in the non-financial business economy, with up to 250 employees, representing 99.8% of all businesses and 67.1% of the non-financial business economy workforce – about 85 million jobs (2005 Eurostat data, acc. Schmiemann, 2008).

To support the growth and development of existing SMEs and promote the creation of new SMEs, the European Commission (EC) adopted in June 2008 the 'Small Business Act' for Europe, reflecting the EC political will to recognise the central role of SMEs in the EU economy, by providing a comprehensive SME policy framework for the EU and its Member States (European Commission Directorate-General for Enterprise, 2008).

Yet in spite of this role, played by such firms in the European economy, there is a lack of specific training for people heading and/or managing SMEs, and the training that is available "tends to serve either start-ups or medium sized firms" (NJM European, 2000, p. 4).

Heads of SMEs are clearly professionals facing serious time and location constraints for attending training and education, and the range of competences that they must master is varied and multi-disciplinary (Velegrakis et al., 2009). For this reason, and given the economic relevance put forward in the preceding paragraphs, we will use SME management training and education as context for the remainder of this discussion.

Potential For Blending Apprenticeship Learning And Formal Training

If our statements expressed at the end of the second section hold true, that means that students, trainees, and learners in general can be involved in activities taking place in virtual worlds that are an integral part of other, non-virtual world activities, and therefore be involved in real moments of apprenticeship learning.

Many virtual worlds have a significant number of active users, organized as diverse communities (Woodcock, 2008). One can consider the possibility of approaching some of these users/communities as part of a promotional or sales strategy, among other possibilities.

For instance, a group of virtual world users could be invited for a virtual world meeting with a marketing executive, where they would be able to experience the inworld version of a new car model, analyse it and discuss its various features. We can imagine one of those users entering the car, inviting some friends to seat their avatars inside with him or her and drive the car model through a city road or scenic road while discussing it, and then try it with a dog, with a surfboard, with different amounts of luggage, etc. Obviously, involving users in this fashion and collecting data and feedback would require significant planning and marketing expertise, as would being able to follow-up from this virtual activity into changes to product development or later sales approaches, for instance.

Another example would be a situation where a virtual world location is selected to create an alternative interface for e-commerce. For instance, instead of simply seeing jewelry photographs on a Web site, users could visit a virtual store, try out virtual versions of those pieces of jewellery on an avatar and ask friends for opinions; or simply enjoy browsing for items in a spatial arrangement, not simply on a list on a Web page. Several virtual world stores do exist, particularly in the Second Life virtual world, not only for virtual world items but indeed as virtual world interfaces for real-world items (e.g., Tedeschi, 2007). To be successful as a sales outlet, such stores must consider how to establish a relationship with users, both with the communities active within virtual worlds and with other users, some of whom may find it interesting the option to experience a product in this fashion (and therefore providing a competitive advantage by using the virtual store as a service differentiator).

As a final example, businesses can and have used virtual worlds' ability to convey a sense of presence to hold virtual world meetings instead of real-world meetings (e.g., Linden Lab, 2009). In such meetings, only the settings and visual paraphernalia (avatars, virtual location) are related to the virtual world: the content of the discussions, the items on the agenda, the management of the meeting, are all quite real and relevant to day-to-day business operations.

Such activities, where the virtual and real dimensions are naturally intertwined, are examples of how business and management activities in virtual worlds can be immersed in the overall business and management activities of a company – and thus a nice opportunity for apprenticeship learning.

Activities such as those mentioned in the previous paragraphs employ virtual worlds as a medium supporting or complementing business activities, not as an alternative, isolated reality. This opens up a tantalizing possibility: if those virtual worlds are open to any user connected to the Internet (a common situation), then students/trainers involved in formal training situations can take part in them – and thus be involved in apprenticeship training while their formal training or education is ongoing. They are not taking part in simulated activities, but in real activities! Typically, in physical, real-world situations, this would only be possible if the apprenticeship location would be in the same town or region as the formal training/education location. But using virtual worlds, learners can be receiving their formal training in any physical location – thus enlarging the number of apprenticeship opportunities available for learners. In this sense, virtual world learning environments empower not only stronger constructivist and connective approaches in learning processes but also the possibility of integrating experiences and contexts (both real and virtual) supporting ubiquitous, social, and multichannel learning.

As businesses increase the number of activities that involve virtual worlds as a place where activities and tasks take place, more

opportunities for this kind of learning will appear. A specific case is that of companies whose main business area is the development of products and/or services specifically for virtual worlds. The University of Trás-os-Montes e Alto Douro (UTAD), a member of the VITA project consortium , cooperates since 2007 with the Beta Technologies consortium, and an agreement was signed allowing UTAD students from computing-related programmes of studies to benefit from traineeships during their second enrolment year (therefore, halfway through their three-year BSc programmes). The students are physically living and attending classes in Vila Real, Northeast Portugal, and use various cooperative software tools to develop the business activities associated with those traineeships. While this consortium is focused on developing spaces and services based on Second Life and Open Simulator virtual world technologies, most of its day-to-day business operations and management processes are also based on these platforms. For instance, coordination meetings between employees, partners, and trainees are held in them, since they are typically located in far apart locations (the consortium offices are in New York and Lisbon, for instance). This allows trainees to proceed with their education in the educational institution that they chose (UTAD), but be part of professional teams and involved with business activities that are global in nature and scope (i.e., not just develop tasks at a distance).

As more businesses and business activities involve virtual world activities as part of daily routines, the greater the number of opportunities to expand training situations to apprenticeship-like contexts, not just simulations. Procedures and concepts can thus be learned in real-life contexts – the actual virtual worlds where they are taking place – not just in isolated training courses.

What about simulations? How do current virtual worlds impact their use?

Despite what we have previously stated, currently (and possibly in the future) simulations will remain the most relevant aspect of

virtual world use for learning procedures and providing context for concepts. Examples are becoming commonplace in scientific literature (and also in anecdotal reports, obviously), for different cases: training of Canadian border guards (Hudson & deGast-Kennedy, 2009); clinical practice (Henrichs, Youngblood, Harter & Dev, 2008); fire-response training (Padgett, Strickland, & Coles, 2006).

One must however emphasize that much of what is achieved in such cases is similar to the use of virtual reality in traditional simulation environments. What are, then, the novel opportunities for training found by resorting to a multi-user virtual world, besides team training?

A particularly important aspect of current virtual world technologies is that various platforms enable users to create their own content. Such is the case of Open Croquet/Open Cobalt (Open Cobalt, n.d.), Active Worlds (Activeworlds, n.d.), Second Life (Linden Research, n.d.), and OpenSimulator (OpenSimulator, n.d.), to name a few. Such platforms have been used to develop many educational initiatives, including simulations.

This aspect is relevant because the production of a simulation using software development tools is a resource-intensive process, at the human, and/or financial level. Therefore it is not something that can be applied to any case where a simulation could be useful. Development time is typically quite significant, and this is yet another limitation to the educational use of simulations, since it implies that they need to be planned early enough in the educational process. Normally, it is not possible to create or change a simulation in response to doubts or ideas that came up during a lesson or training session.

And this is precisely the point where we see the larger impact potential for current virtual world technologies: by providing any user with the tools to develop three-dimensional content and various effects (avatar gestures, reactions, automated behaviours, etc.). This allows new cases, contexts, and situations to be created and

tested in a relatively quick way. While obviously it is not just anything that can be quickly rendered as a simulation, in many cases it is indeed possible: creating a new layout for a restaurant, to see how that would impact the employee's actions or organizing products differently in a warehouse, are just two examples of changes that can be expedited. A factor that cannot be easily automated in these examples is customer's behaviour. But since we are talking about multi-user platforms, we can plan role-playing situations where some trainees act as clients, as clerks or as team coordinators, so that the new situation can be experienced without further delay.

The platforms mentioned above also allow any user with enough expertise to programme behaviours for virtual objects and avatars, and make them interact with external computer systems (for data recording, decision-making, control, etc.). Such programming expertise is the realm of just a few people, but unlike other simulation systems, in virtual world platforms small programming components can be distributed and shared by their authors, using methods simple enough for any user to be able to employ and combine components, and thus expand the number of people that can create and develop educational applications of virtual worlds, automated behaviours, and systems integration.

Final Thoughts

The current situation as we've described it is one of widespread availability of virtual world platforms that enable groups of users to interact, create, and customize simulations. This prompts a parallel with earlier events: the appearance of the World Wide Web and more recently the dawn of blog-creating tools.

Regarding the Web, while methods of putting information on-line existed previously, suddenly a small subset of skills was enough to achieve it: creating the content itself was the main issue, since network management and systems administration were from

then on taken care of by hosting service providers. This enabled the explosive growth in information available on-line, and the consequent drastic change in how that information was used and impacted society.

As for blogs, people had been producing Web pages with journals and forms almost since the Web's beginning for on-line forums, for instance. But once on-line tools were invented, enabling any user to focus just on the tasks of producing text and managing comments and settings, blog creation became much simpler – and indeed the term "blog" appeared. The functional complexity of producing a Web site that was edited regularly, where old information is archived, and where comments are accepted and managed was simplified, reduced to the simpler requirement of using a task-specific tool. The result was also the explosive growth of the number of blogs, of the variety of users producing them and consequently the emergence of novel and diverse ways of making use of this communication tool, and of the impact of blogs in society.

The parallel that we emphasize is clearly that these new tools (virtual worlds) are specifically bringing a similar level of simplification to the process of creating virtual spaces and performing simulations in them. The set of skills and resources that this involves is now significantly smaller than with traditional simulation-creation tools, and therefore we expect a significant increase in the use of simulations in diverse contexts. Will we then witness the emergence of novel and diverse ways to leverage simulations and subsequent impacts in society? This is an enticing possibility.

References

Activeworlds. Home of the 3D Internet, Virtual Worlds and Community Chat. April 11, 2009, http://www.activeworlds.com/

Aldrich, C. (2005). *Learning by Doing: A Comprehensive Guide*

to Simulations, Computer Games, and Pedagogy in e-Learning and Other Educational Experiences. San Francisco, USA: Pfeiffer.

Bryant, Todd (2006). "Using World of Warcraft and Other MMORPGs to Foster a Targeted, Social, and Cooperative Approach Toward Language Learning," Academic Commons. April 11, 2009, http://www.academiccommons.org/commons/essay/bryant-MMORPGs-for-SLA

Castello, Valentina; Pescuma, Saverio; Sorrentino, Giovanni; Dell'Aiuto, Vittorio; Sancin, Chiara (2009). "Ubiquitous (and) social learning. Where is the potential for innovation?" In *Proceedings of the European Distance and E-Learning Network Annual Conference, Innovation in Learning Communities*, Gdansk, Poland, 10-13 June 2009. Budapest, Hungary: EDEN, Budapest University of Technology and Economics.

De Lucia, Andrea; Francese, Rita; Passero, Ignazio; Tortora, Genoveffa (2008). "Supporting Jigsaw-Based Collaborative Learning in Second Life." In *Proceedings of the 2008 Eighth IEEE International Conference on Advanced Learning Technologies*, pp. 806-808. Washington, DC: IEEE Computer Society.

European Commission Directorate-General for Enterprise (2008). Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: "Think Small First - A Small Business Act for Europe," SEC(2008) 2101, SEC(2008) 2102 [On-line]. May 16, 2009, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0394:EN:NOT

Henrichs, W. L.; Youngblood, P.; Harter, P. M., & Dev, P. (2008). "Simulation for Team Training and Assessment: Case Studies of On-line Training with Virtual Worlds," *World Journal of Surgery,* 32 (2), 161-170.

Hetherington, Robina; Bonar-Law, Janette; Fleet, Tony; Parkinson, Lindy (2008). "Learning in a Multi-User Virtual Environment." In *Proceedings of the 2008 International Conference Visualisation,*

Volume IV-VI, pp. 99-105. Washington, DC: IEEE Computer Society.

Holzinger, A., Kickmeier-Rust, M. D., Wassertheurer, S., and Hessinger, M. (2009). "Learning performance with interactive simulations in medical education: Lessons learned from results of learning complex physiological models with the HAEMOdynamics SIMulator." *Computers & Education* 52 (2), 292-301.

Hudson, K.; deGast-Kennedy, K. (2009). "Canadian Border Simulation at Loyalist College," *Journal of Virtual Worlds Research*, 2 (1), 4-11.

Kirriemuir, J. & McFarlane, A. (2004). "Report 8: Literature Review in Games and Learning." Bristol, UK: Futurelab.

Kurniawan, S. H. (2008). "Intergenerational Learning through World of Warcraft." In *Proceedings of the 2008 Second IEEE international Conference on Digital Game and Intelligent Toy Enhanced Learning* (November 17 - 19, 2008), DIGITEL, pp. 98-102. Washington, DC: IEEE Computer Society.

Linden Lab (2009). "How Meeting In Second Life Transformed IBM's Technology Elite Into Virtual World Believers." June 15, 2009. http://secondlifegrid.net.s3.amazonaws.com/docs/Second_Life_Case_IBM.pdf

Linden Research. Virtual worlds, avatars, 3D chat, on-line meetings - Second Life Official Site. April 11, 2009, http://secondlife.com/

NJM European (2000). "A Study and Analysis of Management Training~Techniques for the Heads of SMEs, Particularly Using the Information and Communication Technologies (ICTs)," Report for the Directorate-General for Enterprise of the European Commission under contract DGENT 99/C/A3/31 S12.128934 [On-line]. May 16, 2009, http://ec.europa.eu/enterprise/entrepreneurship/support_measures/training_education/doc/study_man-training2.pdf.

Open Cobalt. April 11, 2009, http://www.duke.edu/~julian/

Cobalt/Home.html

OpenSimulator. OpenSim. April 11, 2009, http://opensimulator.org/wiki/Main_Page

Padgett, L. S.; Strickland, D.; & Coles, C. C. (2006). "Case Study: Using a Virtual Reality Computer Game to Teach Fire Safety Skills to Children Diagnosed with Fetal Alcohol Syndrome," *Journal of Pediatric Psychology*, 31 (1), 65-70.

Reeves, B.; & Malone, T. (2007). *Leadership in Games and at Work: Implications for the Enterprise of Massively Multiplayer Online Role-playing Games.* Palo Alto, USA: Seriousity.

Schmiemann, Manfred (2008). "Enterprises by size class - overview of SMEs in the EU," Eurostat manuscript KS-SF-08-031-EN-N. Luxembourg: Office for Official Publications of the European Communities.

Shaffer, D. W., Squire, K. R., Halverson, R., and Gee, J. P. (2004). "Video games and the future of learning". April 11, 2009, http://www.academiccolab.org/resources/gappspaper1.pdf

Tedeschi, Bob (2007). "In Second Life, Virtual Storefronts Aim For Tangible Sales," *The New York Times*, June 11, http://www.nytimes.com/2007/06/11/technology/11iht-ecom.1.6087369.html

Velegrakis, George; Rodrigues, Clara; Coelho, Dalila; Varajão, João; Morgado, Leonel; Dominguez, Caroline; Sancín, Chiara; Doppler, Gerhard; Koivusalo, Hillevi; Lakanen, Erja; Haidimoschi, Aura (2009). "Profile of the SME manager - Competences defining the profile of the European entrepreneur." In *Proceedings of CENTERIS 2009 – Conference on ENTERprise Information Systems*, 7-9, October 2009, Ofir, Portugal, ISBN 978-972-669-929-3, pp. 725-726, Vila Real, Portugal: UTAD.

VV.AA. "Pac-Man." In Wikipédia (http://pt.wikipedia.org/wiki/Pac-Man). April 9, 2009.

Woodcock, Bruce (2008). "An Analysis of MMOG Subscription Growth Version 23.0." June 15, 2009, http://www.mmogchart.com/analysis-and-conclusions/

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