Serious Games: How Are They Perceived by the End-User?

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Abstract

The Canadian Navy has just begun experimenting with serious games as a mean of delivering skills training to its personnel. In order to determine the usability of such technology to support training, the Navy conducted a proof of concept to determine the reaction of its personnel to the implementation of serious games. This study demonstrates that there is a very high receptivity from naval personnel for serious games to be used as a training tool. It also indicates that we must be careful when designing serious games for experienced personnel since lack of fidelity may cause distraction which could impede learning.

Introduction

The Canadian Navy has just begun experimenting with serious games as a mean of delivering skills training to its personnel. In order to determine the usability of such technology to support training, the Navy e-Learning Center of Expertise (NeLCoE) conducted a proof of concept to determine the reaction of its personnel to the implementation of serious games.

Although many researches have been conducted to determine the effectiveness of serious games as training tools, there are quite few that address the perceptions of the learners towards serious games. In fact, the literature seems clear to the effect that games, such as first person shooter (FPS), can be effectively used to support spatial awareness and task training but how the learners perceive these tools is not as widely documented. As we believe that the perception of the tool may have an influence on its efficiency, we wanted to see how sailors perceive computer games when used in a training context.

The rationale behind the use of serious games by the Navy is that, as mentioned by Stone (2002), access to naval vessels for the purpose of training personnel in familiarization, evacuation procedures, safety equipment location and incident muster procedures can no longer be guaranteed. Fleet reductions have increased the operational tempo of ships and submarines and time alongside is therefore often used to perform maintenance which often leave these platform in such condition that some spaces are barely recognizable.

To address the issue of platform availability, serious games have the capacity of simulating real world places and activities and, according to Zeltzer & Pioch (1996), good simulations can systematically provide a wide range of possible training scenarios without incurring the high cost and risk of fielding personnel, equipment and vehicles. In fact, the research of Witmer & al (1996) demonstrated that a virtual environment can be almost as effective as real world environments in training participants to follow a designated route.

As reported by Linden lab (2009), all of the students participating in a training program involving a virtual simulation viewed the simulation as their best opportunity to learn and develop necessary skills that they might not otherwise receive until actually on the job. Similar results have also been observed by Tate & al. (1997) when participants in a virtual shipboard firefighting simulation expressed increased confidence in performing their firefighting tasks because of familiarization with the spaces and spatial awareness received through the virtual environment.

While game play is voluntary, non-productive, and separate from the real world, instruction or training is typically nonvoluntary, undertaken to achieve certain learning outcomes, and related to life or work skills (Garris & al., 2002). But, according to Sanchez & Smith (2007), game-based simulations incorporate the characteristics of games that make them appealing without reducing the seriousness of the training. De Freitas & Levene (2004) even argue that *gamesim* – a hybrid of simulations and games – could combine the pedagogic value of simulations with the motivational attributes of games.

Therefore, since computer games motivate via fun, challenge and instant feedback within an environment that creates an immersive experience (Greitzer & al., 2007), we believe that learners should have a positive perception of serious games, provided that they can see a pedagogical value to their utilization. As mentioned by Stone (2005), as long as the user's attention is captured, serious games are capable of delivering content to highly motivated students of all ages and skills.

Methodology

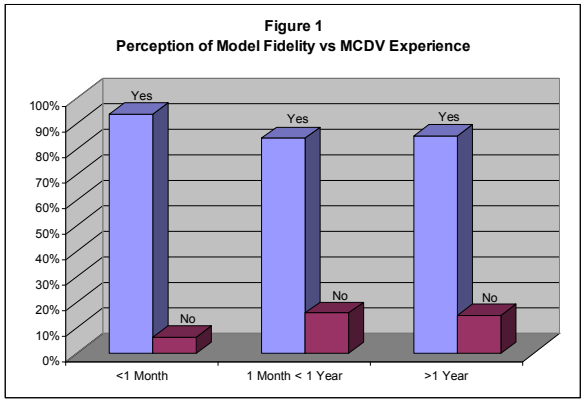
The experiment consisted in presenting a group of volunteers from 24 Naval Reserve Divisions across Canada with a virtual 3D model of a Kingston Class maritime coastal defence vessel (MCDV). The virtual ship has been developed as a mod of the commercial game SWAT4, based on Unreal 2 game engine. Interaction within the game was very limited as no equipment could be moved or operated. The aim was to have the sailors walk through the ship to either familiarize themselves with its layout or, for those with actual experience onboard this class of ship, to see if the virtual ship matched the real one.

After having experimented with the virtual ship, sailors were asked to fill an online questionnaire to determine how they perceived this training tool as well as to provide comments on the level of fidelity. They were also asked to suggest potential applications that could be developed to support training or operations.

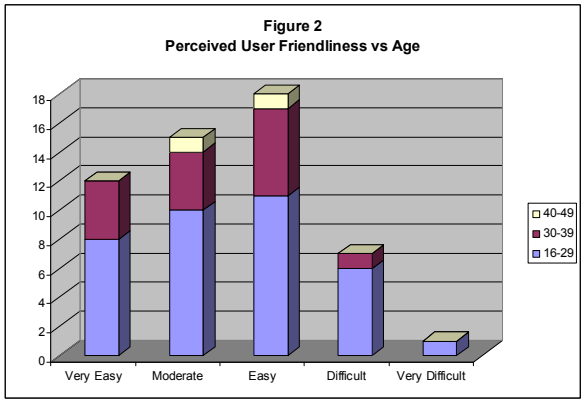
Over 164 volunteers registered for the trial and 71 returned completed questionnaires. Respondents were mostly (68%) aged between 16 and 29 while 28% were between 30 and 39 and 4% between 40 and 49. They came from various ranks and naval trades with 45% of the respondent having less than a month experience aboard Kingston Class vessels, the rest being divided between those having between a month and a year of experience (27%) or more than a year (28%). 66% indicated they played video games at least occasionally while 34% rarely or never play.

Results

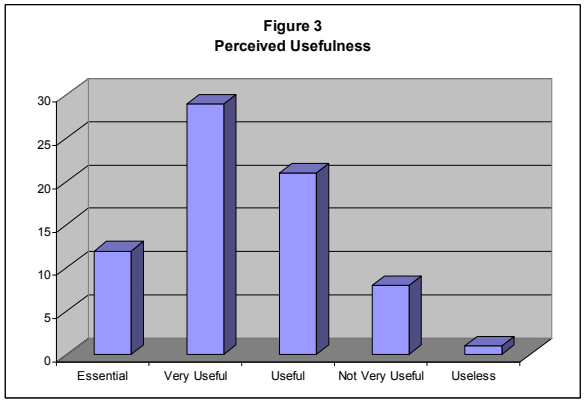
When asked if the digital ship model was matching the real ship, 89% answered yes. We observed however that people with less experience onboard the real ship find the model a little more realistic (Figure 1).



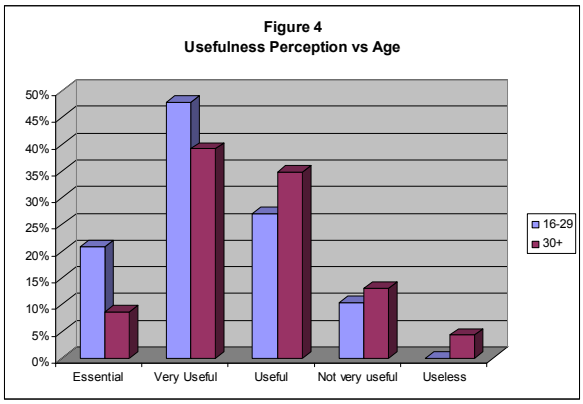
When asked about the user friendliness of the game navigation, over 83% of respondents said it either was easy, moderate or very easy (figure 2). Although a significant majority of those regularly playing video games found it very easy, there was no significant difference among the other groups.



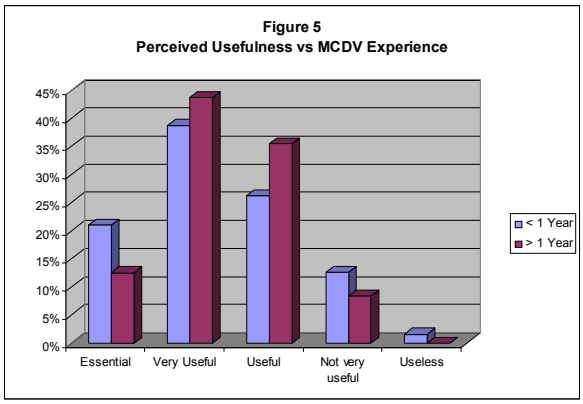
Finally, to the question about the usefulness of the virtual model, 87% of respondents indicated it was at least useful with a little less than 13% seeing little or no utility for such training tool (figure 3).



Cross examination indicated that more people 30 years old and over were finding the model not very useful or useless (17%) that those under 30 years old (10%). (figure 4)



As well, based on experience aboard real ships, people with more than a year of experience find it more useful (92%) that those with less than a year of experience (85%). (figure 5)



Finally, respondents who rarely or never play video games find it more useful (97%) than those who play video games at least occasionally (83%).

We also asked respondent what improvements should be made to the model so it can better match the real ship as well as suggestions of potential applications for such a model. Since it would not be practical to list all the answers provided, we will refer to some of them in the discussion section of this paper.

Discussion

As shown by the results, we observed that individuals with more experience aboard the real ship seem to expect more physical fidelity from the virtual model. This was somehow expected based on the fact that, to save development time, we omitted certain details and we also used 3D objects that were not exact representations of the real objects. In fact, when looking at comments, such as "*No Anchor at bow of ship*", "*not the same type of door as on ship*", "*no spaces had fire or smoke detectors*" or "*the ladder to General stores was on the wrong side*" we can easily see that experienced user were often looking at details.

What this means, is that the more the target audience is experienced, the more we must ensure physical realism. This is somehow in contradiction with Daly & Thorpe (2009) who reported evidence that overall high fidelity is not required for effective training. They argue that realism can detract or deter from the focus of the training and in fact result in less effective training. Our findings, however, seems to demonstrate that, for experienced learners, lack of physical fidelity can have a negative impact on learning since they can be distracted by things they do not find, recognize or are wrongly placed, which does not seem to be the case for inexperienced learners since they have no mental reference to the real environment.

The usability aspect does not seem to pose problem, whatever the age or gaming experience. Although gamers may have a greater facility to navigate around the virtual ship, non gamers also reported a facility to navigate which indicate that using such games for training do not represent a usability challenge for most learners. This should have a positive impact on the pedagogical aspect of using first person shooter type games since, based on the work of Wong & al. (2007) we can expect usability issues to create distraction to content processing. Therefore ease of use should have a positive effect on learning, as long as game scenarios are conducive of learning.

Finally, the perceived usefulness of the game by users seems quite clear. This is consistent with the findings of Pannese & Carlesi (2007) that the perception of games as valuable training and educational instruments is generally very high; people seem to appreciate this innovative and unconventional training tool more than traditional exercises. Younger people seems to see more potential in this type of learning tools than older people, which is not a surprise given that younger generations are normally more familiar with this kind of technology.

What is interesting though is that more experienced sailors find it more useful than those with few or no experience onboard the ship. This may be due to the fact that experienced sailors can compare it to the way they trained in the past and see where it could fit in the training sequence. Comments such as "*It can really help new sailors become accustomed to the ship*", "*It*

would be great to use this simulations on Fire fighting on ships", "*Refresher tour of ship before redeploying*" or "*If expanded, could be used for engineering drawings*" really show that this kind of simulation could potentially be used in many aspects of sailors' training.

Another interesting observation was the fact that "non-gamers" find that type of simulation more useful than those who play video games. This has also been observed by Pannese & Carlesi (2007) when they mentioned that Students, who are more used to playing games, seem to be slightly more critical about the proposed game. Is that due to the fact that, for gamers, this is perceived as just another game while for non gamers this is perceived more as a training tool? Our data did not provide an answer to that but it would be interesting to study this further.

Conclusion

Our study demonstrated that there is a very high receptivity for first person serious games to be used as training tools for naval personnel. This as well as the fact that most people show no problem in navigating within a virtual environment are two factors that can have a positive impact on learning transfer from computer based training tools.

The study also indicates that we must be careful when designing serious games for experienced personnel since they tend to compare the virtual representation of the environment with the real environment, which, with lower fidelity models may cause distraction and impede proper learning.

Now that we have demonstrated that sailors are receptive to that kind of training tool, we should measure its efficiency for specific applications such as spatial awareness training as well as ship's systems awareness and operation.

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