

Serious Military Games for Policymaking in Literature Review

Abstract

Games are considered as a form of just entertainment. However, they can have educational and practical side, at that case notion of “serious game” can be referred. There is a growing interest towards serious games in various fields. Since serious games can be utilized for wide range of opportunities. In this document, serious games and counter-terrorism are surveyed to explore usage of serious games in military. Previous researches and example applications are investigated to conduct our project in order to provide strategic policymaking laboratory as a solution for COE-DAT.

1. Introduction

Serious games have been used for distinct purposes. Military field is also give attention to serious games, since they can use these games in training and education (e.g. combat experiences, strategic decision making, usage of military equipment and vehicles). In this project, COE-DAT needs a policymaking laboratory for given theoretical counter-terrorism courses to military personnel. Our aim is to develop a serious game for COE-DAT. The outcome of the project will contribute as a policymaking laboratory to improve decision making and strategical skill of military personnel.

The organization of this paper is firstly followed by the notion of serious game and its examples in different areas. Then serious games are examined in the scope of military field. Previous applications and their benefits for military are investigated. In the following part, the notion of terrorism is described, and pervious counter-terrorism applications are surveyed. Finally, the paper is ended with conclusion and references.

2. Serious Games

Recent technological developments have a significant impact on interactive approaches such as games in terms of human-computer interaction (Hasan & Yu, 2015). Software development organizations may benefit from technological enhancements that improve decision making skills of individuals especially on social and organizational issues where the software development process relies on information-based human intensive activities (Yilmaz & O'Connor, 2011).

Serious game is a special type of game with an education and training component rather than pure entertainment. Therefore, main goal of serious games is to train or educate participants' by providing them some virtual experience (Lim & Jung, 2013). In fact, Morley et al. (2017) claim that these games are able to place a strong emphasis on awareness, understanding of problems and concessions.

It is important that the player keeps the results of what is happening in real time learning while playing the game. This dataset gives the opportunity to better measurement about the players' progressions (Freire, et al., 7 April 2016). Serious games provide the ability to collect data according to the game topic. This data goes beyond experimental tests and makes performance evaluations of users easier. It also facilitates the use of analytical methods (Peddycord-Liu, et al., 2017). Therefore, serious games are utilized in also performance measurements.

According to Zyda (2005), if scientific activities using games (i.e. ludology) develops; utilization rate of serious games would increase especially in governmental and corporate areas. Some organizations take heed of innovative approach about serious games. For instance, North Atlantic Treaty Organization (NATO), the U.S. Department of Defense (DoD), non-governmental organizations, etc. (Harz, 2006).

There are some serious games in the field of health. For example, game of "Sims" that models and simulates hospital operations was developed for nurse intern education to support their professional education (Zyda, 2005). University of Birmingham developed a serious game project known as "PULSE". Civilian and military healthcare professionals can gain experience using the virtual environment by practicing medicine with PULSE (Harz, 2006). As described by Kayabasi (2005), serious games are utilized also in education field for teaching and learning. If serious games are utilized in schools, permanent learning rate of students should increase.

As a result, serious games can be used in different fields such as health, public policy, military, education, etc. They can improve various skills and abilities of people as well as provide them to gain virtual experience.

3. Military Serious Games

Another usage field of serious games are in the field of defense. Recently, military personnel have growing interest towards modeling, simulation and game development. Yildirim (2010) claims that capacity of games for increasing awareness of widespread war area

and providing real time information between military units are causes of this interest. In addition, virtual operations could enhance the ability to observe ally and foe distinctions on common battlefields. They might likely to increase the performance speed of military training. Therefore, military games have been utilized in both tactical and strategical level by creating virtual operations. Some defense games are a type of serious games that contains skills trainings and first-person shooter. Strategic and tactical games require complex infrastructure in accordance with the principles they hold (Raybourn, 2014). Various institutions, especially military institution, have utilized from serious games. According to Raybourn (2014), security forces always take precautions against terrorism and its attacks. Therefore, serious military games are utilized to train security forces. Additionally, as described by Van der Hulst et al. (Hulst, Muller, Besselink, & Vink, 2013), military serious games are very beneficial and provide an opportunity, when there is an impossible or challenging situation to realize military practice for trainees. Boinodiris et al. (2016) state that for air corps, armada and army; military serious games were developed and used in virtual military trainings.

Benefits of these serious games are plenty. According to Boinodiris et al. (2016), military serious game's missions are reducing cost, saving lives and time. They mention that increasing quality of mission to 60%, while improving cycle time efficiency to 90%. Furthermore, Lim et al. (2013) note that moving all the equipment to exercise areas are time consuming and costly. However, serious games could provide all required equipment that should be included in real-time practice. Therefore, time and cost saving are other benefits of military serious games. In addition to time and cost saving, loss of life and physical injuries should be prevented by virtual exercises. Lele (2011) considers that if warfare is considered to do live practice for trainees, it cannot be simulated in the real life. Since, it is very dangerous for recruits. Therefore, game-based simulation gives opportunity to take risk and tricky maneuvers that cannot be taken in to risk in the real life. According to Boinodiris (2016), consequences and long-term impacts of decision of trainees can be observed and evaluated with serious wargames. Therefore, simulation is essential for military training where there is no loss of life and any damaged property (Lele, 2011).

In the limited time, planning smarter and making effective decision can be provided by serious military games. Games can be utilized for political and policy purposes. To illustrate, "America's Army" and "Airport (In)Security" were developed to stimulate critical thinking (Hulst, Muller, Besselink, & Vink, 2013). America has utilized "America's Army" in recruit's trainings to deal with rifle range and obstacles of course (Zyda, 2005). "DARWARS Ambush"

is another military serious game. In this game, participants play in a convoy and get training together. They experience in moving together towards possible threats and dangers during virtual operations (Roman & Brown, 2008). As another example, “Sibilla” is serious game of NATO. It is utilized to train staffs who work in terrorism prevention. According to Bruzzone et al. (2009), the aims of game are developing analysis skills, information sharing, and giving value to information quality to prevent terrorism attacks. Thus, “Sibilla” is a good example of strategical serious game in military field.

De Freitas et al. (2007) claim that the potential of serious games to help increase the effectiveness of training and learning has been a subject of debate in much of the literature recently published in the field of learning. To bring this argument to an end, Roman et al. (2008) observed the effects of serious games on training and sought ways of learning with the help of an experiment. Therefore, they point out that Defense Advanced Research Projects Agency (DARPA) conducted an experiment on the United States Marine Corp (USMC). In the experiment, specific game-based scenarios were utilized. For the experiment, participants were separated into two groups. While control group encountered for the first time with combat scenario, another group had a desktop immersive training related with combat scenario before live training. In the live training, the control group had a success about 80% and 20% waste of time, success of game playing group was 100% in the all of runs. According to result of the experiment, it can be said that serious games are very beneficial for training and learning. Additionally, Roman et al. (2008) also mentioned a conducted research by Canadian Combat Training Centre (CTC) for Armour School. It analyzed effectiveness and efficiency of serious games in the military field. In the experiment, participants were analyzed in different groups by dividing them into three groups. Groups used VBS (Virtual Battleship Simulation) that is a game-based simulation and multi-player educational game, and it was utilized with different usage rates for a course education. According to this research, Roman et al. (2008) proved that course passing rates and performance of the participants were increased proportionally to usage of VBS.

4. Terrorism

The word meaning of Terrorism has been defined in different ways. Thomas (2002) states that there is no universal acceptance for definition of “Terrorism”. Therefore, a definition in the journal of COE-DAT was selected to define the term. According to Baseren (2008), terrorism means that a strategical approach contains organizedly, systematically and continuously terror for political aims to frighten, to intimidate and to threaten innocent people.

Terrorism is a global threat that must be tackled by international societies. Since, it doesn't know border, nationality or religion. The threats to international stability and welfare, and civil people of NATO occur because of terrorism (NATO, 2017). NATO aims to combat international terrorism with its allied countries (Purtas, 2005). For many years there have been many ways to deal with terrorists, such as conflict, conflict prevention, negotiation and peaceful politics. Terrorist groups are not a physical entity or legitimate representative of the population. For this reason, these groups do not conform to international law, principles and agreements (Toros, 2015). When we look at the history of terrorism, we can see many effects and actions. According to Chin (2015), the terrorist attacks were increased by 61% in 2014. Together with loss of lives, terrorist groups shake the confidence of the community in management and organization (Dogu,1992). Chin (2015) points out that terrorism has become a political war and will exist in the future as well as in the past.

Serious games have been used for different purposes in the military field. For instance, U.S. Army could cope with a problem by "America's Army". The game helped to reach volunteer soldiers to recruit. Additionally, the game of "Navy Training Exercise" has been used in recruiting by U.S. Navy. The International Center on Nonviolent Conflict (ICNC) utilized the game of "A Force More Powerful" (Susi, Johannesson, & Backlund, 2007). The game provides strategically fighting against tough adversaries to improve strategic skills (Aforcemorepowerful.org, 2017). The game known as "TacOps 4" has been used by US to train their soldiers against opposing forces (terrorism). The simulation based game contains tactical training and combat environment. The game that has been standard training device of US Army also promotes massive multiplayer teamplay. Accordingly, it demonstrates that serious games can be used to train soldiers about acting together against terrorism (Battlefront.com, 2002).

The game theory has a great impact on military field. It provides various strategic environments and policy choices pursuant to present day terrorism threats. Some researches about counter-terrorism have been conducted with the help of game theory. The application of game theory to operational decision making is supportive and encouraging for counter terrorism campaigns such as homeland security and counterterrorism officials (Jacobson & Kaplan, 2007).

Military serious games are very beneficial in counter-terrorism trainings and education. They are used in different areas in military. BinSubaih et al. (2009) state that wide range of military training opportunities are provided by serious games. These opportunities are tactical experience, rifle range, ambush, foreign language and culture, leadership, post-traumatic stress order and obstacle courses. Therefore, these games are developed for military

education and training field. As we mentioned in “Military Serious Game” part, the impact of the serious games used for training in military fields is too much.

In conclusion, serious games are utilized in various fields. Developments in military field are very significant. It provides many advantages such as critical decision making, time and cost saving, virtual experience, etc. Therefore, recruits and trainees can be trained effectively. Our project’s goal is to develop a serious game for COE-DAT to address their virtual policymaking requirements. COE-DAT can use the outcomes of this project as a complementary tool to help training their personnel against terrorism.

References

1. Aforcemorepowerful.org. (2017). A Force More Powerful. [online] Available at: <http://www.aforcemorepowerful.org/game/> [Accessed 26 Nov. 2017].
2. Arce M., D. and Sandler, T. (2005). Counterterrorism. *Journal of Conflict Resolution*, 49(2), pp.183-200. doi:10.1177/0022002704272863.
3. Baseren, S. H. (2008). Terrorism with its Differentiating Aspects. *Defence Against Terrorism Review*, 1(1), 1307-9190, 1-11. Retrieved November 26, 2017, from http://www.coedat.nato.int/publication/datr/volume1/01-Terrorism_with_Its_Differentiating_Aspects.pdf
4. Battlefield.com. (2002). TacOps 4: Overview. [online] Available at: <http://www.battlefront.com/products/tacops4/tacops4.html> [Accessed 26 Nov. 2017].
5. BinSubaih, A., Maddock, S. and Romano, D. (2009). Developing a Serious Game for Police Training. *Handbook of Research on Effective Electronic Gaming in Education*, pp.451-477.
6. Boinodiris, P., Sokol, L., Blejer, H., & Behrens, R. (2016, September 30). IBM Redbooks. Retrieved November 07, 2017, from www.redbooks.ibm.com/redpapers/pdfs/redp5128.pdf.
7. Bruzzone, A., Tremori, A., & Massei, M. (2009). Serious games for training and education on defense against terrorism. Technical Report, RTO-MP-MSG-069-16, Oct. 2009.
8. Chin, W. (2015). NATO and the Future of International Terrorism and Counterterrorism. Retrieved from www.coedat.nato.int/publication/researches/02-FutureofInternationalTerrorism.pdf.
9. Dogu, E. (1992). Uluslararası Terörizm. *Ankara Üniversitesi SBF Dergisi*, 47(3), 139–143. doi: http://dx.doi.org/10.1501/SBFder_0000001609.

10. Freire, M., Serrano-Laguna, Á, Iglesias, B. M., Martínez-Ortiz, I., Moreno-Ger, P., & Fernández-Manjón, B. (2016). Game Learning Analytics: Learning Analytics for Serious Games. *Learning, Design, and Technology*, 1-29. doi:10.1007/978-3-319-17727-4_21-1.
11. Freitas, S. D., & Jarvis, S. (2007). Serious Games-engaging training solutions: A research and development project for supporting training needs. *British Journal of Educational Technology*, 38(3), 523-525. doi:10.1111/j.1467-8535.2007.00716.x.
12. Harz, C. (2006, April 26). Games for Learning: Serious Entertainment. Retrieved November 05, 2017, from <http://www.awn.com/animationworld/games-learning-serious-entertainment>.
13. Hasan, M. S., & Yu, H. (2017). Innovative developments in HCI and Future Trends. *International Conference on Automation and Computing (ICAC)*, 14(1), 10-20. doi:10.1109/iconac.2015.7313959
14. Hulst, A. V., Muller, T., Besselink, S., & Vink, N. (2013). The Potential of Serious Games for Training Urban Operation Tasks. *Proceedings of the Nato Modelling Simulation and Gaming-111 Multi-Workshop, Sydney, Australia*, 19-1-19-8. doi:10.14339/STO-MP-MSG-111-19-pdf.
15. Jacobson, D. & Kaplan, E. (2007). Suicide Bombings and Targeted Killings in (Counter-) Terror Games. *Journal of Conflict Resolution*, 51(5), pp.772-792.
16. Kayabasi, Y. (2005). Sanal Gerçeklik Ve Eğitim Amaçlı Kullanılması. *The Turkish Online Journal of Educational Technology*, 4(3), 151-158.
17. Lele, A. (2011). Virtual reality and its military utility. *Journal of Ambient Intelligence and Humanized Computing*, 4(1), 17-26. doi:10.1007/s12652-011-0052-4.
18. Lim, C., & Jung, H. (2013). A study on the Military Serious Game. *Advanced Science and Technology Letters*. doi:10.14257/astl.2013.39.14.
19. Morley, M. S., Khoury, M., & Savić, D. A. (2017). Serious Game Approach to Water Distribution System Design and Rehabilitation Problems. *Procedia Engineering*, 186, 76-83. doi:10.1016/j.proeng.2017.03.213.
20. NATO. (2017, 6 Nov). Countering Terrorism. Retrieved from www.nato.int/cps/en/natohq/topics_77646.htm.
21. Peddycord-Liu, Z., Cody, C., Kessler, S., Barnes, T., Lynch, C. F., & Rutherford, T. (2017). Using Serious Game Analytics to Inform Digital Curricular Sequencing. *Proceedings of the Annual Symposium on Computer-Human Interaction in Play - CHI PLAY 17*. doi:10.1145/3116595.3116620.

22. Purtaş, F. (2005). Soğuk Savaş Sonrası Nato'nun Dönüşümü Ve Genişlemesi Çerçevesinde Türk Amerikan Askeri İlişkileri. *Güvenlik Stratejileri Dergisi*, 1(2), 7–29.
23. Raybourn, E. M. (2014). A new paradigm for serious games: Transmedia learning for more effective training and education. *Journal of Computational Science*, 5(3), 471-481. doi:10.1016/j.jocs.2013.08.005.
24. Roman, P. A., & Brown, D. (2008). Games—Just how serious are they? *Interservice/Industry Training, Simulation, and Education Conference (IITSEC)*, 1-11.
25. Susi, T., Johannesson, M. & Backlund, P. (2007). Serious Games - An overview. Technical report, HS-IKI-TR-07-001, University of Skövde. Retrieved from <https://pdfs.semanticscholar.org/13e8/d4f8e2fe1bd2b82d63c0856c8585e15bb188.pdf>.
26. Thomas, I. (2002). Global Terrorism Organizations Yearbook. Washington: International Business Publications, p.5.
27. Toros, H. (2015). Terrorism, Counterterrorism, and Conflict Resolution: Building Bridges.
28. Yildirim, S. (2010). Serious Game Design for Military Training. *Games: Design & Research Conference*. Retrieved from www.academia.edu/24903765/Serious_Game_Design_for_Military_Training.
29. Yilmaz, M. and O'Connor, R. (2011). An Approach for Improving the Social Aspects of the Software Development Process by Using a Game Theoretic Perspective: Towards a Theory of Social Productivity of Software Development Teams. *ICSOFT 2011:6th International Conference on Software and Data Technologies*; Seville, Spain, 18-21 July, 2011. S.I: SciTePress.
30. Zyda, M. (2005). From visual simulation to virtual reality to games. *Computer*, 38(9), 25-32. doi:10.1109/mc.2005.297.