Understanding Game Modding through Phases of Mod Development

Satyam Agarwal and Priya Seetharaman

Indian Institute of Management Calcutta, Kolkata, India

Abstract: Game modding has been rapidly emerging as a source of competitive advantage in the gaming industry. While gaming companies are increasingly focusing towards establishing modder communities, very little is known about the process of modding itself. In this paper, we have carried out an analysis of activities of mod developers on mod distribution websites and their interactions with mod users. The theoretical lens of meta-structuring of technology use mediation helps us understand the phases of mod development. The phases relate to the activities that gamers and modders perform in order to maximize the game-play experience and usage of the mods respectively. We believe that these phases are integral part of mod development and can be used to establish appropriate support infrastructure to nurture modder communities. The paper concludes with implications for gaming firms and modding communities along with potential for further research in the area.

1 INTRODUCTION

The size of the world gaming industry is an estimated US $ 76 billion (Osathanunkul, 2014). Numerous business models operate in this industry that offer game development firms and gamers a diverse set of options while at the same time the industry is gradually attempting to adopt standards towards portability across platforms (Laakso and Nyman, 2014). The new platforms also offer the possibility of co-creation of gaming content with intense involvement from a community of people, often called "modders".

Modding can be defined as the activity to modify an existing game with dedicated tools. (George, 2012). Mod developers, or modders, as they are generally called, are the people who develop software patches known as "mods" that modify an existing game.

Mods offer numerous advantages to firms in the gaming industry, to the extent that some game publishers view mods as means to achieve competitive advantage. The advantage of modding can be nurtured by establishing dedicated and loyal modding communities who provide priceless value addition to the games. Firms make conscious choices regarding the degree of formal support extended to modders and modding communities.

At a fundamental level, mods are akin to any software update or patch. Yet, unlike traditional software development in proprietary software, mod development has certain unique characteristics. First, official patches or updates to software are usually developed by the firm which released the software. Mods are more commonly "unofficial patches" that are developed by third-party modders. In some sense this is similar to the open source software development. Second, patches to software usually do not alter the fundamental purpose or 'tone' of the main software or application, while mods can extend to altering the entire look and feel of the game (often termed 'total conversions'). Third, unlike utility software and applications, games are "high-involvement" products whose purpose is "fun". This "fun-factor" significantly influences game-playing decisions. This makes development of games a lot more complex than developing utility-oriented business applications. Such complexity results from the need to combine graphics and animation, simulation, artificial intelligence and gameplay, audio and in more recent times high degree of networking resulting from multi-player options.

These unique characteristics necessitate treating game development and therefore modding as a unique phenomenon that deserves special attention in information systems research. This paper attempts to take a closer look at the process of mod

development. While some similarities with traditional methods of software development are unavoidable, certain uniqueness in mod development and modding as a phenomenon of technology use can be seen. Considering the process of modding as co-creation of content presents an opportunity to also view it as a complex meta-structuring of technology use. IS literature has viewed structuring of technology use in the context of utility-focused systems that are commonly one-way (user uses the system) and sometimes two-way (end-user uses the system and makes changes to the system to suit her preferences) (Orlikowski et al., 1994). But in the context of modding the complexity increases by a magnitude much higher given the interactions between a few thousand users and a few modders within one game-one mod context. Our aim in this paper, is to capture this complexity by adapting and extending an existing framework of structuring of technology use.

The paper is structured in the following manner. We begin with a brief background on mods. Since our paper uses meta-structuring of technology use as the theoretical lens to understand modding and phases of mod development, we then present a brief review of meta-structuring in the context of technology use. Section 3 presents an overview of the methodology used to understand phases of mod development. Using textual analysis of conversations between modders and gamers on third party modding platforms, and drawing from a theoretical lens of meta-structuring of technology use mediation, we then present phases in mod development. We use conversations from a modding forum of one particular mod as a case in point to highlight the occurrence of the phases. The paper concludes with implications of these findings for modders, game development firms and for further research in the area of modding.

2 BACKGROUND

2.1 Mods and Game Publishers

Mods are extremely valuable for game publishers or gaming firms. Mods are essentially content generated by modders free of cost that would have otherwise been difficult for the game publishers to create, design and develop on their own. It has been estimated that the financial value of 39 mods developed for top six first person shooter games of 2004 alone was between $10 million to $30 million (Postigo, 2007). In addition, mods increase the value

of the game for the gamer. This results in increased sales of the game and longer shelf life (Postigo, 2007). Mods also tend to create a dedicated community of modders and fans which strengthens the brand identity of the game and results in longer-tailed sales curves (Harvard Law Review, 2012).

Two popular games to have specifically benefitted from the phenomenon of modding are Half-Life and Arma II. Half Life developed by Valve, was a regular first person shooter game which allowed users to add modifications such as custom maps. These mods helped Half Life to achieve extreme popularity. Indeed, one of Half Life's mods, Counter-Strike became so popular, that it was repackaged by Valve as a separate game. Half Life sold a total of 9.3 million units, and was the most sold game ever till 2008 (Remo, 2008). In addition, the sales of Half Life in its second and third years were actually higher than its sales in its first year, clearly indicating lengthening of its shelf life (Arakji and Lang, 2007).

Another success story for user created mods has been the DayZ mod for the game Arma II. The game was released in 2009 by Bohemia Interactive (BI) as a military simulator. The mod was developed by Dean "Rocket" Hall, who then received critical acclaim for his work and also joined BI as a lead developer to work on the standalone version of DayZ (Harman, 2012). The mod DayZ instilled life into a game to which the response had hitherto been lukewarm.

Many game publishers appreciate the impact of mods on their revenues. This is evident when game publishers - such as id Software, BethedsaSoftworks, Epic Games, etc. explicitly encourage modding activities (Postigo, 2007). About 38,000 mods are hosted on nexusmods.com for one of Bethedsa's game - Skyrim. These huge numbers clearly indicate that given the right support from game publishers, the modding community can churn significant amount of content which will be beneficial for both gamers as well as game publishers. It is obvious, therefore, that the companies, which can successfully foster dedicated modder communities around their games, will stand to gain a lot in an industry where increasing costs of development coupled with unpredictable gamer response have made game development an extremely risky venture. In order for game publishers to promote modding and modders, understanding the uniqueness of modding and modder communities is essential.

This paper attempts to answer the following questions:

(a) How do modders and gamers interact? Can their interactions help us understand the uniqueness of modding as beyond "application" development?

(b) Can we draw from existing models of structuring of technology use to help us draw parallels in the modding context, but capture the nuances and complexities in the co-creation of content?

2.2 Structuring of Technology Use

Most studies in the area of technology structuring have thus far been able to capture the nuances in structuration when the relationship between developer and user is well-defined using the software application or the organizational process supported by the software application as the basis of such interaction. Unlike such organizational applications, games operate as "applications" with a wider appeal and hardly any specific expected "process support". Interaction between modders and gamers is reflective of a combination of co-creation of content and application.

'Structuration' is the process through which defined forms and arrangements are produced and reproduced through the interaction between the organizational human elements and technology. Structuration theories in IS research (such as DeSanctis and Poole, 1994) have argued that use of technology (created by an interaction of the human, organisational factors and the technology) is structured by the context over time.IS research has used structuration theory to understand various aspects of technology use in organizations. A detailed review of use of structuration in IS research is available in Jones and Harsten (2003).

Adaptive structuration theory was also in parallel supported by the Orlikowski's duality of technology model and subsequently meta-structuring of technology use. In this stream of thought, technology is identified as the outcome of human action being fundamentally created and sustained through human action, and being constituted through use by such action. This emphasizes that only through the appropriation of technology through such continued use by humans can it exert influence (Orlikowski, 1992). This is further extended in the concept of meta-structuring where technology structuring and use is influenced by the users' understanding of their application of such technology to their work, the social and organizational environment, and the norms governing such use in their context. Such meta-structuring, therefore occurs over a period of time, resulting in phased transitions of technology

structuring (Orlikowski et al., 1994). Further studies have examined meta-structuring in the context of more recent media including groupp support systems (Henrikson et al., 2002; Yu and Khalifa, 2007).

3 METHODOLOGY

Our research questions mentioned above necessitated analysing modder-gamer interactions over time in order to understand the phases of mod development reflective of the meta-structuring process. Such interactions between modders and gamers were usually on mod-sharing websites – forum meant for interaction between modders and gamers. We found that modders and gamers primarily interact through third-party mod websites and on game development firms' platform. Third-party mod websites are likely to be more neutral, unrestricted by the gaming firm and therefore present greater depth of conversations.

From amongst various third party mod websites, we found nexusmods.com to be a relatively popular mod distribution website. For the purpose of this study, we have used the game The Elder Scrolls V:Skryim developed by Bethedsa Game Studios and distributed by Bethedsa Softworks. Skyrim was chosen because it is one of the most popular single player video games ever built, having sold over 20 million copies (Makuch, 2014). It must be noted that only 14% of Skyrim's sales were on the PC platform (Statistic Brain, 2013), the platform for which mods actually exist. Even so, it has become a phenomenon and today of all games hosted on nexusmods.com, Skyrim boasts of highest number of mods. It must also be mentioned that the game's developers, Bethedsa studios, have always supported modding in a big way and as a result a dedicated modding community has been created around their Elder Scolls franchise and Fallout franchise, since the days of The Elder scrolls III: Morrowind, released back in 2002. Our choice of Skyrim does not preclude us from extending our study to other games in the future.

We chose to study two mods of Skyrim - Skyrim Unleashed and Skyrim Redone. Our choice of game and mods were based on various factors. Both these mods can be categorized as overhauls, i.e. mods that change multiple features of the game in order to provide a new experience. Both of them are available on nexumods.com for download. These mods took around six to twelve months to develop and are extremely popular amongst the Skyrim gamers. We believe that popularity of a mod is

reflective of the level of engagement between the users, i.e. gamers and the creators, i.e. modders being very high. Both mods, Skyrim Unleashed and Skyrim Redone have used some form of collaboration between the mod creators to reach their present forms.

We downloaded the conversations between modders and gamers for the two mods mentioned above for over a 24 month period from the mod platform. Typical conversations included guides to game play; clarifications on game features and mod features; experience sharing; comments on game-play experience; suggestions for mods; questions to modders on mod-related and game-related issues; solicitation of feedback from gamers by modders; responses of modders to gamers' requests; and notices on new releases of the mod. These mods were hugely popular going by the period of time over which they were being downloaded (close to two years) apart from the continued activity on the mod forum.

The conversation text was coded using a thematic coding approach. Thematic coding helps in identifying patterned meaning in a dataset (Attride-Stirling, 2001). In order to truly reflect the spirit of the interaction, we used a combination of deductive and inductive coding methods. Deductive coding allowed us to be directed by our own understanding of potential themes underlying the interactions, but inductive allowed us to capture the surprises in the data. To be specific, we have used the Word Lists and Key words in Context technique (Ryan and Bernard, 2003) to categorize the conversation snippets into phases.

A total of 21000 snippets of conversation were analysed using two levels of coding. First-level coding was used to generate codes based on standard phrases and keywords characterising the interaction. For example keywords such as "interesting", "promising", "endorsing" etc. were coded as *comments on game-play experience* while keywords such as "await", "coming soon", etc. were coded as *response of modders to gamers' requests*. Given the volume of conversations, we partially automated the first-level coding process using auto-coding mechanisms, but random snippets were checked for accuracy of coding. This first level coding process was aimed at capturing a few types of interaction – request, response, comment, feedback, etc.

A second level coding was done to look for more in-depth themes surrounding mod development as 'content' or 'application' development such as *gamer involvement, requirements generation, continuous development, iterations, mod rejections,*

expression of user satisfaction, modder-gamer collaboration, etc. The second level codes were generated based on analysis of the text itself. One author completed the coding process although codes were agreed upon by all authors through discussion.

The codes were categorized and summarized to help identify patterns and dominant themes in the conversations between modders and gamers. An iterative categorization and summarization process enabled us to visualize the structuring of the gamer-modder experience through the lens of meta-structures. Due to paucity of space, we do not present our complete textual analysis here, but snippets are presented as part of the analysis and findings.

4 RESULTS

A lens that we felt suited the meta-structuring of modder-gamer interaction is the Orlikowski et al., (1994) technology use mediation phases. Their work refers to four phases through which meta structuring occurs in technology use mediation–establishment, reinforcement, adjustment and episodic change. While retaining four of the phases from their work, we also felt the need to include one other phase termed "promotion" as gamers and modders do not necessarily function in an organizational context and in most cases, active promotion of the mod is required in order to enhance its user base. While this is similar to the action of technology champions and sponsors in organizational application diffusion, it is usually an activity engaged upon by the modder himself and through gamer-followers.

We have also replaced the phase "episodic change" with the phase "expansion" since mod development does not generally follow time-specific episodic changes related to other organizational variables. Although it is not rare that special needs of different class of mod users warrants development of more than one version of mods. We refer to this as "expansion". It must be noted that these phases do not follow each other chronologically but exist simultaneously throughout the lifetime of the mod.

We describe each phase in greater detail below. Table 1 presents a summary of the five phases in the context of modding. In table 2, we present snippets of the conversations segregated according to the phases. These conversations demonstrate how interactions of modders with their target audience drive the development of mods.

4.1 Establishment

The establishment phase begins with uploading the mod on the distribution platform. In general, overhaul mods change one or more features of the game to make it more appealing to a particular class of people. This target group is clearly defined by all the mod developers. The changes to his/her gameplay that the user will be required to make after installing the mod are also communicated clearly. Also, the mod developers have to take into account that their users might be using other popular mods which might be incompatible with their mods. Such compatibility issues are resolved by making changes to load order or using patches.

Table 1: Mediation in the Context of Modding.

Phase	Description
1. Establishment:	Upload the mod on the internet and establish the basic usage guidelines
2. Reinforcement:	Maintain the operational fidelity of the mod and enable the users to make changes to their game configuration and gameplay in order to use the mod
3. Adjustment:	Make changes to the mod to bring it line with its stated objectives based on discussions with the mod users
4. Promotion:	Advertising activities, especially those other than development and support that focus primarily on increasing the usage of the mod
5. Expansion:	Produce additional versions of the mod to cater to the special needs of different class of users

4.2 Reinforcement

The reinforcement phase entails enabling the users to make the fullest use of the mods. To remove any bugs, the mod developers enlist some early users as the beta testers of the mod. They also regularly answer the queries of the mod users using the comments section for each mod. Skyrim Redone and Requiem also released guides which explained all the changes made by the mod in detail. The guide of SkryimRedone was 110 pages long while it 83 pages long for Requiem. The developer of Skryim redone also released a Reproccer which was basically a software which allowed a user to make his own compatibility patch for Skyrim Redone. Thus the modders increase the usage of their mods by enabling users to run them.

4.3 Adjustment

The Adjustment phase deals with making changes to

the mod according to the users' demand to keep it relevant. Since overhaul mods are more complex as compared to most mods, they introduce far more bugs. Fixing the bugs is the most important activity of the Adjustment phase. Simultaneously, long discussions with users on the comments section are carried out where feedback is collected and the mod developer may choose to carry out further development provided there is sufficient number of users demanding it.

4.4 Promotion

The nexusmods distribution platforms provides the mod developers with some promotion features. The mod developers can write articles giving a glimpse to users about the upcoming features of the mod, thereby keeping them engaged. The developers also release videos and screenshots that show the difference in gameplay brought upon by the mod, thereby making it easier for the user to decide whether to install the mod. They also host user testimonials on their mod description page as a means of attracting more users.

4.5 Expansion

The expansion phase deals with activities that allow more users to use the mod. Skyrim has multiple versions due to regular release of game updates as well as release of 3 DLCs (downloadable content). Therefore mods built for one particular version on Skyrim may not work on others. These issues force mod developers to build different versions of their mod, each for a different version of Skyrim. In addition, Skyrim was released in various languages. To serve users using different languages, Skyrim redone has been released in different languages. A mod utility, Skyrim String localizer can translate content introduced by mod into other languages.

5 DISCUSSION

The paper has attempted to analyse the interactions between modders and gamers. This is the first time interactions between modders and gamers are being studied. Sotamaa (2010) states that the mod users give ideas to modders and demand new features, however, the extent of user participation and its impact had not been investigated, until now.

The snippets show that modders are not only active on mod forums, they also listen to their users and even make changes to their mods according to

Table 2: Snippets of the Conversation between Modder and Gamers.

Phase	Classification	Keywords	Examples
Establishment	In the establishment phase, we have classified those conversations which help to clarify the purpose and the target audience of the mod, as well as some guidelines that are to be followed while using the mod. It is usually available in the mod description. However many times, users do require clarification. Since most mods focus on a particular type of change in the gameplay, the keywords referring to this classification usually denote the change that the mods bring into the gameplay	Difficult, Specialization, Realistic	USER: "SOUNDS, brilliant... My argument though with the average RPG, is that they tend to avoid realism..<<>>... I love the idea of a harder Skyrim... But I'll just raise the difficulty to the highest if need be... <<>> I'm gonna track this one and see if things change to the tactical and realistic... <<>> Modder: "realism and rpg are not always a good combination. Gameplay is the most important thing to keep in mind. Killing mobs in one shot, or being killed in one shot, ok it is ultra realistic, but I don't think it would be appreciated by a lot of players.<<>> an elder scrolls should remain a "not so realistic but immersive and modded" RPG ;)Unleashed adds the realistic leveling and DUEL adds the tactical combats, so why don't you give it a try? ^^" Modder: "<<>> If you only wield one weapon, you have a free hand to be filled with a shield, spell, whatever; with two handed weapons, you have less options, and therefore need more specialization."
Promotion	Promotion is done by modders to increase the usage of their mods. Modders make videos, screenshots, available and gamers write testimonials. But such promotion is also likely to occur through positive user comments about the mod which serve to validate the mod's promise and thus increase the probability of its download. Therefore, such positive comments have been categorized under the promotion phase. Keywords referring to the promotion phase are usually those which represent possible adjectives used by the users for the mods.	Awesome, fantastic, impressive, thank you, nice	User: "This sounds awesome! But I will probably wait for the Immersive armors compatibility. Tracking!" User: "This sounds fantastic. Very well laid out and it's obvious that a lot of thought and testing went into it. "Skyrim Unleashed" is now featured on Skyrim GEMS under category 300 - Gameplay Overhaul. User: "This looks promising! Basically it seems to be exactly what i've been looking for regarding scaling. I'm going to test it soon." User:"Reading through the changelog, it appears to be an impressively well thought out amount of content. <<>>." User: "I managed to load it with a recently started game without corrupting any data, as I'd only taken basic perks. Everything looks good, and it's good to have such room to grow, seeing as I also use the uncapper. Thank you for sharing this with us." User: "Wow, really nice mod you got there! I think your mod is the closest thing I've seen from the perfect intelligent and not overpowering balanced needed for perks. Quite a feat!"
Reinforcement	In the reinforcement phase, the snippets represent the conversation where the user has already downloaded the mod but is having problems in playing the game with the mod. Hence the modder solves the problems & doubts of the users, thereby reinforcing the mod usage. The keywords used for the reinforcement phase are generally indicative of some of the problems that the user might be facing while using the mod.	crash, compatible, working	User: "Im using better horses and its compatible so far as i can tell. Havent done much riding but at least it doesnt crash.."<<>> Modder: "@ shiaun: Good news on Better Horses. Bad news on the Nord racial... I'll look into it<<>>" User: "This mod is great! however, as i am using midas and Phenderix with this mod, the game always crash when i use conjuration spells, so could i ask you to kindly made a compatible version with these two mods?" Modder: "@donald926: Your PM was answered. I'll also add a paragraph about compatibility to the description." User: "hum ... i just updated from 1.5 to version 1.6 and hum ... the item seems not to be working anymore.<<>> Think i'll just try to go back to version 1.5 ...." Modder: "@Zack777 Version 1.6 works fine (I play with it and users of this mod too), be sure it's loaded last in your load order, and...je suisfrançaisaussi ^^"

Table 2: Snippets of the Conversation between Modder and Gamers (cont.).

Adjustment	In adjustment phase, users induce the modder to make changes to the mod, either to remove a big, or further updates to make the mod more relevant to their needs. Keywords referring to adjustment phase either refer to bugs, or focus on further changes in the mod.	Additional, shouldn't, Bug, update, suggestion	User: "Stability could use some more ranks. Like maybe 1 additional rank for another 50% duration or 2 additional ranks for 25% each." Modder: "Stability definitely needs additional ranks. Somehow I managed to overlook that."
			User: "Impact shouldn't be allowed to be 100% of the time. You could set it to only 30% or make 2 ranks of 15..<<>>" Modder: "Destruction: Agreed completely on Impact..<<>>" Modder: "I've added a new version that makes Impact chance-based.."<<>>
			User: "There's a bug that removes the Ice Spike spell from the game, also enemy shouts level up the player's speech" Modder: "@ archxeno: "the shouts-bug will be fixed in a couple of minutes. <<>>"
			User: "I think modifying Speechcraft so that shouts increase the skill is an incredible idea.<<>>" Modder: "<<>>(next update). That update will also include shouts that level Speechcraft"<<>>
Expansion	Expansion phase refers to those conversations that result in development of additional versions of the mod for users running different setups of Skyrim. The Keywords for expansion refer to parameters on the basis of which Skyrim setups are differentiated.	Language, version	User: "Hi! Is there any chance that this mod will be translated in other languages, like Italian?" Modder: "@Begazzo81 If you use the standard version, it can be easily translated in your own language using Skyrim string localizer. Try to learn how to use this tool (really easy by the way)"
			User: "A version without Dawnguard? :(" User: "Sounds promising, but sadly won't be able to use it because it requires dawnguard." User: "Would love to buy the Dawnguard DLC but sadly it brings too much trouble/issues with other mods" Modder: "COMING SOON: NON-DAWNGUARD VERSION! (If everything is well...)"
Note: The snippets are not chronological, but have been edited to show continuity			

users' wishes. Users also help modders by giving ideas for future development of mods & contributing in the form of beta testers. Hence, tracking interactions on mod forums using thematic analysis proves to be an effective tool to study mod development.

Mod forums provide an excellent platform for the interaction between modders and gamers, with their reach, focus, and flexibility. However, not all mod platforms might be suitable for research. For example, the most all-time top rated Skyrim mod on Steam workshop, another popular mod distribution system, had only 1600 comments and 2 small threads. By comparison, on Nexusmods, the thread of Skyrim Redone mod alone has over 38000 posts. Hence, Nexus is the best platform to study interactions between modders and gamers for now.

6 CONCLUSIONS

It is intriguing that despite obvious benefits of modding for the gaming industry, the process of modding itself has not been dealt with in greater detail. A similar phenomenon such as open source software development received tremendous attention in the IS literature. One possible explanation is that gaming and simulation researchers are more concerned with the technological aspects of the gaming and modding less with modding as a phenomenon – behavioural or sociological. IS researchers, on the other hand, are more interested in organizational and individual technology use with a focus on infrastructure and utility applications, far less with entertainment-focused "applications". The trend, though, is fast changing. Games, apps, especially in the context of 'mobile' and 'social' are indeed amongst the interests of IS researchers.

Modding as a phenomenon has attempted to enhance gaming experience while the process of modding through community driven discussion forums has introduced a significant social aspect to the entire phenomenon. 'Are geeks social?' is a question that has often been asked. Modding as a phenomenon is testimony to the fact that geeks (in this case, modders) are indeed tending towards 'social' as more and more technologies that enable social interaction come to play.

REFERENCES

Arakji, R., Lang, K., 2007. Digital Consumer Networks and Producer-Consumer Collaboration: Innovation and Product Development in the Video Game Industry. *Journal of Management Information Systems* 24(2), 195-219.

Attride-Stiring, J. 2001 Thematic netweorks: An Analytial tool for Quantitative Research. *Qualitative Research*, 1(3), 385-405

DeSanctis, G., Poole, M. S. 1994. Capturing the complexity in Advanced Technology use: Adaptive Structuration Theory, *Organization Science* 5(2), 121–147

George, S., Lavoué, E., Monterrat, B., 2012. An Environment to Support Collaborative Learning by Modding. *Le Centre national de la recherchescientifiqueestunorganisme public de recherche.*

Jones, M., Karsten, H. 2003. Review: Structuration Theory and Information Systems Research, Working Paper, Judge Institute of Management, University of Cambridge.

Harman, S., 2012. *DayZ's Dean Hall: Rocket Man Rising.* August 21. http://www.eurogamer.net/articles/2012-08-21-dayzs-dean-hall-rocket-man-rising. [Accessed 3rd December, 2014]

Harvard Law Review. 2012. Spare the mod: in support of total-conversion modified video games. *Harvard Law Review,* 125(3), 789-810.

Henrikson, D., Nicolajsen, H. W., Pors, J. K. 2002. Towards Variation or Uniformity? Comparing Technology-Use Mediations of Web-Based Groupware. *In Proceedings of the 10th European Conference of Information Systems*, Gdansk, Poland

Laakso, M., Nyman, L., 2014. Innovation Opportunities: An Overview of Standards and Platforms in the Video Game Industry,*Technology Innovation Management Review, available at* http://timreview.ca/article/808. [Accessed: 3rd December, 2014].

Makuch, E., 2014. *The Elder Scrolls V: Skyrim sells 20 million copies.* January 27, available at http://www.gamespot.com/articles/the-elder-scrolls-v-skyrim-sells-20-million-copies/1100-6417363/. [Accessed: 3rd December, 2014]

Orlikowski, W. J. 1992. The duality of technology: rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398-427.

Orlikowski, W., Yates, J., Okamura, K., Masayo F., 1994. Shaping Electronic Communication: The Metastructuring of Technology in Use. *Organization Science,* 6(4), 423-444.

Osathanunkul, C., A classification of business models in video game industry. *International Journal of Management Cases*, 17(1), 35-44.

Postigo, H., 2007. Of Mods and Modders: Chasing Down the Value of Fan-Based Digital Game Modifications. *Games and Culture.*2(4), 300-313.

Pozzebon, M., Pinsonneault, A. 2001. Structuration Theory in the IS field: an Assessment of Research Strategies.In *Proceedings of European Conference on Information Systems* held at Bled, Slovenia.

Ryan, G. W., Bernard, H. R. 2003 Techniques to identify themes. *Field methods*. 15(1), 85-109

Remo, C., 2008. *Analysis: Valve's Lifetime Retail Sales for Half-Life, Counter-Strike Franchises.* December 3. http://www.gamasutra.com/php-bin/news_index.php?story=21319. [Accessed 3rd December, 2014]

Sotamaa, O., 2010. When the Game Is Not Enough: Motivations and Practices Among Computer Game Modding Culture. *Games and Culture*, 5(3), 239-255.

Statistic Brain. 2013. *Skyrim: The Elder Scrolls V Statistics.* Dec 19, available at http://www.statisticbrain.com/skyrim-the-elder-scrolls-v-statistics/. [Accessed: 3rd December, 2014].

Yu, A. Y., Khalifa, M. 2007. *A Conceptual Model for Enhancing Intra-Group Knowledge Sharing* [Online] http://sprouts.aisnet.org/7-15 [Accessed: 29th January, 2015]