ModelMMORPG - D1.3. Report on socio-economic impacts of MMORPGs

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Large-Scale Multi-Agent Modeling of Massively Multi-Player On-line Role-Playing Games

D1.3. Report on socio-economic impacts of MMORPGs

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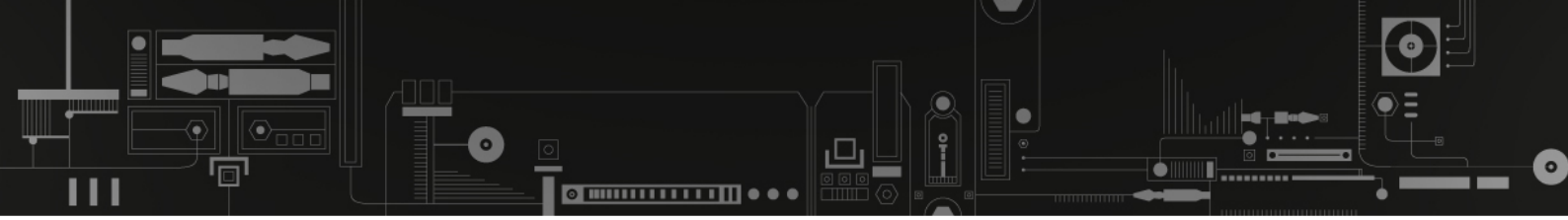

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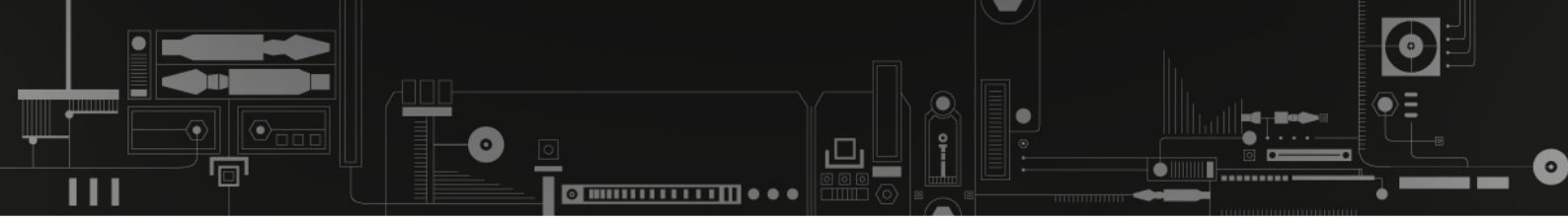

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1. Project Description

1.1 Abstract

Massively multi-player on-line role playing games (MMORPGs) give us the opportunity to study two important aspects of computing: (1) large-scale virtual social interaction of people (players) and (2) the design, development and coordination of large-scale distributed artificial inteligence (AI). A common denominator for both aspects are the methods used to study them: social interaction can be descibed and simulated using agent-based models (ABM social science perspective) whilst distributed AI is commonly modelled in terms of multi-agent systems (MAS computer science perspective).

The important question to ask in both perspectives is how do agents organize in order to perform their tasks and reach their objectives? Project ModelMMORPG (Large-Scale Multi-Agent Modelling of Massively On-Line Role-Playing Games) will employ a combined empirical and theoretical approach towards finding the answer to this question.

From the empirical side, we shall study the human behaviour on a number of venues across various gaming servers in order to find most suitable structures, cultures, processes, strategies and dynamics employed by most successful player communities. From the theoretical side, we shall test a multitude of organizational architectures from organization theory in various MMORPG settings, and compare them with methods found in empirical research.

Our research is therefore aimed towards enriching the organizational design methods for the development of MMORPG to foster the development of self-organizing and adaptable networks of large-scale multi-agent systems.

With this in mind, our main goals are:

1. To identify and formalize adequate organizational design methods for developing LSMAS in MMORPGs.
2. To couple them with real-life and future scenarios from industry.
3. To provide open and accessible tools, which will allow for design, development, implementation, control, simulation and maintenance of LSMAS in MMORPG

1.2 Introduction

Role-playing video or computer games (commonly referred to as only role-playing games or RPGs) are a game genre in which the player controls the actions of some protagonist (or potentially several party members) in a world which is well defined [26]. A massively multi-player on-line game (MMOG) is a (computer) game that supports a great number of players playing on-line simultaneously causing or even fostering interaction among them [24]. Massively multi-player on-line role playing games are thus a mixture of these two genres allowing players to control the action of their protagonist (avatar) by interacting with a potentially large user-base on-line [25].

The global market for MMO games is growing rapidly with 2011 $\approx$ 8.5 billion €, 2012 $\approx$ 10.2 Bn€, 2013 $\approx$ 11.7 Bn€ and 2014 $\approx$ 15.0 Bn€ [15, 19]. While the economic importance of MMORPGs is obvious, another aspect is of equal importance: it allows us to investigate two aspects of large-scale computing - (1) social interaction of (large numbers of) players through a computing platform as well as (2) the design and implementation large-scale distributed artificial intelligence (in form of non-player characters – NPCs, mobs – various monsters to be fought, as well as AI players – bots). Both aspects can and should be studied using agent-based methods, the former by ABM (a social science perspective) and the latter by MAS (a computer science perspective), whilst the important question to ask in both perspectives is: how do agents organize in order to perform their tasks and reach their objectives?

The ModelMMORPG (Large-Scale Multi-Agent Modeling of Massively On-Line Role-Playing Games) project will employ a combined empirical and theoretical approach towards finding the answer to this question. From the empirical side, we shall study the human behavior on a number of venues across various gaming servers in order to find most suitable organizational structures, cultures, processes, strategies and dynamics employed by most successful player communities. From the theoretical side, we shall test a multitude of organizational architectures from organization theory in various MMORPG settings, and compare them with methods found in empirical research. The research is therefore aimed towards enriching the organizational design methods for the development of MMORPGs and to understand the undelying principles of self-organizing and adaptable networks of large-scale multi-agent systems.

MMORPGs have a number of different subgenres, but a usual setting is that a protagonist is placed into a world in which he interacts with various NPCs and mobs which give out tasks (quests) that it has to solve to be able to buy better equipment, learn new skills like magic and similar, or proceed to higher levels. In ModelMMORPG we have chosen The Mana World (TMW)[1] MMORPG to conduct our research. The reasons for selection were: (a) it is open source (GPL licensed) allowing us to modify code and add additional functionality, (b) it has a supportive community, (c) it supports a number of interaction techniques which can be studied (e.g. trade among players, IRC based chat, organizing teams called parties, social network functions e.g. friends, enemies, parties etc.), (d) it is a (more or less) finished game featuring lots of quests that can be analyzed.

In order to answer our outlined questions, we firstly designed a special quest in which players ought to organize their activities in order to solve it. The quest is designed during a 3-day brainstorming session. Later on, during a data collection phase we will allow players to play the game in order to collect their behavioral data during a period of one month. After data collection, the data has been analyzed using social network analysis (SNA) and natural language processing (NLP) techniques in order to identify patterns of organizational behavior among successful players. In addition to these patterns, various organizational forms from organization theory literature have been been formalized in form of an ontology and consequently a meta-model for a graphical modelling tool. This tool has been extended with end-point plug-ins that allow us to not only

[1] See `http://themanaworld.org` for details.

develop models of agent organizations, but also to generate code templates to implement such agent systems. Herein three such organizations have been modelled and from these models three simulations were implemented in order to test the expressivity of the modelling tool as well as analyze data gathered during simulation.

In this deliverable we will present the socio-economic impacts of Massively Multi-player Online Role-Playing Games (MMORPGs) that provide a bigger picture and context for the research of the project.

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2. Introduction

Socio-economic impacts of MMORPGs are multifold and there have been numerous studies in various venues that have analyzed particular aspects of this phenomenon in which so many people participate on a daily basis. According to Wikipedia contributors [23] numbers of players on MMORPGs in 2014 were:

- Dofus – 10,000,000
- World of Warcraft – 7,600,000 (average at any time about 34,000 players)
- MapleStory – 5,000,000
- Knight Online – 4,250,000
- Start Trek Online – 3,200,000
- Guild Wars 2 – 3,000,000
- Final Fantasy XIV – 2,500,000 (average 30,000-45,000)

While there are many impacts, including the recent announcement by the World Health Organization (WHO) that the gaming disorder might soon be recognized as an official psychological clinical description [17], we have chosen to limit this overview to (1) the impacts to the global economy (summarized in chapter 3), (2) the emergent virtual economies (described in chapter 4), and (3) the recent phenomenon of electronic sports (eSports) (detailed in chapter 5).

3. The Global MMO Market

The global Massively Multi-player Online (MMO) games market is a multi-billion business world-wide. According to [22] the market revenue in 2016 by region was about 2.08 billion Euro in North America, 0.85 billion Euro in South America, 2.96 billion Euro in Europe, 10.54 billion Euro in Asia and about 0.22 billion Euro in the rest of the world grossing to over 16.65 billion Euro all over the world as shown on figure 3.1.

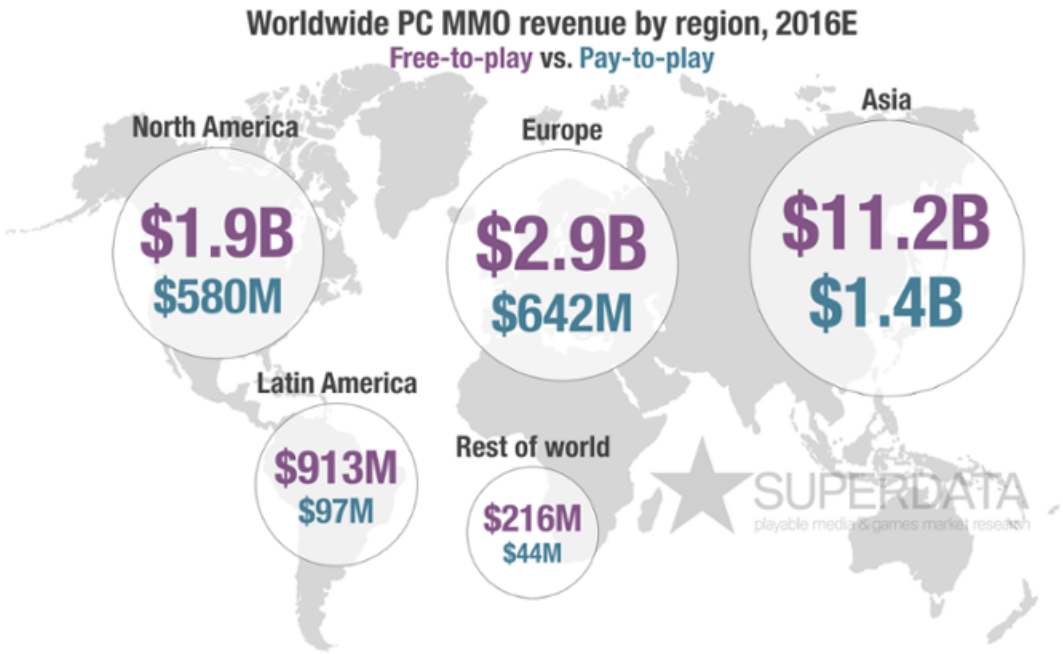


Figure 3.1: Worldwide PC MMO revenue by region 2016
Source: `http://www.texyon.com/newscorp/global-mmorpg-market`

There is a very similar situation in the global games market as seen on figure 3.2 [18] where

Asia also covers the largest share of the market (47%), but MMO games are more popular in Europe than in North America: whilst the global game market for North America covers for 25% market share, MMO cover only 12.5%.

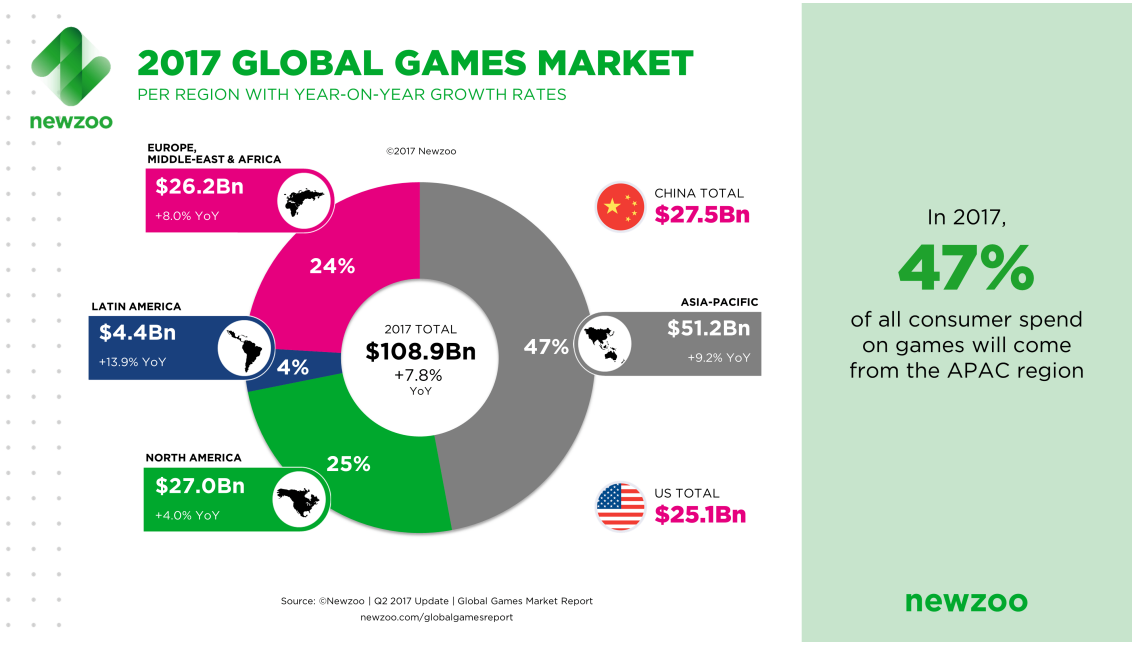


Figure 3.2: Global Games Market per region
Source: `https://newzoo.com/insights/articles/the-global-games-market-will-reach-108-9-billion-in-2017-with-mobile-taking-42/`

The MMO market has been growing more or less steadily since the first MMO games have been put into the world, with a gross revenue of 16.74 billion Euro in 2015, 16.57 billion Euro in 2016 (estimated; a slight decrease due to a fall in pay-to-play subscriptions), 16.82 billion Euro in 2017 (estimated), and 17.41 billion Euro in 2018 (estimated), as can be seen on figure 3.3 [22].

Figure 3.3: Free-to-play vs. Pay-to-play
Source: `http://www.texyon.com/newscorp/global-mmorpg-market`

When compared with the global games market, which is also growing steadily according to recent forecasts (with 84.6 billion Euro in 2016, 91.1 billion Euro in 2017, 96.9 billion Euro in 2018, 102.7 billion Euro in 2019, and 107.5 billion Euro in 2020 [18]), one can see that the market

share of MMO games is slightly decreasing (from almost 20% in 2016 to almost 17% in 2018).

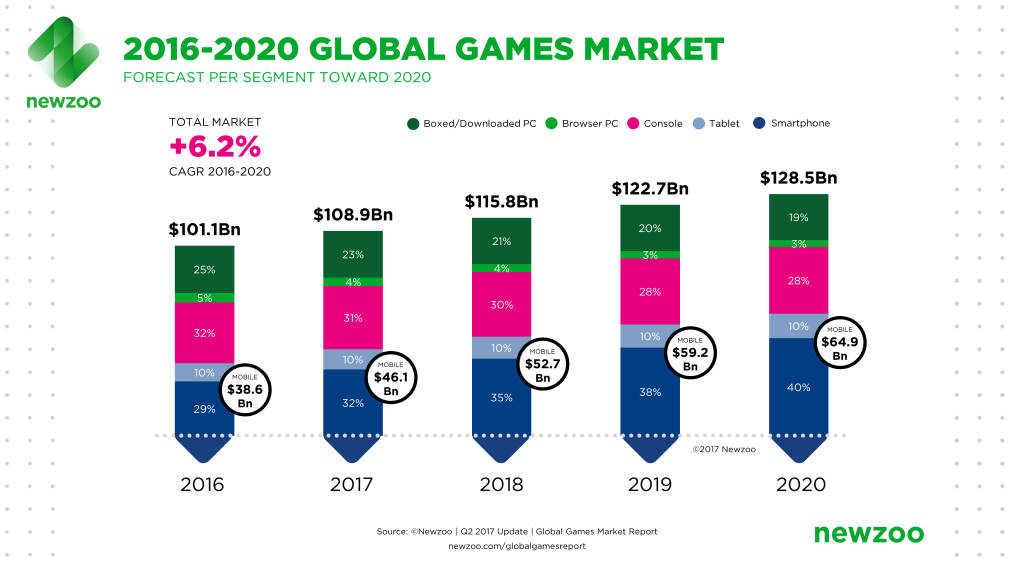


Figure 3.4: Global Games Market 2016 – 2020
Source: `https://newzoo.com/insights/articles/the-global-games-market-will-reach-108-9-billion-in-2017-with-mobile-taking-42/`

Figure 3.4 shows a comparison of gaming platforms in regard to gross revenue. PC based games (both downloaded and browser based) as well as consoles show a slight decrease in market share. An increase is visible with smartphone games while tablet based games seem to be at a constant 10% share of the market. This is even better visible on figure 3.5: mobile games are taking the lead in the global market share with 42% of the market in 2017. Console games with 31% and PC based games with 27% cover the rest of the market.

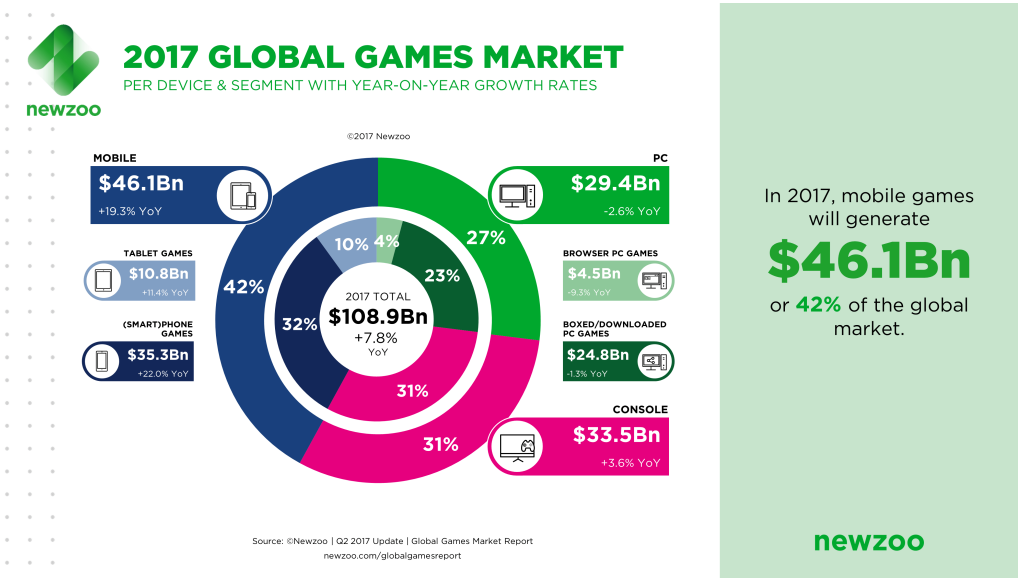


Figure 3.5: Global Games Market per device & segment
Source: `https://newzoo.com/insights/articles/the-global-games-market-will-reach-108-9-billion-in-2017-with-mobile-taking-42/`

The growth of mobile games revenue in Asia, and especially in China is particularly dramatic. Figure 3.6 shows a comparison between the dynamics of mobile games and other types of game platforms. As one can see, mobile games are increasing sometimes with a growth rate of over 10%, while other types of platforms are loosing their market share steadily.

Figure 3.6: Chinese Games Market 2013 – 2020
Source: `https://newzoo.com/insights/articles/the-global-games-market-will-reach-108-9-billion-in-2017-with-mobile-taking-42/`

Figure 3.7 shows the top-grossing PC MMO games from January to April 2016 [22]. Standing out are League of Legends, Crossfire, Dungeon Fighter Online, World of Warcraft and World of Tanks.

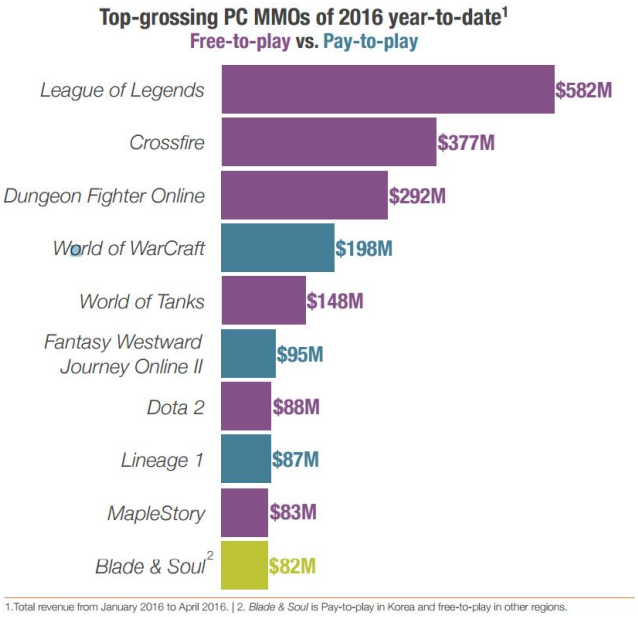


Figure 3.7: Top-grossing PC MMOs of 2016
Source: `http://www.texyon.com/newscorp/global-mmorpg-market`

According to [1] the list of top 10 most profitable MMO and MMORPGs is very similar. The following games made the most revenue:

10. Dota 2 – 2015 Revenue: $238 000 000 (Figure 3.8)
9. MapleStory – 2015 Revenue: ≈ $253 000 000 (Figure 3.9)
8. Counter-Strike: Global Offensive – 2016 Revenue: ≈ $300 000 000 (Figure 3.10)
7. Lineage – 2016 Revenue: $327 000 000 (Figure 3.11)
6. Hearthstone – 2016 Revenue: ≈ $395 000 000 (Figure 3.12)
5. World of Tanks – 2015 Revenue ≈ $446 000 000 (Figure 3.13)
4. World of Warcraft – 2015 Revenue: ≈ $814 000 000 (Figure 3.14)
3. Dungeon Fighter Online – 2016 Revenue: ≈ $1 200 000 000 (Figure 3.15)
2. Crossfire – 2015 Revenue: ≈ $1 200 000 000 (Figure 3.16)
1. League of Legends – 2016 Revenue: ≈ $1 800 000 000 (Figure 3.17)

According to Wikipedia contributors [4] Dota 2 is a multiplayer online battle arena (MOBA) computer game which is free to play, meaning there are no costs for starting to play the game. Dota 2 is being developed by Valve Corporation and is a sequel to a community developed mod for Blizzard Entertainment's Warcraft III: Reign of Chaos game, especially its extension package The Frozen Throne.

Figure 3.8: Dota 2
Source: `https://mmos.com/editorials/most-profitable-mmos-mmorpgs`

MapleStory, on the other hand is a MMORPG, implemented by Wized, a South Korean company [9]. It is also free to play and there are various country or region dependent versions of the game available, sometimes published by other companies including Nexon.

Figure 3.9: MapleStory
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

Counter-Strike: Global Offensive (or CS:GO for short) is an MMO but of a differen genre: first-person shooter (FPS). It was released by Valve Corporation and Hidden Path Entertainment as the fourth game of the Counter Strike games' series [2].

Figure 3.10: Counter-Strike: Global Offensive
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

Lineage is again a MMORPG from the fantasy genre [8] similar to The Mana World (TMW). It has been released NCSoft, a South Korean company, in 1998 and is most popular in South Korea.

There are versions in English, Chinese and Japanese available and it is the first game in a series of similar Lineage games.

Figure 3.11: Lineage
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

Hearthstone: Heroes of Warcraft (or just Hearthstone for short) is an MMO from the collectible card genre developed by Blizzard Entertainment [6]. It is free to play and builds upon the existing Warcraft series by using same characters, artifacts and other elements of these games.

Figure 3.12: Hearthstone
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

World of Tanks (or WoT for short) is an MMO [12] released by a company called Wargaming

which is based partly in Cyprus, partly in Belarus. It's genre are mid 20th century combat vehicles and it is uses a freemium business model meaning it is free to play, but player who pay can get access to certain premium features.

Figure 3.13: World of Tanks
Source: `https://mmos.com/editorials/most-profitable-mmos-mmorpgs`

World of Warcraft (or WoW for short) is a game of the already mentioned World of Warcraft franchise developed by Blizzard Entertainment [13] and is currently the world's MMORPG with the most subscribers holding a Guinness World Record for the most popular MMORPG.

Figure 3.14: World of Warcraft
Source: `https://mmos.com/editorials/most-profitable-mmos-mmorpgs`

Dungeon Fighter Online is an MMO from the fightign game genre similar to Street Fighter or Mortal Kombat [5]. It has initially been published in Korea (as Dungeon & Fighter) and Japan (as Arad Senki) firstly by Hangame, then by Nexon and currently by Neople.

Figure 3.15: Dungeon Fighter Online
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

CrossFire is another MMO FPS that has been developed by SmileGate (a South Korean company) and released by Tencent in China which operates the game across service areas and networks from China Netcom and China Telecom [3]. An interesting fact is that it will have a movie adaptation announced in 2015.

Figure 3.16: Crossfire
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

League of Legends (or LoL for short) which is the most profitable MMORPG according to [1] is a MOBA game released by Riot Games [7]. It follows a freemium business model using microtransactions for players to access premium features of the game. It was inspired by Warcraft III: The Frozen Throne mod, Defense of the Ancients of which Dota 2 is the sequel to.

Figure 3.17: League of Legends
Source: https://mmos.com/editorials/most-profitable-mmos-mmorpgs

4. Virtual MMORPG Economies

Virtual economies are economies that emerge on various on-line games due to economic activities of their players including transactions of virtual goods, services and (virtual) currency [11]. They are most often observed in MMORPGs and multi-user dungeons (MUDs) which are virtual worlds that combine elements of role-playing games, hack and slash, player versus player, interactive fiction, and online chat [10].

According to [14] MMORPG economies are the most complex virtual economic systems and a large amount of scholarly publishing has been dealing with them lately. Since people usually participate in virtual economies for fun and recreation they often lack the aspects of real economies that aren't considered to be interesting (like gahtering food to survive for example) [11].

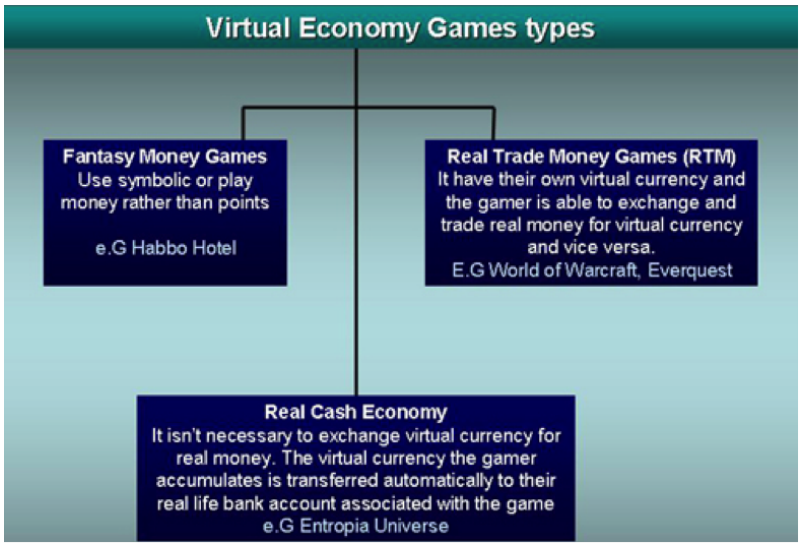


Figure 4.1: Three types of virtual economies in online games [14]
Source: `http://www.cyberpsyke.org/`

While these economic activities are performed in virtual world, they often do have real-world economic implications. It is being the case evermore often that people buy virtual properties and assets for real-world money [14]. In this regard, the difference between virtual and real-world economy gets more and more blurred. In fact there three types of virtual economies from this perspective (see figure 4.1).

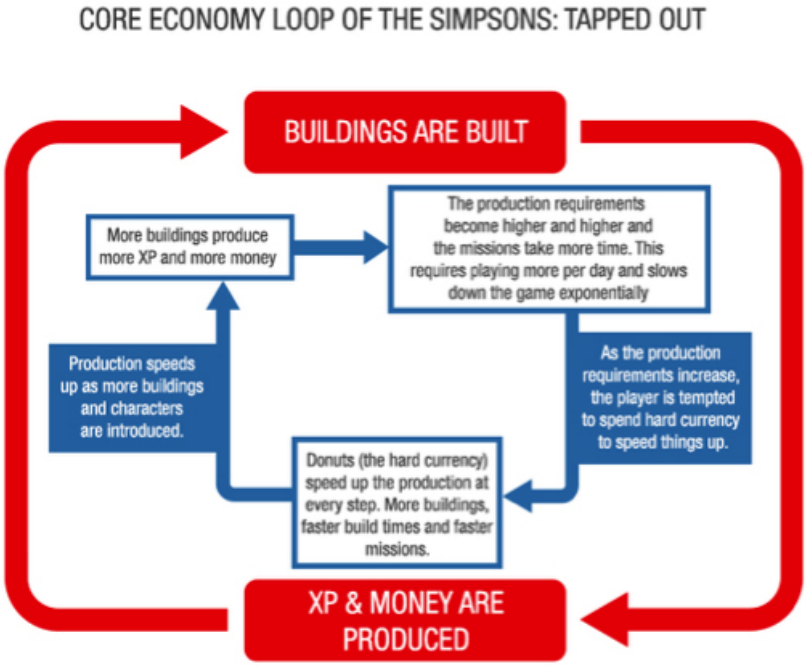


Figure 4.2: The core loop of the virtual economy of The Simpsons: Tapped Out [14]
Source: `http://virtualeconomists.com/blogs/news/9721924-virtual-economy-analysis-the-simpsons-tapped-out`

Virtual economies have been an integral part of video games since the first trading non-player character (NPC) emerged most probably in an role-playing game (RPG) [14]. Players were able to buy items like weapons, food, potions etc. for a virtual currency they were able to gather during playing. The most simple virtual economies in MMOs today are based around various freemium based games that use microtransactions from players to get game related assets faster like in The Simpsons: Tapped Out (see figure 4.2). The game evolves around building various buildings and other assets which take time. With game progression the amount of time needed to build evermore complex buildings rises exponentially, which motivates players to buy "boosts" that give them the possibility to finish their building faster or immediately.

While such economies are simple, even to simplistic, complex MMORPG economies can function "*with complex, multilayered economic systems, with multiple currencies and trading systems, providing players with a variety of ways to generate and spend their in game, and real-life resources*" [14]. Figure 4.3 shows and infographic of such a more complex economy Guildwars 2. Such complex economies can exhibit various problems, known from realworld economies including economic stagnation and hyperinflation [20, 21]. Such problems can induce headaches to game developers since they have to commit their resources to balance the economy on a day to day basis.

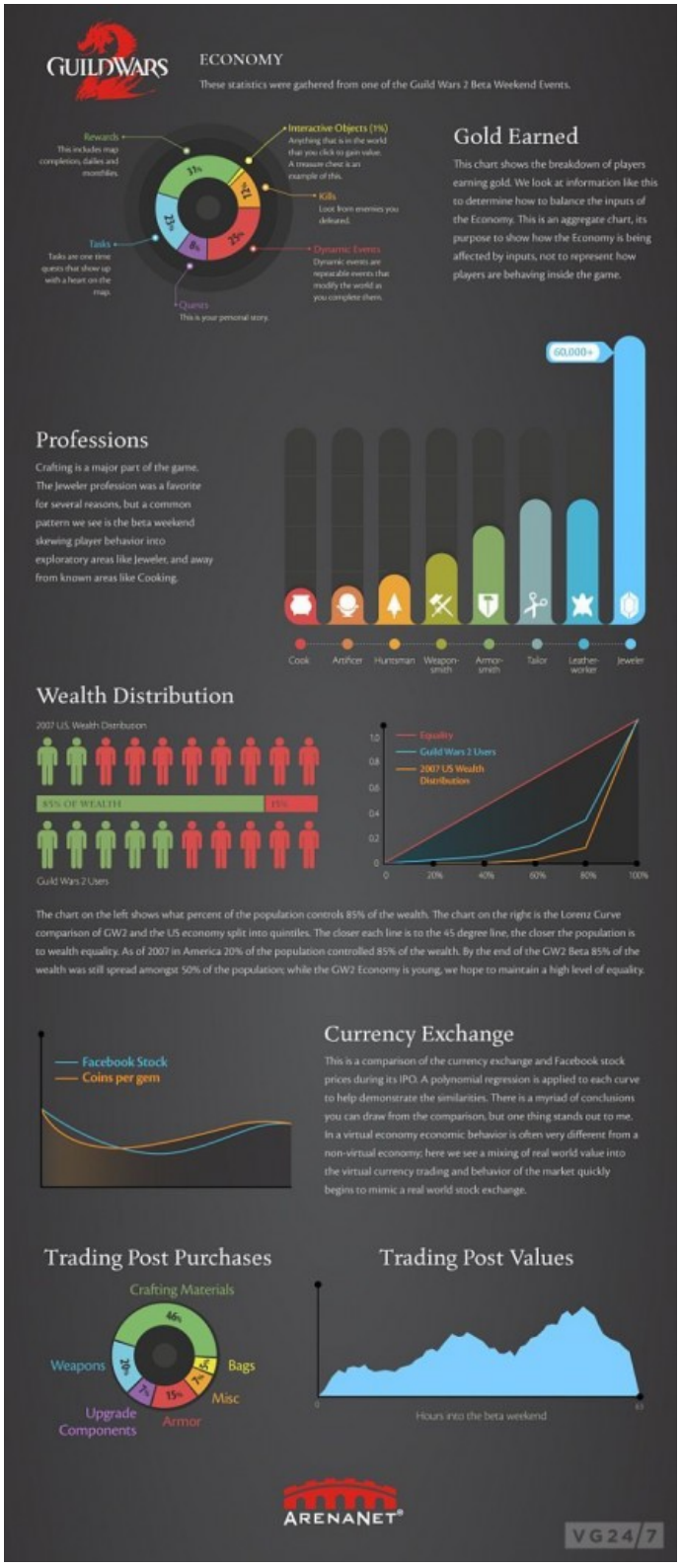


Figure 4.3: An infographic from the beta weekend of the MMORPG Guild Wars 2, showing a breakdown of different economic indicators [14]

Source: `http://www.vg247.com/2012/08/24/guild-wars-2-infographic-provides-insight-into-the-games-virtual-economy/`

The Faucet-Drain Model (seen of figure 4.4) summarizes the flow of currency (both virtual and real), virtual items and premium features in typical MMORPG economies.

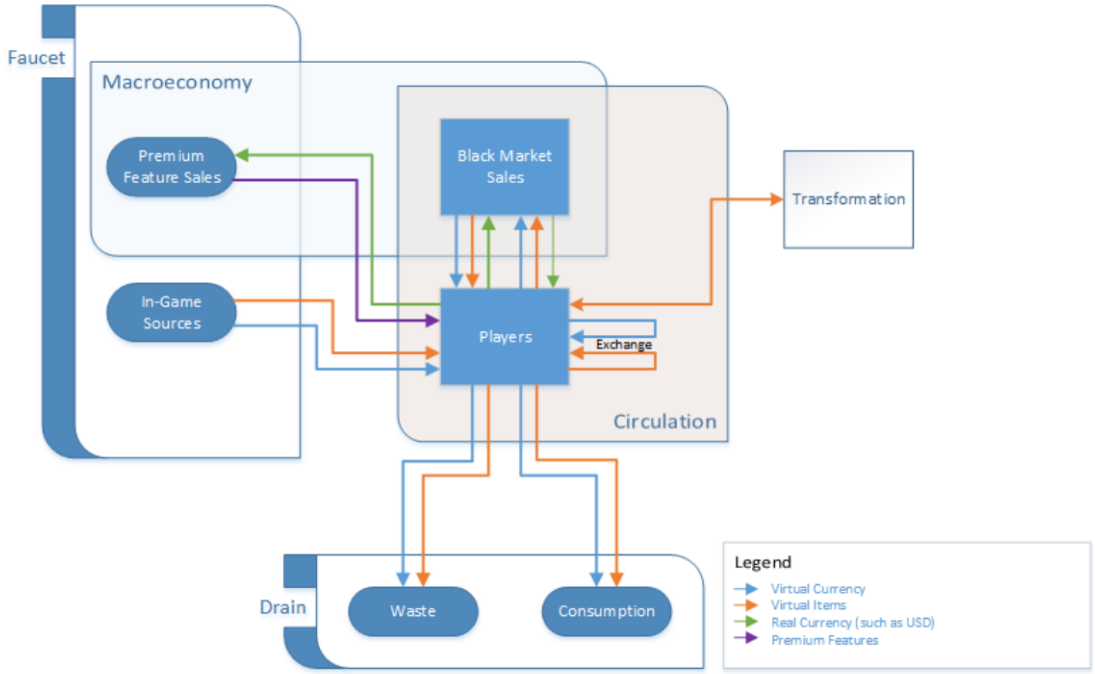


Figure 4.4: Faucet-Drain Model [20, 27]
Source: `http://massivelyop.com/2015/09/13/mmo-mechanics-economic-stagnation-in-mmo-economies/`

In his thesis Chris Wolf hypothesises that the Faucet (e.g. the introduction of new money and items into the game, by for example, looting some enemy) has a higher magnitude than Drain (e.g. the exclusion of items and money, by for example, destruction of some property). This imbalance leads to inflation [27].

5. Electronic Sports

Electronic sports (eSports) has become on of the fastest growing entertainment industries in 2017 which in every aspect has become a record year for eSport [16]. According to SuperDataResearch the eSport global market has already surpassed 1.25 billion Euro (see figure 5.1).

Figure 5.1: Worldwide eSports market according to SuperDataResearch [16]
Source: `https://www.superdataresearch.com/market-data/esports-market-report/`

Defined as competitions in which usually teams of players compete in a given game for awards and pleasure, eSports have become a major market in the gaming industry. Figure 5.2 shows a

comparison of earnings by game in 2016 and 2017. As one can see from the comparison, most games show a growth in the last two years and the first few games are closely related to the list of most grossing MMORPGs shown previously.

Rank	Game	Total Prizes 2017	Total Prizes 2016	Difference
1	*Dota 2*	$37,977,710.28	$37,435,285.30	+1.4%
2	*CS:GO*	$19,040,890.33	$17,255,317.98	+10.3%
3	*League of Legends*	$11,821,700.85	$10,482,595.27	+12.8%
4	*Heroes of the Storm*	$4,783,332.54	$4,635,149.10	+3.2%
5	*CoD: Infinite Warfare*	$4,027,526.40	$3,767,758.56*	+6.9%
6	*Overwatch*	$3,382,137.85	$1,989,264.81	+70%
7	*Starcraft II*	$3,295,514.89	$3,179,232.38	+3.7%
8	*Hearthstone*	$2,758,572.28	$3,446,735.02	-20%
9	*Halo 5: Guardians*	$1,745,000.00	$3,259,240.03	-46.5%
10	*H1Z1*	$1,551,550.00	$267,244.00	+580.1%

Figure 5.2: eSports earnings in 2016 and 2017 by game [16]
Source: `http://www.esportsearnings.com`

Figure 5.3 shows a comparison of the most successful eSport teams and their earnings in 2016 and 2017. It is easy to conclude that all these teams drastically raised their incomes during the last year since eSports are gaining more and more momentum and interested fans.

Rank	Team	Total Prizes 2017	Total Prizes 2016
1	Team Liquid	$13,379,499.30	$3,054,130.46
2	Newbee	$4,835,462.69	$1,576,381.90
3	LGD Gaming	$4,777,479.15	$977,054.50
4	Virtus.pro	$3,544,695.81	$1,434,555.77
5	OpTic Gaming	$2,500,550.00	$1,363,424.16
6	Invictus Gaming	$2,295,900.40	$1,014,628.69
7	Team EnVyUs	$2,087,500.36	$2,047,281.20
8	Team OG	$2,030,212.00	$2,915,144.00
9	Samsung	$1,923,434.45	$995,487.38
10	FaZe Clan	$1,821,435.71	$501,849.22

Figure 5.3: Worldwide eSports market according to SuperDataResearch [16]
Source: `http://www.esportsearnings.com`

The most popular gaming tournament in 2017 was the League of Legends World Championship organized in China from the beginning of Semptember until the beggining of November. At one

moment a semi-final match between SK Telecom T1 and the chinese team Royal Never Give Up was viewed by more than 80 million people, most of them from Chinese origin [16].

With the growth of the eSports industry, evermore sponsors and investors are attracted to these events[16]. For example the Overwatch League and the american League of Legends Championship Series have sold spaces in their leagues to various franchises including some well known sports brands like Kroenke Sports & Entertainment, Comcast Spectacor, Sterling.VC, Joe & Kirk Lacob, Cleveland Cavaliers & Houston Rockets. Since these places are estimated to cost about 10 or more million U.S. dollars, these are seriuos investments, and more and more professional sportsmen and ex-sport stars are investing in eSport teams or have even established their own eSport organizations [16].

Sponsors from various types of industries including computer (e.g. Intel and HyperX), cars (e.g. Mercedes-Benz and Audi), food (e.g. Pringles) or cosmetics (e.g. Gillete) are investing in eSports. Also head organizations of various sports clubs, events and leagues have shown tremendous interest in eSports competitions and there have already been competitions organized under the sponsorship of Formula 1, WRC as well as an NBA 2K league which is planned for 2018. Sports brands hope to become more attractive this way to younger audiences which have slowly lost interest in real sport events [16].

6. Conclusion

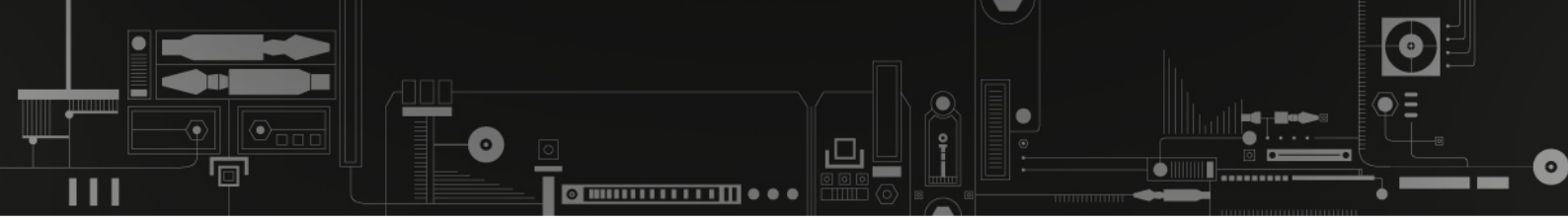
From the presented overview it becomes clear that MMORPGs are an important phenomenon worthy of (scientific, scholary and professional) analysis. The numbers outlined herein in terms of involved players, money, time and resources indicate that MMORPGs have been, are and will be a trending topic in quite a reasonable amount of time.

The global MMO market is growing steadily, since the first such games have been published and represent a multi-billion Euro economy. A lot of global companies have recognized this and are investing huge amounts of funds into development, marketing and maintenance of such games.

Since the first NPCs merchants have been introduced into RPGs, virtual economies have emerged. Especially with the rise of MMORPGs and various business models like freemimum and microtransactions, this phenomenon has become interesting, not only from a scholary perspective, but also from an economic one, since virtual and real-world economies become more and more intertwined.

In the end eSports are becoming a major element in the entertainment industry. In a few introductory events to the Winter Olimpics in PyeongChang 2018, eSports tournaments will be organized, which adds recognition to this phenomenon [16]. eSports events, teams and organizations are gaining momentum and we will probably see more of them in the upcoming years.

In the end, there are many other interesting socio-economic impacts of MMORPGs, which haven't been outlined in this, rather short, overview, but will certainly be subject to further studies.



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