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Cryptocurrencies in the Ludic Economies: The Case of Contemporary Game Cultures

Leonardo José Mataruna-dos-Santos and
Vanissa Wanick

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Abstract

Games have their own economic models. Today, players can not only collect digital currencies, but they can also use real currencies to buy virtual goods. Business models in games such as freemium and in-app purchases, for example, sustain this structure. Within this context, there is also the expansion of models outside the game realm like eSports, which happens in the form of tournaments. With this, there is constant exchange of value that emerges from games, which could also include the use of cryptocurrencies. In this chapter, we give an overview of the current state of the art of economic models within games and eSports. The current chapter aims to situate and analyse the application of these business models derived from games, e-sport and the future of ludic economies.

Keywords: games, cryptocurrencies, ludic economies, eSports, economic models

1. Introduction

Games and eSports market are increasing every year, including the mobile sector that is competing directly with the traditional platforms and consoles. According to [1], by 2020, the eSports industry will reach 1.65 billion US dollars. Similarly, a study by [2] on the global games market forecasts that '2.3 billion gamers across the globe will spend \$137.9 billion on games in 2018. Digital game revenues will take 91% of the global market with \$125.3 billion'. The same trend can also be observed in the video game consumer market performance, with an increase of value from downloadable contents (DLC) in comparison to usual package models (see **Figure 1**). Most of the time, this revenue is earned through the selling of virtual goods within games.

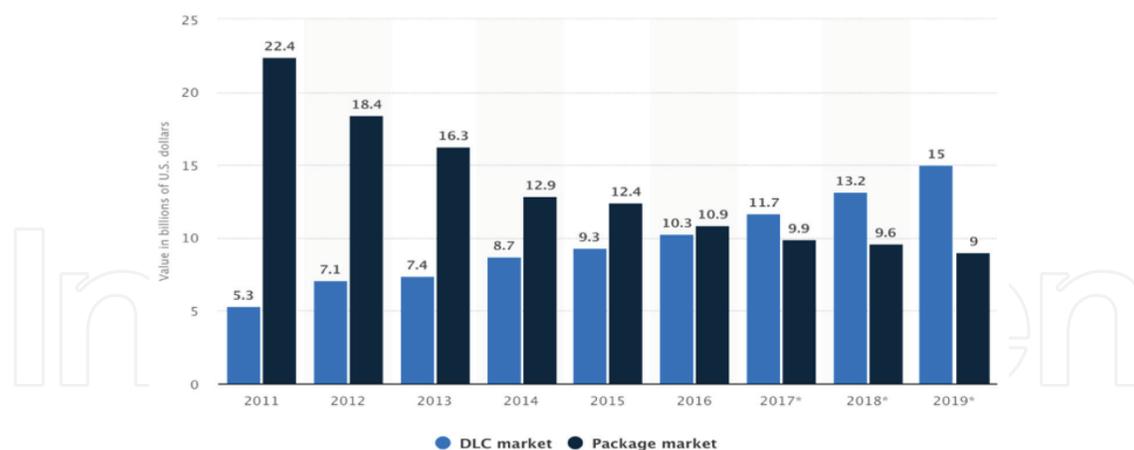


Figure 1. Video game consumer market value worldwide from 2011 to 2019, by distribution type (in billion US dollars) [1].

With technological advances, game developers and designers have found an opportunity to explore the business of virtual goods in order to increase their revenue stream, particularly through in-app purchases (IAP). One example is the freemium model [3]. For example, in the mobile game *Clash of Clans*, players can buy ‘time’ to have their goods ready for battle (e.g. players can pay to get their house built quicker), relying on players’ impatience to progress in the game [4]. No wonder, *Clash of Clans*’ creators earn more than 15 million per day using this game-business model [5]. Considering this, it is possible to understand the intersection between economics and games in two ways: one as a game structure (e.g. collecting coins, accumulation of goods) and another through microtransactions (e.g. buying time or goods to progress in the game). This opens the door to possible problems that could affect the player experience. For example, players might buy their way up in the leaderboard using real money, or they might buy power-ups to win battles inside the game or even use cheat codes to have as much virtual money as they can. In fact, some websites offer online auctions for power-ups of some games following the tendencies of online auctions. Auctions were very popular in the early days of Internet commerce, but today online sellers mostly use posted prices [6]. This is not an official market developed by the gaming industry; however, there is an emerging and potential economy around power-ups (selling and buying), with physical currencies and/or cryptocurrencies that require attention. It notes that complex games, especially massively multiplayer online role-playing games (MMORPGs), contain narrative and mechanisms that mimic real economic activities, such as production, trade and consumption [7]. Those factors can contribute to this ‘emerging economy’ using the auction system.

Virtual goods are not the only venue that could be explored in games business models. Since there are many transactions involved in games, this could also open the opportunity to explore cryptocurrencies. It mentions the gamification techniques as a strategy used to incentivize participation in mobile crowd-sensing applications that can be conveyed by cryptocurrencies [8]. The effectiveness of cryptocurrency gamification schemes depends considerably on a large set of interrelated factors from community-related (number of participants) to cultural or motivational factors [9]. According to [10], if societies want to adopt cryptocurrencies, it is necessary to think differently about past sources, investments and revenues (including sustainability).

Cryptocurrencies are decentralised currencies that rely on cryptography to secure their safety and trust; these are powerful mathematical protocols (e.g. blockchain) that avoid 'cheating' or fraud [11]. Blockchain is a decentralised transaction and data management technology developed first for *Bitcoin* [12]. The authors [13] reinforce that the term cryptocurrency can be seen either as currency or as a 'synthetic commodity money', which 'resembles fiat money in having no nonmonetary value (but also) resembles commodity money in being not just contingently but absolutely scarce' [14]. Online and social media factors are currently related to the time intervals of cryptocurrency prices; thus it was observed 'that cryptocurrencies are prone to experience intervals of bubble-like price growth' [15].

One of the most popular cryptocurrencies is *Bitcoin* that dominates the cryptocurrency markets and presents researchers with a rich source of real-time transactional data [16]. *Bitcoin* is a decentralised currency [11] that relies on peer-to-peer (P2P) cash system and network consensus. Thus, cryptocurrencies are 'agreed' currencies that rely on algorithms to be trustable. The mechanics of cryptocurrencies like *Bitcoin* are similar to a game. Metaphorically speaking, mining could be the effort that one has in the game to progress and the currency is the virtual reward that could be exchanged for something else. With that, games and money have a lot in common. For instance, cryptocurrencies allow individuals to have fun while earning money [17]. This association is part of a rewarding experience, which is a core mechanic in games. Hence, like in a game, 'real' money becomes a reward. Considering this, with many advances on technology and games, there is an opportunity to explore the application of cryptocurrencies in games. How can designers and developers implement cryptocurrencies in their game business models? What are the main characteristics of cryptocurrencies in games? What are the main challenges? In light of these questions, this chapter aims to understand the features and current state of the art that dwells within the profitable market of games and eSports.

2. Ludic economies, economic models and virtual goods

The term ludic economies is a critical reflection on the parallels between play and economic models [18]. These relationships could be understood through comparisons towards 'capitalist' thinking through the accumulation of resources. The 'capitalisation' refers to the action of collecting points, coins, digital currency or other incoming, just for getting rich or to enhance the score. The 'monetisation' refers to the points or money collected in the game which can be used to buy items such as clothes, guns, powers and others that will provide more power or capacity to collect more money or incomings. According to [19], there are three revenue models to consider: Freemium is 'coined through the contraction of "free" and "premium"'. It refers to a revenue model which enables consumers to have a certain product or service for free and getting revenue from additional features provided, usually to a small percentage of the user base'; premium is 'basing income on a transaction with a given price which is agreed, and many times paid for, prior to getting the product or service'; and subscription is the 'model based on periodic payments in return for a periodic or continuous service and/or product deliveries'. These models have been used historically in the video game industry, and, theoretically, they would fit personal computer video games and the specific genre of Multiplayer Online Battle Arena (MOBA). Some game companies are studying ways to implement cryptocurrencies for payments of the three revenue models.

A classic example of ‘capitalisation’ occurs in *SuperMario Bros* (Nintendo®), in which players need to collect coins while jumping and fighting enemies. Also, in the classic board game *Monopoly*, players start with a specific amount of money and then buy houses, charge rent and upgrade their belongings. These models are inherent in the mechanics of these games. Although in *SuperMario Bros* players cannot ‘buy’ anything in the game, there is still an accumulation of ‘capital’ that could be traded to extra health, new avatar clothing or others. This helps to create an in-game economy or a micro-economy inside the game, supported by game mechanics and player psychology. Considering this, mechanics that might favour currency exchange are object collection through accumulation, trading systems (with virtual or real money) and mastery through accumulation (e.g. players could collect a bunch of abilities/power-ups). In fact, Nintendo® also created a new version of *SuperMario* for iPhone and Android, called *SuperMario Run*. In the new game for mobile, the personage collects coins to exchange for elements in the game. It is available in the same game, the ‘Toad Rally Ticket’, a kind of currency to exchange for the opportunity to play special phases or mini-rally. You may have to pay one ‘Rally’ ticket to enter a race, but you can earn back what you paid, plus more, if you win a ‘Rally’. In the game *Need for Speed* (2015), the player can collect points, convert it into money and use it to upgrade the car before the race. In this case, the concept of monetarism according to the definition of [20], who present an ‘economic theory based on the view that the quantity of money is the main determinant of money incomes’, is applicable.

Remembering the precursor games, since beginning the Mario Bros® arcade version in 1983, designed by Shigeru Miyamoto and Gunpei Yokoi, the same developers of *Donkey Kong* (first arcade where the character *Mario* appears as coadjutant, early 1980s) used basic concepts of capitalisation described by [21], when the personage collects coins in the route, breaking boxes or eliminating adversaries [22]. However, Nintendo® launched in 1985 the platform for video games and since then used concepts in more than 70 versions of the *Super Mario* series, such as *Odyssey*, *Galaxy*, *World* and others. With this, games would have their own economic model, be it using real or digital money. For instance, with just a click, players can buy a very valuable item in the game by just using their credit card. [19] comments:

Paying customers are offered either to progress at a faster pace or a certain advantage also available to non-playing users willing to invest enough time into the game. In light of this, some games function with a dual currency system. Hard currency is obtained only by putting money into the game and soft currency is only obtained through time spent in game or logons (or through other mechanism such as number of wins). Offers for sale can be priced then in one or both of these currencies, determining then what can be bought with money, with time or with either one or the other (p.6) [19].

For instance, ‘pay to win’ is an option that can be applied for cheating or winning, escaping hard stages, collecting more sources or enhancing the revenue. For example, in the game *Candy Crush*, the user can buy power-ups to destroy barriers in hard stages or extra movements and additional life, to follow to the next stage increasing the revenue. The game also provides free power-ups in different stages for promoting a power-up testing. For multiplayer games, as player(s) versus player(s) (PvP), it is not ethically accepted in the western countries [19]. That action provides a customer engagement and a transformation in the consumer behaviour of users. A kind of power-up dependence is generated for further improvement of performance, promoting a consumer who is continuously engaged and the usage of currency conversion for digital or virtual money.

2.1. Virtual goods in games

Virtual goods are 'in-game objects' that players can use only in the game, like avatar clothing styles, power-ups, extra lives, weapons, places and time (p1) [23]. Virtual goods can be bought by real money or in-game currency. For example, in the popular farm game *Farmville*, players can trade in the game, earn money from their farm and use this money to buy goods, but they can also buy these goods using real money. The willingness to buy a virtual good will then depend on the player. For instance, [24] has found when players have fun with the game, they would be less keen to buy virtual goods. On the other hand, if players play the game with more frequency, they tend to buy more virtual goods. Thus, purchasing virtual goods in games can be subjective. Also, in the same study, the author found that social interaction influences people's intention to buy virtual goods [24]. It is also important to note that games are rewarding systems and game currencies reflect those rewards. For example, you can only get coins in *SuperMario Bros* if you jump in the right position. Therefore, it is possible to say that virtual goods are in-game rewards, which could be a new character ability, new clothing, new scenarios/arenas/environments and objects that could be purchased by in-game currency or real money (through in-app purchases).

2.2. Cryptocurrencies in games

Cryptocurrencies are currencies supported by agreed protocols [11]. Thus, in a game, a cryptocurrency is a currency that allows players to make exchanges inside the game, which may also involve 'real' money. *The Sims* is a great example of using virtual money inside a game. The game itself mimics the real world; players can go to work, earn their salary and buy objects for their house. However, according to [25] players may wish to cheat in the game to get as much money as they can. In fact, a simple code in the game can give more than 1000 *simoleons* to the player 'for free'. With that, becoming a 'cheater' in the game can be easy and acceptable since the codes are public. Thus, how to protect the dignity of the currency? How to prevent cheating? In sports games, there is no cheat code list. However, on the perspective of [26] in games like FIFA, developed by EA for mobile platforms, there is a constant use of in-app purchases inside the game. This suggests that if a player would like to have more power-ups, he/she could pay for it. Thus, what cryptocurrencies and games have in common is their rewarding system. The difference between them is on the path towards earning this currency and the player's values and intentions, since while playing games, players tend to exercise their values [27]. This means that if players feel like cheating and if the game allows this behaviour, they might do it. Thus, how can we make sure this currency is trustable?

Regarding cryptocurrency and games, it is possible to mention strong market correlations between *Bitcoin* and other gaming currencies. Some currencies in the blockchain carry in their names the terminology 'games' or description in their profiles and using the games as principles in the market. Using *Bitcoin* as comparative parameter, it is possible to observe some examples in the market (see **Figures 2** and **3**).

[28] remembered that 'gaming cryptocurrencies could change the face and economies of gaming and they are growing on an industry-wide scale to new all-time highs every day'.

GameCredits (GAME)	\$1.19 USD (19.47%) 0.00015585 BTC (16.28%)			Cryptocurrency Ranking 155
	Market Cap	Volume (24h)	Circulating Supply	Max Supply
	\$76557127 USD	\$1160790 USD	64355352 GAME	84000000 GAME
	10030 BTC	152.08 BTC		
MonaCoin (MONA)	\$3.32 USD (0.69%) 0.00043452 BTC (-2.00%)			Cryptocurrency Ranking 74
	Market Cap	Volume (24h)	Circulating Supply	Max Supply
	\$198895385 USD	\$861695 USD	59970025 MONA	
	26058 BTC	112.89 BTC		
Game.com (GTC)	\$0.135197 USD (5.99%) 0.00001774 BTC (3.34%) 0.00022190 ETH (2.18%)			Cryptocurrency Ranking 153
	Market Cap	Volume (24h)	Circulating Supply	Max Supply
	\$81587500 USD	\$2258850 USD	603471233 GTC	2000000000 GTC
	10703 BTC	296.34 BTC		
	133908 ETH	3707 ETH		

Figure 2. Comparative market of gaming currencies using Bitcoin and USD as references. (Data extracted from Coinmarketcap on June 5, 2018) [30].

As mentioned by [29], it is possible to observe that although the Bitcoin market grows rapidly, there are still some doubts whether cryptocurrencies are a fad or a more efficient way to exchange goods (and money).



Figure 3. Two years' chart comparison between GameCredits, Bitcoin and US Dollar [30].

In the game perspective, it is possible to observe as shown in **Figure 3** the 2-year behaviour of *GameCredits* while comparing its value in US dollar and Bitcoin. **Figure 4** is a visual impression of the trend in stock prices measured on daily closing records. The fluctuations in the prices are shown during the period from June 2017 to June 2018. The two estimated trend lines are showing a 3-month moving average and a linear trend, respectively. In simple words they are showing average movement during the period. The behaviour in June 2017 and during December 2017 to January 2018 is abnormal and showing unusual rise compared to the overall fluctuations during 2017–2018. Except these two points, the overall trend was stable.

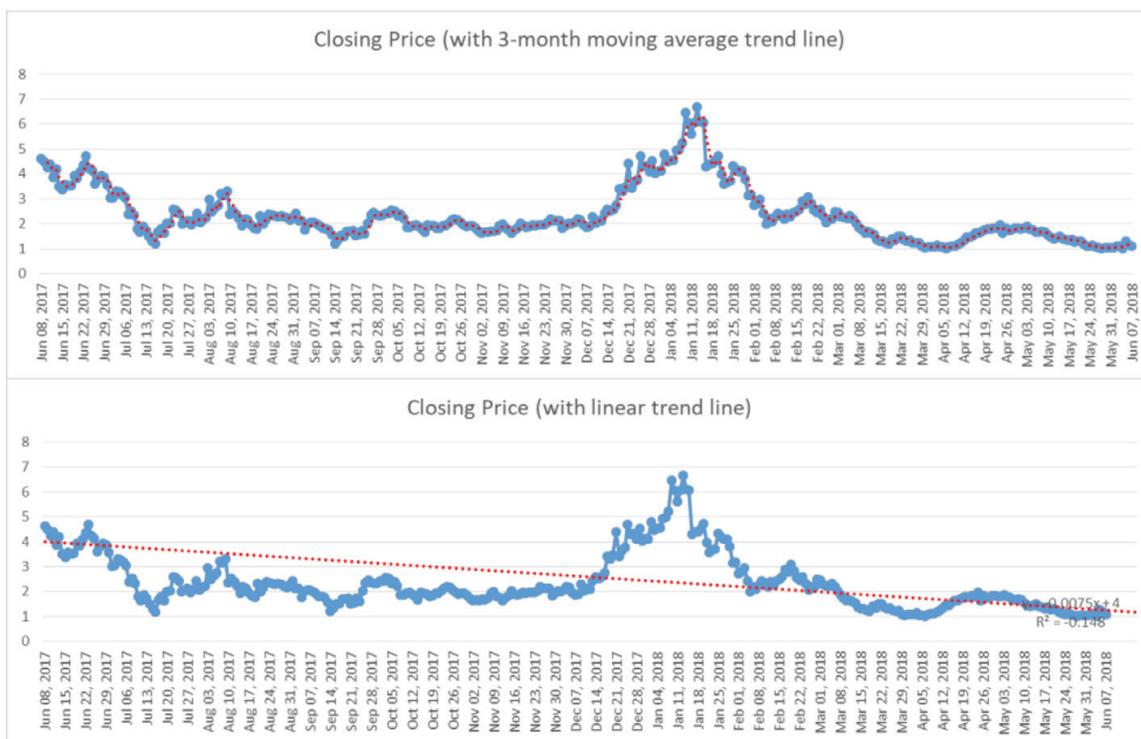


Figure 4. GameCredits' stock price trend 2017–2018. Source: developed by the authors based on the market data [30].

The linear trend prediction for the rest of the months in 2018 is showing the similar expected price level. The estimated linear regression line is $Y = 4 - 0.0075 t$. The goodness of linear fit (R^2) is not very strong due to the seasonal nature of the data. Therefore the 3-month moving average provides better forecasting in this type of fluctuations. In **Figure 3**, the period from August 2016 to September 2017, the variables are highly correlated. Thereafter the variables seem to move in opposite directions. In **Figure 4**, it seems to have a downward trend with a high volatility in the period analysed.

2.2.1. Blockchain in the cryptogames

Cryptocurrencies have structures that are similar to a game. The same principle is applied in both: people are rewarded by their actions, and they can use the rewards to buy goods. One of the first 'cryptogames' that use similarities with *Bitcoin* is the *Huntercoin*. Using the blockchain universe to collect coins, *Huntercoin* presents an element P2P combat to fight over resources. This can be termed as human (or AI) mining, and the competition which has gotten more difficult over time can be called a human (or AI) difficulty level [31]. Using a cryptographically secure technology, decentralised and innovative, *Huntercoin* was released in February 2014 as a live experimental test to see how blockchain technology could handle full on-game worlds. *Huntercoin* proved this concept well and is still in development today. In the cryptogame market, a diversity of cryptocurrencies are available, represented by the ticker symbol as presented in the world cloud, **Figure 5**—sides 'A' and 'B'. The cryptogame shares the principles with other cryptogames in the blockchain perspective, such as *Namecoin* (NMC); *Spells of Genesis* (a mobile game that is a mix of a trading card game (TCG), bringing in deck collection and strategy, along with arcade-style gaming aspect); *Rare Pepe Party* (RAREPEPEPTY) that is a TCG in development with role-playing game (RPG) elements, inspired by *Hearthstone* and the *Pokemon* series; and others. Ref. [32] mentioned *Chimaera* (CHI) is one of the first and only second-generation game coin. Different than other gaming cryptocurrencies, CHI primarily focuses on asset registry and trade, creating an ecosystem in which games are built and played directly on the blockchain with two possibilities of cryptocurrencies: *GameCredits* (GAME) and *MobileGO* (MGO) [32].



Figure 5. (A) List of cryptocurrency connected with games designed in world cloud and (B) Pac-man word cloud of gaming cryptocurrency ticker symbol. Source: developed by the authors.

Ref. [33] mentioned that 'six months after the *CryptoKitties* craze, momentum continues to build behind blockchain-based games and non-fungible crypto collectibles'. The AEON Foundation, the blockchain game company and publisher of the Crypto Alpaca crypto-pet game, announced that it had secured USD 5 M in seed funding for the development of its distributed blockchain video-gaming platform. The Crypto Alpaca is based on the reality game in which players collect, breed and trade unique alpacas, the South American animal (similar to a llama) that is the original mascot of bitcoin; the game has logged more than 200,000 registrations since launch, comments [33]. Players are able to collect rewards and increase the value of their alpacas by feeding and shearing them and doing other activities. It is a new moment for the industry that probably will associate sooner the conventional platforms with the blockchain, mixing the real world and virtual actions. This is a huge opportunity for businesses and markets to expand their models. The video game industry is a sector worth \$100 bil [34].

Observed data has four types of trend known as secular, seasonal, cyclical and random. Various statistical techniques are used to separate these trends and fit the best trend line according to the true nature of the data. Observed data in **Figure 4** is seasonally affected and fluctuates persistently from year to year in quarterly stretched intervals. Therefore, the trend measured on the constant value of β is not appropriate statistics to predict in the recent future. Separating seasonal trends on the bases of 3-months moving average predicts based on the average value of 3 periods and moves along with the observed data.

2.3. eSports and economic models

The term 'eSports' (or electronic sports) is a derivation of the conventional sports; thus, ethical and educational values are part of the play action of users. Recently, eSports are following one tendency to become part of sport mega-events, such as the Asian Games, the Olympic Games and the FIFA World Cup [35]. Commenting on the eSports and gaming, [28] describe both as one of the biggest industries today, and in 2017, there were about 2.2 billion gamers across the globe that are expected to generate \$108.9 billion in-game revenues.

There is a large discussion if eSports could be considered a 'real' sport and if players are 'athletes'. eSports are sports since they share the same type of mechanics as a traditional sport like football [36]. eSports have fans, spectators, leagues, teams, structures and financial support (e.g. sponsorships). There is a huge opportunity for companies to sponsor players and teams. In fact, eSports have been considered as an Olympic game modality, and its first event was the eGames showcase that took place in Brazil [37]. The Rio de Janeiro eGames Showcase 2016, launched as part of this week's London Games Festival and the Rio Olympics Games, offered medals and national pride rather than cash prizes for the winners. Ref. [38] comments that eSports 'will be an official medal sport at the 2022 Asian Games in China, in the boldest step yet towards mainstream recognition of competitive gaming'. The same author highlighted that the Olympic Council of Asia (OCA) announced a partnership with Alisports, the sports arm of Chinese online retail giant Alibaba, to introduce eSports as a demonstration sport at next year's games in Indonesia 2018, with full-fledged inclusion in the official sporting programme at the Hangzhou Games in 2022. Some people still have the idea that eSport is just for fun, but it is not. This is a powerful market and businesses should pay attention to it.

Ref. [38] refreshed that the Alibaba Sports Group announced a \$150 m investment in 2016 with the International eSports Federation (IeSF), the South Korea-based federation that has long campaigned for the inclusion of competitive gaming in the Olympic Games. “It put forth more than \$14.5m to organize the World Electronic Sports Games in China’s Changzhou province, where roughly 60,000 players from 120 countries and regions competed for a \$5.5m purse in 2018”.

According to [2, 39], FIFA 2018 is one of the most watched games on Twitch and YouTube Gaming. In April 2018, the total prize pools for console eSports events reached \$2.5 million, which is the double the amount awarded in the first quarter of 2017. Those data show that the game market is bigger than just selling consoles, games, accessories, power-ups and gadgets. Nowadays, the game industry manages the other slice of the market, such as the social media platforms, betting companies, mega-events, sport consumer and identity, television rights and e-channels that manage viewership hours, market share, top tournaments and titles and investments [40–43]. Ref. [39] comments that 20 M of console eSports hours was watched on Twitch and YouTube Gaming between January and April 2018, representing 4.6% of the total games broadcasted. It is demonstrated in the 95% year-on-year growth of viewership of major tournaments on Twitch and put eSports in third position of top console genres with 21% of the market.

Betting companies also use eSports; however, both big traditional sportsbooks and newer start-ups are competing for space. It is possible to find examples of virtual or physical betting companies such as: bet365, betway esport, unibet, #OneHash – are possible to find virtual or physical, such as bet365, betway esport, unibet, and #OneHash—using *Bitcoin*, mr green, gg.bet, Betsson, and Betsafe – that is a sponsor of extreme sports events like *Redbull* and hosts the yearly Gumball 3000 car race across continents. This industry uses a real money, digital currency, cryptocurrency or ‘fake currency’ to gather and compose the most interesting contemporary eSports sportsbooks and move the game economy.

The virtual economies created within massively multiplayer online role-playing games (MMORPGs) often blur the line between real and virtual worlds. The result is often seen as an unwanted interaction between the real and virtual economies by the players and the provider of the virtual world. This practice (economy interaction) is mostly seen in this genre of games. The two seem to come hand in hand with even the earliest MMORPGs such as *Ultima Online* having this kind of trade, real money for virtual things.

The importance of having a working virtual economy within an MMORPG is increasing as they develop. A sign of this is the CCP Games hiring the first real-life economist for its MMORPG ‘Eve Online’ to assist and analyse the virtual economy and production within this game. The results of this interaction between the virtual world, and our real economy, is the future of the gaming industry.

3. Models and applications of cryptocurrencies in games and eSports

Since ludic economies rely on economic dynamics and the way the game is designed, we have synthesised the main models that drive cryptocurrencies in games and eSports into a combination of virtual goods, game mechanics, values, economic models and currencies (see **Figure 6**). This combination of elements reflects the interdisciplinarity and relationship

of several elements that are both derived from economics and design. Thus, in order to understand the economic aspect of businesses of games and ludic economies, we have also included four models:

Market model. The market model is a concept that explains how prices of the various items are determined in the game (or game market place). It explains how demand and supply forces interact with each other and settle down the prices. Whether it is virtual or real money, they are scarce, and the player has to put efforts to get it [44]. Thus, the market model functions as a holistic approach that guides ludic economies.

Consumer behaviour. Consumer (or player) behaviour reflects the factors that play an important role in the decision-making of consumers (or players) in order to buy any item or product. For example, there are many factors that can influence the player's purchases of in-game virtual goods, including fun and social interactions [24]. Furthermore, consumer behaviour has a strong relationship to what the game offers to players. For example, time left in the game, or the position of player in the game (or status), influences the player's perceptions and willingness to buy virtual goods [42, 43].

Income model. Income model is a construct that explains the variables that determine the level of income of the player. It is the average level of income that a player maintains to achieve strategic depth in the game. It further explains how psychological factors of the player act to change the income generating behaviour [45-47] of the player act to change the income generating behaviour [45-47].

Price strategy. Price strategy is a form of economic theory. In games, it can be related to how different players in oligopolistic market conditions are maintaining certain degree of rivalry. It can also include how players design their game strategies to win economic victory that ultimately will help them to win the game [7, 44, 48].

The four models mentioned are part of the drivers of the other elements that mediate the use of cryptocurrencies in games and eSports. As illustrated in **Figure 6**, price strategy, consumer behaviour, market model and income model permeate the other five drivers of the applications of cryptocurrencies in ludic economies. For example, if considering values (e.g. individual values, cultural values, etc.), consumer behaviour could function as the main influencer of game systems. Thus, in the next section, we introduce and discuss the main applications of cryptocurrencies in games and eSports with examples in two scenarios: eSports and (digital) games.

3.1. eSports

3.1.1. Tournaments

For eSports tournaments, the consumer is the spectator, who pays to watch the 'match' in an arena. From the consumer behaviour perspective, spectators find value in buying tickets to watch the game being played by professional players. As a tournament or event, eSports is a very valuable market. There are many opportunities for brands to sponsor professional players and games. Some managers are offering sponsorship for teams and players via Internet-booming opportunities. Comparing with other conventional sports, it is easy to find companies and businessmen available for investing in this sector. The type of the game, the place and the

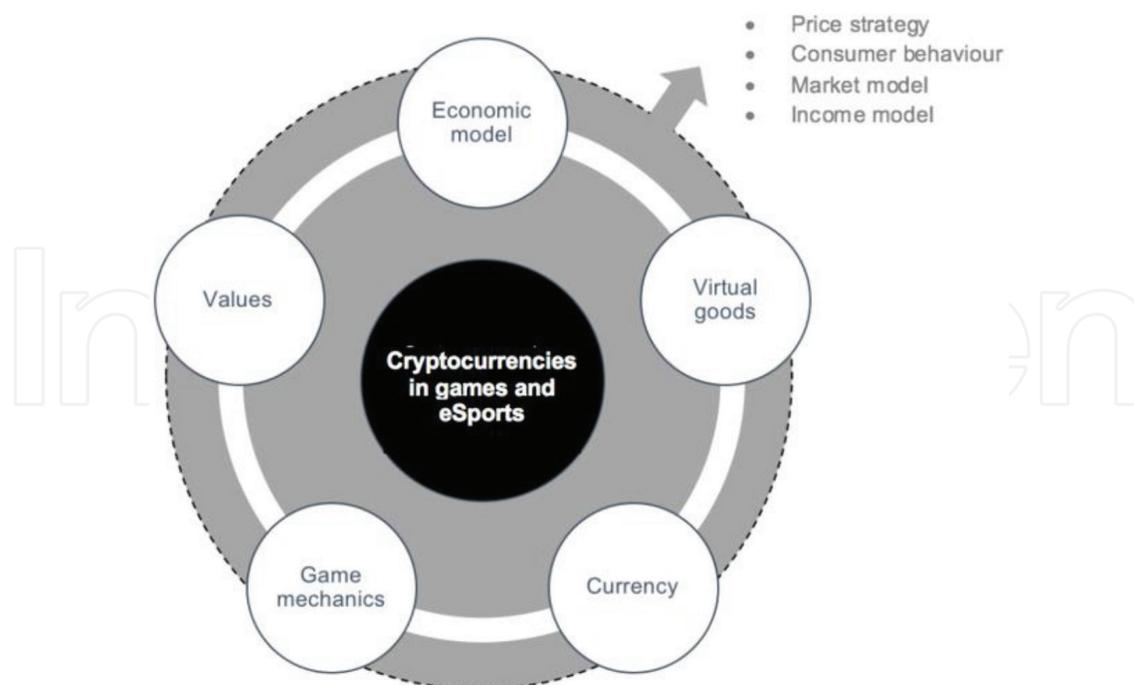


Figure 6. Cryptocurrencies in games and eSports. Source: developed by the authors.

prizes are some of the aspects responsible for attracting players and spectators. With this, the consumer identity is developed based on the teams, ‘athletes’ and the events [49].

3.1.2. Broadcasting

When players are broadcasting their gameplay, spectators can also participate, interacting directly with the events, players and market according to the rules and structure of the competition. For example, *Youtube Gaming* and *Twitch* have forums that allow users to share their thoughts with other spectators. In a more participatory scenario, spectators could use platforms like *Microsoft Mixer* to give hints and comments to the player [[50, 49]. In the case of using virtual goods, spectators could get points to buy goods in the game for the players. Also, spectators could get points by watching and commenting on players’ performance. These points could be exchanged to real goods (e.g., pizza, drinks, etc.) or virtual goods (e.g. unlock more content, etc.). Players could get more currency by counting the amount of people who are watching them play. The commercialization of eSports is a new opportunity for the game market that can be associated with new digital currencies [51]. Cryptocurrencies could be employed in this context in order to aid the exchange between points collected by watching other players and real goods, such as food or other commodities. As players and spectators interact more often through digital tools, the cryptocurrency could earn more value in its own stock market.

3.2. Games

The biggest market for games (in particular mobile games) is the utilisation of in-app purchases and the commercialisation of virtual goods. This can be employed in any digital game. Thus,

Model	eSports	Games
Market model	Spectators can buy goods in the arena and merchandising; spectators can sponsor players and collect points	In-app purchases, freemium, virtual goods
Consumer behaviour	Identity with teams; fan culture, community	Identity, ownership, competition, collaboration, community
Income model	Brands could sponsor players; might depend on the place; points could be exchanged to virtual/real goods	Players pay for virtual goods that could be exchanged to real/virtual goods; players could exchange their virtual/real goods through the game
Price strategy	Depends on the demand and place	Could be more fixed; depends on competitors

Table 1. Comparison between eSports and games models using cryptocurrencies.

for digital games, the market model depends on the game mechanics. For example, if players want to buy assets for their game character, then they will purchase them. Thus, the main concern for these games is to match the mechanics to this model and build a digital access to these virtual goods. For players, it could be that they want to buy specific clothes for their characters in order to resemble their own appearance. Thus, the need to buy virtual goods might have a relationship with the player’s preference. As [40] mentioned, some assets and specific characters might carry an advantage in the game, depending on the character’s ability and the game challenge. Therefore, there is an opportunity to generate a need for new gaming assets, creating a high demand for this type of commodity (or virtual goods). Another opportunity for games is the integration with emerging technologies such as virtual reality (VR) and augmented reality (AR). For instance, mobile games like *Pokemon Go* could merge the digital market model with the physical, generating new demands and interactions between players [52]. For example, players could play a mobile game and pay for a virtual good that will only appear in their screen. Ref. [53] mentioned that brands like IKEA are already using this type of technology to help consumers to visualise the position of furniture in their own homes. Games could use a similar strategy to allow players to visualise and have the feeling of ownership upon their virtual goods. Also, players could be able to share their own virtual goods and with that promote a more decentralised model, which could be supported by cryptocurrencies (**Table 1**).

4. Final remarks

In this chapter, we have analysed and discussed the current market and economic opportunities for games and eSports. For that, we explored the models and applications of cryptocurrencies in games and eSports and how economic models may emerge from interactions between players, spectators and games. From freemium models to betting, games have many mechanisms that are similar to our capitalist society, mimicking systems of trade, capital accumulation (e.g. same as game points) and exchange. For instance, [54] commented that the stock exchange is minting millionaires who know how to play the market every day, just like a game. Thanks to online trading with the BAWSAQ stock exchange, it is possible to lay it all on the line by betting on a stock. The problem of approaching games as an economy is that gambling and betting

can become real risks for players. For example, gaming structures like *Loot Boxes* (e.g. players buy ‘boxes’ of virtual goods without knowing what is inside) can become a similar form of gambling, and in fact, there are countries in the globe that consider this as gambling [55]. Thus, it is possible that cryptocurrencies in the gaming environment should consider ethical and psychological effects on consumers, which may include issues around local regulations.

As mentioned in this chapter, games can embed their own stock market. The stock market in the game *Grand Theft Auto V* (GTA V) operates with the same goal as real-life stock trading; in the game, players can buy products with low prices and sell them with higher prices, in order to turn them into profit. The value of stocks is affected by various things including story progress, in-game purchases and other players [56]. It is expected that the same model could be applied to the value of cryptocurrency in the next edition of the game. Cryptocurrencies could also act as a medium of exchange of goods and services in-game (like convenience stores). Multiplayer games could also allow collective team mining in reward of in-game points.

On the other hand, there are many challenges regarding the use of cryptocurrencies within gaming environments that deserve attention. For example, [57] identified gambling as one problem in the current scenario of the eSports. The game currency and the direct connection between players/athletes and the spectators’ interference can generate ethical issues about adjustment of results, corruption and economic manipulation. Those aspects deserve attention and future studies about the impact of game currencies in the actual scene of eSports. In fact, connecting cryptocurrencies and traditional sports could become a new tendency beyond the eSports, perhaps achieving the conventional sports marketing management models.

The potential for exploration of the boundaries between gaming and currencies is huge, and it requires more investigation for further and stronger conclusions. Trends like VR and AR games like *Pokemon Go* could generate an extensive competition not just for points but for using cryptocurrencies. Mobile gamers might be able to compete and collaborate in other levels, using geo-localisation strategies, for example. In VR environments, other types of economies might be explored. Players could exchange experiences and not just virtual goods, sharing their own recording of a concert in a high immersive environment or interacting with people around the world. The opportunities are huge and a large number of new game currencies emerge daily. Thus, although there is no recipe for the use of cryptocurrencies in gaming environments, there is a large scope that should be discussed by scholars and practitioners. It is possible that in the future, we may see a new ludic economy, supported by many gaming currencies created by players and stakeholders.

Author details

Leonardo José Mataruna-dos-Santos^{1,2*} and Vanissa Wanick³

*Address all correspondence to: leonardo.mataruna@aue.ae

1 American University in the Emirates, Dubai, UAE

2 Coventry University – CTPSR, UK

3 University of Southampton, Southampton, UK

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