

How Game Theory Affects the Video Games Industry

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ABSTRACT: Despite the video gaming industry's ever-increasing engagement from both consumers and developers, it can be argued that it has somewhat reached a point of stagnancy. It is common to find complaints from consumers about its current overall state and how poorly it's performing. Why is the gaming industry, especially at the premium level, so unappealing for consumers? Why is it so easy to find complaints about how badly the field is performing despite its plentiful choices and apparent success? The modern video gaming industry is an extremely broad market that plays a major part in many people's lives, yet in recent times, there has been increasing dissatisfaction associated with the more premium levels of the medium, especially in the multiplayer genre, seemingly following very similar trends every time. If there is a pattern, then can it be explored such that a solution can be found that will satisfy customers and yet still appeal to a business's needs? The experiment consists of analyzing games based on user-based data. Then, dynamic modeling is used to draw conclusions from the data to support the claim that balancing between profit-based and customer-based thinking will ensure a healthier business environment for both parties.

KEYWORDS: Game Theory, Strategic Games, Video Games Industry, Profit Zone, Profit Driven, Community Driven.

■ Introduction

Every business's main goal is to be financially successful, and there are many ways to achieve it. However, while plenty of businesses are able to reach the end goal, there are a decent number of companies that fail to succeed for one reason or another. The most common reason is that a product doesn't appeal to enough people or drives them away. To verify this, the paper analyzes the live-service video games industry.

Firstly, to establish a baseline, we look at "The Profit Zone," a book written in 1997 by Adrian J. Slywotzky. The book provides insight into various uniquely applicable strategies in business that have persisted into modern-day, and, in our case, are especially applicable to the video games industry.¹

The first of the strategies, the "product pyramid" model, provides options for different customers in different price ranges, from entry-level to premium. An example of this is Electronic Arts, a large video games publisher and developer, where there is a game for every price range in its value chain, most notably, a collection of free-to-play games at the "base" of the product pyramid and >\$50 premium games at the "peak." This allows EA to be very accessible for a large number of age groups and spending profiles.²

The "switchboard" model not only creates and shares multiple products for consumers but also serves as a hub for other developers and businesses to spread their influence, allowing all parties involved to benefit. While there are many examples of a switchboard model in the video games industry, Valve's online video game store, Steam, stands out as one of the largest digital gaming distribution storefronts, providing a place for developers to sell their own products, both to consumers and other developers. This allows Steam to be very accessible to a large number of developers and to establish various connections between consumers and developers within its own network.³

The "total solution" model ensures that nearly any customer can be satisfied with one or more of the products along a value chain that a company provides. Epic Games is known for having a large online video game storefront – the Epic Games Store – for customers, a popular game-as-a-social-platform – Fortnite – for players, and a powerful, easily accessible game engine – Unreal Engine – for developers, all making up a thorough total solution model. This allows Epic Games to be a hub for all potential customers to find a satisfactory product in their value chain, regardless of what they are there for or what their background is.⁴

The "setting the standard" model can be applied when the company creates products that will revolutionize the market and encourage other companies to align with their standard; although a very difficult model to implement, it ensures that the market landscape is aligned with the company's interests, and will most often lead to success.¹ Nintendo, especially in the hardware market, has set the standard for handheld gaming consoles paired with high-quality games, historically with its Nintendo DS and Wii, and most recently with its Nintendo Switch in 2017, a handheld gaming console that is widely known for its high quality, longevity, and successful dive into an – at the time – lesser-used medium, setting the standard for an entire subcategory of console gaming to expand upon. This allows Nintendo to be a trendsetter that the rest of the industry looks to follow.⁵

In short, the "Profit Zone" strategies are used by a lot of modern businesses, and they, recently, have all culminated in a prevalent strategy: the "subscription" model, more commonly known as the "freemium" or "free-to-play" model. This ever-increasingly used business model, in its most prevalent form, encourages customers to play their game/use their product or service by providing all core features for free while monetizing

additional content via cosmetics, expansions, and/or advertisements.⁶

To come out on top from the perspective of both parties, the product must establish a strong balance between customer and business to last in the long term.¹ To find said balance, companies need to use game theory strategically to analyze the landscape and successfully sell a product/service.⁷

Game theory is a field of mathematics that analyzes the various strategies in a game between two or more players, where each player has values assigned to each decision they can make; with game theory, predictions can be made on how the game will play out, and what decisions are most beneficial to each player. In business, game theory can be utilized to a great extent to analyze the actions made by both the consumer and competition, such that businesses can make well-informed decisions.⁷

Three major types of strategic games can be played and visualized between customers and businesses.

Coordination encourages – somewhat temporary – loyalty between both parties for greater benefit.

Collaboration is repeated cooperation that often results in a highly beneficial outcome for both parties when they rely upon and bounce off of each other, but it can also be easily undermined by one party deviating to gain a short-term advantage over the other, however minuscule it may be.

Competition occurs when cooperation isn't favorable for either side, and both sides have a clear intent to gain a significant, albeit possibly short-term, advantage over the other.⁷

The payoff matrices for each game are shown in Figure 1.

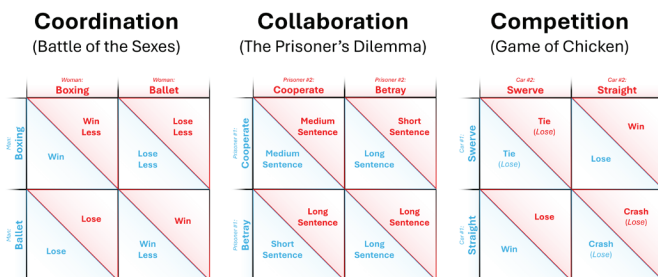


Figure 1: The payoff matrices for the “Battle of the Sexes”, “Prisoner's Dilemma”, and “Game of Chicken” games. The Battle of the Sexes favors cooperating, the Prisoner's Dilemma favors competition long-term and cooperation short-term, and the Game of Chicken is strictly competitive.

Competition between the customer and business occurs in the gaming industry due to business strategies being implemented, like "freemium," which encourages decisions that are unfavorable to the consumer, like paying for an expensive cosmetic that they might not have considered before.⁸ Many patents from various companies, such as Activision Blizzard and Kabam, show exploitation of consumers through practices like FOMO – Fear of Missing Out – and giving consumers who pay an advantage over those who don't – Pay to Win. As a result, many games and companies that utilize such practices often gain a bad reputation with consumers.⁹

Gaming is a saturated market, and many strategies are exemplified by the businesses in the field. Strategic game theory and "profit zone" analyses are not only useful in the video

game industry; however, they can also be projected onto other industries, allowing businesses in other fields to use the video game industry's strategies and appeal to customers with quality and support through collaboration, without losing potential profits in the long term.

The rest of the paper is organized as follows:

- Methods – a step-by-step walkthrough of how data is collected and analyzed.
- Results and Discussion – a presentation of the results found from the experiment and an explanation of how those results were reached.
- Conclusion – a summary of all the information that has been given until that point, and a proposition for how to further expand the topic.

■ Methods

To start, player data is collected from a selection of popular and/or notable live-service, multiplayer games in a multitude of genres, mainly collected from steamdb.info, a third-party website that contains data about all games on the online game playing and distribution platform Steam, by Valve Corporation.

Once the data is downloaded and organized in Excel, we focus on the user base over a game's lifespan and create a line graph from the exact data. The data from each time series is then categorized into 4 types of general graphs. Most of the games' time series align with the behavior of one of these graphs and, as such, can be categorized by their structure/pattern:

- o Spike and Decline (250 days short-term)
- o Spike and Increase (250 days short-term, 750 days long-term)
- o Sustained Growth (>1000 days long-term)
- o Growth and Decline (>1000 days long-term)

By categorizing games in this way, patterns may emerge between the games and their trends, which may align with our hypothesis.

■ Results

Tables 2 and 3 are the results of the data analysis. (τ) (days) stands for the time constant (the dynamics for the short and long term), and (Δ) (days) stands for the delay (the delay for the short- and long-term dynamics). The blue line is the real data, and the orange line is formed from the equations in Table 1.

Table 1: Equations for each graph type.

	Short Term	Long Term
Min to Max	$\begin{aligned} \text{Init} &= \text{Min} \\ \text{Value}(t+1) &= \text{Value}(t) + (\text{Max} - \text{Value}(t))/\tau_{\text{short}} \\ \text{Value}(t+1) &= \text{Value}(t+1) * \text{sigmoid} \end{aligned}$	$\text{Max} * (1 + t/\tau_{\text{long}} * \text{sigmoid})$
Max to Min	$\begin{aligned} \text{Init} &= \text{Max} \\ \text{Value}(t+1) &= \text{Value}(t) - (\text{Value}(t) - \text{Min})/\tau_{\text{short}} \\ \text{Value}(t+1) &= \text{Value}(t+1) * \text{sigmoid} \end{aligned}$	$\text{Min} * (1 + t/\tau_{\text{long}} * \text{sigmoid})$
sigmoid	$\text{sigmoid} = 1/(1 + \exp(-(t - \Delta_{\text{short}})/\text{smoothing}))$	$\text{sigmoid} = 1/(1 + \exp(-(t - \Delta_{\text{long}})/\text{smoothing}))$

Table 2: Real and predicted graph data for each profit-driven game, along with the graph behavior and values produced from the equations.

Game	Picture	τ (Short Term)	τ (Long Term)	Δ (Short Term)	Δ (Long Term)
Call of Duty (2022) Spike and Decline Profit Driven		20	N/A	25	N/A
Destiny 2 Spike and Decline Profit Driven		50	N/A	1	N/A
Lost Ark Spike and Decline Profit Driven		125	N/A	5	N/A
Player Unknown's Battlegrounds Spike and Decline Profit Driven		250	N/A	250	N/A
Overwatch 2 Spike and Increase Profit Driven		10	500	1	N/A
Hunt: Showdown Sustained Growth Profit Driven		1000	3000	750	2000
War Robots Sustained Growth Profit Driven		N/A	900	500	N/A
DOTA 2 Growth and Decline Profit Driven		N/A	900	200	950
Apex Legends Growth and Decline Profit Driven		500	2000	60	N/A
Tom Clancy's Rainbow Six Siege Growth and Decline Profit Driven		N/A	1000	950	N/A
				170 (delay increase)	

Table 3: Real and predicted graph data for each community-driven game, along with the graph behavior and values produced from the equations.

Game	Picture	τ (Short Term)	τ (Long Term)	Δ (Short Term)	Δ (Long Term)
Counter Strike 2 Sustained Growth Community Driven		50	4200	1200	3000
Dead by Daylight Sustained Growth Community Driven		2000	3700	100	2000
Rust Sustained Growth Community Driven		3500	200000	1	1
Team Fortress 2 Sustained Growth Community Driven		70	9000	1300	4500
War Thunder Sustained Growth Community Driven		N/A	1100	2300	N/A
VRCat Sustained Growth Community Driven		25	1200	370	1300
Warframe Growth and Decline Community Driven		N/A	1200	750	2000
Lethal Company Spike and Decline Community Driven		50	N/A	30	N/A
				5 (delay increase)	

Discussion

The data has two added labels: "Community Driven" and "Profit Driven". The way that "Community Driven" was reached was through research to determine if these games supported community-created content or had a strong community base that was actively involved in the development of the game. Otherwise, it was labeled "Profit Driven" as the community would only have minor involvement in the development and content creation of the game, and/or the game's

progression was affected by inherently predatory microtransactions.

Games like Apex Legends, Overwatch 2, and War Robots were all considered "profit-driven" as the games did not allow for direct community content contributions and/or had many rather predatory microtransactions that dampened user experience and/or provided an unfair advantage.

Games such as Lethal Company, VRChat, and Team Fortress 2 were all considered "Community Driven" as the games allowed and endorsed extensive community content creation and modding tools to help improve and enhance the experience of the game for everyone.

A common pattern that can be seen is that profit-driven games tend to decrease in player base over time, while community-driven games increase in player base over time. There are a few outliers, such as War Robots, Overwatch 2, and Lethal Company. A reason for both profit-driven games seemingly increasing in popularity is that the population data was taken from only one platform, Steam. The main user base of War Robots is located on mobile platforms, such as iOS and Android, and the main user base of Overwatch 2 is located on Battle.net, Blizzard Entertainment's game store and launcher. Therefore, the increasing user base on Steam can be attributed to a platform conversion, where the user base on one platform is slowly being converted to another. Lethal Company, despite being community-driven, still declines in popularity, which can be explained by its simple premise, leading to fatigue and a lack of progression for the player. Even after its brief period of extreme popularity, the game still possesses a solid core fanbase and modding community.

Game theory can be used strategically to explain the other parts of this data. Figure 2 shows the three different types of game theory games that have been covered, how they align when put up with each other, and what sort of categories they fall into.

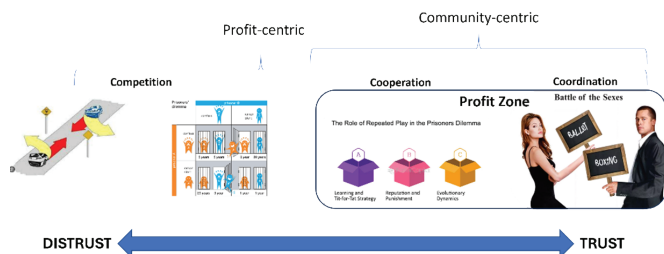


Figure 2: A graphical depiction of the game theory graphs and their relation to community-based and profit-based business strategies.

The Game of Chicken and Prisoner's Dilemma games on the left are grouped with an arrow pointing to the left and represent profit-oriented games. There is more competition and potential for conflict between the developer and the consumer, meaning that player interest and player numbers may drop, though the initial engagement may be high.

The Prisoner's Dilemma and the Battle of the Sexes games on the right are grouped with an arrow pointing to the right and represent community-oriented games. There is more cooperation and potential for connections to be formed between the developer and the consumer, meaning that player interest

and player numbers may be steadier and increase over time, though the initial engagement may start low.

It may be noted that the Prisoner's Dilemma is in both the community-oriented and profit-oriented categories. This is because the Prisoner's Dilemma is an interesting case where only playing a game once will most often lead to competition since the best option is to compete due to lack of trust; however, playing a game multiple times will often lead to cooperation, since the much better option, in the long run, is to cooperate.

While most businesses align with an extreme end of the spectrum, it is possible to strike a balance in the middle, where profit can be earned and is stable, but the community can also be formed and endorsed. It is difficult to find this balance, but with the correct adjustments to both a business and a game, developers can keep players engaged in their game and keep profits stable as the game stays in service.

The business models featured in "The Profit Zone" also support this ideology, as they all encourage the creation of connections between developers and/or players – such as the switchboard and setting-the-standard models – or encouraging loyalty from the player through accessibility and ease of use – such as the product pyramid and total solution models – forming communities that last longer and are healthier.

■ Conclusion

In summary, game theory can be used to logically improve modern-day strategies in the video game industry. By analyzing player base data from different games, we drew the conclusion that a healthier game for both players and developers puts player sentiment into account to increase the game's longevity and hopefully make the game as community-oriented as possible, building up connections and attachments between the players and developers.

This can be shown by how community-oriented games usually experience a slower yet more stable increase in users, whereas profit-oriented games experience large spikes and plateaus because community-oriented games strive for longevity and community health, while profit-oriented games tend to prioritize monetization.

Game theory can be used to come to logical conclusions as to why each decision leads to each outcome, since prioritizing profit only works effectively in the short term, while prioritizing community leads to much more substantial long-term profits, as shown in the Prisoner's Dilemma, where "cheating" is short-term and repeated "cooperating" is long-term. This, therefore, leads to an average net positive in profits when a game is community-oriented, as players stay longer and spend more over that time.

A business can become more community-oriented by listening to player feedback for all parts of their business model, as well as engaging their community in the evolution of the product. Allowing developers and players to work together to improve a game for all involved should be increasingly normalized in today's video games industry, as more and more innovative and unique games are created and released, yet undetermined by poor management.

Ultimately, due to the prevalence of subscription models, the results of this analysis can be utilized in more than just the video game industry. The logic and reasoning done through game theory can be used to explain any decision made in almost every other business.

in which he used game theory to prove that specific business strategies led to more satisfaction amongst customers while not impacting profits negatively.

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