Video Game Anti-Cheat Software and Its Importance to a Game's Success

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Abstract - This paper will discuss the importance of video game anti-cheat and anti- "modding" software, which prevents users from modifying the games they play to give unfair advantages in multiplayer games. It will discuss the success of games that do and do not have an effective set of software necessary to prevent these intrusions and how that overall affects the success of the game and by extension the company. It will also look at the counter argument that a game can survive without it or fail with it. It will also discuss how it affects the game from both a player and business perspective.

I. Introduction

In today's age, as society and its inventions progress, so does the power and the scope of the technology that we use, making all forms of transportation, finances, entertainment, and security even better with time. However, as the ability to produce better technologies continues to grow, so does the power of the systems and software designed to alter or sabotage those systems. This is why the growth of cyber security is so important to the progression of technology, and not just in systems such as the government or protection of personal information, but even activities and software as simple as what one might use for their daily entertainment.

Video games are no exception to this, especially as a medium of entertainment and art that must exist exclusively on a piece of hardware, and that is often experienced competitively. To maintain its ability to be experienced as the developers intended and to allow players to experience an untainted entertainment experience, there has to be security measures in place even in video games. In fact, video games are already so frequently the target of cyber-attacks inside of matches and/or during times of play. They are so frequent, that almost 90 percent of people who played video games, according to a survey in 2018, had at some point experienced a hacker in a game that they played [2].

To understand why cheating in video games is so common, an understanding of how video games are able to be changed needs to be established. When video games are downloaded onto a system, all of their files are loaded onto the game owner's machine and those files are able to be accessed by that owner. Sometimes these games allow someone to create new files and edit existing ones, but this process is referred to as modding and is done with developer consent. It is considered hacking when this process is done without consent, and usually involves the person hacking giving themselves the upper hand in some way, especially in games that involve multiplayer, competitive, or tournament style game modes or events [5].

The way that anti-cheat combats this is by doing a full sweep of all of the game files upon start-up that primarily searches for new files but also searches code for any possible alterations to the video games files that would drastically change or break the game. Once it does, it can prevent the game from being opened, prevent start up, or even just immediately ban the IP from any further interactions with the game's servers [1]. The way that so many hackers get around this system is just as stated in the beginning, where technology evolves alongside itself, and the ability to hide as such activities grows. To create a sustainable environment in which video games can exist and still be used as a viable form of entertainment, anti-cheat must grow with it.

A. Problem Statement

With the increase in strength of hacking ability, will video games that rely on multiplayer be able to remain

successful without anti-cheat. Will it be the determining factor between a successful game and one that cannot get off the ground should it need it or games that will fade into obscurity.

II.   Methodology

This study will use a combination of a literature review, interviews, and a survey related to the overall enjoyment of the game from members of the player base. Each stage of the methodology will be as follows:

A.   *Literature Review*

Since there is no way to legally observe the statistics for number of caught hackers, number of banned hackers, number of people who download cheats for a game because of the fact that each of these statistics is submitted by players anonymously or is kept hidden by cheating websites for the purpose of preventing them from being banned automatically. Therefore, as a part of this study, available statistics such as monthly player base of a game, dates, and times for releases of anti-cheat systems or updates to pre-existing systems and collected statistics such as available cheats able to be found on public forums will be used to draw further conclusions. These will then be used to analyze any obvious correlations between anti-cheat and continued game success.

B.   *Survey*

As a part of the study, a very important aspect of this was considered, which is the ability for people to continue playing these games. Their ability to continue playing these games is very heavily dependent on their enjoyment, so using a survey to get an understanding of more recent games with newer player bases and how people feel about them gives a better understanding of how important preventing cheating and hackers is. A survey of five (5) questions was posed to a random selection of people across public social platforms and forums, specifically targeting games that have an extensive history of cheating

involved with their titles, and the results will be discussed in the Methodology section of the paper.

III.   Results

This section will cover all of the results obtained from the analysis of 3 video games with well-known issues with hackers, how they went about handling these situations, how the results of their solutions ended up, and the effect on the success of these games. It will also include the results of the interviews with the 2 professionals from both sides of the maintenance of a game. The final section will be covering the results of the survey asked to a specific game's player base.

A.   Literature Review

To start, looking at an incredibly long running game with a prolific hacking community is the Valve made game *Counter Strike: Global Offensive (CS:GO)* from 2012. To understand how prolific it is, Valve's automatic banning system responsible for removing hackers has both professional and player made trackers that can be both used to track how many hackers have been seen within games via both number of player reports and number of confirmed bans by Valve. Observing the number of confirmed bans, the greatest rise in number occurs around May of 2021, when massive waves of players were banned as a part of Valve's initiative to reduce the number of hackers. This is around the time where most of the hackers were being found. Fifty thousand (50,000) players were banned in May and ten thousand (10,000) were banned in early June alone, and according to the statistics of player base to go along with these reports, this is when the game saw its sharpest decline in players.

Figure 1. Chart from SteamCharts that shows the average daily players over a 1 year period starting from November of 2020 [6].

Month	Avg. Players	Gain	% Gain	Peak
Last 30 Days	*511,941.2*	*-409.7*	*-0.08%*	
September 2021	512,350.9	+269.0	+0.05%	
August 2021	512,082.0	+6,014.6	+1.19%	
July 2021	506,067.4	-43,279.7	-7.88%	
June 2021	549,347.1	-110,541.8	-16.75%	
May 2021	659,888.9	-63,457.6	-8.77%	1
April 2021	723,346.5	-17,581.3	-2.37%	1
March 2021	740,927.8	-85.4	-0.01%	1
February 2021	741,013.2	-2,196.4	-0.30%	1
January 2021	743,209.7	+25,405.9	+3.54%	1
December 2020	717,803.8	+49,049.2	+7.33%	1
November 2020	668,754.6	+55,087.9	+8.98%	1
October 2020	613,666.7	+6,816.4	+1.12%	

Figure 2. Printed data version of Figure 1. [6]

With over 100,000 players quitting the game overall in July alone over Valve's poor management of the game. Now that Valve has rolled out their new anti-cheat software that promises to further reduce the number of reported hackers, there has been an increase since the ban wave that happened in the Summer of 2021. However, there is still news that the new system isn't handling the hackers fast enough for the players to be able to continue to play the games without issue, and the total player increase begins to drop over time as shown in the figures above. The other dips that match these issues are equally as telling as to how the player base reacts to changes in the cheating climate of the game.

What's incredibly telling is the information that can be pulled from public websites that distribute cheats that are periodically updated to further get around updates from Valve's Anti-cheat System (VAC). On Google alone, there can be found a near infinite number of resources for cheating that include exploiting developer only consoles that some players have found access to and websites that offer free file downloads that add cheating techniques to one's game such as the ability to see players through walls and the ability to instantly aim for an opposing player's head. CS:GO features an in-game mechanic that allows any player to die with any amount of damage dealt to the head, which means that any player that accesses these is given an immediate unfair advantage especially in a competitive environment.

Before moving on to look at another game with many similar problems and players to CS:GO, the study will make sure there aren't other possible factors that affect the playerbase. There could be things such as other unfavorable updates to the game that deter players from continuing to play or from ever picking up the game in general. There could also be other games that compete with the game to give it a harder time with their updates. The current major competitor in terms of a game with enough of similar gameplay design to the point where the games could be compared and considered competing with each other would be the game Valorant by Riot Games.

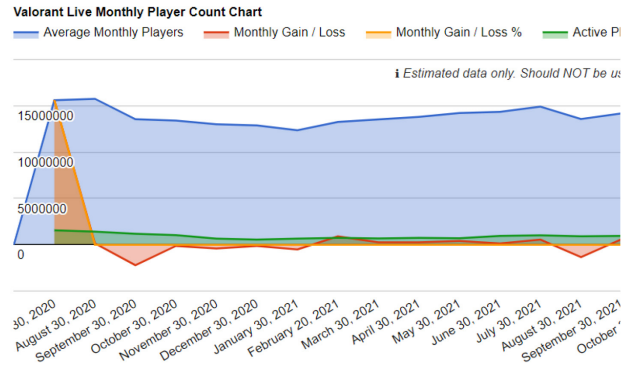| 1.37.9.7 | 27 July 2021 | • Map Changes (Calavera)
• Misc Changes |
1.37.9.6	21 July 2021	• Dreams & Nightmares Contest • Matchmaking Changes • Map Changes (Pitstop, Mocha)
1.37.9.5	6 July 2021	• Matchmaking Changes • Misc Changes
1.37.9.4	8 June 2021	• UI Changes • SDK Updates • Map Changes (Pitstop)
1.37.9.3	3 June 2021	• Non-Prime Changes • Introduce Unranked matches, Scrimmage removed • VScript Updates
1.37.9.2	27 May 2021	• Misc Changes • Map Changes (Ancient, Grind, Mocha, Cache)
1.37.9.1	13 May 2021	• CS:GO 360 Stats Update • Misc Changes • Map Changes (Ancient, Grind, Frostbite)
1.37.9.0	6 May 2021	• CS:GO 360 Stats Update • Misc Changes • Map Changes (Ancient, Pitstop)
1.37.8.9	3 May 2021	• Operation Broken Fang ends • New Snakebite Case • Misc Changes • Changes to Map Groupings • Map Changes (Ancient, Nuke, Frostbite)
1.37.8.8	28 April 2021	• Misc Changes
1.37.8.8-rc1	27 April 2021	• **Pre-release** • Misc Changes
1.37.8.7	16 April 2021	• Steam Market Changes • Misc Changes
1.37.8.6	29 March 2021	• Operation Broken Fang update • Misc Changes

Figure 3. A brief history of the updates to CS:GO during the same period collected player data as Figures 1 and 2. [7]

This figure of listed updates to CS:GO shows that all major updates during the same period that the most bans were occurring also contained no updates that had been given negative reviews. There were also no updates that had been given many positive reviews either. There were also no updates to the Anti-Cheat system. The game's system was completely stagnant, and therefore there could not have been any other changes to the structure of the game that would have affected the massive reduction in playerbase during those months besides the increase in cheating and the waves of bans by Valve.

Patch 3.02	20 July 2021		• Bug Fixes
Patch 3.01	7 July 2021		• Bug Fixes
3.00.573400	22 June 2021	1.5 GB	• New Agent: KAY/O • All agents tweaks • All weapons prize changes • Run and shoot nerfed • Round rollback for custom games
Patch 2.11	8 June 2021		• System Updates • Bug Fixes • Replication is back
Patch 2.09	11 May 2021		• Viper nerf • Breeze competitive • Tactical timeouts • Bug fixes
Patch 2.08	27 April 2021		• Bug Fixes • Coach Slots • New map: Breeze
Patch 2.07	13 April 2021		• Astra Buffs • Raze Tweaks • Viper Bug Fix

Figure 4. A brief history of the updates to Valorant during the same period collected player data as Figures 1 and 2. [8]

According to the above figure, the most major updates to CS:GO's primary competitor, Valorant, all happened far before and far after any of the ban waves and player reductions were a problem for CS:GO. Release of major content including a new character for players to interact with had come out at the end of CS:GO's major dip and therefore most likely has no causation. There was a new map released which means a different new play experience at the start, but based on the figures below going over the Valorant player base, the game displayed the same increase in players over that period it was already experiencing, and no sudden increases as if it had been taking players from CS:GO. There is definitely correlation and most likely causation between the prolific hacking community within CS:GO and the changes in playerbase and the game's success. However, Valorant does deserve more recognition as a game for the fact that it does incorporate a proper anti-cheat system that is effective at keeping the hackers away and preventing them from returning.

Valorant Live Monthly Player Count Chart
— Average Monthly Players — Monthly Gain / Loss — Monthly Gain / Loss % — Active Pl

i Estimated data only. Should NOT be us

15000000

10000000

5000000

0

30, 2020
August 30, 2020
September 30, 2020
October 30, 2020
November 30, 2020
December 30, 2020
January 30, 2021
February 20, 2021
March 30, 2021
April 30, 2021
May 30, 2021
June 30, 2021
July 30, 2021
August 30, 2021
September 30, 2021
October

Figure 5. A graph of the monthly player base of Valorant since the release of the game. [9]

Month	Average Monthly Players	Monthly Gain / Loss	Monthly Gain / Loss %	Active Pl
Last 30 Days	13,255,980	-342,890	-3%	
October 30, 2021	13,598,870	-567,144	-4%	
September 30, 2021	14,166,014	596,029	4%	
August 30, 2021	13,569,985	-1,331,162	-9%	
July 30, 2021	14,901,147	552,172	4%	
June 30, 2021	14,348,975	138,638	1%	
May 30, 2021	14,210,337	414,221	3%	
April 30, 2021	13,796,116	270,512	2%	
March 30, 2021	13,525,604	265,208	2%	
February 20, 2021	13,260,396	897,282	7%	
January 30, 2021	12,363,114	-513,761	-4%	
December 30, 2020	12,876,875	-128,715	-1%	
November 30, 2020	13,005,590	-402,235	-3%	
October 30, 2020	13,407,825	-129,675	-1%	
September 30, 2020	13,537,500	-2,212,500	-14%	
August 30, 2020	15,750,000	144,000	1%	
July 30, 2020	15,606,000	15,605,999	1560599900%	

Figure 6. A table of the monthly player base of Valorant since the release of the game. [9]

Valorant themselves reports that they barely have issues with people being reported for hacking, where only ninety-three (93) percent of their player base is ever reported for hacking. This does not always mean that there aren't hackers however, since they end up banning around sixty (60) percent of all reported hackers picked up by their anti-cheat. [10] This displays that their anti-cheat does work and their system can be effective, especially since there's no major points in time where they lose players correlating to major changes in the actual game. Their early losses are a result of the normal changes in which a game loses players once they finally decide they are no longer interested, which most studies show is very normal. [12] A small up and down of a few thousand players is normal, and August dip could be attributed to poor reception of a new map [13] and increase in televised competitive match viewings rather than people actually playing the game. Finally, doesn't remove IP bans that they dole out to cheaters, even to this day the cheaters that were banned during the Beta,

the unofficial test release of the game, are still banned, [11] so they keep the game from attracting new cheaters as well as stopping previous cheaters from affecting the quality of the game. CS:GO has been known to unban cheaters from previous years, meaning they aren't actually cleaning up their system, and the cycle can continue, allowing more cheaters to have to be processed, but it takes new ways to develop more chances to stop cheaters, which makes it harder to stop cheaters in the future, even if they've hacked in the past. Overall, it is clear that using a proper anti-cheat does more for the continued success of a game when taken seriously and used properly.

B. Methodology

As the main part of my Methodology, I disseminated a 5 question survey targeting both game communities with prolific cheating in either their past or their present and ones that have good records for getting rid of hackers as well. I used public social platforms such as Discord servers dedicated to the games such as *Valorant, Warzone, CS:GO, and Rainbow 6: Siege (R6), Fortnite*, and some public spaces that are dedicated to all games as well. The questions and answers, along with their results, will be discussed below. The sample size of this survey was **currently 30** people. (I am not going to submit the finalized results of the survey until the actual paper is due since I'm still getting responses over time, but at the time of submission, here are the results).

Do encounters with hackers ever cut your playtime short?
30 responses

● Often
● Not Often
● Never

23.3%
60%
16.7%
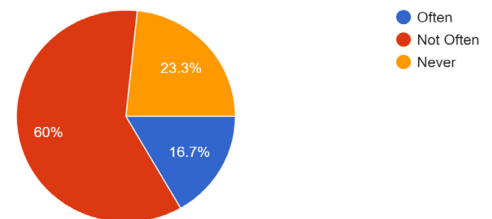
Figure 7. Question 1 of the survey with results.

This question was asked to get a sense of how often people in these kinds of games encounter hackers, but also to get a sense of how much it affects people. Since this covers all levels of play within a game, it means

that there's probably levels of play which exhibit more hackers and levels that exhibit less. It could also mean that based on the breadth of games covered, some typically experience more hackers than others. Regardless, the consensus is that it happens, but more rarely. In this graphic, *Not Often* was said by 60 percent of survey takers, *Never* is 23.3 percent, and *Often* is 16.7 percent.

Has an encounter or repeated encounters with a hacker ever caused you to stop pla
altogether?
30 responses

● Yes, Permanently
● Yes, Temporarily
● No

30%
20%
50%
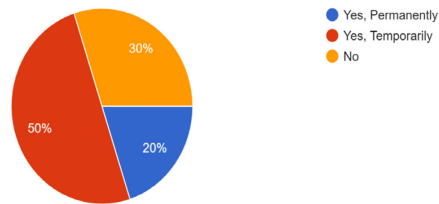
Figure 8. Question 2 of the Survey with results.

This question was asked to get a sense if hackers pose more of a long term or short term problem to a game's success. If a large set of players are convinced that leaving the game entirely after experiencing a hacker, the game can never take off or continue to be successful. If encounters lead to temporary leaving the game, the game will struggle overall and eventually lead to it not being able to support itself. Overall, it gets a sense of if hacking affects more long term or short term game success. In this graphic, *Yes, Temporarily* is the answer of 50 percent of survey takers, *No* is 30 percent, and *Yes, Permanently* is 20 percent.

Has a hacker ever ruined a ranked experience for you?
30 responses

● Yes
● No

36.7%
63.3%
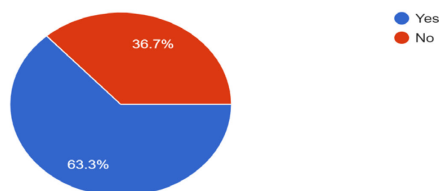
Figure 9. Question 3 of the survey with results.

This question is to get a sense of if player's ever have games with stakes affected by the lack of foresight on the developer's part. Game's functions do not stop at entertainment or wasting time, people who play ranked can often be practicing for professional levels of play in tournaments and competitions and have their experience ruined because of it. Some people just want to get better at the game, and that is the best place to do it. This question gives the best idea of how often people are affected when attempting to interact with higher levels of play. In this graphic, *Yes* was chosen as an answer by 63.3 percent of survey takers, and *No* is 36.7 percent.

If you encountered a hacker early in a game's playtime, would you try to refund it?
30 responses

● Yes
● No
● Maybe

46.7%
13.3%
40%
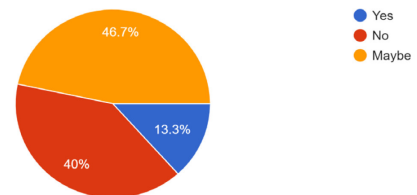
Figure 10. Question 4 of the survey with results.

This question is also about trying to determine a game's long term success. Rather than affecting the metrics that game's use to measure their success, this directly affects the money the game makes. It's about checking a person's likelihood to continue wasting money on playing a game if they are affected by it. The limitations for refunding a game on most platforms, especially Steam where the paper has taken a lot of its information, is that more than 2 hours can't be played. This question gets answers on if short term experiences can affect a game's performance in the long term. For this question, 46.7 percent answered *Maybe*, 40 percent answered *No*, and 13.3 percent answered a definitive *Yes.*

Yes
Unsure
No
Never
Rarely
Always

16.7%
23.3%
43.3%
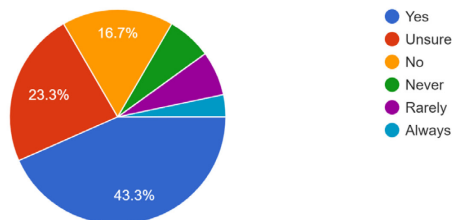
Figure 11. Question 5 of the survey with results.

This question asks about the easiest way to measure a game's success which is player reviews which are often regularly accessible and viewable by the player base as, typically, the first means by which players would decide whether to buy the game or not. The game's reviews are the easiest way to measure player opinion. When frequent hackers are encountered, it asks whether or not players are willing to prevent other players from desiring to play the game in the future, which is the biggest toll on the game's success, being a potential complete lack of growth. 45.3 percent of survey takers answered *Yes,* 23.3 percent answered unsure, and 16.7 percent answered a definitive *No,* with 6 percent answering *Never* or *Rarely,* exhibiting these actions, and 3 percent saying *Always* exhibiting these actions.

To get a sense of the opinion of people on the state of hacking, the people who got the survey were also given a chance to elaborate on answers and add to the idea of the survey and the paper. These answers are not always helpful, but they are useful in giving the paper more ideas to elaborate on.

The paper will only look at answers from this survey that are relevant to the paper. It will also analyze how people typically feel about the scenarios with hackers and how they cope or deal with the scenario.

I usually consider hackers in video games to be a short term problem, unless the company is very small or has shown that they don't care to address the issue.

While hackers can ruin a game experience I wouldn't give it a bad review because I wouldn't want to punish the devs for other players ruining their game, like if guys were hacking in a battlefield game I still love the game and its features but I'm not gonna give a bad review because of bad players trying to ruin it.

Hackers, to me, are more of a nuisance to a community rather than an issue with the overall game. That does change though when a Triple A company does little to nothing to combat hackers (e.g. Activision).

Big example is escape from tarkov - it used to be extremely common to cheat at that game since there was very little to no punishment. They implemented it a while ago and there's a lot less cheating now, and it's easier and more fun as a regular player

Hackers have become so regular that in many cases I've just accepted them as a part of life. Certain games have become instantly unplayable or simply overran by hackers, and in those cases it can really make them feel entirely futile.

:)

Figure 12. Question 5 of the survey with results.

The vast majority of the answers from this particular section of the survey all follow a similar trend of saying that cheating in video games is a completely unavoidable problem. This is a completely fair assertion, since there has been plenty of talk about how the anti-cheat that video games create has to keep up with the same pace that new cheats are developed by plenty of random players from all levels of play across the fanbase. To even quote one of the people who responded to the survey, *"Hackers, to me, are more of a nuisance to a community rather than an issue with the overall game. That does change though when a Triple A company does little to nothing to combat hackers (e.g. Activision)."* There is another similar quote from an anonymous answerer who also says, *"Hackers have become so regular that in many cases I've just accepted them as a part of life. Certain games have become instantly unplayable or simply overran by hackers, and in those cases it can really make them feel entirely futile."* Here it shows that there is a clear correlation between the number of hackers that cause a player to actually develop a bad opinion of a game, which is typically only caused by a lack of response from developers in the form of a competent anti-cheat. There is a need for anti-cheat, but players won't immediately blame a game or the developers until there is a large enough problem. Just as Riot Games and the Valorant developers have said that almost all hackers are reported and then flagged for the anti-cheat review, it is not possible to completely remove the problem from the game, and it is good that players are

aware of that when they formulate opinions on the game.

IV. Analysis of Results

A. Literature Review

From all the information across all possible media covering the aforementioned game's success as well as the public statistics that can be correlated to the opinions found, it is clear that anti-cheat does have an effect on the game's overall success. When looking at two games with nearly identical game mechanics and only small differences in the game's aesthetics or minor tweaks developers might make to set their game apart, the one with the better anti-cheat is clearly attracting more players over time. Valorant is a newer game, and that might entice players, but it's clear that CS:GO was losing players long before Valorant had stepped on the scene due to their toxic cheating culture that has purveyed most aspects of the gameplay. CS:GO should have also had more time to fix and develop their game, which should have given them an advantage over Valorant as a game, not a disadvantage.

Valorant has also proven itself to be a more successful game, attracting more players more consistently overall, so it's not that CS:GO simply loses players over time compared to Valorant. Valorant as a game also provides more performance updates that let the game and its ability to stop hackers evolve as shown through the update logs of the game. Their public message to their players says that they want more of them to report players and they keep reported players away from the game so the cheating community cannot resurface or grow faster. CS:GO does things such as actively letting old, banned hacking players with no evidence of redemption return to the game, and they don't inform their players of anything so they are simply forced to deal with a continuously growing hacking problem which affects their overall players by losing hundreds of thousands regularly and millions in the absolute worst case. There is a clear sign of player dissatisfaction from both opinions from players online and the way players decide to continue playing the game.

B. Survey

From the multiple choice questions on the survey, there is clearly a problem with hacking in certain gaming communities. Considering the survey was disseminated to specifically gaming communities with prolific hacking cultures and people often answered in favor of seeing more hackers means that these games that have had hackers in the past aren't doing anything about their hackers in the present. It's continuing to cause problems for players as it ruins competitive experiences and ruins enjoyment.

Players are also willing to go as far as quitting the game entirely. While most wouldn't actually quit forever, that bit of space where they stop means the game stops growing and attracting new players as fast. There's also small chances that players will get rid of a game entirely, considering it a waste of time and money, and not find it worth supporting the company that can't defend their game, but some do say that the game would have to be by larger developers since they should be held to a higher standard. The most common response to hacking is a bad review, which is incredibly important to the growing playerbase, and since it is so abundant, that's the biggest blow to a game's success. Players are clearly willing to not let a game succeed if they don't create a system of defense.

But also, at the same time, players' opinions of cheaters as an inevitable issue that any person who plays games will have to encounter shows that there is leniency in the need for an anti-cheat. The anti-cheat cannot be perfect, and cheaters will always come back since all technology and its creations evolve together. Most, if not all, players who took the survey agree that cheating is pretty much always going to happen, but getting upset at every instance is not worth the effort since the game can always be more than that singular instance. They consider hackers to be a short term problem overall, but that doesn't necessarily mean that it is always a short term problem. Continuous experiences will always deter them, which will greatly impact the game's success, and cause them to leave, according to what the survey takers have said. Anti-cheat is important, but perfecting the art of eliminating hackers is never something they'd expect.

V.   Conclusion

Video game anti-cheat and anti-hacking software is not as crucial to a game's success as it could be compared to just how good the game is and the effort developers put into creating a game players will enjoy, but it does make it so that players will still at some point in some way affect how the game will maintain an ability to grow or succeed. Anti-cheat is crucial in stopping an upward trend in cheating rather than eliminating it all together, since the very notion of getting rid of all cheaters should truthfully be an impossible task. Players have been subjected to the idea so long that while it is common to them and it is something they deal with regularly, they develop a thicker skin to it, but won't put up with the pain forever. Through word of mouth and short bursts of playing, a game can't grow properly without a constantly growing and evolving player base that plays the game in a varied way enough to give feedback on many levels and gains players consistently to fund or fuel any relevant changes. Therefore, the game will fall into irrelevance as a game only picked up by dedicated people who simply lie down and take the punishment of being subjected to hacking without ever really enjoying it.

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Link to Survey taken: https://docs.google.com/forms/d/1N5jpIwWdUyyvGxdjCTajjHuBEdDDhRACImUhbKHrA9Q/edit