WebAssembly: Constructing Versatile Programs with Multiple Programming Languages

Effect of Recent Rise in Popularity of Gacha Games on Players in the US Compared to Chinese Players

A Thesis Prospectus Submitted to the

Faculty of the School of Engineering and Applied Science

University of Virginia - Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2023

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Virtual gambling games (gacha games) have seen unprecedented growth in the United States with recent behemoths like Genshin Impact becoming the largest launch of a mobile RPG (role-playing game) in the US (Chan, 2020) and earning total revenue of $3.7 billion with 17% of that coming just from the US (Partis, 2022). While the first gacha games have been around since the early 2010s they were not as mainstream as they are in China and Japan until recently as games like Genshin Impact grew the gacha game market tremendously in Western audiences (Adams, 2022). Games are considered "gacha" when they reward players who spend in-game currency with a random virtual prize, often an in-game character or weapon (Vincente, 2020).

To answer the question of how the meteoric rise of the gacha game market in the West came to be can be rooted back to how these games are designed to be so addictive to players. The three main factors that form addictive gambling in-game similar to in-real-life (IRL) gambling are formulating habits, sunk cost fallacy, and a sense of community (Choo, 2021). These factors can be seen in gacha games as companies have mastered the art of bringing back players daily with login rewards and limited-time events to lure players back and avoid missing out on flashy new virtual collectibles. With these games charging high premiums for players to ensure their gambling attempts are fruitful – it costs $444 to guarantee an exclusive character in Genshin Impact (Puleo 2020) – ensuring that players' well-being is taken care of is not always on the agenda of game companies.

After seeing the dangers of these addictive games countries have implemented policies to ensure the health of players such as China enforcing games to require ID verification to enforce game time and spending limits for minors (Niko, 2020) and Japan implementing similar spending limits for minors (Shibuya et al., 2019). However, this brings up the issue of how gacha

players in the US are faring as they will not receive similar limits to their gaming. With gacha being a relatively new experience for many new players of the genre, their well-being needs to be taken into consideration when the government will offer little help in regulation and companies seek to maximize their own profits in the growing market.

This issue is further complicated by how accessible these gacha games are. Currently, playing a gacha game requires downloading a large game on mobile devices which takes up large masses of data storage with larger games such as Genshin Impact taking up to 15 GB of storage (Raj, 2021). While this does deter some people from downloading too many games and growing a gacha addiction, there are solutions to this as the technology to port games to web browsers is growing. Namely, WebAssembly (WebAssembly MDN, 2022) is a technology developed for web development to port over code previously unable to be run on browsers which is especially useful in this regard as many games are written in C++ which is not supported by web browsers.

As games and applications previously unsupported on browsers can now be ported onto browsers with speeds as fast as a natively installed application (Jylänki, 2017), the accessibility of gacha games can further be expanded for those who don't want to spend time downloading and installing games. Players will be enabled to play gacha games more easily and often, contributing to impairments to daily, work, or educational activities (Chamarro, 2020). As accessibility for gacha games grow and more players sign on to play gacha games, the gacha community needs to ensure that players are not becoming addicted to the games and developing unhealthy habits, especially without government limitations.

Technical Topic

In my last internship, I worked at an Arlington, VA-based cloud computing company. For my internship project, I was tasked with building an easy-to-use and fast-to-deploy web app but

also utilize the team's Rust code base, a high-level programming language similar to C++, which housed the logic to process data for the project. The goal was to create an easy-to-use web app that customers can quickly use with the already existing code that processes data. The problem that arose is Rust as well as most other high-level programming languages are not natively supported on most web browsers. Developing a web app for this purpose would require the browser to run the Rust code or have a system of processing the data and sending it back to the customer through the web app in a timely manner.

One solution to this problem is for customers to send their data to developers who can process it and send the processed data back to the customer. However, there are two main issues with this approach some customers have confidential data that might not be shareable with developers and this process can be slow as data needs to be sent to a cloud server which needs to first boot up, and then wait in a queue to finally process it to send back. This leads to the second solution which is to create an installable application that customers can download to process their data. However, this would go against the requirement of an easy-to-use web app as utilizing Rust would require installing the language itself and all the packages used which can be overwhelming for someone who is not very familiar with the language.

To summarize, my project was to find a way to create an easily accessible website for customers who needed an easy way and secure method to process data without sending it to developers. And to accomplish this, I utilized WebAssembly which is a relatively new technology that compiles code that generally cannot be run on browsers, like C++ and Rust, into "WebAssembly" code, similar to low-level assembly code, which can then be run on browsers alongside popular browser languages such as JavaScript (JavaScript MDN, 2022). With WebAssembly, I was able to build a web application using React.js, a popular web development

framework that uses JavaScript and HTML, while also building in the Rust data processing capabilities but in WebAssembly code. This enabled customers to essentially navigate to a website and process their data without sending any data to developers or installing many complex technologies they have no experience with.

In this case, WebAssembly was utilized as a tool to solve a unique problem by providing an extremely fast and efficient approach to a web app. However, it also has many other use cases including porting games that were originally written in C++ (Stroustrup, 1995), another high-level programming language and very popular for video games, to web browsers. This would mean that players would no longer need to install the game on their computer or mobile device and can play large games just by navigating to a website. Both use cases enable many more users to use the application and showcase how versatile WebAssembly can be for developing unique and accessible applications. As developers utilize this technology for new applications and games, they can use this opportunity to reimagine a healthier gaming experience whether through limiting play time or just ensuring they are not overzealous in their pursuit of profits.

STS Topic

As this research will focus on the differences in gacha game players in the US and China, a lens of community responsibility will be used to analyze the differences in spending and addiction. Community responsibility is an obligation of technological citizenship and "defines our rights and obligations as technology changes" (Andrews, 2006). This change in rights and obligations is especially noticeable with the rapid growth of technology in the past few decades and even more obvious in the rapid expansion of the internet. As the internet grows, technological citizenship defines its growth as the growth of a public space and its users

changing their behaviors along with it. With this growth that enables so many new opportunities and ideas, comes the responsibility to keep it a safe space while "sustaining democratic values, procedures, and institutions" (Sclove, 1999). Similarly, as gacha games grow their audience and expand their horizons to new demographics, comes the responsibility to keep the gacha community a safe space for its players.

Without the correct portrayal of these games in the media, many will not know how sinister the cycle of addiction is when players get sucked into the flashy login incentives. This is where technological citizenship needs to be practiced in the gacha community as they are in charge of ensuring new and current players have the information needed to ensure they don't develop an addiction or spending problem. Because the government is not always able to step in with regulatory policies the responsibility of ensuring a healthy community is pushed onto either the community involved or the companies developing the games. With this in mind and the growth of gacha games not slowing anytime soon, tech citizenship will be crucial in analyzing how the community responds to the growth of new players. Not only that, but as gacha game companies learn their player base more and develop more functionalities to lure players into playing, players will need to learn how to spot these potentially dangerous trends. Companies are unlikely to prioritize player health over their own profits in most cases but if their games begin to develop unhealthy playing then the community might need to consider pushing back against the dangerous game mechanics.

New players who are unaware of the alluring login reward systems might feel pressured to keep playing a game every day when in the past they might not have felt this type of pressure for gacha less games. This delves into the rights of access to knowledge in the gacha community as these game features are not advertised but found through playing or researching media articles

to uncover them. While players in the community will always want to expand their community and share their joy in the game, it can be detrimental to some who are not ready for this type of game but feel the need to play more and keep up with their fellow gamers. This type of feeling is labeled as FOMO (fear of missing out) and can cause pathological gaming whenever players have some type of event in-game and watch their fellow gamers receive the rewards they are gambling for (Li et al., 2020). As social engagement in gacha games is a key factor in increasing in-game purchases (Jang, 2019), the community's responsibility is even more key in ensuring new players have access to common gacha game practices.

Research Question and Methods

Research Question: How has a recent surge in mobile gambling game (gacha game) popularity affected video game expenditures and increased addiction of players in the US compared to China?

With the gacha game market growing larger in the US and the lack of any regulation set by the US government, it will be critical to analyze if this rapid growth has led to any potential hidden consequences. If the rates of in-game spending are growing much faster than the rates found in veteran communities, some type of intervention might be required or further research as to why this is happening will be needed as well.

To measure this difference I will conduct online polls on gacha game communities specifically on sites such as Reddit for the US communities and Baidu Tieba for the Chinese communities (Henriques, 2021). Both platforms organize communities into categories where users create forum posts and receive interactions from other community members in the form of comments, likes, and awards. Through these platforms, I will be able to create polls that can determine the overall spending of players, how far along the games they are, and how often they

play as well as if it affects their real-life routines. This data will prove useful in analyzing the difference between the two communities and determining if a significant difference exists. I will also separate the data between players who are relatively newer to the scene and those who have been veterans which will be useful in determining if newer players in recent years have been affected by the gacha game boom.

Conclusion

Growth of a new market can be exciting especially when it leads to new communities being formed and connecting people across multiple countries. However, in the case of gacha game growth, there are many issues that come with it including excessive in-game spending and addiction which can both lead to pathological gaming where players overlook their social or work routines (Ismail, 2021). Along with this comes the potential for new technologies to expand access to more players and create even more convenient-to-play games which can enable the addictive features of gacha games to shine even further. This research will reveal if the growth of the gacha game community has been detrimental to new players and whether the community has done its job keeping the gacha space safe and healthy.

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