Improving Post-Trade Risk Analysis at Jump Trading

The Effects of Techniques Used by App Developers to Retain Users

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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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General Research Problem

Why do apps need to focus on attracting and retaining users, and are users harmed by retention techniques?

In 2008, Apple introduced the iPhone App Store where users could go to download third-party applications onto their phones. Since then, apps have become a staple of technology, as there are now millions of apps available, ranging from social media to games to streaming and everything in between. Thus, app development is one of modern day's biggest industries, as apps generate revenue from both in-app purchases and data collection/advertising. The massive app economy has led to technology companies investing millions to billions of dollars on research and engineering to develop the best versions of their apps in order to maximize revenues and capture as much of the market as possible.

An app is only as successful as its user base. In order for an app to be successful, it needs to be able to attract users to its platform. One of the most difficult parts of releasing an app is getting initial users to download the app. (Rampton, 2015) This problem is especially prevalent for double-sided marketplace apps where users pose as both buyers and sellers of products or services (ex. Uber, Airbnb, eBay). The problem also exists for social media-type apps, where the app is only as good as the user-generated content being created and displayed for other users to see and interact with (ex. Instagram, Twitter, Snapchat). The technical portion of this paper will dive into the development of a tool that could potentially help solve the problem of attracting initial users for app developers.

Additionally, retaining users is just as important to developing a successful app. As put by former VP of Growth at HubSpot Brian Balfour, "If your retention is poor then nothing else matters" (McBride, 2020, n. p). Thus, companies focus on researching and engineering strategies

to keep users on their apps. However, the problem is that most developers don't worry about the effects of these strategies on their users. The latter portion of the paper will cover the techniques that app developers use to retain users, and how these techniques can have a harmful effect on the users themselves especially due to the lack of regulation. The paper will utilize both direct information from tech companies, as well as outside perspectives on the tech companies' strategies.

Development of Platform for Developers to Hire Stock Users

How can the "chicken and egg" problem be solved for new apps, where they need users to create content but need content to attract users?

Applications take an incredible amount of work to create. From designing and coding to releasing and marketing, building, and releasing an app from the ground up is difficult. However, after putting in all the work to develop an app, many developers are unable to attract users, rendering their app somewhat useless. Many apps are community-based, meaning that the main content and focus of the apps are based on the content delivered by other users. For example, Reddit is based on users themselves delivering all of the content for the app – Reddit themselves doesn't make content, they just deliver a platform. New community-based apps run into a "chicken and egg" problem where they need users on their app to create content but need content on the app to attract users. (Hagiu et al., 2021) This is an interesting problem to look into as app success rate is not high – it is difficult to get users to use an app outside of the normal popular apps. Roughly 85% of mobile apps will not cross 1000 downloads or achieve 1000 activity users on their platforms. (Steiner, 2021) Increasing the success rate of apps for smaller development

firms could potentially make a massive impact on the app market and allow these smaller firms to compete with large technology firms.

To address this problem, I will build a tool to help developers fight this problem. Specifically, we will be looking into how to build a platform that allows app developers to pay for stock users for their apps - basically people who are paid to use the app. These stock users will be able to generate initial content for an app in order to legitimize the app and make it more attractive for new potential users. Several companies have used similar techniques in order to gain initial traction. For example, when trying to attract users to Reddit, the founders themselves created content under artificially created user accounts in order to create the illusion of an activity community and website. Steve Huffman, a co-founder of Reddit, explains that users are attracted to places that "feel alive" with activity, so creating the illusion of an alive and active website was extremely important for the platform's success. (Mead, 2012) The founders of Alibaba, China's largest online marketplace akin to Amazon, also used a similar strategy. When their platform was launched, they created the illusion of having an active marketplace by buying and selling products themselves. (Alibaba Group, n.d.)

This platform will likely be developed using web development technologies such as React, HTML, CSS, NodeJS, and MySQL. There would be two types of users on this platform - those who are willing to get paid to use apps, and developers who are seeking these users and are willing to pay for the simulated activity. The developers would be able to scroll through and hire specific stock users, and directly outline to them their tasks. After hiring a stock user, the developers would be able to leave a review on how well the stock user accomplished his task. The goal of this research is to build a prototype platform and test it with real companies trying to release new applications that could potentially benefit from this tool. I would use this prototype

and testing to determine the effectiveness of the platform itself, and if it is a viable way of alleviating the problem of attaining users for app developers. If viable, this prototype would hopefully encourage the development of a production-level platform that could be used by people all over the globe.

The Effects of Techniques Used by App Developers to Retain Users

What techniques do app developers use to make users "addicted" to their platforms in order to increase user retention? What effect do these techniques have on the users, and should these techniques be regulated?

"There are only two industries that call their customers 'users': illegal drugs and software". (Orlowski, 2020) This quote by Yale Computer Science Professor Edward Tuftle effectively portrays the massive tech industry, as companies have spent years and millions on research and engineering to evolve their apps to use specific techniques in order to optimize user retention. This paper will be focusing on the influence that these apps have on users, specifically looking into the techniques that app developers use to manipulate users to make the users "addicted" to their platforms in order to drive engagement on the platform. The problem is that the technology companies tend to focus solely on revenue generation without considering the potentially harmful effects that these techniques have on their users, and there is no regulation preventing this problem. There is currently literature and media describing the problem of phone addiction that these companies perpetuate. However, there is limited information regarding the background and motivations behind designing these technologies, since the majority of this information is proprietary and unreleased by the companies who develop them. As people become more and more reliant on mobile technology, it is extremely important to fully

understand this problem and the effects of these technologies in order to ensure that long-term, detrimental harm is not inflicted on them. It is also important to fully understand this issue in order to effectively determine whether or not regulation is necessary, and if so what regulation could potentially look like.

App success is directly related to how much revenue the app generates. There are two main paths to monetization that apps use to generate revenue - direct purchasing (ex. subscriptions, in-app purchases, paying to download the app) and advertising (free for users). The majority of the most downloaded apps in the world, such as Instagram, Facebook, TikTok, Google, Snapchat, Twitter, along with many others, use the advertising model to generate revenue, as they allow users to use the platforms completely for free. (Curry, 2022) Since users are able to use apps for free, revenue is directly tied to how much time they spend on the app: more time spent on the app leads to more advertisements being shown. As Tristan Harris, former Design Ethicist at Google, puts it: "[Users'] attention is the product being sold to advertisers". (Orlowski, 2020) While users believe that they are using the applications for free, they are actually the product themselves, as they are giving their attention and data to the apps in order to increase the success rate of advertisements. For these types of companies, in order to get more funding and increase valuations, they need to increase the amount of time that people spend on their apps. (Andersson, 2018) It's not just enough to get the users on the platform initially - research and engineering need to be done in order to continuously increase the average daily time spent on the app.

In order to increase daily time spent on their apps, some companies will directly target the psychology of humans in order to effectively manipulate their users. Many of the biggest development companies have entire teams of engineers dedicated to "growth hacking", whose

job is to hack people's psychology so they can get more growth, such as more user signups and more engagement. (Orlowski, 2020) Previous VP of User Growth at Facebook Chamath Palihapitiya explains "We want to psychologically figure out how to manipulate you as fast as possible and then give you back that dopamine hit. We did that brilliantly at Facebook." (Orlowski, 2020) Companies such as Facebook work to specifically increase the amount of dopamine that you get from using the app since an increase in dopamine is directly correlated to developing an addiction. (MACİT et al., 2018) They use the psychological technique of positive intermittent reinforcement in order to keep users constantly checking their devices. (Wilding, 2017)

There are a multitude of different techniques that have been developed and are used across many popular apps in order to increase retention and engagement. One such example is the infinite scroll, developed by engineer Aza Raskin. **(**Andersson, 2018) This is a design technique where apps will automatically load the next page of content or next video so that the user can keep scrolling "infinitely". Another such example is the use of log-in streaks. Apps such as Duolingo and Snapchat gamify their platforms by introducing usage streaks in order to keep users engaged and coming back to their platforms. Apps also take advantage of the phone's built-in notification system. For example, when a user doesn't log in for a while, apps will send a notification reminding them to come back. Finally, we will look into the recommendation system that many apps utilize to personalize experiences for their users, automatically suggesting content based on a user's perceived interests. Recommendation systems are specifically designed to try to introduce users down "rabbit holes" topics such as fake news or conspiracy theories. According to an MIT research study, fake news spreads about 6 times faster than real news, so it is beneficial for companies to recommend false information since it makes them more money.

(Dizikes, 2018) This paper will dive into how these techniques work and examine their effectiveness.

The research paper will make use of a wide variety of different sources of evidence in order to fully understand the design and effectiveness of these techniques, the impact the techniques have on users, and the regulation that could possibly be introduced. To understand the motivations for designing these manipulative techniques, the paper will include quotes from interviews and articles of past executives and engineers at technology companies. To show the effectiveness of the techniques, the paper will utilize screen time and app usage statistics over time. The paper will also take advantage of public documents and information released by the companies themselves to shareholders that describe company motivations to increase daily active user and engagement metrics. One example of this is the public Duolingo Engineering Blog which describes the "habit-building research behind your Duolingo streak". (Mansur, 2022) To understand the effects of these techniques on users, the paper will dive into psychological literature describing the effects of certain mobile apps on users' psyche. (Neyman, 2017) The paper will then look at critiques of addictive techniques by certain critics, such as those at the Center for Humane Technology. Finally, I will look at transcripts of congressional hearings, such as the Senate hearing on persuasive technology (*Disrupting Dangerous Algorithms: Addressing the Harms of Persuasive Technology,* 2021) and the testimony of Mark Zuckerberg regarding Facebook's data and misinformation principles to better understand the government's view on some of these technologies and gather information on how possible regulation has been pitched. (*Zuckerberg Testimony,* 2020)

In closing, this paper will attempt to bridge the understanding between a company's motivations and the development of addictive, manipulative techniques on their mobile apps and

how it potentially affects the users negatively, ending with a discussion on possible regulations that could be enforced by the government.

Conclusion

This paper is essentially focused on the mobile app industry, looking into the motivations of app developers, how they focus on solving the problems of attaining and attracting users, and how these apps have had a massive amount of influence on their users. I hope to bridge all of these topics under one paper that effectively describes the different problems and conflicts. At the end of the project, I hope to better understand how the future of mobile app technology could be shaped in order to avoid harm to users, which would potentially be useful for future discussions of regulation.

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