A Change of Environment Is Refreshing: How Current Business Models Are Engineering Ways To Utilize Human-Computer Interaction Implementations To Take Advantage Of Vulnerable Human Psyche In Social Media

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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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Introduction

"If you're not paying for the product, then you are the product."

— Daniel Hövermann

In the 21st century, the world saw exponential growth in social media platforms. With online media consumption accounting for 33% of daily internet activities and an average time spent of 2 hours and 15 minutes a day on these social networking sites, it is safe to say that social media has become an integral part of people's lives (Zainuddin, 2022, p. 1038). Social media can help people stay connected, share and exchange knowledge, provide a platform, and many other beneficial interactions. However, this growth shouldn't be completely attributed to the central idea that everyone wants to connect and interact, but rather a flawed model of revenue that takes advantage of the vulnerabilities of the human psyche.

Many of the world's top social media platforms such as Facebook recorded over 1.09 billion daily active users in March of 2016, Instagram at 400 million weekly users, and Twitter standing at 310 million monthly active users (Zainuddin, 2022, p. 1038), they are all free to use and functions under the basic premise of capitalism. To generate revenue, these social media applications utilize user attention as a form of currency. "Increasing personal activities can bring profits in a short time." was a quote from a research article with the purpose to utilize deep neural networks and evolutionary algorithms in social media to optimize marketing (Bian, 2021, n.p.). It is in the best interest of these social media companies to retain user attention from a for-profit standpoint. Applications that utilize this type of business model to develop psychology-based strategies aimed at purely retaining total user time spent without any consideration of the user's mental health.

To properly tackle this issue we must understand the current human-computer interaction implementations prominently utilized in social media applications. With an established common understanding, I will explore some of the short-term and long-term effects on the users who interact with these features. Additionally, I will leverage Ze ̆igarnik's research as a sociotechnical framework to analyze features implemented by social media companies in their platform. Using that as a framework I argue that the fundamental change isn't just needed on an engineering level but rather on the entire business model that drives the goals of engineered solutions.

Problem Definition: The Effect of Human-Computer Interaction Design From a For-Profit Perspective and The Social and Technological Problem it Creates

When one thinks about addiction, perhaps they will think about drugs or alcohol, rather than the internet. The National Institute on Drug Abuse developed a framework called the "disease model of addiction" stating that "drugs cause biological euphoria by promoting the release of neurotransmitters, preventing their re-uptake, or mimicking their effects."(Friedman, 2021, n.p.). We see a similar function of the release of neurotransmitters when it comes to digital addiction. In a study published by the National Library of Medicine, Doctor Small and his team published an article on "Brain Health Consequences Of Digital Technology Use" and concluded that "frequent use [of digital technology] heightens ADHD symptoms, interferes with emotional and social intelligence, can lead to addictive behaviors, increases social isolation, and interferes with brain development and sleep." Dr. Smalls and his team found that excessive and pathological internet use shares feature similar to substance-use disorders and pathological gambling (Small, 2020).

A paper examining the impact of social media on mood and body dissatisfaction using ecological momentary assessment from the Journal of American College Health has concluded that there is a positive correlation between the number of sites visited and body dissatisfaction. The number of sites you visit can equate to how many scratch-off tickets you scratch. Every time you open social media and see materials that display the best of someone, it will affect your view of yourself since it's human nature to compare. Opening more and more of these "scratch-off tickets", will start to take a mental toll on you (Bennet, 2019). Those who develop body dissatisfaction based on the thin-ideal social media pushes will often result in frustration toward fatter body images. This frustration will then lead those who are affected, mostly young women, to make choices to obtain the desired image they saw on social media such as a new diet, new exercise routine, and surgery (Pilar Aparicio, 2019).

In another paper titled Addictive Use of Smartphones and Mental Disorders in University Students, instead of concluding with the idea that overuse and addiction to smart devices lead to an overall negative effect on their mental health, this paper concludes with the opposite. Out of the many papers I explored, this paper stood out as it is the first to talk about how poor mental health can lead to an addiction to smart devices. This correlation is scary in the sense that it makes smartphone addiction a way more daunting topic. It's now a positive feedback loop of application addiction and poor mental health, where not only does utilizing social media applications cause addiction and damage the overall user's mental health, those who are already affected by mental health started to become reliant and dependent on these social media applications as a form of dopamine. The more addicted you are to smartphone usage, the poorer your mental state is, the poorer your mental state is, and the more reliant you become on your smart devices (Alavi, 2020). Investigating the relationship between social media, general anxiety

disorder, and traits of emotional intelligence it was concluded that social media obsession has a significantly strong association with general anxiety disorder. Prior studies have also reached similar conclusions that intemperate social media usage and anxiety, depression, stress, and other emotional/mental disorders (Farid, 2022). The prevalence of depression has been identified as a health epidemic across the world. The level of social media addiction is related to time spent on social media, and with that social media contributed to narcissism as well as lower levels of happiness. “Unhappy people use social media to be happy, whereas those who are truly happy have less social media addiction.” (Ciplak, 2020, n.p.).

“Desire is the productive motor of social media in a regime of cybernetic capitalism” (Friedman, 2021, n.p.). Engineering can cause rapid cultural changes which in turn affects technological systems and social systems. The benefits of something such as social media can create a sense of connectedness across different geography, an instrument to find a job, and not to mention giving a platform for those who want to share. However, somewhere along the way business models of many applications we see on smart devices have become fundamentally flawed in the sense that it no longer serves the best interest of the customer but profit for the business. Utilizing time (user retention) as monetary currency, this type of business model dominates the free application market. To maximize profit in this sense, these business models have implemented tactics and features in their applications to capitalize on time spent on application by taking advantage of vulnerable human psychology, going as far as studying user interaction to predict user behavior. Designing applications that exploit the psychology of the human brain creates an addictive behavior similar to tobacco. (Sapone, 2021). This addictive behavior often overlooked as harmless, can lead to many negative mental health issues as seen above. As smart devices and applications like these become more and more prominent, it is in

the best interest of the businesses as well as the users to take a step back and analyze just what kind of social psychological techniques are currently utilized by big tech as well as challenge the current model of business to produce products that keeps the consumers' best interest as the main priority instead of profit. This change will create different problems to solve and broaden the perspective of engineers to keep different aspects of the user in mind instead of the company's revenue resulting in an overall solution that is more adaptable and less prone to create more problems down the road.

Method: Looking Through The Lens Of Sociotechnical Frameworks

One element used to prolong the usage time of social media apps is called the Ze ̆igarnik effect/Ovsiankina effect. The Zeigarnik effect came to be when Zeigarnik conducted a study where she interrupted her participants while they were trying to solve a puzzle. Afterward, those who best remembered the tasks were the ones who experienced interruptions. Rickers-Ovsiankina then observed that not only do these people seem to remember the tasks better, but several participants had the urge to come back and try to finish the unfinished tasks even after the experiment had ended. These classic works from the field of psychology suggest that those involved in the execution of a high-investment task experience emotional strain if they get interrupted. In Freemium games like Candy Crush Saga, players are often interrupted when a "super hard level" is approaching. Often rumored as being impossible to accomplish on the first try, players experience emotional strain and then the players try to resolve that strain by coming back to it later or spending money to continue playing the game. (Christian, 2019) In this article, the authors explore five more psychological mechanisms utilized by social media apps and freemium games to gauge attention retention. With Smartphone Use Disorder associated with

negative emotionality and loneliness, it is in the best interest of users to inform them about just how easy it is to take advantage of human psychology.

In Zeigarnik's study, she talked about memory functions and actions regarding interruption. Zeigarnik concluded that of those participants in her study who got interrupted while performing a task while solving a puzzle, they remembered the task better and felt the need to go back and finish the task. This classic work of psychology shows the emotional strain of interruption on an individual while executing a task. Similar features can be seen in today's top freemium games such as Candy Crush Saga. Solving the puzzle is one thing, however as you keep playing, these puzzles become progressively harder, some say even impossible on first or second attempts. The user often gets prompted a message of "super hard level is approaching" during their play causing the user to be more invested in their current level to get to the next level. If the user fails to complete a level, the game will prompt users to a menu to spend money to keep on playing. This produces an emotional strain on the user as the interruption they experience is causing them to feel the need to get to that next level.

From what we know so far regarding the effects of human-computer interaction implementations having unforeseen negative effects on the users it is merely scratching the surface of the problem. If one wants to design ethical technology, societal impacts, and the broader picture must be considered instead of looking at the issue from a profit standpoint. This continuation of disregard for human psychology will cause more harm than good. Many of the studies we see today that show the negative effects are merely short-term effects, the long-term effects of these implementations could be way more negative than imagined. By using the Zeigarnik effect as a framework while evaluating the current implementations of these human-computer interactions, it will give us a better understanding of usability, intended

effectiveness, and of course unintended consequences. Implementations, where profit is the main scope, are not ethical and companies who go about that route should reevaluate their design as a whole as well as set up future prevention measures so something like this won't happen again. Creating conversation by talking about some of the current prominent features implemented in big tech along with the psychological effects will be a mere first step into fixing this deeply rooted issue. I will delve into the ethicality of such implementations in addition to why we must be wary of such features. In the end, we will wrap up everything by looking at current suggestions to regulate such an issue and explore new ideas to challenge current standards.

With more than 2.71 billion humans utilizing a smart device of some sort around the world, it is only fair to step back and talk about the potential negative impacts of utilizing smart devices, more specifically utilizing the applications the smart devices have to offer. It is not new news that app developers and businesses have pivoted from a subscription or payment structure to utilizing their app, rather they now see a bigger market of opportunity in the world of exchanging user attention and time for revenue generated by advertisements. This scope has caused many of the current businesses to approach issues they are targeting not from a perspective of solving a problem or providing a service that betters the life of users, but rather how to retain user attention for as long as possible to generate more revenue. In the end, money not made is money lost from their point of view. The aim of a research paper titled "Addictive Features of Social Media/Messenger Platforms and Freemium Games against the Background of Psychological and Economic Theories" utilizes theories such as mere-exposure effect, endowment effect, and Zeigarnik effect to analyze this business model that we've seen in recent smartphone app development. The goal of the paper is not to challenge the advantages of smartphones but rather question the tactics business models utilize that have unintentionally

detrimental effects on the user's mental health, all for the sake of revenue. Associations of increase in anxiety disorder, depression, and other mental health issues have been observed.

Applications these days are designed to be as immersive as possible. One of the current prominent features we see today is this endless scrolling/auto-streaming feature. Where one's content feed never seems to end and a video, generated based on your interests and watch patterns, will automatically start once the video you're currently viewing has come to an end. This is called flow. Flow is a positive thing for humans as it promotes high productivity and gives one a stronger sense of control and accomplishment in the task they are doing. However, this implementation in applications that is more on the side of entertainment abuses this effect. The user feels a sense of flow when they utilize these social media applications and freemium apps, however, this type of flow is captured by short attention spans, quick dopamine increases, and the user feels the need to chase that continuous stream of dopamine will lose their sense of time and space while using the platform. This technique combined with AI-powered learning algorithms that learn from your actions and patterns to generate videos specific to your taste is a daunting combination. It comes down to your ability to self-control against top engineers that are working countless hours.

Psychological Mechanisms Built-in Social Media/Messenger Apps and/or Freemium Games	Example/Illustration
Endless scrolling/streaming	As soon as one video is at the end on a website such as YouTube, the next video begins with either a similar content or the second episode of a TV show and so forth. By this, viewers get more and more absorbed, which makes it hard to stop watching.
Endowment effect/ mere-exposure effect	Every time players visit the app platform and invest more time in the construction of the virtual world, it will get harder for them to detach from the game or even delete the app. The endowment effect might be both explained by ownership and loss aversion. Also, of importance is the mere exposure effect describing that the more often you are exposed to a certain (neutral) thing or application (here a game), the more you like it.
Social pressure	Illustration from a WhatsApp feature: If a user sends a message to a friend, the sender is presented with two gray ticks, which means that the message has successfully arrived at the recipient's phone. If the recipient reads the message, the grey ticks turn blue. As both sides know about these rules, social pressure emerges. Both parties likely expect a fast answer, above all, if the message apparently has been read.
Show users of an app what they like	Facebook has a great interest in studying the behavior of each person at perfection and in much detail, so that at best only such information is presented in the 'Newsfeed' which is most interesting for the user. Otherwise, people could get bored and close the browser window.
Social comparison and social reward	Perhaps one of the most prominent features of social reward mechanisms in social media is the iconic 'thumbs up'. A 'thumbs up' ('Like') demonstrates either positive social feedback on one's own post or gives another person such a feedback.
Zeĭgarnik effect/ Ovsiankina effect	The Zeigarnik effect refers to better remembering of tasks, where a person has been interrupted. Rickers-Ovsiankina then showed that such interrupted tasks are more likely to be finished later on (even if one is not forced to do this). Illustration: Some levels in Freemium games are very hard to solve and in case of Candy Crush Saga it is even mentioned that a "super hard level" is coming up. As some of these levels are "super hard" to solve (rumor has it that it is even impossible at first try), players easily loose several of those free lives ending up with no energy to finish this "super hard level". Being now really attracted by the game, this results in emotional strain which consequently provokes people to spend extra money to buy additional lives/gaming energy, because the next level is only a couple of minutes away.

Table I: Psychological Mechanisms Built-In Social Media/Messenger Apps and/or Freemium Games

By looking at the above elements/features observed in current popular applications and games, one can conclude that there is a positive correlation between the use of these designs and prolonged app usage. These features have an underlying addictive nature. It is important to continue to talk about the ethicality of such implementations. With Smartphone Use Disorder already correlated to negative emotionality and addictive behaviors similar to tobacco and alcohol perhaps it's time to take a step back and hold those implementing these mechanisms accountable.

Results: A New Implementation That Is More Formidable Than Those Before

One feature that became apparent to social media users came with the explosive rise in TikTok, this content-sharing application that focuses on short full-screen videos that have endless

scrolling. This type of application, integrated with an extremely well-written algorithm that learns what the user likes and then provides content tailored to the user's taste, becomes a dominant force to keep people's attention on the application as long as possible.

There are many good parts of utilizing social media such as sharing content regarding well–being or resources that can aid in mental health issues, chronic use of social media can lead to low self-esteem, disturbed sleeping patterns, and an overall negative impact on your mental state (O'Reilly, 2020). In O'Reilly's paper, she observed the perspectives of adolescents aged 11-18 while being told to discuss the good, the bad, and the ugly sides of social media. O'Reilly concluded in the paper that there are positive as well as bad things social media can bring, it is an extremely complex problem that needs a lot of research. However, I believe that just because we don't know the full extent of an issue, doesn't mean we shouldn't educate ourselves on what we currently know. There was a near consensus that social media addiction can lead to many negative mental health issues, that alone should be enough to start exploring the possibility of regulations regarding the usage of social media.

If you utilize some of the popular social media applications such as Snapchat, Youtube, Facebook, or Instagram today they all now have a feature similar to that of TikTok. Facebook has Watch, Instagram has Reels, Snapchat has Spotlight, and Youtube has Shorts. These big social media companies are seeing that more and more people are spending their time on TikTok. Not only is TikTok an "unlimited" source of entertainment but rather it is the go-to search engine for some teens. Businesses consider that and implement features just like TikTok in hopes to reap some of the customers. Utilizing Zeigarnik research as a framework we see this is just an implementation that retains user engagement with the application.

The findings in the above examples reinforce my ideas that there need to be more educational resources regarding the additive effect of social media. Conversations must be prompted to show the importance of regulation and research regarding social media. The first step to combat a problem that is already deeply rooted in our society is to educate. With education comes a better understanding then comes better implementations and regulations regarding the ethicality of features being implemented in these applications. Ethics of care is an approach that current businesses must try to adapt into their business model. As developers, the goal should be to accomplish an area of need for the user as well as care for the user's overall well-being. A system under capitalism driven solely on profit deviates from the fundamental idea of why capitalism works; to serve the best interest of the people. This observation can be further supported by a research article titled, "Effects of Short Video Addiction on the MOtivation and Well-Being of Chinese Vocational College Students". As short video flow results in a positive effect on video addiction while simultaneously having a negative effect on intrinsic and extrinsic learning, and learning well-being (Ye, 2022). It is impossible to eliminate such a prominent content delivery system as nearly all social media companies have adopted it as an attempt for monetization. There are ways to improve the situation such as educating consumers regarding the possible negative consequences of consuming large amounts of this type of content, in addition to suggesting that governments should set regulations on implementation such as short video content delivery. It is a necessity to prompt proper internet usage.

Conclusion

To prevent social media companies from implementing features that take advantage of the vulnerable human psyche, the current business model needs to be completely reimagined and taken from a different approach. The freemium model has to be challenged and removed as the business will shape that model to seek revenue in a different way such as advertisements capitalizing on user total time spent. This thinking creates problems with solutions intended to keep profit as a goal instead of focusing on the user.

By analyzing the goals of these implementations, and utilizing the foundations Zeigarnik has established, this research aims to create conversation. In turn, I hope to convince future developers to keep ethics in mind when serving the people, and I hope to convince businesses to develop an ethical architecture for all implementations to go through before releasing the products to the consumers. Internet-related mental health impacts have promoted increasing research interest, and further studies have to be done. If companies keep these things in mind when providing their services, it creates a better cohesion between their target consumer as well as their business. Perhaps even staying away from the freemium model into a subscription-based model should alleviate the aim not at profit driven, but rather users.

Resource

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