Social Media's Inherent Ties with Dark Patterns and Artificial User Engagement

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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:

Recent evidence indicates that an uptick in social media usage among adolescents is leading towards increased likelihoods of being diagnosed with depression and anxiety disorders (Twenge & Campbell, 2018). Design decisions implemented in the front-end design of the most popular current social media platforms promotes addictive behavior towards social media and increased prevalence of emotional issues such as FoMO ("Fear of Missing Out") or low self-esteem, particularly among the adolescent population (Sha & Dong, 2021). Alongside such issues, adolescents are also highly susceptible to identity issues that are further compounded through the design of current social media platforms. While the majority of existing research surrounding social media has been conducted on adolescents, these design decisions affect the wellbeing of the user base as a whole.

Social media as both a technology and concept has numerous actors exerting their influences on one another (Latour, 1996). In this thesis, Actor-Network Theory will be used in order to analyze how actors such as social media companies, the intrinsic concept of social media itself, and the user base primarily interact with each other. In addition, the concept of social comparison theory plays a key role in shaping the interactions of the user base with the social media platform itself. Meanwhile, governmental bodies regulate the extent of how social media companies may take advantage of natural human inclinations to increase user engagement. The focus will primarily be on the definition of social media itself and each actor's core motivations or interests along with their root causes. Analyzing how the developers behind current social media platforms, along with the broader concept of social media itself as a whole as an actor, helps us examine how users' mental well-being are being affected. To effectively use Actor-Network Theory, it is necessary to define what social media truly is; according to Merriam-Webster, it is defined as "forms of electronic communication (such as websites for

social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (such as videos)" (Merriam-Webster, n.d.).

With the given previous definition of social media, the primary research method incorporates a comprehensive literature review, in which pre-existing studies, data, and other relevant publications on this topic will be analyzed in order to determine both the scientific consensus and the user base's opinions on social media. Such research will also be used in order to ascertain how different user bases are being affected by modern social media software design, specifically focusing on recent trends. Furthermore, case studies and personal testimonies will be incorporated as a means to provide a more personal and real-world dimension to the scientific literature.

In our current social media landscape, major social media companies such as X, Meta, and Instagram are not transparent enough about the inherent dangers that social media poses towards its users. Often, major social media platforms purposefully include hidden malicious forms of addictive algorithms and software design in order to retain and attract users and their engagement. These sophisticated software design practices are called "dark patterns", and can be summarized as "tricks used in websites and apps that make [users] do things [they] didn't mean to" (Deceptive Design*,* 2022). These include, but are not limited to, deceptive functionality such as difficult-to-cancel subscription services or disguised ads (Federal Trade Commission, 2022). Arguably, even common design practices in social media such as the implementation of an "endless scroll", where a user can scroll infinitely, or a "like button" can be considered dark patterns, as they trick the user to engage with the software more than intended. The full dangerous extent of these elements, which have been shown to worsen users' mental health and

promote addictive behavior, are not clearly explained to its user base, if even at all. While computer scientists and developers must strive to create and implement software design decisions that promote healthy behavior among all users, social media companies must also be fully transparent towards its users, explaining and emphasizing the full extent to which individual software decisions can cascade into a series of negative effects on its user base. Furthermore, the government must pass new laws that combat malicious software design and dark patterns, alongside better enforcing current policies on the current dominant social media platforms.

Literature Review:

From the start of the 21st century, phone usage and social media usage among adolescents has gradually been increasing, resulting in various negative consequences towards adolescents (Twenge & Campbell, 2018). While there exists a lack of studies conducted after the Coronavirus pandemic, studies prior to the pandemic have demonstrated an increased usage of social media among adolescents (Anderson & Jiang, 2019). This increased social media usage and online presence among adolescents has been shown to result in an increased likelihood of mental and emotional issues, alongside other negative health effects. Yet, adolescents themselves tend to favor social media despite its statistically demonstrated negative effects on its users. In one study, adolescents were surveyed in order to determine their opinions on social media, including the aspects of social media they liked and disliked the most, in which there appeared to be a general consensus among adolescents themselves in believing that social media is more of a boon than a bane (Anderson & Jiang, 2019). Despite the overall positive opinion on social media from adolescents, many recent studies have also linked an increased usage of social media to

higher stress levels (Fabris et al., 2020). On a similar note, the average screen time of teenagers has risen to a mean of 7.70 hours per day (Nagata et al., 2021). Many other studies have noted correlations between higher screen time rates and worsening mental health or general psychological well-being (Apurvakumar & Pragya, 2021).

Certain software design elements of social media, such as gamification elements, can also lead to increased social media usage and addiction. According to the Oxford Dictionary, gamification is the "application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity, typically as an online marketing technique to encourage engagement with a product or service" (Oxford University Press, n.d.). By utilizing gamification elements such as the implementation of leaderboards and numerical point-based systems, platforms are able to increase engagement in various activities (Jemma Looyestyn et al., 2017). While there is a lack of studies done specifically on how gamification elements in social media impacts individuals, there is much literature surrounding gamification itself as a concept and its usage in increasing engagement among users. One such study analyzed that the incorporation of gamification elements positively affects the learning of students, stimulating competition between students through leaderboards, introducing game elements to an environment in order to promote interest in order to promote a state of "flow", one form of high user engagement (Andrade et al., 2016).

Motivations of Social Media Actors

The motivations and interests of social media companies inherently conflict with that of its users. Financially, the dominant social media companies in our social landscape are motivated by two primary factors: retaining users of the specific social media and attracting new users. In

order for social media companies to continue providing their services, they must receive enough revenue to maintain their yearly upkeep; the primary method being advertisements paid for by companies or individuals (McFarlane, 2022). While the software itself is free-to-use, social media companies such as X, Meta, and Instagram are incentivized to grow, retain, and "engage" their users as much as possible such that these paid advertisements have the largest amount of exposure possible. Developers such as the co-inventor of the Facebook "Like" button or the inventor of the "infinite scroll" functionality have stated that major social media companies are all competing for the same limited resource: the users' attention span (The Social Dilemma, 2020). In the Social Dilemma (2020), a Netflix documentary on the ethics of social media design practices, one former employee of the search engine Firefox & Mozilla Labs states that "because we don't pay for the products that we use, advertisers pay for the products that we use, advertisers are the customers— we're the thing being sold". Similarly, one well-known Facebook early investor, Roger McNamee, mentions that while originally the tech industry made money through selling products, with the advent of free software like social media, the new way for tech companies to make money is through "selling their users" (The Social Dilemma, 2020).

Having proven metrics of being able to advertise specific content to millions of users results in more sponsorships and paid advertising, creating a cycle where the primary motivating factor of social media companies is to keep the user base engaged as much as possible. While users themselves aim to discover new information from social media, the current social media architecture is not fully transparent about the tactics it employs to retain user engagement. Users themselves are not looking to engage in these online communities as much as possible; rather, it is the software design of software that is resulting in users engaging more with social media than ever before. Hansen, writing in Harvard Business Review, noted how during their adolescent

years, they would constantly neglect their studies and browse social media instead. Despite the fact that they themselves remarked how “most notifications [they] got were surface-level comments or passive “likes” that didn’t really mean anything” (Hansen, 2022), they were unable to stop checking their social media, even blaming themselves for this problem. Psychologist Nicholas Kardaras explains how designers of platforms such as *Meta* and *Instagram* have designed the software in such a way so that the users are unable to bring themselves to stop using social media. On a similar note, one UCLA study conducted on adolescents aged 13 to 18 showed that adolescents were more likely to “like” posts with large numbers of likes on them already, even if they were photos of people engaging in risky behaviors or activities. The lead researcher of the study, Lauren Sherman, claims how “peer pressure to conform has long existed, but online likes are different. ‘In the past, teens made their own judgments about how everyone around them was responding… When it comes to likes, there’s no ambiguity’” (Wolpert, 2016).

In the current social media landscape, all major company actors employ the usage of specific algorithms and design elements that have already been previously demonstrated to promote addictive behavior in its users, without the users’ consent or knowledge. In one study, adolescents were surveyed in order to determine their opinions on social media, including the aspects of social media they liked and disliked the most. Despite the fact that many recent studies have linked an increased usage of social media to higher stress levels (Fabris et al., 2020) and other similar negative factors, there appears to be an overall positive opinion on social media from adolescents (Anderson & Jiang, 2019). The discrepancy between the generally favorable views towards social media among adolescents and the harm that it inflicts on its users (e.g. FoMo, higher stress levels, higher rates of depression and anxiety disorders) shows that the methods in which social media garners and holds onto user “engagement” is not being properly

conveyed to its audience: the user-base. In addition, it is important to note that while the target population for the majority of these studies may be adolescents, these design methods meant to retain engagement affects all users, not simply the most vulnerable populations.

Software Developers in Social Media

Software developers play vital roles in not only the development of social media algorithms and design, but also their overarching impacts on users. While software developers themselves are bound by the decisions of business executives of social media companies, they are still responsible for the consequences of the software that they design. As professionals, developers often have large amounts of experience in designing software that will engage the user to continue using their software, utilizing basic human psychology in order to nudge the user into doing the specific actions that the developers want them to take (Yablonski, 2024). In addition, users engage with software with specific *mental models,* or what users believe a system or software should look like, in mind. These mental models tend to be the industry-standard, and as such, can be difficult to stray away from (Loeffler et al., 2013). As users expect the design of social media to already be a specific way, which already tends to negatively impact the user, it becomes difficult for software developers to push a product that doesn't follow the same harmful design practices that are already being implemented in many social media platforms. Nevertheless, the design strategies originating from software developers are core to the business models of social media, and as such, also play key roles in the increasing amounts of screen time and growing addiction rates among users. Without the expertise of software developers in understanding how users tend to interact with the software that they make, social media companies would never be able to create a product that is able to excessively engage users.

Software developers may face ethical dilemmas between prioritizing their job security and implementing software that they know may cause the user future problems. In one whistleblower case, court documents reveal that the CEO of Meta, Mark Zuckerburg, had already known about the negative impacts that Facebook and Instagram poses towards their users, with children and adolescents in particular (Mehul, 2023). Since then, there has not been any major movement by the company in changing the design policies and algorithms behind the social media platform. While the software developers at the company have the technical capability to create healthier digital environments for the user, their ability to influence change is often constrained by executive decisions. In some situations, software developers might risk job security by pushing for change that lacks executive backing, ultimately not resulting in physical change to the platform itself. Conversely, some software developers may advocate for the implementation of less harmful design practices, or may also opt to work in environments that prioritize more ethical design practices. Nonetheless, the motivations of software developers are often tied between the ethical consideration for the user and the company's internal desire to pursue profit.

Social Comparison as an Actant

While more traditional actors such as social media companies, users, and social media itself have already been analyzed, it is just as important to understand the role that abstract concepts play in this complex network of the current social media. To expand on this idea, the inherent structure of social media platforms themselves (commonly built with a public, numerical "like"-based and "follower" system) negatively impacts users by subconsciously causing them to compare themselves to the best moments of other users' lives. While the primary

purpose of social media is to facilitate ways of sharing information and experiences between users, there is a tendency for users to only post the best moments, or "highlights" of their lives. When users are able to see enormous amounts of likes on some posts and not others, follower counts, and other public forms of social comparison, this type of social environment breeds both perfectionism and lower self-esteem (Messinger, 2019). In one testimonial, Miranda, an 18-year-old from Cambridge emphasizes (Marsh, 2016):

> "I certainly feel the pressure to be perfect and it has got to the point where it's damaging my health. Social media is the main culprit. I had to delete my Instagram account because it would actually make me cry. I am a mature person with a firm grip on reality, but I have so many peers whose lives seem so perfect and sociable that it left me feeling worthless and lonely."

As Miranda states in her testimony, intrinsically, social media users are inclined to share the best moments of their lives and receive social validation from their peers. Yet, in a paradoxical nature, what is supposed to be a medium that generates shared community among its users becomes a medium that promotes inferiority from certain users towards the other users. Nevertheless, despite knowing the fact that much of the content on social media is purposefully crafted in order to present the best aspects of one's life, users simply cannot help but compare themselves to one another. This concept, known as *social comparison*, initially proposed by social psychologist Leon Festinger, explains that "individuals learn about themselves and subsequently alter their self-perceptions by comparing and evaluating their traits, abilities, and opinions against those of other people" (McIntyre & Eisenstadt, 2011). In essence, social media, by nature of being itself, appears to facilitate social comparison among its users in a negative way.

Social comparison plays a notable role as an actant, acting as one of the primary driving forces behind how users engage with the platform. Users who compare themselves more on

average than other users tend to have higher rates of mental problems such as depression, anxiety, or stress (Gibbons & Buunk, 1999). According to one study, this tendency for certain users to compare themselves more often than others results in lower psychological well-being, and is generally also accompanied by a more unstable self-concept (Butzer & Kuiper, 2006). In order to appease this unstable self-concept, certain users aim to compare themselves with others as a means "to reduce their self-related uncertainty" (Reer et al., 2019). These users, high in *social comparison orientation (SCO)*, the amount in which a user compares themselves to others in respect to the average user, engage with social media in a cyclically negative manner. As an example, a user may see images of highly idealized, conventionally attractive profile pictures on their feed. The action of viewing these idealized images often results in the user having lower body satisfaction in themselves (Fardouly & Vartanian, 2015; Haferkamp & Krämer, 2011). While these studies do not examine the specifics as to what happens next, it is highly probable that these same users who view these idealized images and feel worse about themselves consequently engage in the same practice. That is, in portraying themselves through more idealized images than what may actually be in reality. As more content becomes seemingly perfect and highly idealized, more users see this trend and post images of themselves in highly ideal depictions too. In short, this culture of unrealistic content is in reality partially, if not entirely, the product of social comparison as an actor itself. Social comparison governs user action, creating a growing culture of more social comparisons, and then further influences even more users once again. Yet, each time that social comparisons and user action loops into one another, it only grows larger as more and more users see this highly idealized content and join in accordingly, eventually forming communities and platform-wide cultures that are harmful to its users. Thus, social comparison has a large amount of agency in not only users' emotional states,

actions, or decisions, but also the forming of communities (and social media platforms accordingly).

Third-Party Actors (Advertisers)

In this analysis of the current social media landscape, one must also acknowledge the role that third-party actors such as advertisers play amidst this conflict between the interests of social media companies and its userbase. While individual advertisers may belong to completely different acting groups, each of which with their own different motivations, the concept of paid advertising and sponsorship itself has large implications on social media as a whole. For instance, a well-meaning mental health professional specializing in social media addiction may pay a social media platform for advertising their services in order to attract more patients. Despite their good-natured intentions of looking for social media users in need of mental health care, by nature of being a third-party entity paying money towards social media companies for sponsorship, the mental health professional in turn contributes towards the agenda of social media companies. Thus, it is not the individual motivations of each third-party advertiser that we are concerned with, but rather the notion of third-party advertising as a whole.

Third-party advertising itself, generally used to solidify a brand (Gensler et al., 2013), forms a symbiotic relationship with social media companies through the intricate interplay between the two actors. Firms aim to create a brand, promote their image, or create brand stories, now through "a dynamic, ubiquitous, and often real-time interaction enabled by social media" (Gensler et al., 2013). While traditional advertising before the advent of social media was done primarily through forms such as television, telephone, or radio marketing, as well as print and word-of-mouth advertising, social media allows firms to cast a wider net over potential

consumers than ever before. Using techniques such as viral content, consumer engagement efforts, or social media contests, companies are able to attract larger swaths of consumers than ever before.

Targeted Advertising

Additionally, through carefully-crafted algorithms, social media companies can tailor the advertisements that a user is most likely to like based on their previous searches or related browsing habits, resulting in the higher screen time usage for the user. On successfully presenting a user with an advertisement that garners their interest, the user is more "engaged" than prior to having seen the advertisement. One such example of this can be seen in a scene of the documentary *The Social Dilemma* (2020), where the main character, Ben, a teenager, grows more and more addicted to social media. One scene in particular highlights the danger in targeted advertisement, depicting the three AI characters holding an auction of sorts for different third-party advertisers, eventually "selling an impression to Ben for 3.62 cents". Throughout the film, the AI characters thwart Ben's attempts to stay off social media through notifications about his crush, personalized content, and targeted advertising (McDavid, 2020). While Ben's specific scenario is not real, every user of current social media faces similar circumstances in which they are artificially "engaged" through hidden technological design tactics.

On a larger scale, this idea offers numerical proof to third-party advertisers that their payments for advertising are in fact working and attracting users to their product or service. Essentially, if successful in their targeted marketing, social media algorithms can generate larger and more valuable advertising space for its third-party sponsors, who will in turn pay more funds to social media companies. This symbiotic relationship between these two entities is evidenced

by the fact that numerous social media companies popular in the present-day offer businesses to garner statistics on their advertisements, on aspects such as user engagement or retention rate (Instagram, n.d.). These data analytic features are only offered to "business accounts" on Instagram, simultaneously encouraging businesses and content creators themselves to employ various methods to increase user engagement (such as J-cuts, false information, or "click-bait" media) while also benefiting the social media company itself from users staying on the application longer. Likewise, third-parties businesses and content creators benefit from this service, "with social media sites now enabling businesses to gather statistics on the impact, reach, and progress of a product/service, the opportunity to gain insights on customer behavior, customer preferences, product penetration, and branding is tremendous" (Kumar, 2015). This intertwined relationship between third-party advertisers and social media companies also serves as a prime example of how tailored advertisements among curated content for users can negatively impact their wellbeing.

Government Regulation

In spite of the youth of social media, different governments have begun to establish various regulations on advertising, software design decisions on social media platforms, and social media itself. One report from the United States in 2022 found that "more and more companies are using digital dark patterns to trick people into buying products and giving away their personal information", resulting in several of these design decisions being counted as a form of fraud (Federal Trade Commission, 2022). Previously, Congress passed an act in which Section 230 of that law protects Internet companies from being held liable for what users share, with the exception that social media companies are responsible for copyright claims and child

sex trafficking on their sites (Communications Decency Act, 1996). In Europe, similar legislation has been passed, in which large social networks, apps, and online platforms must protect their users from the dissemination of illegal or harmful content. In addition, this act bans targeting advertisements based on sexual orientation, religion, ethnicity, or political beliefs, while also putting restrictions on targeted advertisements towards children (Digital Services Act, 2023). Yet in other countries, there are restrictions on social media platforms entirely, in which political content is completely or partially censored by the government (Nguyen & Chandran, 2022).

While there has been governmental action to curb both harmful design and content on social media platforms, the current level of action represents only the bare minimum of the necessary regulations on social media, notably in the United States. Often, different governments provide varying levels of oversight for social media companies, attempting to strike a balance between free expression and protection against user harm. Regardless, software design in social media should not covertly affect their users in a negative way; rather, design should place greater importance on user satisfaction and wellbeing over the company's. As such, lawmakers should require social media companies to make transparent and user-oriented design, such as limiting the usage of personal data in targeted advertisements and content curation. Additionally, the establishment of more independent oversight bodies would ensure that social media companies are actively following such procedures.

Conclusion

The enormous mark of various software design decisions on the social media landscape and its user base cannot be understated. Current social media companies commonly employ techniques such as dark patterns and targeted advertisements without the user's consent or knowledge in order to inflate user engagement. Yet, by definition, social media companies are highly incentivized to employ such design patterns in order to keep up with their competitors and retain their user base. In doing so, social media sells "certainty" to its advertisers; third-party advertisers are able to sustain the social media company's fundamental need to financially grow while also symbiotically having guaranteed visibility and branding (McDavid, 2020).

The inherent nature of social media companies results in a flawed system that both promotes harmful design practices and negative impact towards its users. While the fundamental purpose of social media is to promote the exchange of information and ideas between users through the building of online communities, in order to build online communities, users must be attracted and retained to continue using the platform until a community is able to form. Likewise, social media companies must be able to generate enough upkeep to continue their services. Regardless of either circumstance, the primary goal of social media companies remains the same: they must keep user "engagement" up, providing themselves with good track records for external parties to be willing to pay these social media companies for advertisements, which are then tailored to each individual user. Furthermore, social media companies benefit from *social comparison* theory in a negative way so that users constantly compare themselves with others in their communities, and continuously "engage" with the software to see how well their peers are doing.

Despite new regulations and laws over social media, social media users continue to be negatively impacted by social media, underlining the gap between legislation and effective protection. While some governments have specific laws against dark patterns and anti-fraud acts, social media companies in many countries are often given relatively free rein because they are simply acting as any business entity would do normally. Though much of what social media companies do may not specifically be illegal, specific design practices have been shown to negatively affect users without their consent (Anderson & Jiang, 2019; Butzer, 2006; Fabris et al., 2020). Elements such as having public likes or an endless scroll functionality are purposeful design decisions targeting users' basic psychology, implemented in spite of the negative impacts they may have on the users' mental well-being.

The previous insights all demonstrate the need for government-effectuated ethical design principles that actively prioritizes user wellbeing over profit and engagement. Issues with current social media can be divided into problems that are intrinsic to the concept of social media as a whole, or almost malicious algorithmic or software design. While certain problems inherent to social media as a concept are difficult, or even impossible, to solve, additional government regulation applied to all large-scale social media software design will enable companies to still maintain an even playing field with one another while reducing the harm towards the user.

Though there is an abundance of pre-existing literature surrounding the negative effects of social media on users, there is a lack of studies conducted on how specific software systems affect users. In general, the current research tends to be more high-level, focusing on how software or media as a whole impacts these populations, rather than specific elements (e.g. does adding a "Like"-based system lead to more FoMO and increased rates of mental and anxiety-based disorders?) of the design. Furthermore, sampled populations tend to bias towards

adolescents in the Western world. It is important to note whether the issues relevant to social media strongly intersect with culture and age too. Future research should investigate how specific software design elements, such as the implementation of an “endless scroll” feature, affect users, and whether these design choices vary across different populations beyond simply adolescents. Investigating specific features deeper and explicitly will paint a more clear-cut picture as to what design choices are better for the user, allowing social media companies to continue to “engage” users and thereby sustaining themselves financially, while also reducing the harm towards their user base.

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