

Addictive digital experiences: the influence of artificial intelligence and more-than-human design

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Abstract:

Due to the novel design paradigm brought about by artificial intelligence (AI), addictive technology is becoming more common and harder to resist. In order to counterbalance the rise of technological addiction, an effort should be made by all the actors involved in the complex world of addictive digital experiences. This paper focuses on the role of designers. It is based on a literature review on addiction to digital experiences based on the evolution of human-machine interactions, highlighting challenges brought by AI within the emerging “more-than-human” perspective. The introduction of a systemic perspective that considers new meeting points between datasets and algorithms can help designers understand how their products can lead to addiction and how addiction is created in the context of “AI factories”. By reinforcing their ethical approach and treating AI as a design material, UX designers can become the bearers of a more responsible mindset and re-humanize addictive technology.

Keywords: technological addiction; user experience design; artificial intelligence; more-than-human

1. Introduction

Addictive digital experiences are becoming extremely common in the tech industry and the adjective “addictive” is now considered as one of the highest compliments paid to an artifact (Evans, 2017, p.161). Existing research has explored what is considered addictive, what are the approaches and strategies performed by tech companies that eventually lead into addiction, and how cultural and societal pressures have contributed to this phenomenon. *From a health standpoint*, it is currently assumed that behaviours like binge watching of videos, playing online games and posting on social networks can be addictive. Addiction to technology has grown into a fully recognized disorder (APA, 2013). *From an economic perspective*, the push for addictive tech has been linked with novel business models based on capturing and retaining the attention of users (Davenport & Beck’s, 2001;

Bhargava & Velasquez, 2021). This is connected to surveillance capitalism (Zuboff, 2019) and the subsequent commodification of personal data. Consequently, new standpoints are stressing the need for more ethical considerations in how we use technology, especially in relation to “dark patterns” (Brignull et al., 2015). *From a cultural and societal angle*, addictive digital experiences have become embedded within the core relations of most social systems and being online is now perceived by many as a prerequisite for feeling part of society.

Although the push for addictive digital experiences is influenced by these drivers (and thereby by different actors of the technology industry), design plays a crucial role in crafting them (Berthon, Pitt & Campbell, 2019). As our capability to detect addiction to technology grows, so does our ability to create software and experiences that lead to it. Indeed, addictive behaviours have become more common and harder to resist (Alter, 2018). In this regard, user experience (UX) designers are undoubtedly complicit in the co-production of addictive user behaviour. Hence, we recognize their role as being both ‘influenced by’ and ‘influencing’ all these domains.

This research is framed within the context of interactive digital experiences, such as social media platforms and online gaming—Facebook, Instagram, TikTok, Candy Crush Saga and such. Within the emerging paradigm brought about by disruptive technologies, the landscape of research linked with addictive digital experiences is changing. Furthermore, *artificial intelligence (AI)* and the *consequent ethical debates* are creating new perspectives on addictive design. With algorithms that learn the schedules and habits of individual users, addiction can now be generated both with finer granularity and at greater scale (Berthon, Pitt & Campbell, 2019). The push for addictive properties is often the result of machine-learning-powered optimisation for quantifiable measures of engagement (Fourcade & Johns, 2020), they themselves being a proxy for the product's ability to generate profit. While scholars recognize how artificial intelligence makes digital artifacts more addictive, it is still unclear how they affect the practice of UX designers. This is because the design practice does not yet commonly recognise AI and machine learning (ML) as materials (Dove et al., 2017).

If this is left unchecked, addictive interactions will become ubiquitous. Therefore, in this paper we advance the need for a more humanistic and ethical approach in a designer's profile that stems from an understanding of AI as a design material. The user-centric role of designers is now more crucial than ever. By gaining familiarity with how contemporary addictive systems work, UX designers can better bring in their user-centric perspective in tech organizations, control “how addictive” a designed experience should be, and help users understand how their actions “feed” these systems.

The study is based on a review of the most relevant literature from each of the five aforementioned domains that overlaps with the design of addictive digital experiences (Figure 1). First, we present an overview of the first three established domains to outline the rise of addictive design from a health, economic and cultural perspective. Then, we refer to recent and emerging research to advance the connection between addiction and AI, which is characterized by interactions that go beyond what UX designers are currently addressing in their practice. It is thus argued that designers should embrace a more systemic perspective that considers non-human agents as new meeting points that lead users into addiction. We eventually draw from this intuition to reflect upon novel knowledge areas that designers should explore to gain control over addictive technological production and advocate for a more responsible mindset.

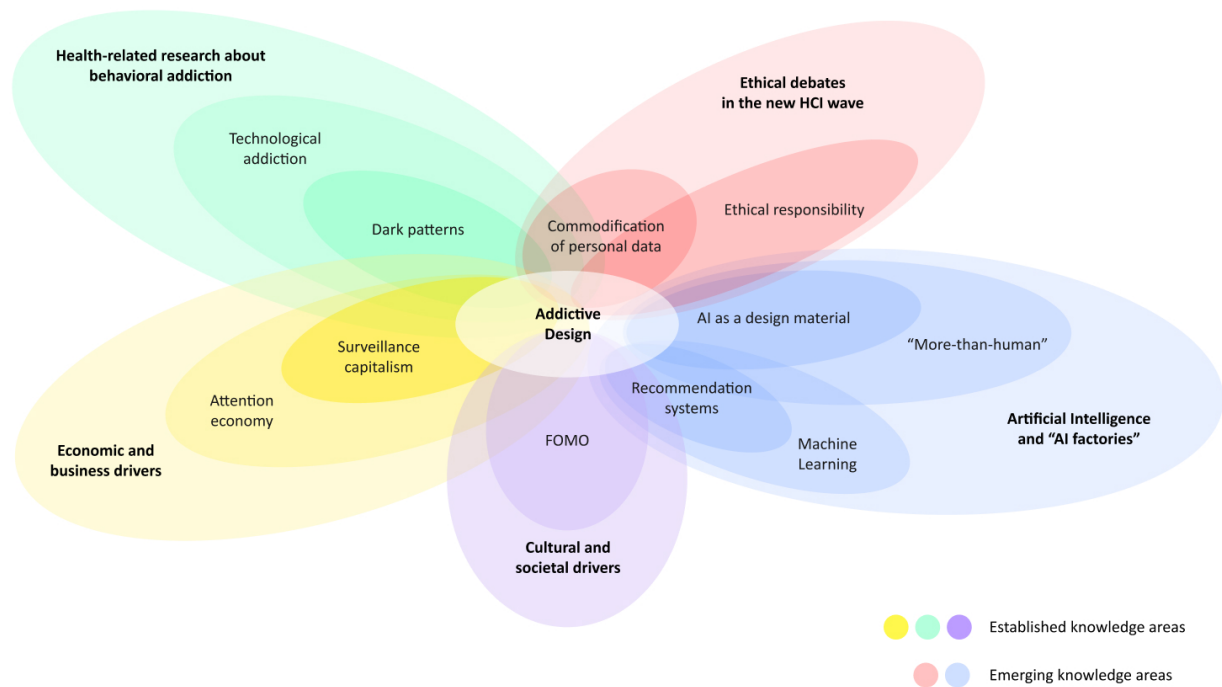


Figure 1. Visualization of established and emerging knowledge areas influencing the design of addictive digital experiences. Established knowledge areas will be introduced in the second section of this paper, while the emerging ones will be introduced in the third and fourth sections.

2. The rise of addictive design

The notion of addiction has recently evolved into a spectrum of terms no longer only associated with drug use. Already in the early 1990s, psychiatrists started classifying some behaviours as forms of “behavioural addiction” (Marks, 1990). Peele & Brodsky (1992) asked: “Can one be addicted to gambling, shopping, exercise, sex, or love in the same sense that one is addicted to alcohol or drugs?”. Scholars showed that many behaviours could become addictive if the outcome was rewarding enough to generate a craving (Alter, 2018). As communication technology became more prominent in our daily lives, some human–machine interactions seemed to be particularly rewarding, sometimes addictive, giving rise to the notion of “technological addiction” (Griffith, 1996). Griffith identified the common behaviours across all technology addicts, and eventually used these as a framework to create a revised, general definition of addiction (Griffith, 2005).

Technological addiction in turn became an umbrella term encompassing, for example, computer addiction (Shaffer & Hall, 2000) and television addiction (Kubey & Csikszentmihalyi, 2004). As more technologies emerge, new addictions are identified. Interestingly, many of the digital experiences that gained global momentum also proved to be easily addictive. Scholars observed addiction to Facebook (Andreassen et al., 2012; Andreassen & Pallesen, 2014), to short-video apps such as TikTok (Zhang, Wu & Liu, 2019), to Candy Crush (Chen & Leung, 2016) and even to Google Glass (Yung et al., 2015). The underlying pattern is that many digital experiences can be defined as addictive when users lose control over their behaviour.

Addictive digital experiences are built around habit loops (Eyal, 2014; Wendel, 2020) or “routines” (Duhigg, 2012) formed over time by repeating a behaviour (e.g. checking your phone) paired with recurring *cues* (e.g. a notification that a friend liked your last post) and *rewards* (e.g. the sense of fulfilment created by being socially accepted). In fact, most interactive digital experiences we use everyday are habit-forming. For example, Facebook uses a push notification system to routinise users

for accessing it multiple times throughout the day (Giannakos et al., 2013). Although they feel “rewarding”, many habit loops engender compulsive and even self-destructive behaviours (Eyal, 2014). Cash et al. (2012), Kuss & Lopez-Fernandez (2016) and Berthon, Pitt & Campbell (2019) listed the negative effects of addiction to digital experiences.

The design process of such experiences includes a series of deceptive techniques turning knowledge about users against them (a few examples are illustrated in Figure 2), called “dark patterns” (Brignull et al., 2015; Bösch et al., 2016; Gray et al., 2018; Luguri & Strahilevitz, 2021). Despite their harm on users, tech companies keep delivering experiences designed to become irresistible (Harris, 2017). Moreover, they promote strategies based on social dynamics that make users feel compelled to actively participate in them. These pressure-based strategies extremize users’ self-perception of how active they are in the digital world. Not being part of the events and interactions happening within digital experiences can become a source of anxiety, also known as FOMO (“fear of missing out”) (Przybylski et al., 2013; Dossey, 2014). In sum, as Alter stated, “addictive tech is part of the mainstream in a way that addictive substances never will be” (Alter, 2018, p.14).

Use of Addictive Design Strategies

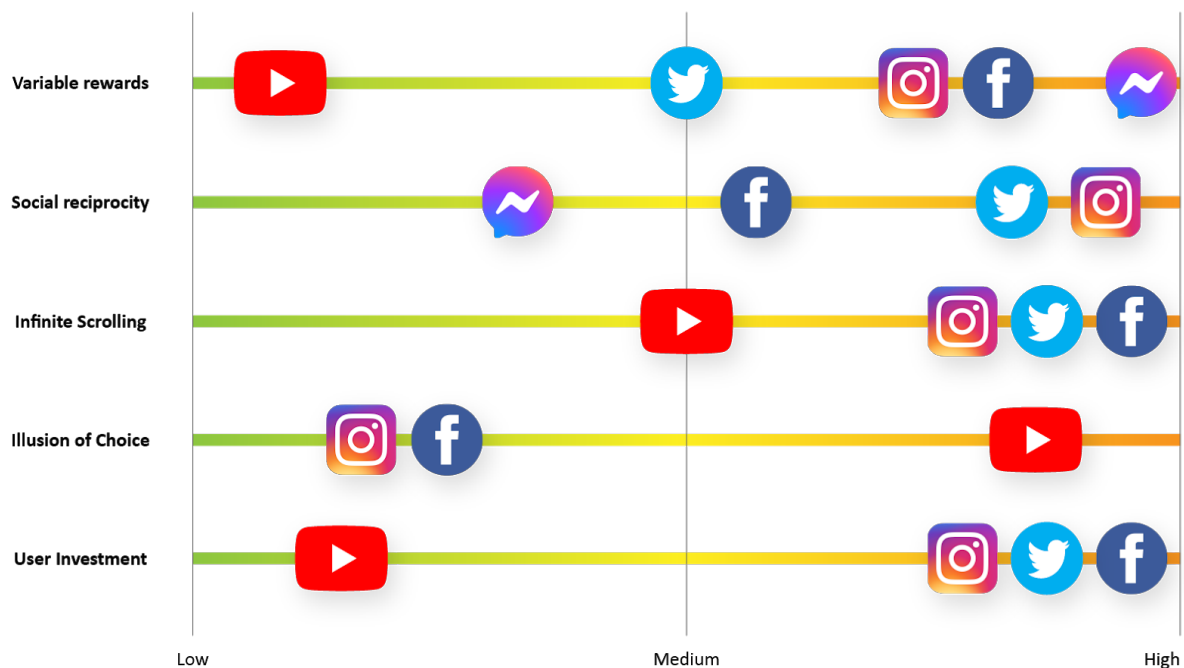


Figure 2. Relative positioning on the use of addictive design strategies in some popular digital experiences. Adapted from Neyman (2017).

The current approach for designing addictive digital experiences focuses on the interaction between a user and an artifact; a subject and an object (Schüll, 2012). This view stems from a human-centered perspective, where an experience is circumscribed within the interaction between a user and the technology used. Along this line of thinking, the implementation of dark patterns has so far been solely associated with the design of user interfaces (Dieter, 2015; Luguri & Strahilevitz, 2021). Presently, interfaces are seen as environments that “suggest, enable, solicit, instigate, encourage, and prevent certain actions, thoughts, affects or promote others” (Lazzarato, 2014, p.30). This could imply that designers can use interfaces both to keep users “hooked” on their screens as long as possible and to help them understand when to stop. This is reflected by existing research on addictive experience design (Nodder, 2013; Evans, 2017; Neyman, 2017). However, designers are

missing a broader view of the other structural characteristics of emerging addictive digital experiences. The following section elucidates this blind spot by drawing from the impact of disruptive technologies and introduces a novel design paradigm.

3. Introducing a “more-than-human” perspective on design

Disruptive technologies, such as artificial intelligence (AI), big data and the internet of things (IoT), are profoundly changing both the practice and process of design. So far, the design process has been seen as derived from industrial production. Production and consumption are often still considered as two distinct processes, where design happens *before* an artifact is deployed to users. However, the line between production and deployment is now becoming blurred (Giaccardi & Redström, 2020). Figure 3 illustrates this notion. Sensors, digital networks and algorithms are connecting modern products to the organizations that designed them. Since behavioural addictions are extremely subjective and hard to generalize, contemporary addictive design relies heavily on the use of AI to customize experiences for each user.

AI allows constant iteration and real-time improvements, providing more granularity (fitting the preferences and behaviours of individual users) and scalability (comparing data and building cross-user frameworks to improve faster). The algorithms that build most addictive digital experiences are instances of what Searle called “weak AI” (Searle, 1980). They can only perform narrow tasks, and for this reason they are usually compiled to run these tasks millions of times until they can make complex predictions about user behaviour. They can use the data they collect to compare behaviours across users and generate tailored recommendations. Users do not need to search: the experience will already know what they like. For example, we can consider the case study of TikTok (the popular short-video sharing network) to show how this principle works. A sophisticated recommendation system such as TikTok’s is designed to collect various data about the behaviour of users, such as the caption or sound of the content that they watch, the time of the day or current GPS location, the times a video was replayed, and even the emotional states that the video communicates (“How TikTok’s Algorithm”, 2021). Masses of data are then used to perform collaborative filtering and create connections that go way beyond human capabilities, providing an experience that matches the neurodiversity of each individual user. The fine level of granularity with which TikTok’s content is customized is what makes this digital experience extremely addictive (Zhao, 2021).

Thanks to the recommendation system used by its AI, the main page or “feed” or an addictive digital experience is hence “designed in the moment” (Verganti, Vendraminelli & Iansiti, 2020) through an algorithm that considers each user’s preference and usage patterns.

Similar engines are used by Facebook, YouTube and many others to filter and rearrange newsfeeds, notifications and messages (Harris, 2017). These are only some of the ways in which AI can make users “hooked”. In order to seriously influence addictive tech, AI should hence be seen as something to be integrated in the practice of UX designers.

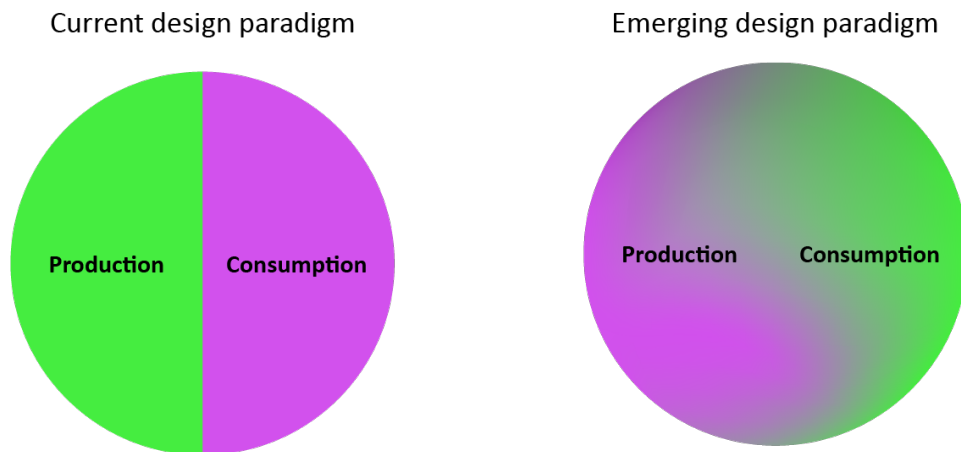


Figure 3. Visual representations of the current and emerging paradigms of the design practice, based on the description by Giaccardi & Redström (2020).

The paradigm of treating systems as one-to-one relationships between a user and a technology is changing. Latour advanced actor-network theory, which advocates for reaching an understanding of the relations between networks of human and non-human actors as equally relevant in shaping issues (Latour, 2005). In place of human-centered design, disruptive technologies inaugurate a new paradigm, defined as “posthuman” (Forlano, 2017) or “more-than-human” (Coulton & Lindley, 2019; Giaccardi & Redström, 2020). Both notions emphasise a decentering of the human, where users become only one of the interconnected agents that can influence a system’s outcome.

In a traditional approach, designers base their process around a user, who is seen as a biological entity that can *interact with* and *influence the outcome of* an experience. This biological perspective is certainly user-centered, yet problematic. In fact, as argued by Homewood et al. (2021), the object of the current new wave of HCI is shifting from users in their biological sense and shifting towards “entwined and interdependent” systems of humans, technologies and algorithms. In the context of addictive digital experiences, users have become more than biological entities that can be addressed through methods such as personas or interviews. The data collected by AI is generating a virtual version of the users, with information about their actions, preferences, emotions and even aspirations. While this information is dislocated across several interconnected algorithms, these represent an enormous opportunity to design more consciously and more ethically. Briefly put, human and non-human entities cannot be addressed separately nor partially by designers, as this would imply addressing only part of the system being created. As humans have become intimately connected with technology, we must evolve both the practice of HCI (Frauenberger, 2019) and design (Giaccardi & Redström, 2020). The current and necessary approaches are illustrated by Figure 4.

By incorporating a thing-centered perspective, thereby giving equal voice to people and things (Cila et al., 2015), the blind spot characterized by human-centered design can be filled. Instead of just interactions between people and things, designers are now called to also address the interactions between things and other things (Giaccardi & Redström, 2020).

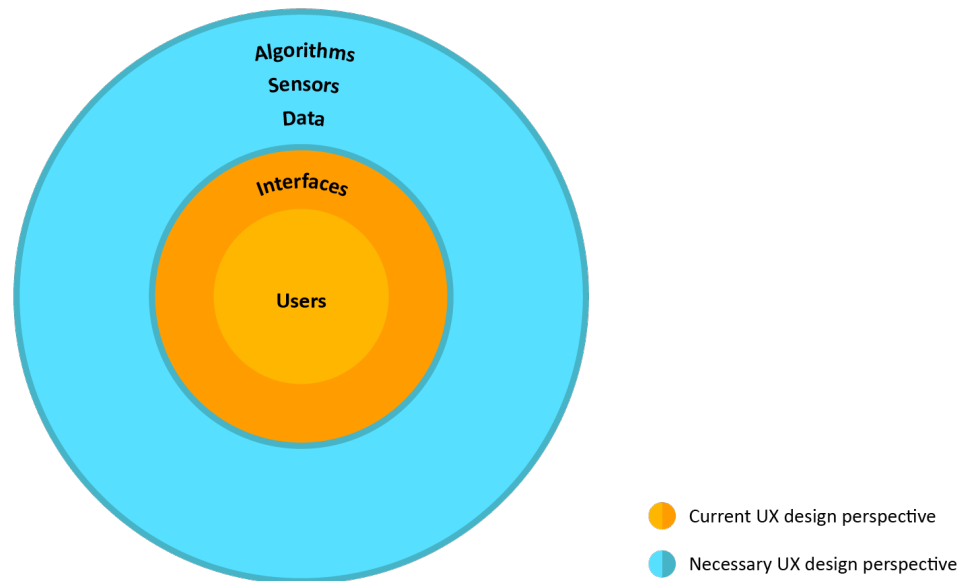


Figure 4. Visual representation of the current and necessary perspectives to be adopted by UX designers in the context of digital experiences that can create addiction.

4. New knowledge areas for UX designers

By ignoring the functioning components of algorithms, designers can only see AI as something “magic” and they will never be able to incorporate it as a material of design (Pilling & Coulton, 2019). In this section, we dive deeper into ways in which designers could start integrating AI in their process.

Among all the goals set by the creators of those artifacts that sometimes become addictive (either intentionally or unintentionally), having a positive outcome in the end user’s life should be at the core of a user or human centred mindset. As Borenstein & Howard (2021) pointed out, the outcome and ethical ramifications of an AI-powered system are the result of the designer’s ethical values. Therefore, all AIs should be designed “to avoid negative ethical impact” (Winfield et al., 2019, p.512). A more ethical use of AI should be addressed by all the actors systemically involved in the design of addictive experiences (those mentioned in Figure 1) and at all stages of the process (before, during and after it has been deployed). Considerations about the outcomes of an AI should hence not be treated as a second thought, but rather as a constant reminder (Borenstein & Howard, 2021).

The design community shares professional, moral and ethical responsibility to take part in the discussion over the impact of AI (Loi et al., 2018), especially when linked to addiction-generating systems. Being the actors who generally promote user-centricity across the entire process, designers can play a critical role in claiming for a more responsible mindset. This can eventually create positive influence across all actors from the other interconnected domains.

To become fully capable of leveraging or limiting an experience’s addictive effects, UX designers must broaden up the object of design, going beyond human-machine interfaces. Interfaces should be considered as more than “meeting points” between users and non-human agencies (Dieter, 2015), including the meeting points between sensors that collect data (e.g. cameras, microphones, accelerometers), as well as between algorithms (e.g. dimensionality reduction, collaborative filtering) that exchange and elaborate the resulting datasets. Briefly put, designers should take lead on developing AI products (Schurig & Thomas, 2017). This does not necessarily imply that they need to

learn how to create algorithms or handle complex datasets. Yang et al. (2018) observed that UX designers could envision innovative solutions even with only a basic understanding of ML. We now introduce three ways in which learning about AI can support UX designers to counterbalance addictive technology.

4.1 AI as a resource for detecting digital addiction

Learning about AI (and more specifically about machine learning) makes UX designers capable of discovering tacit patterns of a user's behaviour (Hebron, 2016, p.111). So far, this approach has only been used to mine behavioural patterns that could be exploited to create digital addiction. However, the intervention of designers can drive a healthier and more user-focused implementation of ML. Designers could address the issue from the user's perspective and use ML to detect when a user is becoming addicted and eventually reinforce non-addictive behaviours. For example, recent research has proven the effectiveness of nudges introduced when users start showing symptoms of digital addiction (Okeke et al., 2018; Purohit, Barclay & Holzer, 2020; Tiersen & Calvo, 2021).

4.2 AI as a boundary object for collaboration

Learning about AI enables UX designers to build tools and boundary objects that foster collaboration with data scientists (Yang et al., 2016; Yang et al., 2018) or bring other stakeholders along to collaboratively make sense of data (Maeda, 2019, p.136), eventually taking part in decision making processes. For example, UX designers of tech companies that deliver addictive experiences could learn the fundamentals of recommendation filtering techniques (such as content-based, collaborative or hybrid filtering) used to display content that can retain users' attention as long as possible. They could hence take part in decision making and identify ways of making such systems more valuable to the user, as well as more ethical.

4.3 AI as an opportunity for transparency

UX designers share the power and the responsibility of crafting experiences that are as transparent with their end-users as possible (Chianella et al., 2021). Learning about AI can empower UX designers in presenting machines as working in a way that is aligned with the intended user behaviour (Giaccardi & Redström, 2020). For example, UX designers involved in the co-creation of addictive digital experiences could use this knowledge to show how recommendation filtering techniques work, how personal data is processed by the underlying network of algorithms, or (more generally) generating transparency about all the interactions that happen "in the background". Designers could hence create resources that help users build what Silicon Valley investor Paul Graham defined as "antibodies to addictive new things" (Graham, 2010).

5. Discussion and conclusion

Designers cover a controversial role in the new paradigm of addictive digital experiences. While they are accountable for a user-centric perspective, their limited understanding of AI is challenging the ethical ramifications of their products.

Considering the systemic complexity that turned the rise of addictive digital experiences into what Rittel & Webber (1973) would call "a wicked problem", an effort from all involved actors (including designers, engineers and business representatives) to reduce addictive behaviours should be made. In this paper, we present the works of the most prominent scholars from both established and emerging domains and present UX designers as potential catalysts to counteract the unethical way in

which these addictive experiences work. Due to the increasing monetary value of their users' attention (Davenport & Beck's, 2001), tech companies have filled mainstream markets with addictive products (Alter, 2018) that rely on sophisticated dark patterns to retain attention for as long as possible (Gray et al., 2018). Users have become addicted to these digital experiences just like society has become addicted to the social interactions happening in the digital world (Dossey, 2014).

As disruptive technologies profoundly revolutionize how digital experiences become addictive, data can be used to deliver highly personalized content through recommendation systems to create customized cues and rewards that build up user-specific routines and to provide real-time feedback for constant improvement. Thanks to AI, contemporary digital experiences can be “designed in the moment” (Verganti, Vendraminelli & Iansiti, 2020) and their chance of becoming addictive has exponentially increased. We presented the example of TikTok's advanced recommendation system (Zhao, 2021) to show how the collection, exchange and use of personal data has made these systems dangerously capable of autonomously becoming addictive to their users. Therefore, while UX designers are mostly occupied designing user interfaces (Luguri, J., & Strahilevitz, 2021), they are lacking a systemic view on the contrapuntal interactions that occur across non-human agents (Giaccardi & Redström, 2020). Data, sensors and algorithms can become new materials for designers to take control of the way in which these addictive artifacts are created and re-humanize addictive technology. Three consequent opportunities were identified. First, AI can augment the methods and purposes through which user research is carried. Second, it can empower designers to engage with data scientists and bring their perspective when collaboratively making decisions on “how addictive” an experience should be. Finally, it allows designers to communicate to their users how an addictive system works, fostering transparency and improving the perceived value of the experience.

The intuitive connection between addictive design, AI and the “more-than-human” presented in this paper represents the first steps toward a deeper reflection on the influence that design can make in counterbalancing the push for addictive tech. By integrating both established and novel knowledge areas, the literature presented in this paper aims to empower designers to promote a more responsible mindset.

Alter (2018) claimed that “it's possible to create a product or experience that is indispensable but not addictive”. In fact, digital experiences purposely built to be ‘non-addictive’ have already started to appear. Some of them rely on the creation of less addictive and more mindful interactions through the addition of nudges or design friction (Okeke et al., 2018; Purohit, Barclay & Holzer, 2020). A further development of this research could investigate how more ethical (hence “non-addictive”) experiences could generate positive interest not only for their end users, but also for decision makers of tech companies. Therefore, applied research could be conducted to further iterate on this initial reflection and present ways in which designers can influence the perspective of other relevant stakeholders—enacting a “stakeholder-centric” approach (Forlizzi, 2018). Nevertheless, designers should first embrace a posthuman perspective and learn how to design with AI.

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