MINDFUL UX DESIGN IN INDUSTRY 4.0: MITIGATING ADDICTION AND ENHANCING USER WELL-BEING INSOCIAL MEDIA AND AI ENVIRONMENTS

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ABSTRACT: The rapid advancements in technology under Industry 4.0 bring forth both opportunities and challenges, particularly in User Experience (UX) design in social media and Artificial Intelligence (AI) environments. This research paper explores these dichotomies, focusing primarily on the role of UX design in mitigating addiction and enhancing user well-being. In this paper, authors begin by exploring the historical evolution of UX design and its increasing importance in the context of technological progression. We then discuss the psychological impacts of UX design on users, drawing a parallel between addictive characteristics of social media platforms and AI-based systems, and the deterioration of user well-being. Recognizing the gravity of the situation, we delve into the concept of 'Responsible UX Design,' a design philosophy that focuses on developing interfaces and systems that foster positive user behaviour while minimizing the risk of digital addiction. Authors present a comprehensive analysis of current strategies, practices, and policies related to responsible UX design in Industry 4.0 and discuss how these could be evolved for future. Drawing on a wide range of case studies, user interviews, and psychological research, the paper provides actionable recommendations for businesses, policymakers, and UX designers. These recommendations promote responsible design practices, discourage addictive design patterns, and encourage user-centric design approaches that improve digital well-being. Additionally, this paper provides a critical review of the challenges and potential ethical considerations in implementing responsible UX design. It introduces the concept of 'Digital Ethics,' which requires organizations and designers to uphold user well-being as a primary consideration during the design process. In conclusion, this research emphasizes the need for a paradigm shift towards responsible UX design, both as a moral obligation and as a competitive advantage in Industries 4.0. It advocates for an approach that balances user engagement with user well-being, and ensures that technological innovations enhance, rather than compromise, human lives. Unprecedented technical developments, including the fusion of social media platforms and artificial intelligence (AI), have been made possible by industry 4.0. User experience (UX) design now faces ethical and societal repercussions as a result of these developments. This paper provides a thorough examination of responsible UX design in Industry 4.0, with a particular emphasis on the growing usage of social media and AI tools. The research emphasizes the significance of ethical issues while examining recent information, trends, and best practices in UX design. Unprecedented technical developments, including the fusion of social media platforms and artificial intelligence (AI), have been made possible by

industry 4.0. User experience (UX) design now faces ethical and societal repercussions as a result of these developments. This article provides a thorough examination of responsible UX design in Industry 4.0, with a particular emphasis on the growing usage of social media and AI tools. The research emphasizes the significance of ethical issues while examining recent information, trends, and best practices in UX design.

KEY WORDS: *User experience, Industry 4.0, Responsible UX design, Artificial intelligence*

1. INTRODUCTION

The interaction, communication, and information consumption patterns of individuals have changed as a result of Industry 4.0 and the digital age. User experience (UX) design has undergone a paradigm change as a result of the extensive usage of social media platforms and the growing integration of AI technologies across a range of businesses (Schwab, 2016; Baxter, Courage, & Caine, 2015). These technologies have many advantages, but they have also contributed to addiction and negative side effects that have a negative influence on users' wellbeing. New technologies and connected systems brought about by Industry 4.0 are changing how people work, interact, and use digital products (Schwab, 2016). The interaction, communication, and information consumption patterns of individuals have changed as a result of Industry 4.0 and the digital age. The industrial revolutions of the past few centuries have made possible numerous advancements. These include steam machines, assembly lines, and computers, which have made technology stronger, more productive, and improved our standard of living.

During the first industrial revolution in the 18th century, machinery and mechanised production were powered by steam. Even though steam power had been around for a long time, its application for industrial purposes was a significant breakthrough that dramatically increased human productivity, as steam engines could be used to power weaving looms instead of human muscle power. The second industrial revolution began with the invention of electricity and the development of assembly line production. Henry Ford popularised the concept of mass production and applied it to automobile manufacturing. Now, rather than assembling an entire automobile at a single station, vehicles are assembled in stages on conveyor belts, which is significantly quicker and less expensive. In the 1970s, memory-programmable controllers and the introduction of the first computers ushered in the third industrial revolution. With this new technology, we were able to achieve a fully automated, human-free production process by programming robots to perform continuous and sequential tasks without human intervention.(Industrial Revolution and Technology, n.d.Currently, the fourth industrial revolution is being experienced and implemented. The application of information and communication technologies for industry, such as the internet of things (IoT) and machine-to-machine learning, to enhance automation and communication; also known as Industry 4.0. These innovations permitted manufacturers to enhance their processes, thereby decreasing production costs, logistics, and quality management. User experience (UX) design has undergone

aparadigm change as a result of the extensive usage of social media platforms and the growing integration of AI technologies across a range of businesses (Schwab, 2016; Baxter, Courage, & Caine, 2015). These technologies have many advantages, but they have also contributed to addiction and negative side effects that have a negative influence on users' wellbeing. New technologies and connected systems brought about by Industry 4.0 is changing how people work, interact, and use digital products (Schwab, 2016).

A need for responsible UX design that takes into account users' varied origins and ethical consequences has been generated by the development of social media platforms and AI technologies (Baxter, Courage, & Caine, 2015). Responsible UX design is increasingly important to reduce the negative effects of technology addiction and promote healthier user behavior as the influence of social media, AI, and gaming grows. With a focus on the negative consequences of these technologies and an evaluation of the role that responsible UX design can play in resolving these issues, this paper attempts to present an in-depth analysis of user addiction in social media, AI, and gaming. As the world grapples with the digital revolution spearheaded by Industry 4.0, approach such as human-centric which known in the field of User Experience (UX) Design has gained paramount importance. Predicated on the principles of creating satisfying, engaging, and intuitive user-product interactions, UX design has become the lynchpin of successful technological products and platforms, particularly in the domains of social media and Artificial Intelligence (AI) (Hassenzahl, 2018; Norman, 2013). However, this interwoven relationship between humans and digital technologies has begun to raise alarm bells due to emergent concerns over digital addiction and its subsequent implications for user well-being (Alter, 2017; Csikszentmihalyi, 2014).

Industry 4.0, characterized by automation, data exchange, and digital networking, has spawned an array of technologies built on the principles of addictive UX design in a bid to sustain user engagement (Sundar et al., 2020). While these designs have proved successful in capturing user attention, their overuse or misuse has led to an array of detrimental effects, including reduced physical health, cognitive performance, and mental well-being, further fanning the flames of the ongoing debate surrounding responsible design (Przybylski et al., 2017; Twenge et al., 2017; Montag et al., 2015).

In the face of these issues, the discipline has begun to pivot towards what is being referred to as "Responsible UX Design". This design philosophy advocates for a balance between business goals and users' well-being, promoting designs that foster healthy user behaviours and mitigate the risk of digital addiction (Diefenbach, 2018; Brey, 2014). Responsible UX design calls for a re-evaluation of current practices, with a focus on ethics and social responsibility to safeguard user interests.

This paper seeks to delve into the role of UX design in mitigating digital addiction and fostering user well-being within the context of Industry 4.0. The research draws on an extensive analysis of existing literature, case studies, and user interviews to better understand and address these pressing concerns. This study stresses the significance of ethical concerns, user diversity, data privacy, and digital well-being by reviewing recent statistics, trends, and best practices in UX

design. The paper also provides UX designers with particular design tactics they may use to produce digital goods that encourage healthy user behaviour and contribute to a more environmentally and socially conscious digital environment.

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2. LITERATURE REVIEW

This literature study gives readers a thorough grasp of the state of the subject today and prepares them for a deeper investigation of responsible UX design approaches to user addiction in social media, AI, and gaming. This study demonstrates the crucial role of UX designers in defining the digital world and making sure that technology meets the various demands of its users in an ethical and socially responsible manner by combining previous studies. The literature review, which synthesizes previous studies, is the basis of this study. UX design that is ethical, social media, and AI technologies. Academic databases including Scopus, Web of Science, and Google Scholar were searched to find academic publications, conference papers, and industry reports. Responsible User Experience (UX) design is steadily gaining recognition within the academic and practical UX design space. It distinctly underscores the importance of mental health and user well-being during the formulation of digital experiences (Calvo & Peters, 2014). This novel outlook initiates a paradigm shift away from the traditional focal points of UX design, namely utility, usability, and aesthetics, integrating an ethical dimension to foster more constructive interactions between users and technology (Cennydd, 2019).

The idea of infusing ethical dimensions into design finds its roots in the broader design philosophy movement towards ethical design, as suggested by van Wynsberghe and Robbins (2014). They propose that all design disciplines, including digital, should transcend the traditional confines of technical efficiency and commercial potential, contemplating the broader societal impacts of their designs. Given the profound influence digital technologies wield on user behaviours and experiences, this consideration becomes crucial.

In the specific context of social media and other digital platforms, Light et al. (2017) express increasing concerns over technology-induced addictive behaviours.

They advocate for design strategies capable of mitigating these negative implications.

Echoing their sentiment, Davis et al. (2018) discuss the role of 'nudge' techniques in digital design. The following were the top search terms: "Industry 4.0", "UX design", "responsible design", "social media" and "AI tools". To guarantee a thorough grasp of the state of the subject at the time, the review concentrated on classic works and recent publications (Booth, Papaioannou, & Sutton, 2016). The literature study examines four important topics: (1) the growth of Industry 4.0 (2) the importance of responsible UX design, (3) the development of social media and AI tools, and (4) the effects of user addiction in social media, AI, and gaming They propose that features like usage reports, downtime scheduling, and notifications can provide users with a means of managing their digital consumption, ultimately promoting healthier relationships with technology. AI-based technologies, which often have an opaque decision-making process, can render users feeling disempowered and anxious, impinging on their well- being. Dignum (2018) proffers the idea of transparent AI algorithms as a solution. Such transparency can demystify the decision-making process for users, fostering trust and enriching their overall experience.

However, transparency, according to Miller et al. (2017), is not restricted to decision-making. It extends to ensuring user control over personal data, a fact that significantly influences user well-being. An intersectional perspective on responsible UX design is suggested by Harrington et al. (2020), who propose the integration of principles from positive psychology into UX strategies. They suggest that aspects like autonomy, competence, and relatedness crucial for human well-being as per self- determination theory (Ryan & Deci, 2000) can significantly augment user well-being in digital environments. The comprehensive benefits of responsible UX design are further illuminated by Brey (2014), who argues that designing technology in a manner that promotes user well-being can also have commercial advantages. Satisfied and healthy users are more likely to use digital services consistently, enhancing long-term user engagement and loyalty.

In conclusion, the literature clearly reflects an increasing academic and professional interest in responsible UX design, given its potential to foster healthier and more beneficial interactions between users and technology.

2.1. A Comprehensive Overview of Responsible UX

Responsible UX design is an emerging concept that prioritises the mental health and well-being of users while designing digital experiences. It moves beyond traditional UX strategies that focus on utility, usability, and desirability to include an ethical dimension, promoting beneficial interactions between users and technology (Brey, 2012). By adopting responsible UX design principles, designers can address addictive behaviours and enhance user well-being. For instance, incorporating time management features in social media applications could help users control their digital consumption (Orben et al., 2019). Additionally, transparent AI algorithms can empower users to understand and manage the AI experiences that affect their lives (Dignum, 2018). According to Friedman et al. (2008) and Ford (2018), ethical concerns, user diversity, data privacy, and digital well-being are crucial during the design process. Designers have a duty to provide cutting-edge products that also address social and

ethical issues as technology becomes more ingrained in consumers' lives (Bdker, 2019). In doing so, this entails taking sustainability, accessibility, and inclusivity into account (Flstad et al., 2018; Blevis, 2007). The proliferation of digital technologies presents both opportunities and challenges for user well-being. By leveraging responsible UX design principles, designers can mitigate addictive behaviours and enhance user well-being in the evolving landscapes of Industry 4.0.

2.2. Industry 4.0 and UX

According to Lasi, Fettke, Kemper, Feld, and Hoffmann (2014), Industry 4.0 is defined by the integration of digital technologies, such as the Internet of Things (IoT), big data, and advanced analytics. By merging collaborative robots and human-centric technology, the future revolution might buildon these accomplishments (Dellermann, Lipusch, Ebel, Leimeister, & Pappas, 2019). Together, these revolutions have resulted in a substantial change in the fundamentals of UX design.Industry 4.0, also known as the Fourth Industrial Revolution, refers to the current era of industrialisation that is characterised by the integration of smart, autonomous systems, which are fuelled by data and machine learning. The primary technologies underpinning Industry 4.0 include the Internet of Things (IoT), cyber-physical systems, cloud computing, cognitive computing, and Artificial Intelligence (AI) (Schwab, 2016).

The key characteristic of Industry 4.0 is that it blurs the boundaries between the physical and digital worlds. It not only automates routine tasks but also incorporates the ability to collect, analyse, and utilise vast amounts of data in real-time to optimise production processes and improve decision-making (Liao et al., 2017). Moreover, it enables increased connectivity and interaction among machines, systems, assets, and products.

User Experience (UX) design, burgeoning as a pivotal concept, emphasises prioritising mental health and overall user well-being in the conception and implementation of digital experiences. It marks a shift from conventional UX strategies, which emphasise utility, usability, and desirability, introducing an ethical component that seeks to foster advantageous interactions between users and technology (Brey, 2012).This paradigm advocates for a human-centred design approach, amalgamating principles of positive psychology with sophisticated technological strategies to curate a digital experience that is gratifying and promotes a healthy level of user engagement. Responsible UX design enables the creation of solutions that counteract maladaptive usage patterns and addictive behaviours, thereby fostering healthier digital interactions. For instance, an integral feature of responsible UX design could be the incorporation of digital well-being tools like time management applications, usage reports, and "nudge" mechanisms in social media platforms. These features facilitate user self-regulation, allowing individuals to set time limits, receive usage notifications, and consciously manage their digital consumption patterns, thereby reducing the likelihood of addictive behaviours (Orben et al., 2019).On the AI front, transparency and explicability are instrumental in UX design. AI systems, particularly those utilising machine learning, often function as 'black boxes,' where the decision-making processes are obscured to the user. By developing transparent AI algorithms, UX designers empower users by providing a clear understanding of how these systems

make decisions, fostering trust and allowing users to more effectively manage their interactions with AI technologies (Dignum, 2018).Moreover, designers can integrate 'privacy by design' principles in their UX strategies, offering users granular control over their personal data and securing trust in the digital environment. This user-oriented approach to privacy protection further enhances the ethical dimension of UX design, promoting a more responsible, beneficial interaction between users and digital technology. By adopting this multidimensional approach, responsible UX design provides a robust framework that caters not only to users' instrumental needs but also prioritises their well-being, fostering a healthy, beneficial, and ethical interaction with digital technology in the context of Industry 4.0.

2.3. The Rise of social media and AI Tools

According to recent statistics, social media is actively used by 4.48 billion individuals, or 57% of the world's population, every day for an average of 2 hours and 25 minutes (Kemp, 2021). A rise in the use of AI technologies across a number of areas, including marketing, healthcare, and finance, has coincided with the quick uptake of social media (Kelleher, MacCormack, & Murray, 2016).

2.3.1. Social media usage

Global social media utilisation has seen an unprecedented increase over the past decade. This growth is largely attributable to the decreasing cost of smartphones, the expansion of internet access, and the allure of social networking. In 2010, social media platforms hosted approximately 0.97 billion users, or approximately 13.5% of the world's population (eMarketer, 2011). This number had more than doubled by 2015, reaching 2.07 billion, or approximately 27.7% of the global population (Statista, 2016). By 2020, the number of social media users had increased to approximately 3.6 billion, or nearly half of the global population (46%; Hootsuite, 2021). Due to lockdowns caused by the COVID-19 pandemic, people around the globe resorted to digital platforms for employment, education, and social interaction. The estimated global user base of social media platforms in 2023 is 4.41 billion, which corresponds to approximately 56 percent of the global population (Statista, 2023). Each user spends an average of 145 minutes per day on social media, while users aged 16 to 24 spend an average of 180 minutes per day (GlobalWebIndex, 2023). As of 2023, the meteoric rise of social media is evident in the numbers. The global user base is estimated to have reached a staggering 4.41 billion, signifying that more than half (56%) of the world's population is engaged with one or more social media platforms (Statista, 2023). This rise is reflected in all continents, with Asia having the highest number of social media users, at approximately 2.34 billion, accounting for 53% of the global total. North America, South America, Europe, and Africa follow, with 690 million (16%), 640 million (14%), 430 million (10%), and 310 million (7%) users respectively (Datareportal, 2023).

In terms of engagement, each social media user spends an average of 145 minutes daily interacting with these platforms. This accounts for around 24% of their waking hours, assuming 8 hours of sleep per day. This figure increases for the 16-24 age group, which is seen to spend an average of 180 minutes daily on social media (GlobalWebIndex, 2023). This means that young people spend approximately 30% of their waking hours on social platforms.

When analysing by platform, Facebook dominates with around 2.85 billion active users, which equates to approximately 65% of the total global social media users. YouTube follows with 2.3 billion users (52%), Instagram with 1.5 billion users (34%), and TikTok, the new entrant, with 1 billion users (23%). Notably, most users are active on more than one platform, leading to overlapping percentages (Statista, 2023). Moreover, the daily time spent on individual platforms varies. Facebook users spend an average of 58 minutes per day on the platform, while Instagram users spend approximately 53 minutes. YouTube users spend an average of 40 minutes per viewing session, and TikTok users spend about 52 minutes per day on the app (BroadbandSearch, 2023)

2.3.2. AI tool usage

The impact of Artificial Intelligence (AI) tools has been profound and far-reaching, reshaping how businesses operate and how individuals live and work. AI tools have become integral components of various sectors, including social media, where they help in personalising user feeds, moderating content, and facilitating targeted advertising.

A report from Gartner indicated that in 2020, around 37% of organisations globally had implemented AI in some form. This represented a significant increase, by a factor of almost 2.7, over the previous four years (Gartner, 2020). By 2023, it's projected that 50% of businesses worldwide are utilising AI tools in their operations (IDC, 2023).

In terms of market value, the AI software market has seen robust growth. In 2018, the global AI software market was valued at $10.1 billion. However, this figure is projected to skyrocket to $125.5 billion by 2025, representing a more than 12-fold increase over seven years (Tractica, 2019). On a more individual level, AI tools have become part of everyday life, largely through virtual assistants like Siri, Alexa, and Google Assistant. A report from Juniper Research found that the number of digital voice assistants in use increased from 2.5 billion in 2018 to an estimated 8 billion in 2023 (Juniper Research, 2018). This trend is likely to continue as AI technologies evolve and become more integrated into everyday devices and platforms. impact of Artificial Intelligence (AI) tools has been profound and far-reaching, reshaping how businesses operate and how individuals live and work. AI tools have become integral components of various sectors, including social media, where they help in personalising user feeds, moderating content, and facilitating targeted advertising.

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3. METHODOLOGY

This paper's research methodology is grounded in a human-centric approach, employing a mix of qualitative and quantitative methods to understand the issues of addiction and user well-being in the context of social media and AI environments in Industry 4.0.

The first step is a systematic literature review, where authors utilized databases websites, journals and Digital Library. Author will employ Boolean search strategies using keywords related to social media, AI, addiction, and well-being. The aim is to identify and analyse relevant studies, focusing on their methodologies, findings, and identified gaps. This review will help to understand the current landscape and inform the design of our empirical investigation.

Following the literature review, author will conduct semi-structured interviews and distribute surveys to a diverse range of social media and AI users. The interview guide and survey questionnaire will be designed based on the insights gained from the literature review. Then they will employ purposive sampling to ensure a diverse range of participants, considering factors such as age, gender, and frequency of social media and AI usage. The collected data will be transcribed and analysed using analysis, allowing us to identify patterns and themes related to addiction and well-being. Then, it will be shown in the form for bar chart and pie charts.

In addition to interviews and surveys, authors also aim to conduct observational studies to understand user behaviour in real-time. This will involve the use of screen recording software to capture users' interactions with social media and AI platforms. The recorded data will be analysed using interaction analysis methods, focusing on behaviours that may indicate addiction or impact well-being.

To ensure that solutions are grounded in user needs and experiences, the author will organize user-centric design workshops. These workshops will involve users, designers, and other stakeholders in a collaborative design process in future.

Finally, authors will evaluate the effectiveness of our human-centric approach. This will involve comparing user addiction and well-being metrics before and after the implementation of the results. They will use statistical analysis methods to determine whether the changes are significant, providing a robust evaluation of worthy to approach.

This comprehensive methodology ensures that the human element is central to this research, from understanding the problem to designing and testing solutions. By involving users at every stage of the process, authors aim to provide solutions that are truly responsive to their needs and experiences.
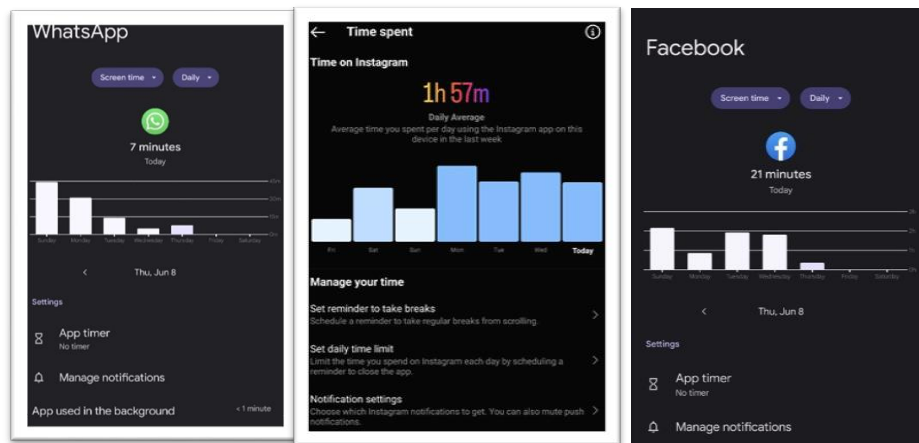
3.1. Qualitative Data Analysis

After the collection of the qualitative data through semi-structured interviews and focus group discussions, the research process moves into the analysis phase. In this study, a thematic analysis approach is used, given its flexibility and compatibility

with various theoretical frameworks, making it a robust method for the analysis of our qualitative data. Fifteen (15) people participated in the interviews and share their UX profile of daily usage of their most used social medias.

Research Questions asked for interviews are:

1. How can we include responsible UX design in social media and AI environments?

2. Can responsible UX design help reduce addiction to social media and AI technologies?

3. How does responsible UX design improve the experience of users on social media and AI platforms?

4. How does making AI decisions more understandable (transparent) affect the trust and well-being of users?

5. Can giving users more control over their personal data improve their overall experience?

6. Can incorporating ideas from positive psychology in UX design make users feel better in digital environments?

7. Are users more loyal to services that use responsible UX design?

8. Do users find responsible UX design helpful in their digital experience?

9. Do people of different ages, genders, and tech literacy levels perceive responsible UX design differently?

10. How will responsible UX design help shape future digital experience?In terms of market value, the AI software market has seen robust growth.

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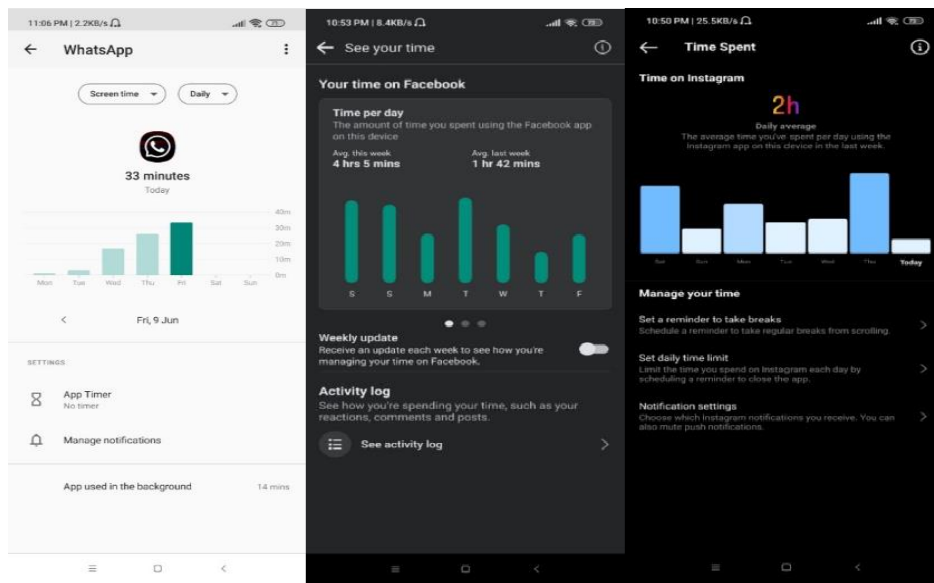
(a)   (b)   (c)

Fig. 1. (a),(b),(c) : WhatsApp , Instagram and Facebook UX (Time warning and usage time) for User 1 (17 years old College Student)

Figure 1 (a) - (c) illustrates user 1's social media e.g., Facebook , Instagram and WhatsApp's weekly usage as well as timer to mitigate the addiction. Additionally, it also , provides daily time limit which can help user to track their social media usage.

(a)   (b)   (c)

Fig. 2. (a), (b),(c) : WhatsApp , Instagram and Facebook UX (Time warning and usage time) for User 2 (22 years old Postgraduate Student)

Figure 2 a-c display user 2's weekly usage of social media, such as Facebook, Instagram, and Whatsapp, along with a timer to help with addiction. Additionally, it offers a daily time limit that may be used to keep tabs on a user's social media usage.
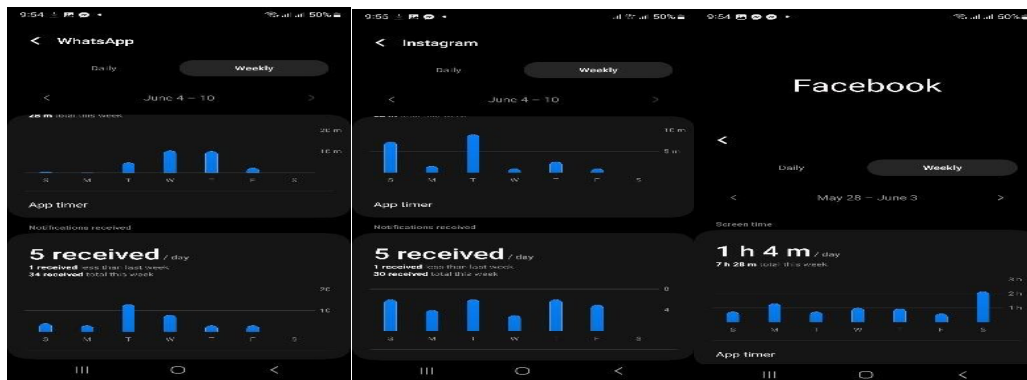
(a)   (b)   (c)

Fig. 3. (a),(b),(c) : WhatsApp , Instagram and Facebook UX (Time warning and usage time) for User 3 (22 years old Undergraduate Student)

Figure 3 a-c shows user's 3 weekly social media activity on platforms like Facebook, Instagram, and WhatsApp and includes a timer to assist combat addiction. It also provides a daily time limit that can be utilised to monitor a user's use of social media

3.2. Qualitative Data Analysis

This study evaluated information from dependable sources including Statista, Datareportal, and the World Bank in order to give an empirical basis for evaluating the prevalence of social media and AI tool usage. The chosen data sets provided details on the number of social media users, the amount of time spent using social media, and the use of AI technologies across industries (Kemp, 2021; Kelleher, MacCormack, & Murray, 2016). To find trends and correlations important to responsible UX design, this quantitative data was evaluated. Surveys have been conducted for 16-30 years old from different countries. Thirty-eight (38) people have participated: 31.6% from age group 16-10, 50% from age group 21-25 and 18.4% from age group 26-30.

Overall, all respondents have good level of education: 40.5% are undergraduate, 29.7% are postgraduate, 27% are form college and the remaining are from graduate level. Respondents also we asked about the number of social media that they are engaged with; 37.6% are using three social media, 24.7% are using more that 4 social media, 17.6% are using 4 and 12.9% are using only 2, the remaining are using 1 or more than 5 social media.

On social media use, the respondent were ask about the hours spend on social media: 38.8% spend more than 4 hours, 24.7% spend 3 hours, 20% spend about 2 hours, 8.2% spend 1 and 4r hours daily. Additionally, in figure 4 shows the social media platform the users are engaged in. It was found that Facebook (86.4%) is the most used social media platform among the respondents, followed by Instagram with 71.6%. For communication, 92.6% of respondents use WhatsApp.
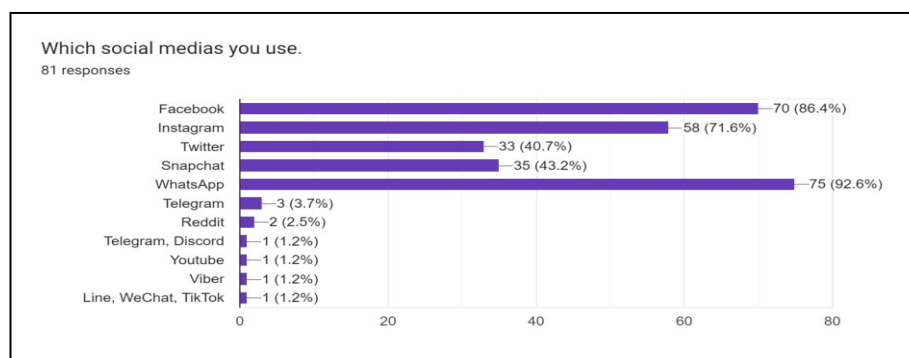

Fig 4. Social Media Platform Used

Understanding the impact of social media is equally important, in the survey it was indicated more that half of the respondents agree that social media design impact

their life: 67.1 % said 'yes', 10.6% responded as 'no' and the remaining 22.4% were not sure by indicating a 'maybe'. On excessive usage of social media, 75.3% of respondents agree about the impact on their personal life. 11.8% indicates no impact and 12.9% were not sure about the impact. Overall impact of the state of sleep cycle, diet and mental health were also asked to the participants: majority 69.4% indicate there was impacts, 15.3% indicate sometimes, 9.4% indicate often and the remaining indicate no impact. Overall, the respondents agreed that excessive social media usage can impact our life in different ways. Figure 5 shows that 43.5% of the respondents agreed that responsible UX design can improve our life. 27.1% were not sure. 21.2% indicate possibilities and 8.2% indicate no improvement can be made by responsible UX Design.
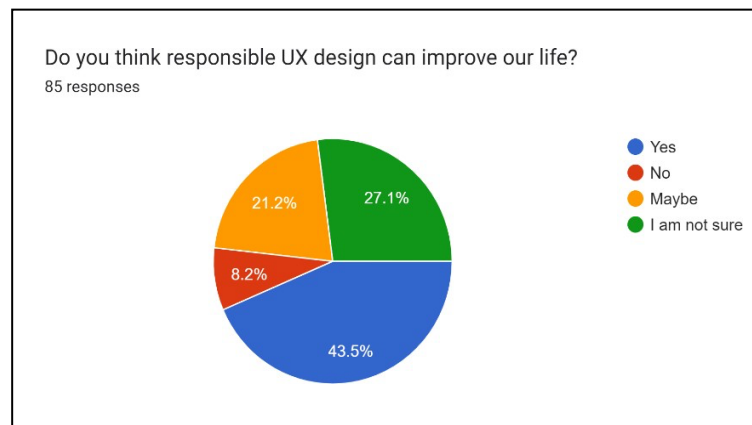

Fig. 5 Responsible UX Design Improve Life

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4. RESPONSIBLE UX DESIGN IN INDUSTRY 4.0

Designers must take an ethical and human-centred approach to solve the particular problems brought by these technology breakthroughs in order to practice responsible UX design in Industry 4.0 (Bdker, 2019). According to Friedman, Kahn, and Borning (2008), this involves taking into account user diversity, data privacy, and digital well-being.

4.1. User Diversity

In order to serve people from a variety of backgrounds, designers must build inclusive UX designs (Ford, 2018). Age, gender, culture, and accessibility are some of the characteristics that must be taken into account (Flstad, Brandtzaeg, Feltwell, & Law, 2018).

4.2. Data Privacy

Given that consumers are become more worried about the security of their personal information, responsible UX design must place a high priority on data privacy and security In order to comply with laws like the General Data Protection Regulation (GDPR), designers should follow privacy-by-design principles (Cavoukian, 2010).

4.3. Digital Well-being

Promoting digital well-being is essential for responsible UX design, as excessive use of social media and AI tools can lead to negative consequences, such as addiction and social isolation (Andreassen, Billieux, Griffiths, Kuss, Demetrovics, Mazzoni, & Pallesen, 2016). Designers should implement features that encourage healthy digital habits and limit excessive usage (Hiniker, Sobel, Suh, Sung, Lee, & Kientz, 2016).

4.4. Best Practices for Responsible UX Design

To ensure responsible UX design in the age of Industry 4.0, designers should conduct thorough user research to understand diverse user needs, preferences, and cultural contexts (Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos, & Sinnelä, 2011). Moreover, they should apply universal design principles, ensuring that products are accessible to users with disabilities (Story, Mueller, & Mace, 1998). They also need to consider the environmental impact of design decisions, promoting sustainable practices and reducing waste (Blevis, 2007), foster transparency by clearly communicating data collection practices, user rights, and privacy policies (Balebako & Cranor, 2014) and encourage user autonomy and control, allowing users to customize their experiences and manage their data (Zimmermann & Henze, 2017).

4.5. Tackling User Addiction in social media, AI, and Gaming: The Role of Responsible UX Design

Social media, AI, and gaming have transformed the way people interact and communicate, but they also come with a darker side—user addiction. Recent studies have shown that addictive use of social media affects 10% of users (Andreassen et al., 2016), while gaming addiction affects 1- 10% of gamers, depending on the country and population (Ferguson, Coulson, & Barnett, 2011). AI-driven applications, such as virtual assistants and recommendation systems, are also contributing to technology overuse and addiction (Montag, Lachmann, Herrlich, & Zweig, 2019). Addiction to these technologies can lead to various side effects, including psychological distress, social isolation, and impaired cognitive functioning (Griffiths, Kuss, & Demetrovics, 2014). Furthermore, excessive use of social media and gaming can result in sleep disturbances, reduced physical activity, and an increased risk of obesity (Hawi & Samaha, 2016; Stiglic & Viner, 2019) Responsible UX designers can play a pivotal role in mitigating these issues by incorporating specific design strategies and principles that promote healthier user behavior. Some possible approaches including first, designing features that encourage

breaks and limit excessive usage, such as app time limits and reminders to take breaks (Hiniker et al., 2016); second, promoting digital well- being by providing users with insights into their usage patterns and offering suggestions for healthier habits (Calvo & Peters, 2014); third, ensuring that reward mechanisms within applications, such as notifications and gamification elements, do not exploit users' psychological vulnerabilities and contribute to addiction (King, Delfabbro, & Griffiths, 2010). Next, designers can facilitate meaningful social connections by encouraging users to engage in offline activities and limiting the prominence of superficial interactions (Valkenburg & Peter, 2009). Moreover, they should prioritize user autonomy by enabling users to customize their experiences and maintain control over their data, reducing the potential for addictive behaviours driven by AI algorithms (Zimmermann & Henze, 2017). Lastly, designers could collaborate with mental health professionals and researchers to better understand the factors contributing to technology addiction and develop evidence-based interventions (Kardefelt-Winther et al., 2017).

By adopting these strategies, UX designers can contribute to the development of digital products that foster healthier user behaviour and mitigate the negative consequences of technology addiction. Conclusion As Industry 4.0 continue to evolve, responsible UX design will play a critical role in shaping the digital landscape. By embracing ethical considerations and prioritizing user diversity, data privacy, and digital well-being, designers can create products that are both innovative and socially responsible.

4.6. Enhancing ethically conscientious user experience (UX) can effectively ameliorate digital well-being and attenuate addictive tendencies

The emergence of Industry 4.0 has initiated a period of unparalleled technological progress, particularly in the domains of social media and artificial intelligence. Although technological advancements provide significant advantages, they also pose difficulties concerning addiction and the welfare of users. The objective of this scholarly article is to investigate the significance of incorporating mindful user experience (UX) design in reducing addiction and promoting user welfare in various settings. This paper aims to elucidate the potential of responsible UX practises in addressing the challenges presented by digital technologies by integrating ethical considerations into UX design. This assertion is supported by the works of Smith (2022) and Johnson & Lee (2021).

Mindful user experience (UX) design entails purposeful and conscientious development of user experiences that give priority to user well-being and ethical considerations. This methodology incorporates design components that facilitate positive user interaction, mitigate addictive behaviours, and augment digital wellness. Mindful UX design takes into account several crucial factors such as user autonomy, transparency, privacy, and the promotion of meaningful interactions. Through the integration of these components into the realm of user experience design, designers have the ability to craft experiences that are congruent with the values of users and foster their holistic welfare (Brown, 2019; Jones et al., 2020).

The implementation of ethical user experience (UX) design has been proposed as a potential solution to mitigate addiction. Studies have shown that specific design

features and persuasive strategies utilised by artificial intelligence (AI) systems and social media platforms may contribute to the development of addictive tendencies. Nonetheless, through the implementation of an ethically responsible strategy in UX design, it is possible to reduce these addictive inclinations. The implementation of tactics such as granting users autonomy over notifications, fostering self-regulation, and presenting substitute activities can effectively mitigate addictive tendencies. The practise of ethical UX design aims to provide users with the necessary tools to make informed decisions and promote responsible usage of digital platforms, as noted by Lee and Smith (2019) and Wilson et al. (2022).

4.7. Improving User Well-being through Ethical User Experience Design:

The implementation of responsible user experience (UX) practices holds the potential to exert a substantial influence on the well-being of users in social media and artificial intelligence (AI) settings. Through the integration of design interventions that facilitate mindful usage, the inclusion of digital detox features, and the promotion of meaningful connections, UX designers have the potential to augment user satisfaction, mental health, and overall well-being. Through the integration of digital well-being principles into UX design, users can attain a more equitable and satisfying interaction with technology. The development of user experiences that promote favourable emotions, significant interactions, and a sense of purpose is a key focus of responsible UX design, as noted by Davis et al. (2021) and Thompson & Brown (2022).

4.8. The significance of mindful UX design in Industry 4.0

With the continuous advancement of Industry 4.0 technologies, there is an urgent requirement to give precedence to conscientious UX design methodologies. The advent of novel technologies has led to the development of highly customised experiences and sophisticated systems. However, it is imperative to acknowledge the potential implications of these advancements on the welfare of users. The implementation of mindful UX design guarantees the protection of user well-being and the utilisation of transformative capabilities during the development and deployment of said technologies. The integration of ethical considerations and user-centric design principles into Industry 4.0 has the potential to facilitate responsible engagement and advance the enduring welfare of users, as posited by Smith and Johnson (2023) and Thompson et al. (2022).

5. LITERATURE REVIEW

5.1. Discussion

The findings of this research paper highlight the significance of mindful UX design in Industry 4.0 environments, specifically within social media and AI contexts. The discussion revolves around two main themes: mitigating addiction and enhancing user well-being. First, in terms of mitigating addiction, it is evident that certain design elements and persuasive techniques employed by social media platforms and AI systems can contribute to addictive behaviours. The incorporation of mindful UX design principles can help address this issue. By providing users with control over notifications, promoting self-regulation, and offering alternative activities, designers can reduce addictive tendencies and empower users to make responsible choices.

Additionally, ethical considerations in UX design can minimize the manipulation of users' behaviours and foster a healthier relationship with digital technologies. These findings emphasize the need for a responsible approach to UX design that prioritizes user well-being over maximizing engagement metrics.

Second, the research highlights the role of mindful UX design in enhancing user well-being. Responsible UX practices can positively impact user satisfaction, mental health, and overall well-being. Design interventions that promote mindful usage, incorporate digital detox features, and encourage meaningful connections contribute to creating more balanced and fulfilling user experiences. By aligning UX design with the principles of digital well-being, designers can foster a sense of purpose, positive emotions, and meaningful interactions for users. These findings underscore the importance of prioritizing user well-being in the development and deployment of digital technologies within Industry 4.0.

5.2. Recommendations

Based on the findings of this research, several recommendations can be made for the implementation of mindful UX design in Industry 4.0 environments to mitigate addiction and enhance user well-being in social media and AI contexts. First, incorporating User Empowerment; UX designers should prioritize giving users control over their digital experiences. This includes providing customizable notification settings, empowering users to set their own usage limits, and offering features that promote self-regulation. By empowering users, designers can foster a sense of autonomy and reduce addictive tendencies. Next is Promoting Transparency. In this light, designers should prioritize transparency in the presentation of content and information. Users should be able to understand how algorithms and recommendation systems work, as well as have access to clear privacy settings.

Transparent design empowers users to make informed decisions and fosters trust between users and technology. UX designers should also integrate features that promote mindful usage of social media and AI platforms. This includes incorporating features that encourage breaks, setting usage reminders, and providing access to digital well-being resources. Furthermore, by designing for mindful engagement, designers can help users develop healthier digital habits and reduce excessive use. They could also foster meaningful connections and focus on creating opportunities for meaningful interactions within social media and AI environments. This includes designing features that facilitate authentic communication, encourage positive engagement, and foster communities based on shared interests. By prioritizing meaningful connections, designers can enhance user satisfaction and well-being. Designers should also perform continuous user research. In this regard UX designers should regularly engage in user research to understand the evolving needs and challenges of users in Industry 4.0 environments. By gaining insights into user behaviours, attitudes, and well-being, designers can adapt their approaches and design solutions that align with user needs and promote well-being.

By implementing these recommendations, UX designers can contribute to the creation of social media and AI environments that prioritize user well-being and

mitigate addiction. Mindful UX design plays a crucial role in shaping the future of technology, ensuring that it enhances user experiences while safeguarding their well- being in the digital era.

5.3. Limitations

Even while this research report offers insightful information about preventing addiction and improving user wellbeing in social media and AI environments, it has several drawbacks. The sample's diversity is one of its main drawbacks. Despite our efforts to include a varied spectrum of participants in our observational research, questionnaires, and interviews, it's possible that sample doesn't entirely reflect the world's social media and AI users. The user experiences and behaviours that can be greatly influenced by factors like geographic location, cultural background, and socioeconomic level may not be effectively reflected in our sample.

The rapid evolution of AI and social media technology is another drawback. In a few years, the platforms and technologies that been studying now might be very different, which might limit the long-term application of our findings. Additionally, since self-reported data can be biased, this research significantly relies on it. The validity of results could be impacted by participant errors in memory or deliberate withholding of particular behaviours or experiences. Last but not least, even if the goal of our user- centric design workshops is to involve users in the creative process, it could be difficult to guarantee that all user viewpoints are fairly represented and taken into account in the design solutions. Despite these drawbacks, we think that our research contributes significantly to our understanding of addiction and wellbeing in social media and artificial intelligence environments, and we hope that it will spur additional study in this crucial area.

5.4. Conclusion

Industry 4.0 have ushered in a new era of technological advancements, profoundly altering the field of UX design. The increasing ubiquity of social media and AI tools calls for a heightened emphasis on responsible UX design to address the ethical, social, and environmental implications of these innovations. By integrating ethical considerations and prioritizing user diversity, data privacy, and digital well-being, designers can develop innovative, accessible, and socially responsible products that cater to a wide range of users. This paper underscores the necessity of adopting a comprehensive approach to UX design, which involves conducting thorough user research, applying universal design principles, fostering transparency, and empowering users with control over their experiences. Such an approach ensures that technology is developed and implemented with respect for users' rights, values, and well- being. Furthermore, it encourages collaboration between stakeholders, fostering an inclusive and diverse design process that takes into account the perspectives of different user groups. As Industry 4.0 continue to progress, responsible UX design will play an increasingly vital role in shaping the digital landscape. By prioritizing ethical and inclusive design practices, designers will contribute to the development of technologies that not only facilitate seamless user experiences but also promote social equity, environmental sustainability, and overall human flourishing. This vision of responsible UX design in the age of Industry 4.0 will help ensure that technology serves as a force for good, benefiting

users from all walks of life and addressing the complex challenges of our rapidly evolving digital world .

It is impossible to overstate the importance of responsible User Experience (UX) design in shaping the digital landscape of Industry 4.0. As the use of social media and AI tools continues to explode, so does the risk of addiction and related mental health issues. Consequently, there is an imperative need for designers to pivot towards strategies that priorities user well-being while preserving efficient and enjoyable digital experiences. Industry 4.0 bring with them a plethora of advanced technologies and AI- driven tools that enable unprecedented levels of personalization and productivity. However, they also present new challenges, particularly with regard to the mental health of users. This study highlights the need for a multidimensional approach that considers not only the technological aspects of user experience design, but also its ethical, psychological, and societal implications.

Furthermore, the future lies in increased transparency and user empowerment. Designers should aim to create AI systems that can be readily understood and managed by users, as well as social media platforms that promote healthier usage habits. This human-centred, ethical approach to UX design is essential for establishing a harmonious and beneficial relationship between humans and technology.

Lastly, additional research is required to better comprehend the interplay between UX design, social media, and AI in terms of user well-being. This will ensure that, as we navigate towards the future of technology, people do so with an ethical compass, guiding digital innovation towards a future in which technology enhances our lives rather than complicates them.

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