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# Enhancing human wellbeing through nature-inspired digital design interventions: An exploration of design opportunities for behavioural change

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**Abstract:** The positive impact of nature on human wellbeing is well-established, while lack of access to natural environments can negatively affect mental and physical health. In today's digital age, challenges such as excessive screen time and strained relationships emphasize the need for digital wellbeing and balanced technology use. This study explores the potential of digital technology to extend natural experiences and promote wellbeing. Through a case study of an industry-academia collaboration in India with a leading Asian digital device manufacturer, the concept of "Soulo" was developed to create digital nature experiences that enhance individual wellbeing. Results suggest that digital technology can do more than balance health and technology-it can improve wellbeing by enriching our experiences with nature. This innovative approach demonstrates how digital tools can foster shared, meaningful natural experiences, advancing wellbeing through deeper connections to nature and others, rather than merely serving as elements for balance.

**Keywords:** user experience; nature experience; digital wellbeing; digital design; conceptual design; behavioural change;

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## 1 Introduction

### 1.1 *The impacts of natural experience on human wellbeing*

The beneficial impacts of nature exposure on well-being are well-established (Martin et al., 2020; Richardson et al., 2021). Existing studies highlight nature's positive influence on three dimensions crucial to overall health (World Health Organization [WHO], 1948): physical well-being (Maller et al., 2006; Velarde et al., 2007), psychological well-being (Hartig et al., 2003; Olafsdottir et al., 2020), and social well-being (Zieris et al., 2023). Both direct and indirect engagements with the natural environment contribute positively to well-being (Ortega-Smith et al., 2004; Rodiek, 2002). A nature walk, compared to an

urban walk, yields emotional benefits (reduced anxiety, rumination, and negative affect, with preserved positive affect) and cognitive benefits (enhanced working memory performance) (Bratman et al., 2012). Additionally, nature experiences facilitate social interaction, fostering the development and broadening of interpersonal relationships (Astles, 2015).

The emotional bond with nature usually forms through perceptual encounters, be it in childhood or adulthood (Tang et al., 2009). Current research indicates a positive correlation between emotional attachment to nature and overall nature experiences, irrespective of age (Cleary et al., 2020), suggesting this connection is universal across societies (Müller et al., 2009). Hence, fostering emotional ties to nature and engaging in diverse nature experiences may be pivotal for a healthy and joyful life, transcending generations and societal boundaries.

### *1.2 Negative aspects of digital technology on human wellbeing*

When individuals are deprived of access to nature, and their innate need for connection with nature remains unfulfilled, adverse effects on well-being ensue (Nisbet & Zelenski, 2022; Zieris et al., 2023). This is particularly relevant in today's digitalized society, where excessive reliance on digital devices is pervasive. Research underscores that overuse of such devices can lead to negative emotions and a significant decline in self-regulation (Chakraborty et al., 2010), negatively impacting mental health (Lanaj et al., 2010) and interpersonal relationships (Lee et al., 2014). For instance, smartphone use can disrupt face-to-face social interactions (Ko et al., 2016) and impede daily tasks like studying and working (Harmon & Mazmanian, 2013).

In light of this, a prior study defines digital well-being as a subjective, personalized experience that strikes a balance between the benefits and drawbacks of mobile connectivity (Vanden Abeele, 2021). This entails individuals achieving a state of maximal controlled pleasure and functional support with minimal loss of control and functional impairment. Therefore, maintaining an optimal equilibrium in the usage of digital technology is essential for digital well-being.

### *1.3 Potential of Designing for natural experience with digital technology*

Throughout history, various consumer-oriented technologies have aimed to optimize user interaction with their offerings. Recently, many tech firms have incorporated digital well-being features, addressing aspects like time management and promoting breaks in usage. Given the benefits of nature experiences on well-being, can digital technology be leveraged to enhance nature experiences, promoting human well-being instead of being merely a tool to be regulated? Peters et al. (2018) underscored a broader question: How can technology be crafted to support well-being beyond immediate pleasure to encompass long-term fulfillment? Hence, this study investigates whether digital tech can stimulate or prolong nature experiences, exploring its potential to bolster well-being. It centers on crafting user experiences that effectively utilize digital tech to facilitate encounters with nature, thus enriching overall well-being. If digital devices can serve as mediums to facilitate experiences in nature, rather than detracting from human wellbeing, they may promote behavioral changes conducive to healthier lifestyles.

## 2 Methodology

This research treats a case study and extracts implications for designing nature experiences enhanced by digital technology. An assumption is based on the idea of "connection to nature," that Wolsko & Lindberg (2013) expounded that exposure to nature correlates with numerous specific advantages in cognitive, emotional, and social functioning. Individuals actively participating in outdoor activities with appreciation are more likely to develop a strong connection with nature and experience elevated psychological well-being. Grounded in the assumption, a case study was undertaken as collaborative industry project.

### 2.1 A case: "Connection with nature": Digital Wellbeing project with a leading Asian digital devices company

The presented case serves as a tangible example of an industry-academia collaboration conducted at an leading Indian design university. The project's aim was to investigate the contemporary scenario of digital well-being among Indian youth while developing innovative concepts leveraging digital technology to enhance users' habits and well-being. The project scope and parameters are detailed in Table 1.

The core challenge was framed based on a design brief provided by the industry partner, a leading Asian digital devices company. This partner was keen on understanding the intersection of digital devices and individual well-being, with a notable concern being the adverse impact of excessive social media use. Digital wellbeing, thus, involves more than just device disconnection; it requires a nuanced comprehension of how digital devices influence well-being.

In line with the background, a design brief was formulated for a system using the Samsung Galaxy Eco-system, aimed at enhancing end-users' well-being in their daily lives. The project's overarching goal was to introduce an innovative system tailored to enhance individual well-being through the thoughtful integration of digital devices into daily routines.

The project involved three students from the design management program selected for their proficiency in crafting integrated product-service systems using design methodologies. Guiding the students were two faculty members, the authors of this work, and three mentors from the collaborating company. Spanning six months, the project adopted a Project Based Learning (PBL) approach, conducted through a hybrid online-offline mode in Pune, India.

**Table 1** Detailed project settings "Digital Wellbeing"

<i>Items</i>	<i>Settings</i>
Goal	Proposing a novel system (framework) designed to enhance people's well-being in their daily lives through the use of digital devices in a harmonious manner.
Design brief	To design a system (framework) using Samsung Galaxy Eco-system which will bring wellbeing in end user's everyday life.
Participants	3 master students in design management program

	3 mentors from Samsung India
	2 faculties from MIT ID
Project details	<ul style="list-style-type: none"><li>• Duration: 6 months lasting industry-university collaborative project</li><li>• Project approach: Project Based Learning (PBL)</li><li>• Location: Pune, India</li></ul>
Project activities	<ul style="list-style-type: none"><li>• Research: secondary research and primary research</li><li>• Concept creation</li><li>• Solution creation</li></ul>
Results	<ul style="list-style-type: none"><li>• Research results: Primary and secondary research results</li><li>• Concept of new system that enhance people's digital wellbeing</li></ul>

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## 2.2 Case Phases and Activities

The project activities were conducted in three phases: research, concept creation, and solution creation.

### Phase 1: Research Phase

This phase included three steps:

1. Basic and secondary research: Comprehensive research including a literature review on wellbeing and digital wellbeing. A comparative analysis of the digital device ecosystem and competitors was also conducted to understand the business competition focus.
2. Diary Study: This anthropological approach provided deep insights into the daily digital experiences of the target audience: 10 participants, ages 20-24 and 25-30, recorded their digital interactions over a 3-day period. Data were analyzed using affinity diagrams to extract meaningful insights.
3. User Survey: 50 participants were surveyed to collect quantitative and qualitative data on digital device usage and content consumption.

### Phase 2: Concept Creation Phase

Key design development directions were defined and five concept seeds were generated. One idea with high potential was further developed in the next phase. Idea generation and refinement took place in an iterative process that included in-depth discussions with faculty, mentors, and young digital natives (20-30 years old). The theme of “outdoor activities and digital wellbeing” became the focus and drove the development of specific solutions.

### Phase 3: Solution Creation Phase

In this phase, specific solutions were designed and developed based on the narrowed-down theme:

1. User personas User personas: Representative user personas were created, reflecting the results of the Phase 1 research.

2. Value Proposition: An offering map was created with “digital-enabled outdoor travel” as the value band.

3. Service Design: Developed a product service system that aligns with the partner's digital product ecosystem. Smartphone and smartwatch designs included rich color imagery to enhance the user experience in nature. Wireframes and user interfaces were developed to visualize the entire user experience. A scenario map depicted a systematic ecosystem of user experiences.

Through these three phases, the project aimed to promote better habits and health through the use of digital technology, especially among the younger generation who are more familiar with digital devices. Through in-depth research, conceptualization, and solution development, the project proposed innovative designs to enhance digital wellbeing.

### **3 Result**

This case showcases the transformative potential of digital technology in enriching well-being through design. It underscores how digital tools can foster connections with nature, inviting individuals to engage with natural experiences and amplify their value. Contrary to being viewed as a hindrance, digital technology emerges as a facilitator, augmenting the potential of nature encounters for enhanced well-being. Below we summarize the results for each phase of the project in turn.

#### *3.1 Research result*

During the research phase, the design team combined secondary and primary research to explore design opportunities and chart a design trajectory.

The secondary research explored the impact of wellbeing and digital technologies. The results provided team members with a basic understanding of wellbeing and digital wellbeing, as well as an understanding of the digital ecosystem and users' use of technology in the firm, including partners and competitors. These basic understandings helped to define the focus of the subsequent primary research as well as the design framework.

At the same time, the primary research included a diary survey (Adler et al., 1998) to delve into both the climax and rock-bottom periods of the subjects' daily lives. The diary survey allowed us to delve into daily digital experiences and identify the triggers for happy and low moments. The premise relied on the clear assumption that “encounters with positive emotions such as happiness and fulfillment are about unlocking one's potential, taking control of one's life, having a sense of purpose, and cultivating positive relationships” (Huppert, 2009; Ruggeri, 2020).

As a result, we sought to understand the stimuli that evoke specific emotional responses in the target population. The results revealed that the three main triggers for moments of happiness were 1. compassion (someone is thinking about you), 2. fulfilling time (spending time with yourself and others), and 3. initiative (making decisions). Conversely, the top four triggers for low tone were identified as: 1. being overwhelmed

(head full), 2. being out of routine (unexpected events), 3. loneliness (isolation), and 4. being unproductive & tired.

Additionally, a survey of 50 subjects revealed that 88% were smartphone users, spending 6-8 hours on their devices each day.

Ultimately, the design direction crystallized from these research.

### 3.2 Concept Creation Result

Building upon the insights gleaned from the entire research endeavor, the team distilled their design direction into a dual-faceted approach to well-being.

On one front, the inquiry focused on elucidating how digital devices and technology could elevate the peak moments in the lives of the target demographic. In a tangible sense, regarding the promotion of positive emotions, the design direction aspired to nurture individuals by incorporating considerate elements that evoke feelings of happiness and affection. Additionally, it sought to ensure connectivity to people and entities that facilitate the quality utilization of time, as well as motivate individuals to make decisions that yield satisfaction and confidence.

Conversely, on the other front, it addressed the question of how these technologies could mitigate negative emotions. In terms of mitigating negative emotions, the design direction rigorously aimed to prevent the exacerbation of detrimental feelings, such as overwhelm, deviation from routine, isolation and loneliness, unproductivity, and fatigue.

Keeping these two perspectives as strong directions for the design, the team developed three concepts as ideas (Figure 1). These are care, quality time, and initiative. Each concept was distilled down to a specific activity base and used as a cornerstone for the development of the next solution.



Figure 1. three concepts developed during the concept creation phase

### *3.3 Solution Creation Result: “Nature-Embracing Digital Experience for wellbeing: Soulo”*

Reflecting the research results and concept creation results, the design team developed a new concept which intends to enhance people’s wellbeing by natural experiences elaborated by digital technology. After iterative ideation and intensive discussion among the design team and company’s participants and faculties, the design team defined the designing situation on “outdoor activity and wellbeing”.

- Premises

Extant literature suggests that the mere presence of a natural environment can have significant positive effects on well-being (e.g. Ryan et al., 2010). Furthermore, Wolsko, C., & Lindberg, K. (2013) examined that those types of experiences that explicitly generate genuine appreciation of and connection with nature are likely to be the most beneficial for psychological well-being. They also stressed that mental health should be enhanced by interventions that facilitate appreciative outdoor recreational activities, as well as those that promote mindfulness (Wolsko & Lindberg, 2013).

Based on the assumptions on the relationship between natural experiences and wellbeing, the design team framed the How Might We (HMW) question; “How might we encourage people to spend more time outdoors so that it has a positive impact on their overall wellbeing?”

To develop solutions, condition was set up; to empower the target persona's mindfulness and wellbeing by harnessing the Samsung ecosystem, seamlessly integrating phone, smartwatch, and earphones for a holistic wellness experience.

This design research is grounded in the fundamental premise that digital devices play a pivotal role in enhancing individuals' well-being by providing an avenue for them to connect with and immerse themselves in nature. Beyond this foundation, the inquiry postulates the prospect that digital devices possess the potential to broaden and amplify the experiential dimensions of nature. The overarching aim is to facilitate the extension of well-being benefits derived from individuals' active engagement with nature through the augmentation afforded by digital devices.

- The concept of “Soulo”

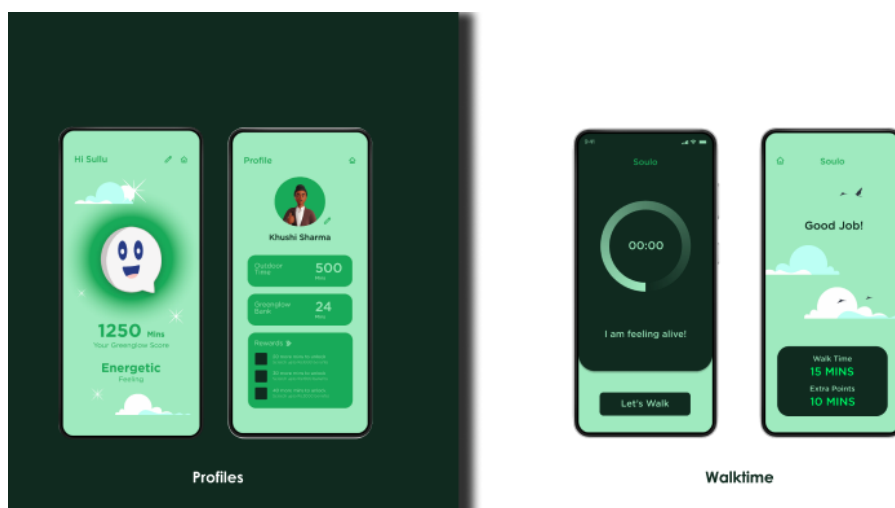
The ultimate conceptual objective is to provide an entirely new digital wellbeing experience rooted in nature. Conceived as a spiritual entity, Soulo embodies a guiding principle designed to reconnect individuals with the rejuvenating embrace of nature; Soulo's mission is to subtly encourage outdoor adventures for those who are enthusiastic, curious, and passionate about living. Acting as a benevolent guide, Soulo gently encourages users to leave their digital routines and immerse themselves in the outdoors. Specifically, Soulo, whose name derives its meaning from the word “Soul,” thrives on sunlight, fresh air, and the energy of the earth, fostering a connection with its users and with nature. Soulo grows symbiotically as the user becomes more connected to nature, its aura expanding with each step outside. This growth symbolizes the user's commitment to

embrace the outdoor experience and represents a shared journey to reconnect with the natural world.

The overarching aim is to develop an outdoor application that motivates individuals to spend more time in natural settings, employing a digital soul that encapsulates their outdoor spirit conditions (Figure 2). The primary function entails providing a timer to display the duration users have spent outdoors and gently encouraging them through notifications (Figure 3). Through this functionality, the Soulo application actively engages users in spending quality time with both loved ones and nature. As depicted in Figures 4 and 5, the basic screens for both the smartphone and smartwatch interfaces are intentionally crafted to feature empathetic soul characters, each expressing facial expressions reflective of users' emotional and spiritual states. They are designed as a product-service system that takes full advantage of the company's digital ecosystem, enriching the user's experience of nature through both products and services.

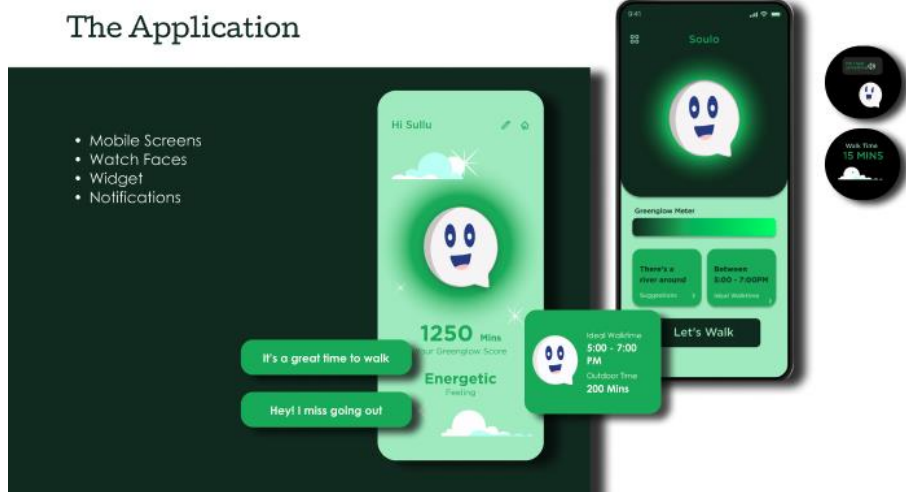


**Figure 2.** Soulo application image, the character represents the user's digital soul.





**Figure 3.** The basic function to provide a timer and to nudge the user through notifications.



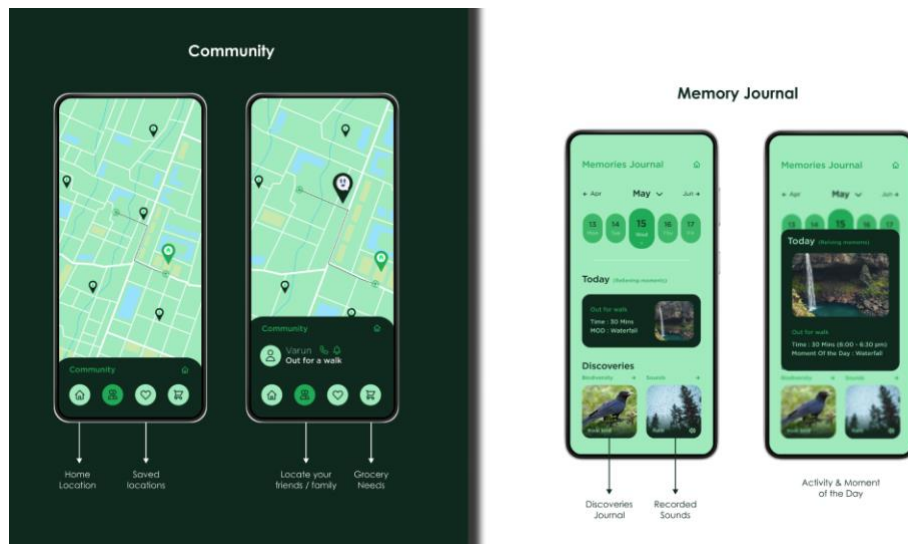
**Figure 4.** The basic screens of the application in smartphones.



**Figure 5.** Smartwatch faces.

The Soulo application not only encourages outdoor activities, but also provides additional user experiences through its discovery feature. Specifically, the Soulo application encourages collaborative outdoor experiences with other Soulo users - friends and colleagues. In doing so, they can discover new aspects of nature that they normally come into contact with. Users can discover the names of familiar flowers, bird life, and soil richness that they would not normally notice. Furthermore, exploring outdoor experiences with friends and colleagues motivates users to forge new connections and encourages the creation of a memory journal (Figure 6) to record and preserve unique

outdoor journeys. Ultimately, Soulo's primary value proposition is to facilitate digital breaks and help users discover the wonders of nature and their immediate environment.



**Figure 6.** Discovery functions: community and memory journal

While the initial focus of the Soulo application has been largely on physical immersion and engagement with nature, there is a profound connection between exposure to nature and mental health that presents an opportunity to make the application more holistic. Extensive research indicates that spending time in natural environments can significantly reduce stress, anxiety, and depression, while enhancing mood, cognitive function, and overall emotional well-being. Integrating mental health features into Soulo can transform it into a comprehensive tool that not only encourages physical activity but also nurtures the mind and spirit.

To address this, the Soulo app can incorporate features designed to promote mental well-being. For instance, guided mindfulness and meditation sessions set in natural soundscapes can help users relax and center their thoughts. These sessions can be personalized based on the user's preferences and emotional state, leveraging the app's ability to adapt and provide relevant recommendations. Additionally, Soulo could introduce journaling prompts that encourage users to reflect on their experiences in nature, fostering a deeper connection with their surroundings and their inner selves.

Another feature could be mood tracking, where users can log their emotional states before and after spending time outdoors. This data can be used to generate insights about the positive impacts of nature on their mental health, providing tangible evidence of the benefits and motivating continued engagement. Furthermore, integrating community features where users can share their experiences and support each other can create a sense of belonging and shared purpose, amplifying the app's positive impact.

By incorporating these mental health aspects, Soulo can offer a more rounded and enriching experience. It can become a digital companion that supports users' physical and mental health journeys, encouraging a balanced lifestyle that embraces the healing power of nature. This holistic approach aligns with the overarching goal of Soulo: to reconnect individuals with the natural world, fostering well-being through a harmonious blend of physical activity, mental relaxation, and emotional support.

In summary, the Soulo concept aims to leverage digital technology to enhance well-being by reshaping interactions between individuals and nature. Essentially, it prompts users to actively engage with the natural environment through digital interfaces and experiences. Furthermore, Soulo strives to amplify the positive impact of nature on well-being, going beyond simply increasing exposure to natural surroundings. It seeks to prolong and enrich these interactions by harnessing the capabilities of digital devices. In essence, digital technology acts as a catalyst for immersive and meaningful nature experiences.

#### **4 Discussion**

This study investigates whether digital technology can act as a catalyst to enhance natural experiences and promote well-being. Traditionally, digital technology has been viewed as a negative influence on well-being, often described as a "drag or a demon" (Burr et al., 2020; Abeele et al., 2022). However, this study seeks to shift this perspective by exploring how digital tools can increase access to and engagement with nature, ultimately fostering positive impacts on well-being.

Through a detailed case study of an industry-academia collaboration, this research will uncover new dimensions of the relationship between digital technology and well-being. By focusing on the potential for technology to facilitate and enrich natural experiences, the study aims to highlight how digital advancements can contribute positively to mental and emotional health. The findings will provide valuable insights into how digital tools can be leveraged to enhance our connection with nature, promoting a more balanced and fulfilling approach to well-being.

This case study demonstrates the potential of digital technologies to enhance the effectiveness of improving human wellbeing through nature experiences. Digital technologies can contribute to improving people's wellbeing by enhancing the inherent power of nature experiences to improve human wellbeing. First, digital technology can act as a device that increases people's opportunities to interact with nature itself; Soulo's gamification component encourages people to impulsively go to nature. The possibility of improving the wellbeing of people who have little contact with nature in their daily lives can be greatly enhanced simply by increasing their opportunities to interact with nature, even if only slightly, through Soulo. Second, digital technology can improve the quality of the nature experience, as seen in the Soulo case study, by creating an enjoyment of discovering other aspects of nature that we normally take for granted. By using all five senses to interact with the smell of the wind, the sound of birds, and the scent of the earth, we can create opportunities to learn more about nature. Third, digital technology has the potential to maximize the collaborative experience of nature experiences by encouraging people to experience the outdoors with friends and

colleagues. These inclusive experiences, not only enjoyed by an individual alone, but also with friends and colleagues, will create new community connections. Once a group of people enjoy nature, it will be possible to enhance wellbeing together in the community.

These possibilities offered by digital technology, in turn, suggest the potential for behavioral change in human experience of nature. Rather than allowing people to become addicted to digital devices to the detriment of their health, digital technology can serve as a complementary “partner” or “friend” that encourages people to experience nature. If digital technology can act as a complementary “partner” or “friend” that encourages natural experiences, people’s behavior could fundamentally change. By extending the definition of digital wellbeing in this way, people will no longer view digital technology as an object of abhorrence, but rather as a companion that actively enhances their wellbeing.

This paper makes two important contributions. First, it presents a broader and more optimistic view of digital wellbeing, challenging the prevailing notion of balancing advantages and disadvantages for human wellbeing. Rather, it advocates viewing digital technology as a human partner that actively improves wellbeing. By actively encouraging human behavior change toward behaviors that in themselves clearly improve human wellbeing, such as contact with the natural environment, digital technology can be expected to function as a good friend that improves human wellbeing. From the perspective of design and futurology, this not only finds a good balance between digital and natural experiences, but also paves the way to explore different harmonies in how digital technologies can embody natural experiences and, in turn, contribute to human wellbeing.

Second, it introduces the notion of natural experiences enhanced by digital technologies, opening new avenues for future design attempts to create products, services, and worldviews. Leveraging the positive relationship between natural experiences and wellbeing, digital technology opens up design possibilities for creating new natural experiences. This perspective could lead to the development of a new “art” of digital experience design that focuses on the emotional and atmospheric elements of users’ digital interactions, such as attraction, seduction, and engagement (Leung, 2008).

It is important to recognize several limitations of this paper. First, the research methodology relies on one case of a joint industry-academia project in India. Therefore, the insights derived need further validation through diverse methodologies and across different countries and cultural contexts. Second, the ideas generated in this study remain in the conceptual stage. Therefore, further empirical testing is required to determine whether digital applications designed for the purpose of enhancing the nature experience, such as the Soulo concept, can truly encourage users to change their behavior. A major challenge is to verify this matter through service implementation by partner companies. In particular, the challenge is to conduct empirical research on whether people’s wellbeing has actually improved, both qualitatively and quantitatively.

As directions for future research, several avenues can be proposed. First, what types of relationships between nature experiences and digital technologies that foster human wellbeing could be identified? A deeper understanding of nature experience itself and the

exploration of new opportunities for nature experience to be enhanced by digital technology would be a very exciting research topic. Second, how can digital technologies enhance, amplify, and extend nature experiences? Because of the tremendous advances in digital technology, the possibilities for creating new experiences to facilitate nature experiences are endless. Third, we can explore which individuals can benefit most from digital technologies in enhancing nature experiences and overall well-being. While this research targeted young adults in India, it goes without saying that it is not just young adults who benefit from nature experiences. Therefore, it is meaningful for people of different ages and interests to explore, create, and experiment with digitally-driven nature experiences that are rich for each. Different types of design research could contribute to enriching these opportunities and enhancing people's well-being.

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