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EMOTIONAL DESIGN IN SMARTPHONES: CRAFTING FUTURE DIGITAL EXPERIENCES

Yasuyuki Hayama[1], Ishaa Chaudhari[2] and Harshit Desai[3]
[1] Strategic Design Department, Faculty of Design, Kyushu University
[2] London College of Communication, University of the Arts London
3 MIT Art, Design and Technology University

ABSTRACT
Design and emotions have a strong correlation and are interdependent. Emotional design is a domain in design that centers around creating design that evoke emotions, which in turn generate positive and delightful user experiences. Since Donald Norman's pioneering work, emotional design has become integral to product and service design. With expanding focus on digital products and experiences, it is crucial to reexamine emotional design in this context and explore its future values. In this paper, the authors aim to explore the emotional design aspects of future digital experiences focusing on Gen Z, how they use smartphones, their perceptions, new meanings and emotional values associated with smartphones. The theoretical focus is on emotional design aspects to discover insights for future development of digital experiences enabled by the interface of smartphones. With the methodology of Research through Design (RtD) approach, this paper investigates both theoretical and practical knowledge, based on a case of Project-Based Learning (PBL) in a Master's Design Management course in an Indian design school. The study explores upcoming emotional aspects for designing new digital experiences in the future, in collaboration with an Asian smartphone company. The results reveal that for Generation Z, the smartphone exists in two metaphorical levels; one is “phone-as-a-companion” and second “phone-as-a-transformer”. Furthermore, a framework of emotional design for digital experience is prototypically proposed. The framework can contribute both theoretical and practical point of view for creating future values of smartphone experiences.

Keywords: Emotional Design, Digital Experience, Metaverse of Things (MoT), Research through Design (RtD), Generation Z

1: INTRODUCTION

There is a strong relationship between design and emotions. Since Desmet [1] and Norman’s [2] research theories regarding the aspects of emotion and design were pioneered, various studies on emotion design and emotional design were rapidly explored under the same umbrella of design and emotion; a topic that became an important one in the field of design during the last decades [3]. Meanwhile, in the last few decades, the scope of design in both academia and practices increasingly covers digital products and experiences [4]. Therefore, emotional design also has to be seen in this changed context. It is crucial for designers, companies, and design scholars to explore the current meaning of emotional design and discover future values in terms of the emotional aspects of digital products and experiences. In a world where products, services, and experiences are becoming increasingly digital, how can we capture what an emotional digital experience is? How can emotional design contribute to digital experiences? All of these concerns are worth investigating and exploring to give a better understanding of the topic regarding emotional design and digital experience.

1.1. Emotion and Design

The concept of "emotion," first introduced by Plato [5], was later highlighted by Darwin [6] as a crucial factor in shaping social behaviours such as communication, forming a basis for his evolutionary theory. Dewey [7] built on this by suggesting that emotion is influenced by experience, not merely a response to external stimuli. Since the 1970s, emotion has been explored across various disciplines, including psychology, philosophy, sociology, and economics [8].

In design studies, researchers have developed theories and methodologies to understand how emotions impact design. Ho and Siu [8] categorized design and emotion studies into three approaches: “user/consumer-driven,” “designer-driven,” and the “relationship among users/consumers, designers, and design outcomes.” The “user/consumer-driven” approach emphasizes understanding user experiences to improve design [9]. The “designer-driven” approach focuses on how external changes influence designers’ goals and emotional responses [10], [11]. The third approach highlights communication between users and designers through design outcomes [12], [13]. Mapping these approaches is fundamental for situating specific research within the broader field of emotion and design studies.

1.2 Emotional Design and Digital Experience

As digital technologies become integral to daily life, most products and experiences are now technology-enabled, impacting psychological well-being and emotions. For instance, Kushlev and Dunn [14] showed that frequent email checks via smartphones increase stress, while Misra et al. [15] found that the mere presence of a mobile phone reduces the quality of face-to-face interactions. Given the pervasive presence of digital technology, designing experiences that consider their emotional and well-being impacts is increasingly crucial.

Leung [4] notes that the "art" of digital experience design extends beyond usability, encompassing emotional and atmospheric elements such as attraction, seduction, and engagement. These intangible aspects are difficult to define or quantify, requiring insights from other disciplines experienced in designing holistic experiences. Peters et al. [16] highlight a knowledge gap in designing technology that supports well-being, despite the potential for technology to be consciously developed to enhance or regulate emotions. Therefore, exploring emotional aspects in digital experiences is essential, but the lack of methodologies and practical knowledge must be addressed in both academic and practical contexts. Empathy is a critical tool for bridging this gap, providing a holistic, human-centered approach to understanding and identifying users’ latent needs.

1.3. Focus of the research: Emotional design for digital experience of smartphone for Generation Z

To address this issue, this paper aims to explore the emotional design aspects of future digital experiences, focusing on Generation Z and their use, perceptions, and new meanings and emotional values associated with smartphones. One trend that is common to Generation Z in all of the Asian countries is the influence of technology on their lives and behavior. It is clear that the members of Generation Z in Asia are not only digital natives but have grown up in a world of both social media and mobile technology [17]. Especially in India, with a population of 472 million, Generation Z in India is the largest in the world [18]. According to Hameed and Mathur [18], members of Generation Z in India show common behaviors and preferences with their counterparts around the world. Additionally, members of Generation Z in India have clear opinions and ideas of how youth can contribute to a developing nation like India. Therefore, by focusing on Generation Z, especially those in India, we will be able to gain future insights about the emotional design of digital experiences through interpreting weak signals of the future of digital experience [19].

There are three main targets of the research. First, it investigates what emotion smartphones bring to generation Z and what they want from smartphones in the future. Second, based on the first set of insights, we derive two hypothetical scenarios about what future smartphones should look like with respect to emotional design. Third, we formulated an emotional design framework for digital experiences as a theoretical model for the prototype. This research aims to contribute to knowledge generation mainly in the categories of “user/consumer-driven approach” based on the categorization by Ho and Siu [8].

2: METHODOLOGY

Owing to the constructive design research as a way of Research through Design (RtD) approach, this paper investigates both theoretical and practical knowledge. A design challenge of creating “emotional design framework for digital experience in smartphone” was the setting of the research, where an industry-collaborative Project-Based-Learning (PBL) in design management program at the Master's level in an Indian design school. Collaborating with an Asian smartphone company, this study explores upcoming emotional aspects for designing new digital experiences in the future.

2.1. Project-Based-Learning (PBL): Creating an "emotional design framework for digital experience

To explore the emotional design aspects of future digital experiences, a Project-Based Learning (PBL) [20] was conducted in a design management program at the master's level in an Indian design school. Project-Based Learning is a pedagogical approach in higher education in order for students to learn cutting-edge academic topics within real-world practice [21]. Project-Based Learning is a student-centered form of instruction that is based on three constructivist principles: learning is context-specific, learners are involved actively in the learning process and they achieve their goals through social interactions and the sharing of knowledge and understanding. It is considered to be a particular type of inquiry-based learning where the context of learning is provided through authentic questions and problems within real-world practices that lead to meaningful learning experiences [21]. Therefore, by collaborating with a leading Asian smartphone company, the research was planned and conducted for the purpose of exploration of emotional design aspects for future digital experiences especially on smartphone.

As the basic conditions of the project, an industry-academia collaborative project was conducted as an educational course under the design management master's program at the MIT Institute of Design (MIT ID) in India. The project was coordinated by the faculty of design management and a leading Asian smartphone company, in which four students and two teachers and three mentors from the company participated. 50 students as interview collaborators also participated. The design project theme was creating an "emotional design framework for digital experience" which can clarify what is the "plausible" level of emotional experiences in digital experience for the smartphone. In order to achieve this goal, the focus of investigation set on understanding generation Z's way of usage and perceptions regarding smartphones to see the future in weak signals [19]. The timeline of the project was planned of three phases with a duration of 13 weeks.

2.2. Research through Design (RtD)

Relying on constructive design research as a way of Research through Design (RtD) approach [22], this research investigates both theoretical and practical knowledge. According to Stappers and Giaccardi [22], RtD indicates design activities that play a formative role in the generation of knowledge, in other words "Doing design as a part of doing research". As most academic publications about RtD focus on the prototype, The designing act of creating prototypes is in itself a potential generator of knowledge (if only its insights do not disappear into the prototype, but are fed back into the disciplinary and cross-disciplinary platforms that can fit these insights into the growth of theory) [22]. Based on the definition of prototype by Houde and Hill [23], prototype is defined as "any representation of a design idea, regardless of medium". Here, we are considering a framework as the end product, and have applied the design process to create the required solution.

Therefore, through generating a prototypical framework of emotional design for digital experience as a visual representation of design outcome, this research pursues to generate a piece of knowledge in the identified research gap between emotional design and digital experience.

Data was collected through two different formats. Firstly, secondary and primary research data during the project which were collected by the students' participants. Secondly, the final outcome of the emotional design framework, which is the generated prototype.

3. RESULTS

First, the research yielded several insights into what emotion smartphones bring to generation Z and what they want from it in the future. As basic insights, eight emotional dimensions were synthesized through a study of how the digital experience of a smartphone is emotionally charged for Generation Z. The desires they expect from future smartphones were also analyzed and integrated into the five sensory aspects. Second, based on the first insights, two hypothetical scenarios were derived. The students generated two metaphorical concepts; one is the "smartphone-as-a-companion" and the other is the "smartphone-as-a-transformer." In both cases, different types of Generation Z's emotional needs could be realized by the smartphone. Third, based on these insights and hypotheses, a prototypical framework of emotional design for digital experiences was formed. This framework is prototyped with the aim of creating a piece of knowledge about emotional design for digital experiences, with reference to the

theoretical background of emotion and consciousness [24], [25]. In particular, in the broader context of emotional design, it is intended to contribute to the "user/consumer-driven approach" [8].

3.1. Insights

First, we gained findings into what emotions smartphones bring to Generation Z and what they want from smartphones in the future. These findings were synthesized through extensive desktop research (secondary research) focusing on how emotional design affects Generation Z today, and workshops and surveys (primary research) to better understand the emotional interests of 50 students in MIT ID who are Generation Z when it comes to smartphones.

3.1.1. What emotion does smartphone bring to generation Z

During the PBL, students explored the fundamental emotions smartphones evoke in Generation Z through primary and secondary research. They identified triggers that lead to emotions and synthesized eight emotional principles based on patterns observed in users' conscious and unconscious experiences: control, familiarity, serendipity, reward, closure, nostalgia, assurance, and attachment.

1. **Control** can be described as an ability to perform a task according to your preferences. Smartphones enable multitasking easily, however, each task should be allowed by preferable gestures, actions and settings that leads to a high emotional level of control. This principle exercises the degree of control smartphones allow the user and is important to establish to enhance user's privacy.
2. **Familiarity** is a sense of relatedness to the real world scenarios and objects. Even with digital interfaces, qualities that stimulate familiar real-world textures and sensory perceptions can enhance emotional utility. An easy-to-use and learn interface also generates familiarity and plays an important part during new developments in smartphones like software updates. For example, phone wallpapers themes form a sense of familiarity to the phone due to the user constantly seeing the particular setting.
3. **Serendipity** is a sense of exploring new things that lead to an unexpected positive reaction. The digital interface of the smartphone is perceived by Generation Z as a doorway to a new world, and the accidental discovery of an experience never seen or experienced before evokes an emotional experience of serendipity and adds new dimensions to the emotional relationship and attachment of humans to smartphones.
4. **Rewarding** is a productive feeling and achievement. When an action is accomplished through a smartphone, having appropriate feedback is important to enhance feelings of being rewarded. For example, having different feedback for each layer of multi-layered tasks can appropriately enhance feelings of fulfillment.
5. **Closure** is a sense of completion. When a task is completed, being able to clearly see that it has been completed is very important for emotional utility. A smartphone's appropriate feedback results in providing the user a feeling of contentedness.
6. **Nostalgia** is "emotional" take me back. This emotion is derived from the historical memories that are stuck in the smartphone. The connections with family members who live far away and various friends and acquaintances you have met over the years are stored in your smartphone. For example, albums from the past can heighten feelings of nostalgia.
7. **Assurance** means affirmation and guarantee. In the digital experience on smartphones, many actions are performed for the first time. Therefore, a clear and understandable explanation of what the results of a certain action will be will help to dispel the user's apprehension and increase the feeling of assurance; providing a guarantee for every action or gesture. For example, informing the user whether the action they are performing is in the right direction or not is critical as is to guide the user throughout their journey.
8. **Attachment** triggers the connection with other people and objects. The connectivity to the world that is achieved through the phone triggers this emotion as smartphones are the primary means to connect with people and other things particularly for Generation Z. For example, images on the home and standby screens are important for enhancing attachment. Another example, is the call log which gives the users the ability to connect with their family, friends and others in mere seconds, increasing attachment to the phone. The ability to change frequently used applications to one's preferred colors and settings will further increase attachment.

These principles serve as fundamental guidelines, aligned with sensory triggers and cognitive processes. In designing digital products, they can be applied to assess emotional design throughout the user journey and act as a checklist to ensure designs are holistic and integrated. This approach influences brand perception, purchase decisions, and user retention, enhancing digital experiences with a human-centered focus.

3.1.2. What generation Z want from smartphones in the future

Through in-depth observation and interaction with Generation Z participants, we gained insights into their needs and visualized future smartphone scenarios. Understanding their emotions and levels of self-awareness offered deeper insights into their preferences and the image they want to project. Our analysis focuses on the emotional design of future smartphones based on the five senses, summarized into four categories: touch, hearing, sight, and futuristic senses (smell and taste).

The close relationship between the senses and emotions presents opportunities for developing emotional smartphone experiences. Knowing that users engage multiple senses (touch, hearing, sight) simultaneously during communication enhances psychological and emotional connections. In addition to exploring these prevalent senses, designing future digital experiences that incorporate taste and smell shows significant potential for creating advanced scenarios.

3.2. Hypothetical scenarios

Second, based on the above insights into future smartphones, two hypothetical scenarios were derived. These hypothetical scenarios are intended to provide conceptual and archetypal hypotheses for the future meaning of smartphones [26]. Smartphones exist at two metaphorical levels: the "smartphone-as-a-companion" and the "smartphone-as-a transformer." In both cases, different types of Generation Z's emotional needs are met by the smartphone.

3.2.1: Smartphone-as-a-companion

The first hypothetical scenario is “smartphone-as-a-companion”. This hypothetical scenario explores the direction of seeking a more core sense of security and comfort, such as healing and attachment to smartphones. The detailed scenario was developed as follows.

“Humans are biologically predisposed to form attachments, extending even to non-human and inanimate objects. Attachment styles affect not only relationships with others but also with objects like smartphones. For Generation Z, phones are more than simple devices; they are companions integral to their lives. Young people display attachment behaviors such as proximity-seeking and separation stress, influenced by their attachment style. Those with higher attachment anxiety are more likely to rely on their phones for constant connection. Generation Z views their phones as companions, providing emotional comfort and fulfilling various needs throughout their day.”

3.2.2 : Smartphone-as-a-transformer

The second hypothetical scenario is that of a smartphone-as-a-transformer. This hypothetical scenario is based on the premise of constant technological evolution, and the rethinking of the smartphone from a more emotional aspect, given that its functionality will continue to evolve in multiple dimensions in the future.

“With advancing technology, cell phones have replaced and rendered many physical items obsolete, such as radios, music players, books, wallets, maps, calculators, and scanners, transforming them into applications accessible with a few taps. Essentially, the cell phone functions as a transformer.
In our user survey, respondents expressed desires beyond emotional needs, envisioning smartphones facilitating various futuristic activities like transportation, knowledge embedding, and digital twins. Technological advancements will further expand the role of smartphones as transformers, integrating AR spaces that blend digital and physical realities, and evolving Metaverse experiences. As smartphones extend reality and perform human-like functions, users may develop deeper emotional attachments to them.”

These two hypothetical scenarios were exploratively constructed as directions for future smartphone ideas. These scenarios are based on the analysis of India's Generation Z in envisioning future smartphones and are hypothetical narratives for examining the emotional design of smartphones.

3. 3. Framework: Emotional Design for Digital Experience

Third, based on these findings and hypotheses, a hypothetical emotional design framework for digital experiences was formed. In constructing the prototypical framework, we referenced several academic theoretical frameworks on emotion and consciousness. The first is a categorical distinction between emotion and consciousness [25]. They argue that emotion consists of an emotional state (functional aspects, including emotional response) as well as feelings (the conscious experience of the emotion), and that consciousness consists of level (e.g. coma, vegetative state and wakefulness) and content (what it is we are conscious of). Freud's classical theory of consciousness was also referred [24], [27]. According to Freud, consciousness consists of three stages; conscious mind, preconscious mind, and unconscious mind. The conscious mind consists of all the mental processes of which we are aware. The preconscious mind Contains thoughts and feelings that a person is not currently aware of, but which can easily be brought to consciousness. And the unconscious mind comprises mental processes that are inaccessible to consciousness but that influences judgments, feelings, or behavior. Based on these two theoretical backgrounds, a prototypical framework for emotion design of digital experience was proposed, by considering the eight aspects of emotion obtained from the desk research and primary research conducted in this study (Figure 1).

This circular prototype framework consists of two parts: the eight emotional aspects and the three levels of depth of awareness aspects. The eight emotional aspects represent the emotional desires of Generation Z regarding smartphones explored in this PBL research. The depth of these aspects was set up so that they could be evaluated on three levels of awareness. This framework allows us to evaluate the emotional aspects of the digital experience regarding smartphones according to each scene, which in turn allows us to improve the design regarding the emotional aspects.

Figure 1. A prototypical framework of emotional design for digital experience

In fact, one case study was set up and evaluated. The students created an example customer journey map of setting up a new wallpaper screen for a smartphone and evaluated it by Generation Z users (Figure 2). In the customer journey map, the pain points of the target users were identified, and based on the emotional principles and awareness level that triggered them, they were marked on the framework as

appropriate. For instance, when the users decide the wallpaper image, they feel a sort of anxious feeling about what the result would be. Touch & sight are the senses at play providing input for the triggers. The emotional principles of “assurance” and “rewarding” have been triggered -assurance was an unconscious trigger, and rewarding was conscious trigger in the action. This allows for a deeper understanding of what emotions are triggered and can be enhanced to provide better human-centered design solutions. Based on the assessment, the level of awareness is plotted and visualized in this framework (Figure 3).

Based on this principle, a framework for determining the level of consciousness emotion was developed and a prototype framework was proposed by the student. This framework was identified as a more attractive and organic way to analyze and quantify emotions.

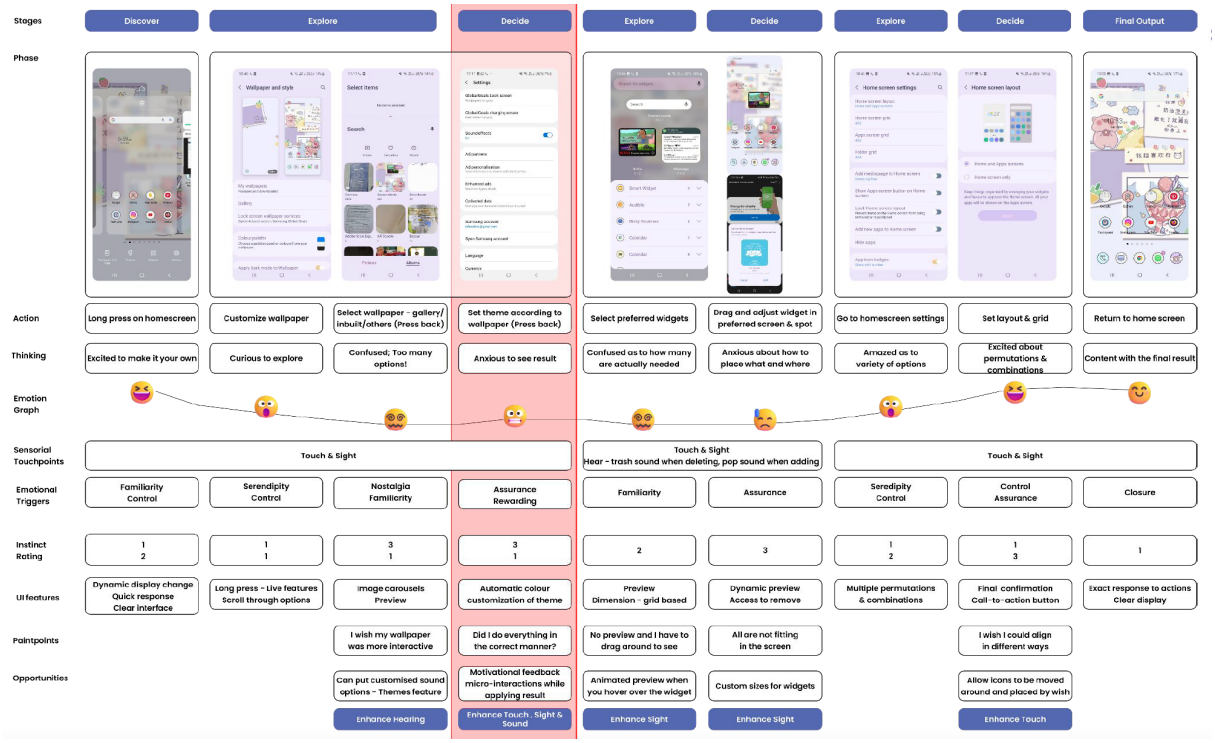

Figure 2. An evaluation of the framework with a customer journey

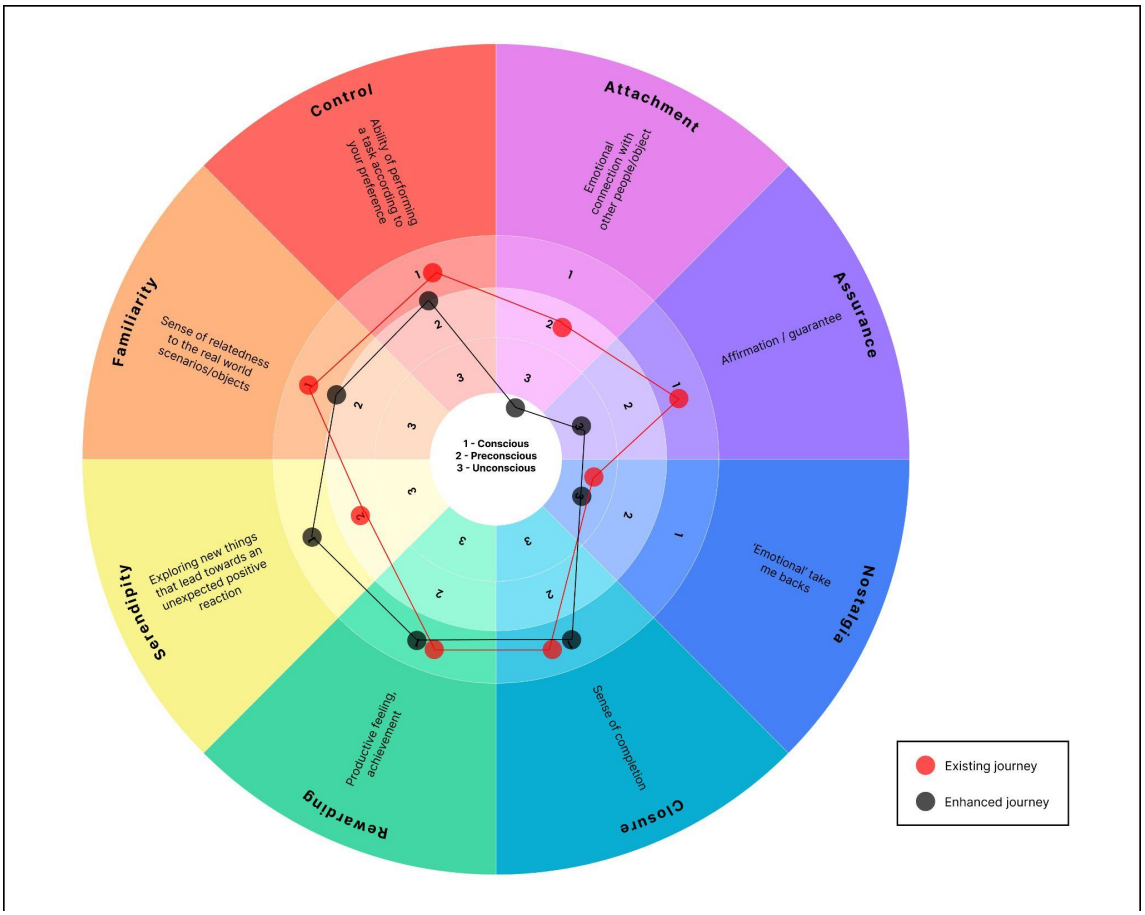

Figure 3. A result of evaluation of a customer journey

4. DISCUSSION AND CONCLUSION

This paper addresses an upcoming but as yet unexplored research gap between emotional design and digital experience design. Through a constructive method of Research through Design, based on a case of Project-Based Learning (PBL) in an Indian design school, this study tackled three focal issues. First, we gained some insights into what emotion smartphones bring to Generation Z and what they want from them in the future. For Generation Z, smartphones are an inseparable part of their lifestyle and an extension of themselves. They are an extension of themselves. Smartphones are also like a therapist, a charger, and a portal to family and friends. Second, based on the above findings and insights, we derived two hypothetical scenarios: making the smartphone a companion and transforming the smartphone. These hypotheses are intended to provide conceptual and archetypal hypotheses for the future meaning of smartphones [26]. Finally, from all the research and user studies conducted to date, we constructed and proposed an affective framework for determining emotions at the level of consciousness, using established affective principles. Since emotions, being intangible, are difficult to map, emotion maps proved to be a more attractive and organic way to analyze and quantify emotions.

This paper contributes to both design education and future research. First, it makes a piecemeal knowledge contribution with respect to the identified research gap: affective design and digital experiences. As digital technology becomes a necessary foundation for our society, business, and daily life, it is important to build on the practical and academic contributions of design on human emotions. Second, through the practice of Project Based Learning in industry-academia collaborations, design education has contributed to providing suggestions for the future. In particular, we found that PBL in industry-academia collaboration in university education is one of the best methods to explore weak signals [19] and scenarios [26] of how Generation Z perceives the current situation and hopes for the future with regard to certain products and services such as smartphones. Third, the results clearly show that design education can not only train future professionals in the field of design management, but also provide them with better opportunities to propose the future [28].

It should be noted that this study has several limitations. First, methodologically speaking, it relies on a single case study, the Research Through Design (RtD) project. Therefore, this study should be widely

implemented by other different methodologies and scopes. For example, a case study of real-world practice on aspects of emotional design in digital experiences would provide a deeper and more practical understanding of this topic. In addition, the vast amount of theoretical knowledge on digital experience and emotional design still exists independently and would provide meaningful suggestions and research directions for both academia and practice. Second, the limitations of the hypothetical framework itself that has been produced need to be pointed out. It is a limited framework, based on the theoretical model of Tsuchiya and Adolphs [25] and Freud [24], [27], but piloted on the eight affective dimensions explored in this PBL. While we may have been able to demonstrate a certain possibility of constructing a theoretical model of Emotional Design through the PBL approach, with reference to theories of emotion and consciousness, the practicality of the model itself and the strengthening of its theoretical background will require further academic and practical However, it must be emphasized that further academic and practical research is needed to strengthen the practicality of the model itself and its theoretical background. It should be emphasized that this is only a limited framework produced within the educational course of PBL.

It is worthwhile to describe possible future research topics related to the research areas of Emotional design and Digital Experience identified by this study. First, it is important to reexamine the broader topic of emotional design from the perspective of digital experience. This study focuses on "user/consumer-driven research" of emotional design of digital experiences [8]. Therefore, as Ho and Siu [8] categorize, other broad areas of emotional design, such as "designer-driven research" and "user/consumer-designer relationships through design outcomes and other means," would be worth further study. Second, with respect to Emotional Design, a focus on the differences with respect to Real Experience and Digital Experience. Third, Emotional design within digital spaces such as the metaverse would be an interesting topic. How realistic emotions can be created in a metaverse space will require progress in design research in various fields.

Finally, as digital experience has become an important experience domain worldwide, we expect that many cross-disciplinary studies on emotional design and digital experience will be raised in the coming decades.

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