Journal of User Experience
Vol. 21, Issue 4, August 2026, pp. 206–229

Toward Total Experience: A UX Framework for Analyzing Experience Concepts

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Abstract

Understanding different experience concepts has been vital in human-computer interaction (HCI) research. Within one interaction context, a human can participate in user experience, customer experience, employee experience, and brand experience. Although these concepts form a broader landscape, this paper focused specifically on conceptualizing user experience as a basis for future work. Conceptual engineering further articulated the concept of total experience (TX), describing how different experience concepts affecting technology experiences may converge. Establishing a UX framework ensured a coherent and theoretically grounded foundation upon which the authors built the concept of total experience. The authors developed the conceptual analysis framework of UX dimensions in a systematic mapping study to identify the main UX dimensions, which included internal state, experience form, quality, intensity and unity, goals, technology, context, and temporality. Addressing total experience in technology experience research provides a broader understanding of how experiences form and can be utilized to increase predictability in experience design.

Keywords

UX, total experience (TX), analysis framework, systematic mapping study

Introduction

Digitalization has been rapidly transforming human-computer interaction, generating new experience contexts and design challenges. As technologies have become increasingly embedded in everyday life, they have challenged the way we think and act. This fast development has created new design possibilities in the digital experience environment. When humans interact with technology, various experiences can take place. Within a single interaction context, a human may simultaneously engage in multiple forms of experience, including embodied experience, user experience, customer experience (CX), brand experience (BX), product experience (PX), work experience, employee experience (EX), and aesthetic experience. To support human well-being in technology interactions, it has become essential to examine how diverse experience concepts, rooted in different discipline traditions, can be meaningfully integrated and acknowledged in design processes. However, experience concepts have had different theoretical grounds (for example, Roto et al., 2021) and have rarely been examined jointly, even though in real life, humans cannot be defined by one experience type. In this study, the focus was on developing a conceptual analysis framework of UX dimensions as a basis for examining broader experience formations in technology interaction. Building on this framework, the present study introduced the concept of total experience (TX).

Experience research has covered numerous research fields and different experience concepts. Among these, HCI has become the third largest discipline in experience research (Roto et al., 2021), and according to previous studies, UX, CX, and BX have been the most cited concepts in experience research. Experience itself has been a dynamic, complex, and subjective phenomenon (Buchenau & Suri, 2000), arising from the integration of cognitive and affective processes (for example, Silvennoinen, 2021), such as perception, action, and motivation; the phenomenon has formed an inseparable, meaningful entity (Forlizzi & Battarbee, 2004). To understand experience formation, several models and theoretical approaches have been developed across disciplines including design, HCI, business, philosophy, anthropology, cognitive science, and social sciences. The concept of UX has been at the core of how humans interact with different technologies; although efforts have been made to define UX without reaching a clear conclusion on its exact meaning (Tokkonen & Saariluoma, 2013). UX has so far described the user’s overall experience of interacting with a platform, product, or service, before, during, and after use (Law et al., 2009; Luther et al., 2020). Good UX can create added value and attractiveness to users, offering competitive benefits for businesses (Luther et al., 2020).

Several widely used industry and practitioner-oriented design models, such as task and object-based modeling approaches (Paternò et al., 1997), experiential and layered UX conceptualizations (Hassenzahl, 2008; Law et al., 2009), and widely adopted industry guidelines such as the Google™ Material Design (Google, n.d.), have illustrated the broader landscape in which the UX concept has been applied and within which the TX concept, as introduced in this paper, can be situated.

UX might seem like a synonym for TX, but TX differs from the overall UX, as the person has not been solely positioned as a user. Thus, TX has striven to conceptualize humans interacting with technology as an overarching umbrella concept that has integrated different experience concepts like UX, CX, BX, PX, employee experience, patient experience, and learning experience, to name a few. A variety of contextual factors have shaped the emerging dimensions of these experiences. It should also be noted that nowadays technologies have become ubiquitous, and therefore, many different experience concepts can play a part within a TX. However, the interplay and integration of some experience concepts have been more central in some technology interaction contexts than in others (for example, a learning platform utilized in a work setting compared to a smart refrigerator in a home).

In this study, the authors used a method of heteronymous conceptual engineering (Chalmers, 2020) to create the construct TX. Rather than refining existing terminology, TX has been presented as a construct that integrates diverse experience-related notions. The authors conducted a systematic mapping study (Petersen et al., 2008, 2015) to create a theoretical analysis framework of UX dimensions, thus forming the conceptual foundation for introducing TX.

This study answered the question of how TX can be understood through the concept of UX and how the UX analysis framework can be utilized as an analysis tool for explicating differences and similarities of other experience concepts involved in forming total experiences in technology interaction. The framework developed in this study may offer a structured way to analyze and compare experience-related concepts. Although the paper was conceptual in nature, its purpose was to clarify the vocabulary and relationships between UX-related constructs, supporting both researchers and practitioners in reflecting on experience formation and informing the development of broader experience models such as TX.

Although TX has been identified as an emerging trend by Gartner (2021), its description has remained organizationally bound, comprising CX, EX, UX, and multi-experience. However, this industry-based view has lacked a theoretical foundation and has not accounted for the broader experiential interplay beyond organizational settings.

The structure of the paper follows. First, a theoretical background outlines the emergence of experience research in HCI, with a particular focus on the concept of UX and its core dimensions. Second, we present the systematic mapping study and thematic analysis of results that enabled us to construct a conceptual analysis framework of UX, which was further enriched by the researchers' domain expertise. We then applied this framework to the analysis of TX, and in this paper, we include a specific illustration focusing on CX. Fourth, we offer recommendations in this paper for applying the UX framework as an analytical tool to examine diverse experience concepts in technology interaction. Fifth, a conclusion summarizes the key findings and reflects on the implications for experience research. Finally, the paper includes practical tips for user experience practitioners.

Background

Simon (1980) described technology as an adaptive information-processing system designed to transform an existing state into a preferred one, operating within the constraints of its internal structure and the demands of a complex, changing environment. Understanding how such systems are experienced by people has become a central concern in HCI. Since the 1990s, the concept of UX has described a person's experience of a system (Norman et al., 1995). More recently, the scope and definition of UX have been actively debated (Berni & Borgianni, 2021). UX may refer to products, systems, services, or objects that a person interacts with through a user interface, for example, knowledge systems or entertainment services. According to the ISO 9241-210 standard (2019), UX has comprised user perceptions and responses resulting from the use or intended use of a system, product, or service. These perceptions and responses can include feelings, beliefs, preferences, perceptions, comfort, behavior, and accomplishments that may occur before, during, and after use. UX has been shaped by product image, presentation, functionality, system performance, interactive behavior, and system, product, or service auxiliary features, as well as by the user's internal and physical state, which reflect previous experiences, attitudes, skills, abilities, personality, and context of use (ISO, 2019). UX has encompassed multiple meanings, ranging from traditional usability to beauty, hedonic, affective, or experiential use of technology (Forlizzi & Battarbee, 2004). Yet, although usability has often been understood as part of UX, the two have not been synonymous. Different schools of thought have existed regarding the relationship between UX and usability (Sauer et al., 2020).

Hassenzahl and Tractinsky (2006) divided the definition of UX into three components: the user's internal state (such as expectations, needs, motivation, and emotions), system characteristics (complexity, purpose, usability, and functionality), and the operating environment. Accordingly, experience in HCI has been studied through a multitude of experience-related concepts, such as user engagement, hedonic and pragmatic qualities, flow, presence, and involvement. Despite this conceptual richness, the core constructs of HCI, UX, and usability have continued to require clarification. Understanding the dimensions of UX and their relations to each other has been an ongoing research pursuit (Hornbæk & Hertzum, 2017). Also, usability has faced challenges regarding its operationalization, construct stability, and measurement (Tractinsky, 2018, 2020). Hence, it has become essential to evaluate and clarify experience-related concepts in HCI, as they function as theoretical instruments for understanding and studying diverse phenomena. Given that these concepts often overlap and co-occur in real-world technology use, it has become important to examine how they interact within broader experiential constructs.

Existing UX frameworks have offered valuable foundations for understanding user interaction with technology. However, they have often focused on isolated experience types or emphasized usability and product-centered metrics, which may not have sufficiently captured the convergence of multiple experience domains, such as user, customer, employee, and brand experience, within a single interaction context. To situate UX within the broader landscape of experience concepts, it may be useful to briefly clarify how the most widely used UX measures have related to their underlying theoretical models. Common instruments such as the System Usability Scale (SUS), the measures based in the Technology Acceptance Model (TAM), the SUMI, and SUPR-Q each operationalize only specific aspects of experience, typically usability, perceived usefulness, ease of use, or pragmatic and hedonic qualities. As Lallemand et al. (2015) highlighted, UX has lacked a unified theoretical foundation, and existing measures have captured only fragments of the broader experiential phenomena in real-world technology interactions. Applied UX research has shown how theoretical UX constructs can be quantified in practice (for example, Lewis & Sauro, 2024), but detailed measurement approaches have not been addressed in this article. This fragmentation has underscored the need for a more integrative construct such as TX, which can account for the interplay of multiple experience types beyond the user role alone.

Methods

In this study, we chose systematic mapping as the literature review methodology, complemented by thematic analysis. Given the conceptual interdisciplinary nature of UX, the systematic mapping study represented an ideal methodological choice for analyzing how UX has been defined across academic literature. The purpose of the systematic mapping study was to permit a structured exploration of the scholarly landscape, systematically cataloging how UX has been defined, evolved, and contextualized across disciplines. By following recognized methodological frameworks (Petersen et al., 2015), this study ensured principles of transparency, replicability, and methodological integrity in its examination of UX definitions. The definitions of UX identified through the systematic mapping study were intended to serve as the foundation for constructing a theoretical analytical framework for UX dimensions.

After establishing the analytical framework based on existing UX definitions, we proceeded with the method of heteronymous conceptual engineering (Chalmers, 2020) to design a new conceptual construct: total experience (TX). TX can integrate various types of experience concepts from different academic disciplines, all connected through the common focus of how humans interact with technology. Recognizing that these experiences have become interlinked and continually evolving, TX can offer researchers a tool to analyze experiences in a dynamic context. Based on this, we defined TX as a concept capturing how multiple experience dimensions within different experience concepts interact to shape how people engage with technology. This methodological combination allowed the study to move systematically from existing definitions toward the development of a broader conceptual construct.

Study Selection

Research on UX has been published in multiple scientific journals and conferences. To align with the methodological scope of this study, we focused on literature that positioned itself explicitly within UX research. Broader foundational theories of human experience were therefore not included, such as Kahneman's original work, Dewey's *Art as Experience* (1934), Carroll's *Beyond Aesthetics* (2001), and Heidegger's analysis of existential structures, as incorporating them comprehensively would have extended the scope beyond the aims of this review. To ensure a comprehensive and high-quality representation of UX within HCI literature, we selected three major databases following established guidelines for systematic mapping studies (Petersen et al., 2015). We reviewed the ACM Digital Library, IEEE Xplore, and Scopus to ensure broad and methodologically consistent coverage of UX-focused research.

The ACM Digital Library served as a central repository for HCI research, hosting publications from leading conferences such as CHI (Zheng et al., 2022). IEEE Xplore was recognized as a high-precision source, particularly in the domains of engineering, technology, and HCI (Gusenbauer, 2022). Scopus complemented this selection by providing broad, multidisciplinary coverage across interdisciplinary areas, including psychology, design, and social sciences (Gusenbauer, 2022). Although these databases provided broad and high-quality coverage of

HCI research, they did not capture all industry- or domain-specific sources, which was a minor limitation of the study. To support methodological consistency, the same Boolean string (Table 1) was used across all three databases. This combination of databases ensured that the study captured both the core developments within HCI and the broader interdisciplinary contributions that have shaped contemporary UX research.

Table 1. Databases and Search String

Databases	Search String
ACM Digital Library, IEEE Xplore, Scopus	("user experience" OR "UX") AND ("Interaction" OR "Human-Computer Interaction" OR "Technology Interaction" OR "HCI") AND ("Dimensions" OR "Concepts")

The initial database search yielded a total of 1,540 records across three digital libraries: ACM Digital Library (n = 153), IEEE Xplore (n = 550), and Scopus (n = 837). Inclusion and exclusion criteria are presented in Table 2. As the first step in the screening process, we reviewed 1,540 records based on their titles. This preliminary filtering phase aimed to identify articles with potential relevance to our study's objectives. We excluded studies that lacked topical alignment, particularly those not referencing UX within the context of HCI, before evaluating the abstracts. As a result, we accepted 304 articles for the abstract screening.

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Clearly defined UX conceptually within human–computer interaction (HCI), using recognized UX frameworks or theories (for example, Forlizzi & Battarbee, 2004; Hassenzahl, 2004; ISO, 2019)	Failed to explicitly define or conceptualize UX; treats UX as vague, implicit, or interchangeable with usability
Examined UX from a human-centered perspective, including user goals, behavior, interaction, and experience evaluation	Focused exclusively on technical implementations, such as programming, architectural design, or UI construction, without UX evaluation or analysis
Published in peer-reviewed outlets, such as academic journals or fully reviewed conference proceedings	Not peer-reviewed, including blog posts, workshop summaries, unreviewed conference abstracts, editorials, or informal reports
Involved human interaction with technology, especially evaluating or analyzing user engagement, perception, emotion, and cognition	Did not address human-centered interaction, such as studies centered solely on automation, AI, or machine-only processes without user-related experiential components

In the abstract screening phase, we excluded 226 articles. The most common reason for exclusion was the lack of sufficient conceptual engagement with UX. Specifically, many abstracts did not provide an explicit or theoretically grounded definition of UX, instead referring to the concept in vague or implicit terms. Because systematic mapping studies typically rely on abstract-based screening to ensure transparent and replicable selection, only papers with a conceptual focus on UX that was clearly articulated at the abstract level were included at this stage. Additional exclusions were made for entries that were not peer-reviewed, such as informal reports or blog posts, as well as short papers and extended abstracts that did not provide adequate depth for analyzing UX definitions. Papers with a primary focus on usability, rather than UX, were excluded when they lacked a conceptual distinction between the two. Research emphasizing usability metrics over experiential UX considerations was removed from the selection. Abstracts that mentioned UX-adjacent terms, such as experience or engagement, without explaining their connection to UX, were also excluded. Method-specific papers (such as those focusing on agile or lean design) were excluded if they referenced UX only as part of a process without defining it conceptually.

Furthermore, studies that approached UX from contextual perspectives, such as learning or business, were excluded if they lacked a standalone definition of UX. However, studies drawing on established UX definitions, such as ISO 9241-210 (2019), were included when the abstract articulated the definition clearly enough for conceptual analysis. Articles emphasizing technical systems (such as algorithms, robotics, or software components) without conceptual engagement with UX were excluded as well. Finally, papers exploring UX within specific technological domains—such as extended reality (XR), augmented reality (AR), or conversational agents—were excluded if no formal or conceptual definition of UX was provided in the abstract. Based on the initial review of titles and abstracts, 78 articles met the inclusion criteria and were selected for full-text assessment. During full-text screening, 13 papers were excluded because they did not provide a theoretically grounded UX definition or lacked sufficient conceptual depth. After evaluating the full texts, 65 studies fulfilled the inclusion criteria and were included in the final synthesis (Figure 1).

The ISO standards related to UX were included in the systematic search, as they represented established terminology within the field. Other theoretical models, such as sociotechnical design models, did not appear in the search results due to the UX-focused search string and were therefore outside the scope of this study.

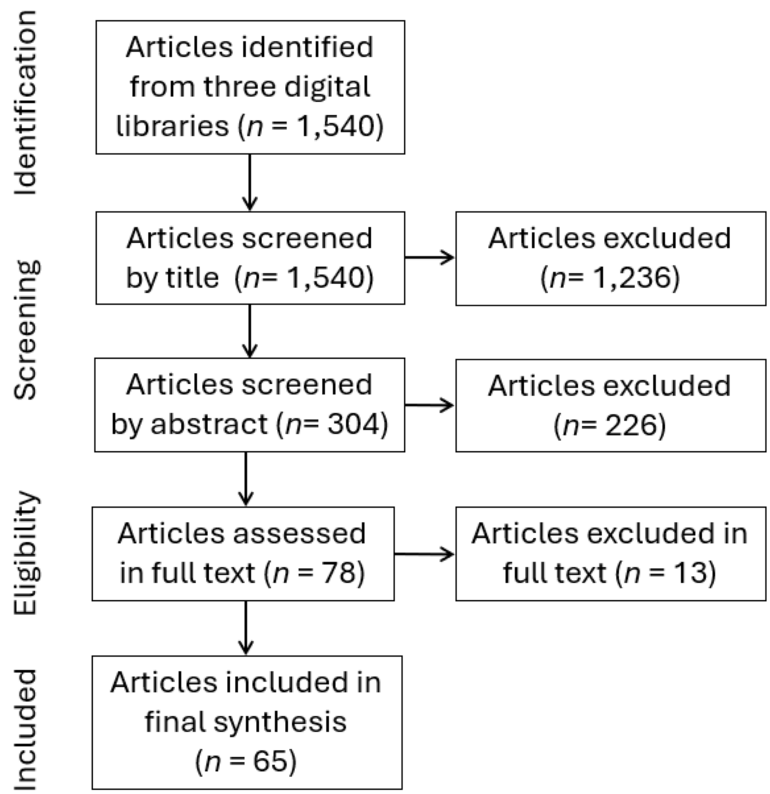

Figure 1. Flow diagram of study selection.

Thematic Analysis
We conducted thematic analysis using the six-phase procedure by Braun and Clarke (2006). The first phase involved familiarizing ourselves with the data through multiple readings. During this iterative process, we took preliminary notes on recurring themes to identify meaningful patterns and conceptual structures. Following Braun and Clarke's (2006) guidelines, the second phase involved developing initial codes. We reviewed the data and coded it manually. In the third to

fifth phases, we grouped codes into potential themes, which we then reviewed and refined to ensure the themes accurately represented the data. After that, each theme was defined and named, and subdimensions and researcher references were identified to support the thematic structure. The final phase of thematic analysis involved synthesizing the defined themes into a report. We identified 6 main UX dimensions and subdimensions that represent UX (Table 3).

Table 3. The Main Dimensions and Subdimensions of UX

Dimension	**Subdimensions**
Internal State	Influenced by the user’s emotions, mood, motivation, expectations, and personality (Hassenzahl & Tractinsky, 2006; Law et al., 2009), perception (ISO, 2019), affective responses (Hassenzahl, 2008), and encouraging experience (Kujala et al., 2011)
Pragmatic and Hedonic	Pragmatic: Focused on usability, utility (Hassenzahl et al., 2000; Hassenzahl et al., Kekez & Burmester, 2002), efficiency, and clarity (Rauschenberger et al., 2013); Hedonic: Focused on pleasure (Hassenzahl, 2004), aesthetics (Desmet & Hekkert, 2007), enjoyment, novelty (Jordan, 2000), elegance, beauty, goodness (Hassenzahl, 2004), and satisfaction (Hassenzahl, 2003)
Temporality	Dynamic user experience (Hassenzahl, 2008) evolving before, during, and after use (Karapanos et al., 2009; Law et al., 2009)
Social	Co-experience, collectiveness, shared use, group interaction (Battarbee & Koskinen, 2005)
Product	Product characteristics (Hassenzahl, 2018; Pucillo & Cascini, 2014)
Contextual	Context-dependent and environment (Hassenzahl & Tractinsky, 2006; Roto et al., 2011)

Results

The findings of the thematic analysis revealed that understanding UX requires a multidisciplinary approach. To ensure that the UX framework would be both conceptually robust and practically relevant, we extended it by including additional dimensions that were absent in the reviewed literature. These new dimensions were derived from gaps identified during the analysis. The additional dimensions were added based on the authors’ understanding of UX dimensions examined in previous research, such as multisensory UX (Silvennoinen et al., 2015), co-experience as one form of UX offered (Battarbee, 2003), and needs and desires as types of UX goals (Hassenzahl et al., 2010). We selected the subdimensions based on conceptual alignment with the experience concepts we were analyzing. This interpretive matching followed the same qualitative logic used in the thematic analysis and ensured consistent yet flexible application of the framework.

Table 4, the enhanced UX framework, shows a consolidated view of the dimensions and subdimensions underpinning the conceptual structure. As a conceptual analytical tool, it may support the examination of experience-related concepts by helping identify similarities and differences between concepts. It may help clarify how its components relate to one another within the broader analytical model, analyze experience constructs in a structured manner, and inform future theoretical and empirical work. Taken as a whole, the framework can support cumulative conceptual development in the field and be adapted and expanded as experience-related research continues to evolve in practice.

As the framework was conceptual in nature, there were no specific detailed agreement criteria for determining when one or multiple subdimensions should be applied. However, we acknowledged that developing such operational guidance, including principles for identifying subdimensions, clarifying boundaries between overlapping constructs, and supporting consistency across evaluators, will be an important direction for future work as the framework is further refined and applied in practice.

Table 4 defines the main UX dimensions and subdimensions. Each dimension includes the result of the thematic analysis; researchers' additions are marked with an asterisk and highlighted in bold.

Table 4. Enhanced UX Framework

Dimension	Subdimensions
Internal State	emotions, mood, motivation, expectation, and personality (Hassenzahl & Tractinsky, 2006; Law et al., 2009), perception (ISO, 2019), affective responses (Hassenzahl, 2008), encouraging experience (Kujala et al., 2011), and **multisensory*** (Silvennoinen et al., 2015)
Experience Form	**individual experience*, co-experience*,** shared experience (Battarbee, 2003; Forlizzi & Battarbee, 2004; Law et al., 2009), collectiveness, shared use, and group interaction (Battarbee & Koskinen, 2005)
Quality	**quality of experience (QOE)*** (Hammer et al., 2018; Hassenzahl & Tractinsky, 2006); **hedonic and pragmatic qualities*** (Diefenbach et al., 2014; Diefenbach & Hassenzahl, 2011; Hassenzahl, 2004, 2005; Hassenzahl & Monk, 2010; Sutcliffe & Hart, 2017); Pragmatic: usability, utility (Hassenzahl et al., 2000; Hassenzahl et al., 2002), efficiency, and clarity (Rauschenberger et al., 2013); Hedonic: pleasure (Hassenzahl, 2004), aesthetics (Desmet & Hekkert, 2007), enjoyment, novelty (Jordan, 2000), elegance, beauty, goodness (Hassenzahl, 2004), and satisfaction (Hassenzahl, 2003)
Intensity and Unity*	**seamless interaction*** (meaning the experience of no experience) (Rousi, 2013), optimal experience (flow) (Bonaiuto et al., 2016; Mao et al., 2016), **wow experience*** (Desmet et al., 2007; Väänänen-Vainio-Mattila et al., 2011), and **peak-end effect*** (Cockburn et al., 2015; Doi et al., 2022)
Goals*	**needs and desires*** (Hassenzahl et al., 2010), be-goal and do-goal cf., hedonic and pragmatic (Hassenzahl, 2008), **goal and task-oriented*** (Bargas-Avila & Hornbæk, 2011; van Schaik & Ling, 2008), and for **entertainment purposes*** (Silvennoinen et al., 2014)
Technology	**computational components** (such as user interface, physical, or virtual) or **combinatory*** (Carroll & Campbell, 1989), product (Desmet & Hekkert, 2007), product characteristics (Hassenzahl, 2018; Pucillo & Cascini, 2014), materials (including content, function, presentation, and interaction) (Hassenzahl, 2008), and service
Context	interaction environment (Hassenzahl & Tractinsky, 2006; Roto et al., 2011), such as **cultural*** (Konstantakis & Caridakis, 2020; Roto et al., 2011), **social**, **physical**, **technical**, **temporal**, **task**, **internal*** (Jumisko-Pyykkö & Vainio, 2010; Lallemand & Koenig, 2020), **physical**, **virtual**, and **cyber-physical contexts*** (Jazdi, 2014; Lee, 2008; Pallot et al., 2013)
Temporality	dynamic (Hassenzahl, 2008), before, during, after use (Karapanos et al., 2009; Law et al., 2009), **over time*** (Roto et al., 2011), and **long term UX*** (such as lifecycle or journey) (Karapanos et al., 2009, 2010; Kujala et al., 2011; Kujala et al., 2013; Pohlmeyer, 2011; Pohlmeyer et al., 2009; Minge & Thüring, 2018)

Internal State

An experience has been considered a unique combination of the product itself and the user's internal state, including the subdimensions emotions, mood, motivation, expectations, and personality. The dimension goals has been closely related. These main and subdimensions have interacted with and shaped each other to create a meaningful experience with a clear beginning and end (Hassenzahl & Tractinsky, 2006). Such internal states have influenced how users perceive and evaluate their experience through sensory input and through users' mental structuring and their evaluation of the experience (ISO, 2019).

Building on the role of internal states in shaping UX, it has been important to consider multisensory and affective interaction. UX has been inherently multisensory, engaging both the cognitive and emotional domains. It has involved direct sensory input and also the mind’s ability to evoke cross-modal associations, enriching the experience beyond the currently active sensory channel (Silvennoinen et al., 2015). Affective responses such as pleasure, frustration, or satisfaction have been central to this process, as they have guided the user’s overall appraisal of the interaction (Hassenzahl, 2008). The subdimension encouraging experience has described how a good UX can foster the feeling of encouragement during interaction with a system or product. By enhancing usability, simplifying tasks, and introducing pleasurable elements, an experience has been shown to significantly improve user satisfaction (Kujala et al., 2011). For instance, a user who becomes tired or stressed may have interpreted even a keyboard error message as more intrusive or frustrating than they would have when they were not tired or stressed, which illustrates how internal state can shape an experience.

Experience Form

In the UX dimensions, experience form has referred to the subdimensions individual experience and co-experience. Experience has often been considered to be individual, private, and unique; that is, only an individual can have felt and known what kind of experience was formed. Experience has involved multiple interactions and emotions, has a clear beginning and end, and has often led to emotional or behavioral change (Forlizzi & Battarbee, 2004).

However, an individual’s experience may be related, for example, to the user’s social groups to which they belong (Law et al., 2009). Additionally, communities may share their experiences, although each community member experienced it individually. The subdimension co-experience has described a UX arising from social interaction. Co-experience has meant a seamless blend of the individual experience of an artifact and social interaction. That is, an experience, even if mainly constructed by users, would not have been the same or even possible without the presence of the artifact and the experience opportunities it offered (Battarbee, 2003).

Thus, experience has formed in an interactionist manner via the cognitive and affective processes of a human as informed by the properties of the encountered artifact (for example, Silvennoinen, 2021). Although the concept of co-experience has been based on the idea that experiences are individual, it has become important to consider the role of social interaction in the formation of UX. People can create, refine, and evaluate their experiences in collaboration with others (Battarbee & Koskinen, 2005), and others may influence an individual’s experience at various stages of interaction.

Whether individual or co-experienced, experiences shaped through technology can occur in physical, virtual, or cyber-physical contexts where the focus is on networking various devices and where embedded computers control and monitor physical processes (Jazdi, 2014; Lee, 2008). Co-experience has overlapped conceptually with collective UX, which has emphasized social interaction among users (Pallot et al., 2013). In such experience types, social context (Lallemand & Koenig, 2020) has intertwined with co-experience.

Similarly, in social contexts, the subdimension shared experiences has not been fixed; shared experiences have been shaped through interaction and may elicit reactions that vary from consensus to deviation, depending on how others choose to engage with the experience (Forlizzi & Battarbee, 2004). Battarbee and Koskinen (2005) emphasized that UX was not solely individual but often socially constructed through collectiveness, shared use, and group interaction. Battarbee and Koskinen’s concept of co-experience highlighted how meaning and emotional resonance have emerged through collective interpretation and shared engagement. In technology contexts, shared use and group interaction have served as central mechanisms through which co-experience unfolded, underscoring the relational nature of experience formation. For example, if two users browsed an online store together and commented on the products to each other, the experience emerged from both their individual interpretations and their shared interaction.

Quality

The subdimension quality of experience (QoE) has been defined as the degree of pleasure or irritation a person experiences while using an application, service, or system (Hammer et al., 2018). The subdimensions hedonic and pragmatic qualities have been central to UX formation. Pragmatic quality has referred to the ability of technology to support the achievement of behavioral goals, such as usefulness, utility, ease of use (Hammer et al., 2018; Hassenzahl, 2003, 2004; Hassenzahl & Monk, 2010), efficiency, and clarity (Rauschenberger et al., 2013).

The hedonic aspect has focused on pleasure (Hassenzahl, 2004), aesthetics (Desmet & Hekkert, 2007), enjoyment, novelty (Jordan, 2000), elegance, beauty, goodness (Hassenzahl, 2004), and satisfaction (Hassenzahl, 2003). Hedonic quality has referred to the users themselves as an increase in knowledge and skill, and hedonic quality has been related to stimulation, the ability of technology to stimulate and enable personal growth, identification, and the ability of technology to respond to the need to express oneself through the objects they own (Diefenbach et al., 2014; Hassenzahl & Monk, 2010).

As the user-technology relationship has evolved, hedonic aspects have been seen as more important than pragmatic aspects for considering long-term UX and strengthening loyalty (Karapanos et al., 2009; Kujala et al., 2011). Also, interactivity has had an impact on user affect and hedonic experience (Sutcliffe & Hart, 2017). Hedonic quality, or more generally, positive experiences through meeting people's needs, can be seen as the ultimate benefit of using technology (Diefenbach & Hassenzahl, 2011). However, this benefit has been more transient and thus more difficult to justify than any pragmatic benefit from the use of technology. This difference may be even more obvious in the field of interactive technology, which traditionally has focused on performing tasks. The dynamics of pragmatic and hedonic qualities have been studied in different contexts to understand their context-dependent nature in UX. For instance, a music app that loaded playlists instantly while also offering a visually elegant interface illustrated how pragmatic performance and hedonic pleasure jointly contributed to perceived quality.

Intensity and Unity

UX has been influenced by intensity and unity. For example, in the subdimension of seamless interaction, the intensity level of intended experiences has been designed in a way that does not draw users' attention; that is, it is the experience of no experience (Rousi, 2013). In design cases in which the interaction must be as transparent or invisible as possible, the design has worked correctly when people do not pay attention to their experiences of the interaction. Seamless experiences have been an efficient UX design in many interaction contexts. The concept of flow has pertained to the subdimension of optimal experience, which has been the state of optimal functioning and very central to human happiness (Bonaiuto et al., 2016). The basis for an optimal experience has been experiencing pleasure. Flow has described a certain psychological state in which an individual feels cognitively efficient, motivated, and happy. Optimal experience can develop abilities and shape future psychological choices. Flow has been a good example of living in the moment and how people describe acting in a state of mind, with self-awareness in harmony and order. That is, attention can be freely directed to achieve goals, and flow seems to carry a person forward (Bonaiuto et al., 2016).

Optimal experience has differed from the concept of TX in terms of valence and presupposed emotional themes. TX has not posited overall valence or emotional themes, but these are constructed within the experience formation process and can consist of several experience types (such as UX, CX, and PX) that can alter in duration, intensity, valence, and effect to create the overall experience. When an experience has needed to be something spectacular, something that exceeded user expectations, it has been called the subdimension wow experience (Desmet et al., 2007; Väänänen-Vainio-Mattila et al., 2011). There have been many types of wows, differing in the characteristics of the person and the context, as well as the characteristics of the product or service. A wow has occurred when a person's and the context's sensitivity to certain types of wows coincided with the triggering of certain (similar) wow-type products or services.

According to the subdimension peak-end effect (Cockburn et al., 2015; Doi et al., 2022), people have evaluated an experience mainly based on how they felt at the peak (the most intense point) and at the end, rather than the sum or average of each moment. Thus, retrospective evaluation of an experience has been strongly influenced by the peak and end of the subjective experience; human memories can essentially be shaped by the most intense moment and the last moment.

The experience dimension of unity, in which many experiences are bound together, has formed an integrated totality (Roelofs, 2016) and hasn't been tied to any specific experience context in which it would only occur in BX or CX, but it has informed the formation of TX. However, in TX, unity of an experience might not occur, and a human can be involved in the metacognitive processes of being aware and contemplating the experience dimensions from different experience concept perspectives and in different experience phases.

The role of intensity and unity has become evident, for example, when a user becomes fully immersed in a fast-paced mobile game, experiencing a strong peak moment during a challenging level and later recalling the session mainly through that intense high point and its satisfying conclusion.

Goals

UX has been shaped by goals. Experiences can be categorized according to the priority they meet, and there has been a clear relationship between meeting the subdimension needs and creating positive impact (Hassenzahl et al., 2010). One common view has been that UX involves non-instrumental, hedonic, or non-task-oriented goals, while instrumental, pragmatic, or task-oriented goals are related to usability (Bargas-Avila & Hornbæk, 2011). For example, a user may want to feel competent, relaxed, or inspired during interaction, which has represented a non-instrumental (experience-oriented) goal. In this context, instrumental goals have referred to task-related objectives, whereas non-instrumental goals have described experiential qualities that shape how the interaction was felt rather than what was accomplished. Thus, instrumental and non-instrumental goals have often been intertwined.

Pragmatic attributes, such as usefulness, have primarily been linked to behavioral goals (Hassenzahl, 2004). When users have engaged with technology in a goal mode, focusing on task completion, pragmatic quality has tended to outweigh hedonic considerations. However, hedonic attributes like excitement have contributed to psychological well-being through self-directed product qualities. In action mode, when users have focused on the activity itself rather than goals, hedonic quality has become more relevant (van Schaik & Ling, 2008). Thus, both pragmatic and hedonic dimensions have related to experience goals, though they have not been tied to specific goal types.

Even in the interaction subdimension of goal-oriented, hedonic qualities have played an important role (van Schaik & Ling, 2008). For instance, during free-time activities such as gaming, users have pursued hedonic experiences while still expecting pragmatic functionality. Visual elements, such as colors, have enhanced both hedonic and pragmatic aspects of task-oriented and entertainment-focused purposes. Silvennoinen et al. (2014) highlighted that visual elements, such as color and layout, have supported both pragmatic and hedonic qualities, especially when technology was used for entertainment purposes.

Interaction has been further shaped by attitudes, expectations, personality traits, and current mood (Minge & Thüring, 2018). Environmental factors, such as the relevance of the activity, has also influenced visual usability (Silvennoinen et al., 2014). Experience goals have also been considered from a design method perspective to concretize the intended user experiences (for example, Kaasinen et al., 2015).

To deepen the understanding of goal structures in UX, Hassenzahl (2008) distinguished between do-goals and be-goals. Do-goals has referred to instrumental objectives, such as completing a task or achieving a specific outcome (such as making a phone call) and have been closely linked to pragmatic quality and usability. Be-goals, by contrast, have reflected deeper psychological needs, such as competence, autonomy, relatedness, and stimulation, and have been associated with hedonic quality and self-oriented motivations. Hassenzahl et al. (2010) argued that positive user experience emerged from the fulfilment of psychological needs, with the subdimension desires reflecting context-specific expressions of those needs in interaction. The relevance of goals became clear, for example, when a user pressed a touchscreen button with the instrumental goal of completing a task quickly while also pursuing the non-instrumental goal of feeling confident that the device responded reliably.

Technology

In UX research, the artifacts under examination have commonly consisted of the subdimension computational components (Carroll & Campbell, 1989) and are broadly considered to be computers and technological artifacts. Traditionally, HCI artifacts have been conceptualized as tools designed to support cognitive tasks. However, present-day goals have become more diverse, encompassing pursuits such as self-actualization through creative accomplishments and self-monitoring for well-being.

Artifacts studied in UX have typically featured some form of user interface, whether physical, virtual, or a combination. For example, in PX research, products have been examined in a broader sense as man-made artifacts that may not involve any computational elements (Desmet & Hekkert, 2007).

The concept of the user has been central to defining the scope of artifacts in UX; interaction with artifacts has been at the core. For instance, the term computer no longer means a desktop computer or laptop devices, but it also has included technologies such as wearable devices like smartwatches. If HCI can be extended to cover a wider range of technologies, research may have to shift focus from interaction with computer equipment to the use of objects more generally. In this context, an artifact has been defined as an interface between its internal and external environment (Simon, 1980).

In UX research, artifacts have not been solely defined by their technological nature or interface modality, but also by their inherent characteristics and the subdimension materials through which interaction is mediated. Product characteristics, such as functionality, usability, and emotional appeal, have played a central role in shaping UX (Hassenzahl, 2018; Pucillo & Cascini, 2014). Additionally, accessibility has been understood as a technological property of an artifact, as the WCAG guidelines stated that content should be perceivable, operable, understandable, and robust for as broad a range of users as possible (W3C, 2023).

Although technological complexity or simplicity have not emerged as an explicit theme in the reviewed literature, elements of complexity have appeared to be embedded within product characteristics, such as usability, learnability, and the scope of available functions. Moreover, the subdimension materials can be conceptualized as a merger of the subdimensions content, function, presentation, interaction, and service, each contributing to the experiential quality of the artifact (Hassenzahl, 2008). In Hassenzahl’s (2008) framework, service referred to the supportive processes and background functionalities that enabled the user to benefit from the artifact (such as enabling user access), rather than to service design as a broader design discipline. This became evident, for example, when a user pressed a physical button on a device, in which the simplicity of the action and the way it was carried out shaped the experience beyond the device’s technical construction.

Context

Context has played an essential role whenever experiences occurred or were examined. Within the experience type, social context (Lallemand & Koenig, 2020) has been exhibited via co-experience. The context of use has referred to the environment in which the interaction between the system and the user took place (Hassenzahl & Tractinsky, 2006). The subdimension interaction environment included the immediate physical setting and also the broader experiential and technological conditions that shaped the user’s engagement (Hassenzahl & Tractinsky, 2006; Roto et al., 2011). Although our analysis was grounded in UX literature identified through the mapping study, the notion of social context partially overlapped with broader socio-technical perspectives, as both have emphasized the interplay between users, technology, and social structures.

For a long time, context of use has been recognized as a key factor impacting UX (Lallemand & Koenig, 2020). Contextual dimensions affecting HCI have included social, physical, technical, and information, temporal, internal, and task context (Jumisko-Pyykkö & Vainio, 2010; Roto et al., 2011). Social context has included the presence of others, their characteristics and roles, interpersonal interactions, and the surrounding culture that shaped how users engaged with technology. Social context has involved the presence of others, their roles and characteristics, interpersonal interactions, and the surrounding culture that shaped how users engage with technology. Cultural background has further influenced UX, as each user brings unique cultural characteristics, learns differently, and interacts with artifacts in distinct ways, ultimately gaining a unique cultural experience (Konstantakis & Caridakis, 2020).

The subdimension physical context has referred to the situational features in which HCI occurred, including spatial and functional location, space, perceived environmental characteristics, movements and mobility, and objects present (Jumisko-Pyykkö & Vainio, 2010; Roto et al., 2011). Technical and information context has included user interaction with technology and the relationship of other relevant systems and services, such as devices, applications, and networks, their interoperability (such as between and across devices, networks, informational objects, or access), and mixed reality environments, such as gaming (Flintham et al., 2003). These contexts have been further categorized into the environmental subdimensions of physical, virtual, and cyber-physical, each offering distinct affordances and constraints for interaction (Jazdi, 2014; Lee, 2008; Pallot et al., 2013).

Temporal context has referred to the user's interaction with technology over time, including duration, time of day, years, situation before and after use, activity over time, and synchronism. Internal and task context has involved surrounding tasks that shaped user interaction, including subcomponents such as task domain, multitasking, and interruptions (Jumisko-Pyykkö & Vainio, 2010). Notably, when the environment has changed during interaction, task alterations may also occur, affecting the formation of experience (Korhonen et al., 2010). Such situations may have also represented edge cases, in which atypical or rapidly changing environments revealed how shifts in context reshaped tasks and influenced the resulting experience.

It has been important to identify the detailed contextual factors that affect experience in a specific situation (Korhonen et al., 2010). Even when a user has performed the same tasks and similarly used the technology, UX may vary across different contexts. Contextual factors have significantly shaped user emotions and behavior and can reinforce a previous negative or positive experience, turning a positive experience into a negative experience, or vice versa. This can be seen, for example, when a user has interacted with a mobile app in a crowded public space, where the surrounding social and physical conditions shaped the experience differently than using the same app at home.

Temporality

Temporality in UX has referred to how experiences are shaped and transformed by time. User experiences and relationships with technology have typically evolved from early learning and enthusiasm into part of everyday life (Kujala et al., 2011). Although it may seem that the subdimension long-term UX has been merely a long period of UX, the concept has become more multifaceted. Time has influentially changed the context and meaning of UX (Kujala et al., 2013).

UX has begun even before actual use as it is shaped by users' previous experiences and attitudes (Pohlmeyer et al., 2009). These expectations have influenced how technology was anticipated and how early impressions were interpreted. As interaction progressed, UX continued to evolve through phases that reflected different temporal orientations. Roto et al. (2011) described this progression as encompassing anticipated UX (occurring before use or in relation to other phases), momentary UX (emotional responses during a clearly defined interaction), episodic UX (experiences formed after a specific period of use), and cumulative UX (long-term impressions developed through extended engagement).

The relative importance of different qualities may also change over time (Karapanos et al., 2009, 2010). UX has been inherently dynamic, shaped by ongoing reflection and emotional evaluation throughout interaction (Hassenzahl, 2008). Although learnability and novelty may be paramount during the pre-use and use phases, other considerations, such as product utility and social capital, have served as motivators for long-term use.

Ultimately, long-term UX has been a key driver that makes people continue to use a product and recommend it (Kujala et al., 2011). Long-term UX must be understood not only as an immediate reaction but as a layered, evolving experience that can unfold over time (Roto et al., 2011). For instance, a user who initially approached a new device with curiosity and uncertainty may, over time, have developed familiarity and routines, fundamentally changing how the experience was perceived.

Discussion

Total Experience

Figure 2 provides an integrated overview of the main dimensions and subdimensions together to illustrate how these elements connect to the broader TX concept. In this figure, the UX dimensions and subdimensions are derived from the results of a systematic mapping study. The surrounding TX-related experience categories (such as customer, employee, brand, or cultural experience) are included to illustrate the broader experiential landscape. These broader TX components are conceptual at this stage and will be examined empirically in future work.

The figure also emphasizes that TX is not a single unified construct but a constellation of overlapping experience domains that influence one another. For example, customer experience may frame expectations before interaction, and brand experience can shape the meaning users attribute to a product or service. Similarly, cultural and social experience categories point to contextual layers that extend beyond the immediate interaction but nonetheless contribute to how the experience is formed and interpreted. By visualizing these relationships, the figure clarifies how UX dimensions connect outward to broader experiential structures and how TX provides a conceptual umbrella for understanding these interdependencies.

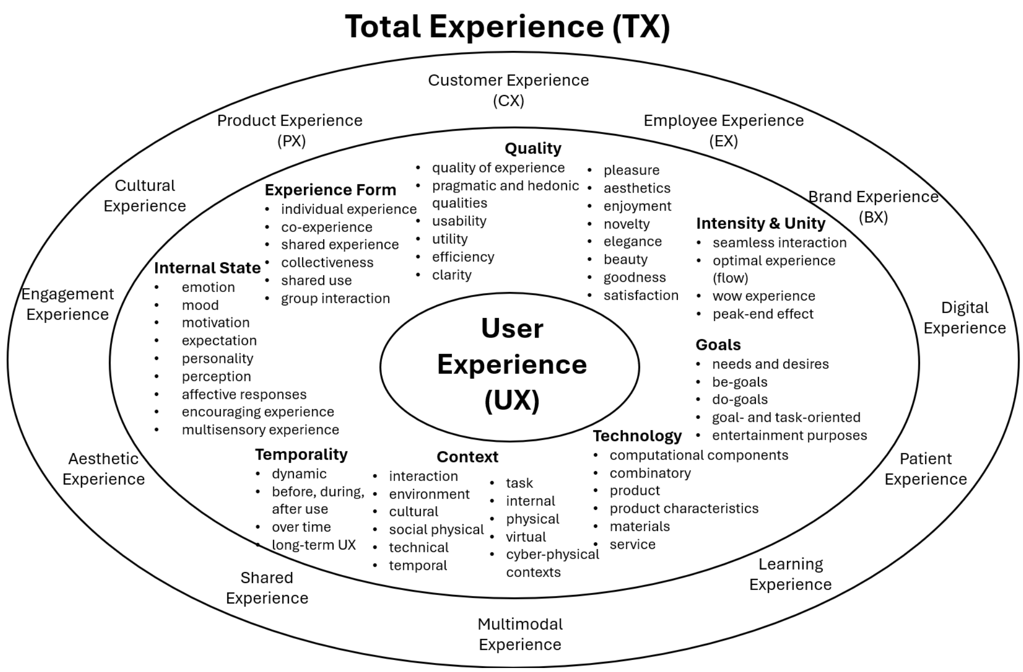

Figure 2. Illustrative TX framework of the multidimensional structure of UX and its relationship to wider TX.

Illustrative Example of the Analysis Framework

Although the analytical framework focuses on UX dimensions, it is grounded in a heteronymous conceptual engineering approach (Chalmers, 2020), which enables the construction of the TX concept through the interaction of diverse technology-experience notions.

Table 5 illustrates how the conceptualization and dimensionality of CX can be examined using the analysis framework. In this example, three established CX definitions are analyzed to show how experience concepts can be positioned within the UX-based dimensions. This example also illustrates how the framework supports systematic comparisons between different experience concepts. The example highlights how the framework can be applied consistently across different experience constructs in a transparent and analytically rigorous manner. It also clarifies how the analytical steps reveal both shared and concept-specific characteristics within these constructs, thereby supporting cumulative conceptual development.

The three CX definitions in this example are the following:

- Becker and Jaakkola (2020) and Waqas et al. (2021) define CX as follows: "The customer experience can be broadly defined as unintentional, spontaneous responses and reactions to service-related stimuli along the customer's journey."
- The definition of CX by Lemon and Verhoef (2016) follows: "CX is a dynamic, time-consuming process that can be perceived through the customer path. The customer

path consists of three main stages: the pre-purchase phase, the purchase phase, and the post-purchase phase. (But) it also includes the customer’s past and future experience.”

- Verhoef et al. (2009) state that “The CX is holistic and covers the entire experience, including the search, purchase, consumption, and after-sales stages of the experience, and may involve multiple retail channels.”

Table 5. Conceptualization and Dimensionality of CX

Dimension	Subdim.	Subdim.	Subdim.	Subdim.	Subdim.	Subdim.	Subdim.
Internal State	**emotion**	**mood**	**motivation**	**personality**	**perception**	**affective responses**	**multisensory**
	-	-	-	-	-	spontaneous responses	-
Experience Form	**individual experience**	**co-experience**	**shared experience**	**collective-ness**	**shared use**	**group interaction**	**new sub-dimension**
	-	-	-	-	-	-	-
Quality	**usability**	**utility**	**efficiency**	**pleasure**	**aesthetics**	**novelty**	**enjoyment**
	-	-	-	-	-	-	-
Intensity and Unity	**seamless interaction**	**optimal experience**	**wow-experience**	**peak-end effect**	**new sub-dimension**	**new sub-dimension**	**new sub-dimension**
	-	-	-	-	holistic	-	-
Goals	**needs**	**desires**	**goal-oriented**	**task-oriented**	**Entertain-ment purposes**	**new sub-dimension**	**new sub-dimension**
	-	-	search	purchase	consumption	-	-
Technology	**Computat-ional compone-nts**	**product**	**product character-istics**	**materials**	**service**	**new sub-dimension**	**new sub-dimension**
	-	-	-	-	Service-related stimuli	Retail channels	-
Context	**environ-ment**	**cultural**	**social**	**physical**	**technical**	**virtual**	**cyber-physical**
	-	-	-	-	-	-	-
Temporal-ity	**dynamic**	**before, during, after use**	**over time**	**long-term UX**	**new sub-dimension**	**new sub-dimension**	**new sub-dimension**
	dynamic	past, search, pre-purchase phase; after-sales stages	time-consuming process	customer path/ journey	future experience	-	-

Recommendations

- The enhanced UX framework in this paper can be used as an analysis tool to examine different experience concepts pertaining to humans interacting with technology to understand similarities and differences of experience dimensions. This analysis work is central to developing and elaborating the concept of TX. By analyzing experience concepts one at a time, the framework becomes progressively enriched, ultimately forming a holistic structure that can be used in empirical analyses and serve as the foundation for a detailed definition of TX. For example, the framework can be used to explore how different experience concepts appear across a multi-stakeholder process, with each concept-focused analysis contributing to the progressive refinement of the framework.
- As the framework evolves, it supports the analysis of experience constructs within specific interaction contexts, such as learning environments, healthcare systems, and workplace technologies. These situated analyses not only deepen the understanding of how TX manifests across domains but also enhance the framework's applicability in empirical research, technology design, and cross-disciplinary collaboration.
- To enrich the UX framework, future work could involve examining theories, principles, and research-based design guidelines for technology-related experiences to establish a taxonomy that strengthens conceptual clarity and supports more predictable TX design.
- The concept of TX provides HCI research with a broader understanding of how experiences are generated and can be applied in technology design and a wider business context. Understanding the formation of TX can facilitate cross-disciplinary innovation and open doors for more creative approaches as design teams from varied specialties collaborate under unified frameworks.
- Develop a TX measurement scale: Future work should involve constructing a TX scale by conducting a content analysis of existing UX scales and other experience-related models (such as customer experience and product experience). This analysis should identify shared elements, distinctions, and missing aspects relevant to TX.

Conclusion

Conceptualizing human experience in technology interaction solely from the perspective of one experience concept provides a limited view of the total and multifaceted nature of experience formation. To understand and study the totality of experience formation and its dimensions, conceptual examinations are needed. We proposed the concept of TX to serve as the source for overcoming this issue. To develop and establish the concept of TX, various experience concepts involved in human interaction with technology were analyzed. We presented an analysis framework for evaluating the experience concept based on UX, as UX is the primary experience concept in human interactions concerned with technology. The framework we presented may serve as an analysis tool for examining experience concepts and identifying differences and similarities. Analyzing dimensions of different experience concepts in detail may progress the establishment of TX. In addition, the enhanced UX framework can support methodological development by clarifying which aspects of experience the current qualitative and quantitative UX methods capture and what conceptual gaps may remain, thereby informing the refinement of existing measures. As TX continues to develop, future research may also reveal additional experience dimensions and subdimensions beyond those identified in this study, further strengthening the conceptual foundation of TX.

Tips for User Experience Practitioners

- For UX designers, it is important to understand that TX enhances UX design by offering a more detailed understanding of the experience dimensions occurring in technology interaction.
- The TX perspective is especially useful in design contexts in which experiences form across several layers, stakeholders, and touchpoints, such as for large service systems

or learning environments in which the experiential landscape is otherwise difficult to articulate.

- It is advisable to analyze what experience concepts take place in the UX context under examination or within pursued UX design goals. By carefully approaching UX design with the underlying UX dimensions, more predictability in designing for certain experiences can be achieved.
- The enhanced UX framework presented in this paper can be utilized to analyze whether all the experience dimensions have been acknowledged in the research and the design process being carried out.
- Breaking a broad concept into dimensions and subdimensions enables a more systematic understanding of how different factors contribute to the total experience, thereby improving the predictability of experience design.
- The enhanced UX framework can support multidisciplinary collaboration by giving teams a shared structure for identifying and comparing relevant experience concepts, regardless of the specific facilitation methods used. As a shared conceptual tool, it can be used in early-stage ideation and conceptualization to align perspectives across disciplines.

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