Enhancing the Design Process by Embedding HCI Research into Experience Triggers

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ABSTRACT

Over the last decade, User Experience (UX) has become a core concept in the field of Human-Computer Interaction (HCI). Beyond the fact of understanding and assessing the User Experience derived from the use of interactive systems, practitioners and researchers from a wide range of disciplines are now facing the challenges of *designing for User Experience*.

Some authors have pinpointed the existence of a gap between the theoretical knowledge developed in HCI Research and the practical knowledge actually used by designers to create rich experiences with interactive artefacts. A special focus of this paper is to translate theoretical work into experiential objects (or situations) called "Experience Triggers" [1]. Through their materiality, these artefacts bring emotions and sensations to the design process and designers can immerge into and understand the theories on experience. As a consequence of this immersion, the final product designed by the team is assumed to be more experiential. Experience Triggers are introduced here as a new tool for science-based UX design.

Keywords
User experience; Design; Experience Triggers; Materiality; HCI Research; Science-Based Design

ACM Classification Keywords
H.5.2. User interfaces: User-Centered design

General Terms
Human Factors; Design; Measurement.

INTRODUCTION
In a world moving from a materialistic view to an ever-growing experiential perspective [33] [18], designing

(for) User Experience (UX) has become a major concern for both researchers and practitioners [22]. However, the complexity of designing experiences, and even of knowing which kind of experiences are desirable or not in specific contexts of use, is a daily challenge that experience designers have to cope with. Despite the availability of theoretical and empirical findings on the way people interact with and therefore experience the world and its artefacts, only few artefacts designed within the HCI field are actually explicitly rooted on this body of knowledge [21].

This obviously leads to questioning the collaboration between several disciplines sharing the common goal of designing interactive products or systems, able to stimulate positive user experiences. Design, Ergonomics and HCI are all at the core of interaction design. In recent approaches that are more and more interdisciplinary, these disciplines profit from each other and we see new methodologies and theoretical frameworks, which do not exclusively relate to one of these domains only [27]. It is obvious both researchers and practitioners have started profiting from cross-fertilization between those domains. It remains unclear however, how each domain actually contributes to an integrated design process in order to support UX design and to what extent there remain domain-specific approaches [47]. Moreover, studies have shown the existence of differences between academia and industry both in the understanding of UX and the underlying UX design practices [21] [25]. Researchers in the field of UX are seeking to understand the nature of human experiences and the drivers of positive experiences with technologies. Models and theories of UX are developed and tested. Unfortunately, this ever-growing body of knowledge developed within the HCI and UX research fields seems to be actually underused by designers in practice [21].

To address this issue, the concept of "Experience Triggers" has been proposed as a promising approach [1]. Experience Triggers (E.T.) are defined as objects or situations created for the design team to influence the design process by embedding design guidelines and various theories of experience. It is therefore assumed

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41

that the use of Experience Triggers within the design process could help designing for an optimal UX of the final product.

In this paper, we first examine how the design process integrates the focus on user experience. We show that design practitioners underuse the existing body of knowledge on UX. As a consequence, we introduce the concept of Experience Triggers as a potential bridge between UX research and UX practice. The benefits of Experience Triggers are presented in relation to the design process and its result. We then propose a first experiment to test the effectiveness of this approach. Finally, we discuss perspectives and challenges related to Experience Triggers as a UX design tool.

DESIGNING (FOR) USER EXPERIENCE

User Experiences are experiences created and shaped through technology [17]. Designing for User Experience is frequently considered as a challenge [30] [17] since it goes beyond the quality or originality of the design and involves a deep understanding of the way technology involves people emotionally, intellectually and sensually [30]. As stated by Hassenzahl [16]: "UX *is not about good industrial design, multi-touch, or fancy interfaces. It is about transcending the material. It is about creating an experience through a device"*. During the last decade, several theoretical models have been developed [11] [19] [28] to account for the complexity of user experience. In 2007, authors of the User Experience Manifesto [26] stated "developing theoretically sound methodologies for analysing, designing, engineering and evaluating UX should be high in the UX research agenda". Since then, several UX evaluation and design methods have been developed and applied in research. It remains however unclear to what extent these methods have been transferred into daily practice by UX professionals and thus needs to be assessed.

We will start by trying to analyse how practitioners do design to show what could be improved. Noteworthy is that the population of practitioners working as "UX Designers" is highly heterogeneous [25]. A majority of UX Practitioners have been educated in one of those four fields: Design, Psychology/Social Sciences, Technology/Software or Human-Computer Interaction [25]. It is therefore not an easy task to describe design in practice as each field might apply specific design processes. In this paper, we will focus on practitioners educated in the field of Design.

The design process is traditionally constituted of four phases: Exploration, Generation, Evaluation, and Communication [5]. During the exploration phase, designers gather information related to the design brief, the user, and sources of inspiration. The generation phase consists in the creation of ideas, mainly through sketches, storyboards, wireframes and mock-ups. The evaluation phase consists of selecting the most appropriate solution(s) among the generated ideas. Finally the chosen solution is communicated to the development team and to clients before entering the product development. Designing for UX is an iterative process with multiple feedback loops between the development and evaluation phases. Each of the design process phases has its specific tools of which a certain number comes from the HCI or Ergonomics domain and others that have been developed by the design community.

First of all, during the exploration phase, the design team seeks to understand who future users are and what their use context looks like. Classical methods used in Ergonomics like field studies, interviews or Focus Groups [3] help gathering explicit or observable information. Observations can also be done indirectly through diaries and camera journals [24] [27]. These fields-based approaches aimed at understanding users were accompanied by the development of "Day in the life" scenarios [31] or Personas [35] in order to make the gathered information tangible for practitioners. These methods notably helped field researchers communicate their findings to designers [46]. Moreover, designers also need information on tacit or latent user desires [44]. The design domain has therefore developed own tools like Design Probes [13] [45] or Role-Playing [40], which give the future user an active role to play.

Once the user and use context are explored, the identified needs and desires have to be translated into design ideas. So far there are no explicit tools used for this UX generation phase. Most commonly used are creativity sessions expected to stimulate UX idea generation through mind maps or brainstorming [5] [16]. Another way to bring the User Experience into early design steps is by inviting users to join the generation process, the so-called participatory design. The goal is to initiate a dialogue between the designer and the user [34] [37]. However, common design generation tools, like sketch or wireframing, simply rely on the empathic capacity (i.e. to project oneself into the user and use context knowledge while conceiving the interface) of the designer.

Finally designers have to choose the most promising solutions from the set of ideas developed so far. To do so, they often follow their instinct, their project leader or the client's choice while more objective UX evaluation is possible at this stage. Mainly the psychology components in HCI provide UX design with a range of tools to test whether or not a design idea is able to trigger the desired UX. User responses to stimuli come in form of emotions, sensations, accorded meaning, etc. These can be measured on three levels: cognition/language, behavioural events, and physiological events [2]. Conscious UX is often measured with self-evaluation questionnaires [8] [27]. The behavioural dimension of UX has so far been the core of Ergonomics. Task analysis and user testing are classical means to measure effectiveness and efficiency [42]. Tools like eye-tracking show which properties of the design the user perceives.

Last but not least, physiological parameters like body temperature, heart rate, breath rhythm, sweating, etc. [38] as well as facial and other somatic muscle movements can be indicators for UX design [2]. They provide data on arousal or valence (i.e. positive vs negative feelings) evoked by a stimulus.

To summarize, this analysis of design in practice allows us to see that UX Design benefits from numerous tools coming from Ergonomics, Design and HCI. Designers already employ various UX specific tools and methods, especially during the exploration and evaluation phases. However, there seems to be a lack of tools to support practitioners in the design of UX for the generation phase. This is not surprising considering that, even in research, few methods only exist to design for UX. Amongst them, the use of *Experience Patterns* [20] or *Needs-Driven Experience Design* approaches [23] are rarely known by designers. Another observation that can be made is that practitioners are developing and using many design methods that have never been rigorously tested [9]. Design practice and HCI research could benefit from a closer integration. HCI research can help designers in the rigorous development of new methods, while designers can provide researchers with industrial use cases to test and enhance design methods.

SCIENTIFIC GROUNDING OF CURRENT PRACTICE IN EXPERIENCE DESIGN

Experience Design requires a deep understanding of people [19], their cognitive and affective processes (e.g. such as cognition, affects, motivation and volition) and basic needs. A profound theoretical and empirical knowledge on the understanding of human experiences has been accumulated through decades of research in several fields such as psychology, sociology, ethnology, philosophy, etc. Universal human needs have for example been identified and thoroughly investigated [39], as well as psycho-cognitive and psycho-social processes, human values [36], human emotions [12] [38] or even optimal experiences at a more generic level [7]. All these considerations are crucial when studying human experiences and especially, within the HCI research field, user experiences with interactive systems and artefacts.

Unfortunately, despite the availability of theoretical and empirical psychological findings, it seems that existing knowledge remains largely underutilized by designers. In a systematic review of 92 publications presenting 143 artefacts from the HCI and Interaction Design domain, Hassenzahl et al. [21] show that less than half of those make explicit use of external theoretical and empirical psychological knowledge. This might be explained by a commonly shared 'bottom-up approach to the analysis of people and contexts […] (where) designers immerse themselves into the context to build up the empathy necessary for sensible design' [21].

Even if the HCI community is highly interdisciplinary by nature, another reason explaining this phenomenon could

be the feeling of incompetence to master concepts from other disciplines, especially those studying the human with regard to his full complexity, such as psychology. Moreover, setting academic and research areas aside, it is easily understandable that designers (as practitioners) may neither have full access to this body of knowledge nor have the time to get acquainted with and use it within their designs [16]. Finally, designers might also fear to constrain their creativity and inspiration if relying on theoretical knowledge instead of listening to their sensitive empathic feelings towards potential future users.

In summary, despite the fact that designers adopt more and more of the tools and methods developed by the research community for the exploration and evaluation phases, there are few tools only specifically developed for User Experience generation. Therefore we propose "Experience Triggers" as one way to transfer HCI knowledge to designers in an attractive way.

EXPERIENCE TRIGGERS: EXPERIENCING TO DESIGN BETTER EXPERIENCES

The concept of "Experience Triggers" [1] is based on the assumption that experiencing through materiality will help designing better experiences. Living a specific experience before or during the design process might unconsciously help designers to develop an intuitive and empathic knowledge about the experience(s) an object can evoke. Once the experiential purpose is understood (even intuitively) by the designers, we assume they are more likely to find ways of expressing and designing this specific experience through the interactive object or system.

Our idea is to speak the same language as designers, materiality being a potential medium to reach this goal. The ability of artefacts to embody and thus mirror theoretical notions, concepts and empirical findings became therefore the core idea of Experience Triggers as an inspirational tool for UX generation.

What are Experience Triggers and what benefits do they bring to the Design Process?

Experience triggers (E.T.) are objects or situations created by a UX expert, whose goal consists of embedding specific theories of experience within those objects or situations.

E.T.s serve three purposes in the design process:
1. to bridge theory and practice by providing designers with new knowledge in an informal way, that is intuitively integrated and does not constrain creativity;
2. to enable designers to experience the type of experience they seek to create;
3. to unite the design team around a reference experience.

Experience Triggers are introduced within the design process during the early steps of idea generation. They are intended to help designers understanding a specific

theory of experience without actually having to read anything formal about it. E.T. will bring new knowledge on human experience that will potentially be intuitively integrated and does not constrain the creativity of designers. Being informal, this embedded knowledge is also less likely to hinder the empathy developed by designers using a bottom-up approach to the analysis of people and contexts. By interacting with E.T. we therefore expect designers to gain new insights on how to design positive experiences, for example how interactive products might support final users in the fulfilment of their primary needs [39] [19]. Moreover, the use of E.T. might also trigger the designers' interest in theories and encourage them to further explore the literature on human experience.

The main assumption behind E.T. is that designers will design better product experiences if they have been previously (i.e. during the design process) immersed in the experience they seek to create. Lived experiences are hard to express and to understand using words and the vocabulary often fails to transmit with accuracy feelings or emotions. People thus frequently feel that their peers or beloved ones are not able to understand what they feel during a memorable event unless they live the same experience. Placing designers in a situation of intense relatedness or making them feel the optimal experience of flow [7] might be a good way to help them transfer this concern in the objects or system they are designing. As inspirational objects, E.T. could stimulate designers to feel something and then do something creative by analogy, so that final users will feel the same experience. In design, analogical reasoning plays a double role by supporting creativity and learning simultaneously [14]. For now, design by analogy has been focused mostly on visual, textual or functional analogy [5] [15]. In our case, we intend E.T. to act as "experiential analogies". It is the felt experience of the final product that is meant to be designed by analogy. Imagining different sets of E.T. to reflect the numerous existing but unfortunately underused theories of UX would therefore be a good way to enhance design practice.

As experiential objects, beyond the fact of embedding a theory of experience (or some elements of a theory), Experience Triggers are meant to boost the creativity of the design team and stimulate a better group dynamic. Indeed, as it is not that trivial to embed a UX theory in a common object, E.T. are likely to be designed under the form of very peculiar objects or situations. This assumption has been explored during a first workshop [1] where we asked 35 participants (all of them being UX practitioners or researchers) to act as E.T. designers. Working in small teams during about an hour, participants had to study four specific human needs: *security relatedness, pleasure* and *self-esteem* adapted from Sheldon et al. [39] and to come up with tangible objects embedding this experience. Two of the resulting E.T. objects are presented in Figure 1. Participants from other groups tested the designed E.T. Despite the very

explorative nature of this first experiment, we were able to witness the potential power of E.T. to have an effect on designers by triggering *something* (at this point we are not able to characterize exactly what kind of feelings / emotions etc. have been triggered) and stimulate a reflection. Research has shown that the more a lived experience is interesting, intense, confusing or impressive, the more humans feel the need to talk about it and to share it with others [17]. Sharing experiences has a high social value and helps feeling related to others [43]. Therefore, we expect the possibly complex and unusual nature of E.T. to be experiential in itself and hence likely to foster discussions and debates between team members. Several design tools already use materiality to inspire design teams and create a shared experience, like for example the well-known design probes [13] or the open-ended objects imagined by Cruz & Gaudron [6].

Figure 1. Examples of draft Experience Triggers created during the UX Workshop [1]. Left: 'security' E.T., right: 'relatedness' E.T.

Thanks to their experiential nature, E.T. are also meant to resonate with the personal history of the designer. Each E.T., by triggering a specific experience, inevitably relates to the identity of the designer using it. It will evoke memories of objects or previous experiences and will therefore help designers to rely on past experiences and personal history to get design inspiration. As an UX ideation tool, E.T. can be classified as an intuitive approach, meant to help designers to "break routines and overcome mental blocks" [16].

The design of Experience Triggers
The design of Experience Triggers basically requires three main elements:

- a UX expert, who designs a single or a set of E.T. (i.e. objects or situations) assisted by an artist or designer for the creation of the object.
- a theory of experience to be embedded or partly embedded within this set of E.T.
- a methodology or guidelines to guarantee the coherence and effectiveness of the process.

Experience Trigger designers are specialists in human experience and could be new actors in the design process. Their role is to embed design guidelines and theories of experience within objects or situations in order to influence the design process. In that sense,

Experience Triggers act as *tangible translations* of a specific body of knowledge on Experience Design. Experience Trigger designers might be considered as "Meta-Designers", since they will not directly be involved in the design of a specific product or system but will influence the whole process by providing the design team with one or several particular E.T. A solution to cope with the fact that experts having both fundamental (i.e. being an expert at a theoretical level) and creative skills (i.e. being able to design an object) are hard - if not impossible - to find, would be a collaboration between a specialist in human experience and an artist or creative designer.

There is no comprehensive list of theories of experience that the E.T. designer might be willing to embed in E.T.; they might be as diverse as the theories of user experiences. Depending on his background and knowledge, the E.T. designer may use theories from HCI, Design and Ergonomics but also from disciplines such as psychology, social sciences, cognitive sciences or even biology.

Last but not least, designing Experience Triggers requires a process to support E.T. designers in their work (see Figure 2). We propose the following methodology as a starting point:

1. *Selection of a theory on user experience*: the E.T. designer selects a theory to be embedded into the E.T.
2. *Extraction of key elements*: the E.T. designer extracts key findings of the theory. If working in collaboration with a designer or an artist, he transcripts these key findings under an easy-to-understand form.
3. *Idea generation*: the E.T. designer (and his collaborators) explores concrete and tangible experiential translations of the theory. These might be physical objects or role-playing situations.
4. *Creation of one or several E.T.*: the E.T. designer and his collaborator choose the most appropriate form for their E.T. and generate one or several E.T.s.
5. *Pre-Evaluation of E.T.*: before providing a design team with the novel set of E.T., a pre-evaluation on a control group is performed to ensure that the E.T. truly triggers the intended experience.

6. *E.T. in use*: the design team interacts with or manipulates the Trigger object during their design activity.
7. *UX evaluation of the final design*: test if the intended experience was translated into a design solution.

Now that we have presented the concept of E.T., the rationale behind the development of this new method and the main expected outcomes, we need to assess the potential of E.T. as a new tool to design for UX.

Assessing the potential of Experience Triggers as a new tool to design for User Experience

During our preliminary workshop on Experience Design organized in Paris during the FLUPA UX-Day 2013 [1], the community of French UX practitioners showed a strong interest for the concept of "Experience Triggers". Feedback gathered during a short post-task questionnaire shows that the Triggers were perceived as a potentially valuable bridge between research and design practice. However, this exploratory experiment does not allow us to claim any benefit provided by Experience Triggers. A more thorough and scientific-based experiment is planned within the next few months.

To assess the potential of Experience Triggers, one should positively answer two main questions:

- Is the final product better than it would have been without Experience Triggers?
- Is the design process experience more memorable (i.e. will be remembered as a particularly positive experience) than it would have been without Experience Triggers?

The goal of the study is to test the potential of the E.T. by comparing three design teams (3-4 members per team) during a design challenge. All teams will work on the same design brief, i.e. a short written document focused on the desired results of design. This document also includes basic data on target users and the context of use. The type of object or system to be designed will therefore be determined beforehand. The theory of UX that will be embedded in E.T. for this experiment is derived from the Psychological Needs-Driven Experience Design approach [23], which states that technology shapes experiences through fulfilling (or not fulfilling) certain psychological needs.

The experiment will be an independent measures design involving three independent groups. A first team will act

Figure 2. Experience Triggers Methodology

as a control group and will therefore design a specific object only by using their knowledge and expertise. A second team will design the same kind of object by using UX Cards (which are cards formally describing a theory of UX). These UX Cards (designed by the first author of this paper) constitute an intermediate condition, using a formal source of knowledge about human experience. They will allow us to see how designers welcome formal UX theories and how textual stimuli will influence idea generation. Previous findings seem contradictory on this issue, some studies arguing that text stimuli may have negative effects [29] while some others [15] show a positive influence of word stimuli as compared to no external stimuli. Finally the third team will design the object by using one or several Experience Triggers embedding the same UX theory as the UX Cards provided to the second team. In order to control for biases, a special attention will be paid to the homogeneity of the groups, i.e. the seniority of team members, the educational background, previous collaboration experience between members, etc.

After the design task, the experiential potential of each designed objects or system will be assessed both by UX experts and potential final users. Qualitative and quantitative measures will be used for this assessment. We also assess the experience lived by the members of each design team in order to know whether the presence and use of E.T. contribute to foster discussions and creativity within the design team. This planned experiment should show how effective E.T. are to enhance the design process.

While this preliminary work on the concept of Experience Triggers is very motivating and might lead to promising outcomes for the practice of design, we are aware that a lot of critical questions on this new tool remain unanswered at this stage. We discuss some of these issues in the last part of this paper.

DISCUSSION
The rationale behind the idea of E.T. is the existence of a gap between research and practice [21] [25] that we would like to reduce by translating the theoretical body and methodologies of researchers into the language of designers. However, we are aware that this translation is very challenging. Experiential objects are already hard to create without having to embed any specific theoretical knowledge. Since these kinds of objects or situations should trigger rich experiences specific to a future product or service, one could raise further questions: should every company invent its own E.T.s based on theories that seem relevant to its projects? Or should E.T.s be universal and only specific to UX theories? For now it is indeed impossible to say if E.T. will be valuable for every designer, dealing with every possible design problem in any design context. As stated by Dorst [9], design research should not only focus on design processes, as if they would be universally valid for each design context, but also on a "deep and systematic

understanding of the design object, the designer and the design context" ([9], p.6).

Another question raised by E.T. is their potential of stimulating analogical reasoning, i.e. being used as examples of what should be lived and felt by final users through the use of the product. Our assumption is that designers live specific a kind of experience and then, by analogy, intuitively embed this specific experience in the final product, so that final users will live the same experience. In a study on the influence on analogies during idea generation, Casakin [4] shows that designers are stimulated by visual analogues (pictures) without any instruction to use analogical reasoning. Participants to our experimental study will therefore not be instructed to use the felt experience to design by analogy. After this first experiment, a considerable amount of work will be needed to explore the conditions required for E.T. to be an effective design tool.

Furthermore, E.T. as tangible objects also carry the risk of subjective interpretation of the intuitive knowledge they are supposed to embed. The question is: do E.T. trigger the same experience for all members of a team design? Based on research findings on inspiration in design [46] [10], the answer would be "not really". Each E.T. will resonate differently for each person, depending on her personal history and sensitivity [46]. We do not fear subjectivity in the interpretation of E.T. as we consider this as a positive outcome that might foster dynamic group discussions and idea generation. However, this dynamic is only one goal out of the three main goals assigned to E.T. Despite its interest, it is probably the easiest goal to achieve and numerous existing tools and design methods succeed in doing so. The biggest goal that might be hindered by this subjective interpretation of E.T. is the one of knowledge embedding. We do not intend the E.T. to trigger the same singular feelings for each person, but we do intend that these feelings relate to the same kind of experience. For example, an object might be considered as aesthetic for one person and anaesthetics for another depending on their personal taste. This subjective assessment is an inevitable process and might be seen as a critical issue for the design of E.T. However, we believe that this is not a problem if the main goal of the object was to embed the notion of visual pleasure, the feeling of visual displeasure being one possible expression of this global intended experiential notion. No matter if some designers have experienced visual pleasure while others have experienced displeasure as long as all of them have intuitively understood the importance of including visual pleasure as an experiential quality of their final design.

The experiment we intend to conduct within the next few months will be a first step to explore the potential of E.T. as a new UX design tool. We hope to be able to analyse the way E.T. impact the design process and the quality of design outcomes. We also aim at finding ways of

improving this method by understanding design mechanisms involved in the use of E.T.

CONCLUSION

In the current *experience economy* [33], designing rich or memorable user experiences has become a key goal to achieve when designing interactive products. For more than a decade, research studies are conducted to understand the mechanisms underlying user experiences and to develop UX evaluation and design methods. However, as we have seen, the bridge between research and practice, as well as the effective integration of several disciplines in the design process, is not yet fully successful.

Experience Triggers are introduced here as a new promising tool for the design of UX. By embedding some theoretical knowledge about user experiences within artefacts or situations to be used or lived by designers, we hope to enhance the quality of both the design process and the design outcomes. The concept of E.T. is only in its early stages and numerous challenging questions are raised. An experimental study will be conducted to bring understanding about the benefits, limitations and prerequisite of E.T. design and usage as a UX design tool.

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