

# Fire in the Kitchen: The Campfire Experience that Led to Innovation in Human Product Interaction

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**Abstract.** User experience (UX), with practical roots in Renaissance and theoretical beginnings in Modernism, is a contemporary design practice concerned with how users are impacted by their interaction with a product or a service. As design thinking has shifted from form based arts and crafts toward user-centered and user-serving profession, so have its methods locked in on user-centric research and validation tactics. Yet, something crucial seems to have been lost in the process – that of direct first hand experiences as triggers of user empathy that reveals their latent desires for speculative innovation. As such, UX is facing a philosophical conundrum: while it seeks to serve the experiential needs of others, it has come to reject experiences as its primary source of insight and inspiration. This article discusses the experience-centric design process of *Black Flame*, a novel induction cooktop product interaction. The case serves as a philosophical call to self-reflection and action to the HCI, Design and Information Systems communities to embrace *empathy*, *speculation* and *design activism* as avenues via which to advance human-technology interactions and the increasingly ubiquitous forms of experience.

**Keywords:** User experience · Human computer interaction · Interaction design · Speculative design · Empathetic design · Design philosophy

## 1 Introduction

Understanding users experiences (UX), that is, their needs, expectations and desires with a product or service is a critical issue for a variety of professions, but especially for designers and product managers who are responsible for customer satisfaction [1].

The tradition for design to support aesthetically, ergonomically and interactively defined experiences is long, but it has evolved from a top-down designer-artist creative practice to a more bottom-up and analytical user service. Undoubtedly, its growing reliance on user centric research and validation methodologies, such as interviews and contextual observations, have allowed designers to complement their personal gut-feelings and preferences with feedback and insight directly from the end-users they are designing for. This is crucial for the User Centered Design (UCD) method that has shifted designers' attention away from the material artifact to the user and their fluid state of experiencing the world.

Importantly, UCD has increased the methodological rigor of the design practice and reduced some of the designer-bias inherent in many of the objects still prevalent in our everyday life. The new focus on UX is raising new questions about how the product meets their expectations, needs, wants, moods and even latent desires and gives them a particular experience over time, many of which have remained unanswered. Indeed, despite the general agreement that its focus on the interactions between people and products (i.e., touch points), and the experience that results from that interaction (across the touch points over time) is what makes it unique [1], the definition of UX has remained inconclusive [2].

Current discussion is mostly centered on how UX differs from usability, by means of separating the many different facets of experiences, such as “*physical, sensual, cognitive, emotional, and aesthetic*” to define how the product impacts the users (i.e., gives a user an experience) [1] (p. 261). A number of design guides have been proposed in an effort to systematically assist the application of UCD processes, yet they tend to focus either on the product [3], the user [4] or the inter-mediating interaction between the two [1], not on the resulting experiences. How are user experiences understood, defined and so designed are questions still in need of answers.

The present article is not seeking to provide these answers. Rather, it serves as a philosophical call to pause, reflect and rethink the way UX is researched and designed. To better understand what UX is today, a brief review of its practical and theoretical histories is offered. While interlinked, the two can still be seen as two distinct strands of UX thinking. An experience centric design process of *Black Flame*, a novel human-product interaction, is used to discuss the current limitations of UCD method and what it could learn from the UX practice in the wild. The *Black Flame* case illustrates the current UX conundrum: namely, designers are designing experiences in response to users’ current ways of doing things without explicitly leveraging their own experiences of the manifold issues and joys present in this world.

## 2 User Experience Design in the Wild

User experience (UX) is a seemingly new design approach of the UCD method, yet its foundational principles of *utility* (i.e., useful, beneficial) and *usability* (i.e., ease of use, learnability) can be traced all the way back, to Da Vinci’s inventions during the Renaissance. What is more recent in the UX context perhaps (not in history in general) is the analytical consideration for *aesthetics* (i.e., beauty), *emotion* (i.e., strong feelings) and *affect* (i.e., impression) as opportunities to *delight* (i.e., pleasure) users.

Utility and usability stem from the ergonomic concerns of the 1900s Industrial Revolution, where principles of *effectiveness* (i.e., achieving the desired results) and *efficiency* (i.e., minimized cost or burden) drove workplace innovations often attributed to industrialists like Winslow Taylor and Henry Ford. Both of these men optimized work for their employees and ignited research into workers’ relationship with their tools (i.e., human factors).

While Ford was driven to increase production volumes and lower prices for his always black T-Models, General Motors’ Alfred Sloan differentiated from Ford by pioneering the now standard way of segmenting the consumers of the car market:

'a car for every purse and purpose' [5]. To counter Ford's utility driven value proposition, Sloan offered consumers a number of aesthetic options with varying affect appeals, capturing the many desires of the different consumer segments. Years later, Toyota's human centered production processes shifted the focus from pure efficiency to workers' experience, igniting a debate on how to better the human-technology interaction via design, and design workers experiences to optimize their work efforts.

In the 1950s, the American industrial designer Henry Dreyfuss reflected on his successes and failures in his now classic text *Designing for People*: "When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed. On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient - or just plain happier - by contact with the product, then the designer has succeeded" [6] (p. 24). In his binary definition of success, Dreyfuss captured the two-fold requirements of UX, namely the baseline need for *usability* (i.e., the meeting of the user needs and expectations) and added value of *joy* (i.e., the exceeding user expectations), which is referred to as *delight* [3] in the contemporary UX literature.

In the 1970s, Walt Disney capitalized on his efforts to achieve delight by his 'Imagineering' principle, which meant to leverage new and emerging technologies to fascinate, surprise and mesmerize people (i.e., what is now known as the joy-offering Disney World) [7]. Together with Bob Taylor and his research on mouse controlled graphical user interfaces (GUI) at the Xerox PARC, the two men laid the groundwork for what UX in practice was about: the design of unimaginable experiences with novel computer technologies.

In the 1990s Don Norman professionalized the UX design discipline when he became Apple's first User Experience Architect. While his book *The Design of Everyday Things* championed cognitive usability and ergonomic functionality over aesthetics [8], Steve Jobs led Apple products remain the epitome examples of balancing usability and aesthetics in mutually reinforcing ways, granting Apple unprecedented market success.

Indeed, by the end of the twentieth century, *utility* and *usability* were no longer enough to define and understand user experiences. The 1996 ISO 9241-11 [9] usability standard was upgraded to a ISO 9241-210 [10], a UCD standard for interactive systems that accounts for users experience as pleasure that results from "the presentation, functionality, system performance, interactive behavior, and assistive capabilities of an interactive system, both hardware and software, [... but also] the user's prior experiences, attitudes, skills, habits and personality" [11] (p. 161).

With the proliferation of user-product touch points, consideration for the users' experiences has grown more important. Where usability became a necessity, the need to differentiate has encouraged speculation of alternative possibilities and embracing users latent desires for joy and imagination.

Yet, systematic ways on how to balance considerations of usability and artistic aesthetics as a unified UX effort have remained difficult to achieve. Currently, the industry is complementarily blending user-centered UX researchers with designer-artist 'imagineers' as the crucial duos offering the best experiences to their users.

### 3 User Experience Research in Academia

Contrary to practice in industry, UX is a newer consideration in design thinking in the academic context, but it has struggled with the same essential dilemma of balancing utility and beauty. Throughout the centuries, design theory has shifted its focus from *form* to *function* and to *communication*, and is only recently discussing the viability of *experiences* as the object of design-theoretical analysis.

Early academic thinking on design is rooted in Modernist movements of the late 19<sup>th</sup> century. In the aftermath of the industrial revolution, design writings were underlined by a social shift: moving from *decorative arts* that bore no direct utility to society, to *usability* that had an agenda to enhance the well-being of people through material objects. Bauhaus design school's systematic practical and theoretical research into the formal, technical and economic informed their Modernist paradigm of *form follows function* [12]. As such, Modernism marked the shift where design stopped being concerned with *form* and became obsessed with *interaction* (i.e., the ways of using, doing, and ultimately, of living).

With the turn of the century, design writing became more concerned with *usability* and perceived *ease of use*. In an effort to make a design easy to understand, interpret and therefore use, something that was not always common among the Bauhaus work, design became a matter of semiotics, where artifacts were messages of usability and utility framed as a form of visual communication. In Smith and Tabor [13] words: “*the fundamental training and skills of artist-designers lie in detecting, creating, and controlling cultural and emotional meanings*” (p. 40).

Today, the discussion has moved beyond communication of messages and meanings. UX has become an established field of research at the intersection of Design and Human Computer Interaction (HCI) [14] with a conceptual discussion centered on how design can embed and convey certain *action potentials* (i.e., affordances) that result in some positive *impact* (i.e., experiences). Herein, design is no longer focused on the physical or symbolic forms of material objects, or the end-users *per se*, but rather on the users' experiences with it at the motor, task and goal levels [11] over time and across different emotional states.

Many different frameworks have been proposed to systematize the manifold nuances that create user experiences. Forlizzi and Battarbee [1] attempted to define experiences with interactive systems as a two-tiered framework of *quality* (usability, cognition and expression) and *depth* (interaction, experience and co-experience with other users). Desmet and Hekkert [3] proposed *aesthetics*, *meanings* and *emotions* as the three variables needed to guide design and evaluate human-product interactions that could account for users affective responses to the experiences studied. A number of affordance based frameworks have also been proposed to better address *user needs* [11] or to leverage *aesthetics* to communicate action potentials [15].

In complement to the UX practice in industry, controlled experiments have proven beauty's mediating role in perceived usability [16]. As such, *aesthetics* and *affordances* are increasingly recognized among HCI, UbiComp and Design researchers as important for designers to provide effective ways of interaction through artifacts. Xenakis and Arnellos' [15] theoretical model is a unique effort to connect the two by leveraging

interaction aesthetics as detection mechanisms for action possibilities (i.e., affordances). Hornecker and Buur [4] provided concepts for enhancing *social* and *collaborative* experiences via tangible interaction technologies.

The models have raised many criticisms and have hardly led to easily actionable and generalizable design methods. On a fundamental level, a distinction can be drawn between *holistic* and *reductive* approaches of UX that are rooted in complexity embracing phenomenology and complexity reducing cognitive psychology, respectively [17] (p. 1). The former focuses on the complex interplay between the many experience-defining variables about the user (e.g., emotion, intellect and sensation), their action, context and time. While invaluable to advancing our understandings of the many complexities associated with user experiences, they are difficult to use as design guides. To this end, the latter approach aims to simplify the holistic perspective, by chunking the variables into independent parts that are easier comprehend.

A number of situated research activities have been proposed to help designers position themselves in the shoes of their intended users and assist them in better understanding the experiences that they seek to design [1]. Yet, with the exception of pure ethnography, social scientific research methods have fallen short in granting designers direct experiences of what they are designing. Redström [18] has articulated the problem that “*with its ambition to create a tight fit between object and user, the development seems to point to a situation where we are trying to optimize fit on the basis of predictions rather than knowledge, eventually trying to design something that is not there for us to design*” (p. 124).

Despite the manifold efforts the relatively new research field lacks the prescriptive tools to guide efforts to research and design experiences. We are faced with critical questions about what it means to design user experiences (vs. products)? What information do we need? How do we go about getting the necessary knowledge? These are crucial questions to answer, unless we are prepared that our work might result in the old problem of offering users “*experiences that they do not wish*” [11] (p. 160).

## 4 Discussion: Bringing a Fire into the Kitchen

*Black Flame* is a novel induction cooktop prototype that emulates a campfire experience by utilizing spatial bodily interaction as its heating control. It serves as an illustrative case for how designers’ personal experiences (vs. the much embraced UCD) can lead to novel human-product interactions and should be considered as a potential source for insight (into users latent desires), inspiration (for experience empathy), and speculative innovation, especially in the banal and naturalized context of the everyday.

### 4.1 First Hand Cooking Experiences

In the summer of 2015, three women: an electrical engineer, industrial designer and a user experience designer –, all working for Whirlpool Corporation in Benton Harbor, MI, came to share a variety of first hand cooking experiences that led them to innovate a novel human-product interaction.

After working their daytime job roles the women convened to cook and dine together. While collaborative cooking was joyous, it increased the already frequent number of cooking related incidents with the classic electric cooktop (see Fig. 1). The common issues that occurred included burning the food, over boiling and spilling, forgetting burners on, melting plastic cooking utensils, and perhaps most frequently, burning one's fingers by touching hot surfaces or foods.

This was not surprising since stovetops are deemed a classic usability issue, alongside microwave interfaces, camera menu options and other products that suffer from the same complexity, feedback and mismatch issues for decades. However, the issues became more prevalent as more people joined the cooking effort. This was thought to have happened for two main reasons: attention had shifted from cooking to social conversation, and with more people executing tasks, it was difficult to preserve an overview of what was going on with the different pots and pans. The main interface flaws of the electric stovetops include the following:

- **Disconnected controls:** The heat controlling knobs of the burners are positioned above the stove top, separate from the actual cooking surface. This made it difficult to know which knob controls which burner and resulted in common errors.
- **Time delay between input and output:** It takes time for burners to get red and hot. This resulted in meats being placed on a pan too early and not getting seared.
- **Lack of feedback:** While the burners turn red when they are in the process of heating and there is nothing placed on them (good safety), they do not stay red while 'on', when a pot is on it, or when it is already cooling but still too hot for touch. This led to burned fingers, pots and melted kitchen utensils.
- **Inflexible heating areas:** Despite the varying sizes, burners are often too large (e.g., when boiling a few eggs) or too small (e.g., when using a square griddle pan). This caused safety hazards when over boiling water splashed off the burner and cooking issues when the griddle pan had to be moved around to heat its corners.
- **Inefficient spatial layout:** An associated issue is the inefficient placement of the burners in each corner of the cooktop and none in the middle. A wok pan's wide radius and high edge makes it too large to fit on back burners and a potential safety hazard on a front burner. Again, most burners are too large for wok's small base.
- **Arbitrary and inconsistent temperature references:** While numeric control is easy for users to remember over repeated use, they are arbitrary and inconsistent from one stove to another, causing usability issues during new encounters.
- **Socio-spatial limitation:** Despite the increasingly open plan living setting cooking by the cooktop always locks the chef in the kitchen, excluded from the social conversations of other family members or guests.

Comparatively, when taking a weekend camping trip to the Dune Lake Campground on the shore of Lake Michigan, the women experienced a similarly social and collaborative, yet far less stressful and more intuitive cooking experience around the campfire. While the oven offers many more functions with much more ease than setting up a campfire, there was something immensely intuitive about how one could control the heat when cooking above live campfire (Fig. 2). The main experience defining campfire features included the following:



**Fig. 1.** Cooktop in the kitchen where shared dinners took place, Beckwith Hall, MI.



**Fig. 2.** Dinner and smores at the campfire, Dune Lake Campground, MI.

- **Direct control:** Cooking a sausage or a smore on a stick above a campfire flame offers users no other control but a direct distance based interaction with the flame.
- **Live input and output:** The direct correlation between moving one's food closer and burning it, or keeping it too far away and not cooking it enough, is an intuitive relative interaction space between the chef (input) and the static campfire (output).
- **Multisensory feedback:** Campfire cooking leverages the human sensors more than stovetop cooking does: one can feel the heat of the fire, sees the impact of the fire on the food, smells the food getting ready, and hears the sizzles of a sausage.
- **Food awareness:** Besides the lid-less pan, most indoor cooking hides the food in pots and pans eliminating the option for visual feedback as the food changes and becomes ready. This visual feedback is readily available when cooking over a fire.
- **Smooth spatial workflow:** While the tactical motion of moving food closer or away from oneself is similar to the motions one makes on the stovetop, campfire contextualizes the interaction in meaningful hot-cold spatial orientations.
- **Social inclusion:** Cooking around a campfire is an inherently social activity, where everybody gathers around the fire to cook and eat together. The circular, inward facing, slow and more seamless cooking experience is socially inclusive.

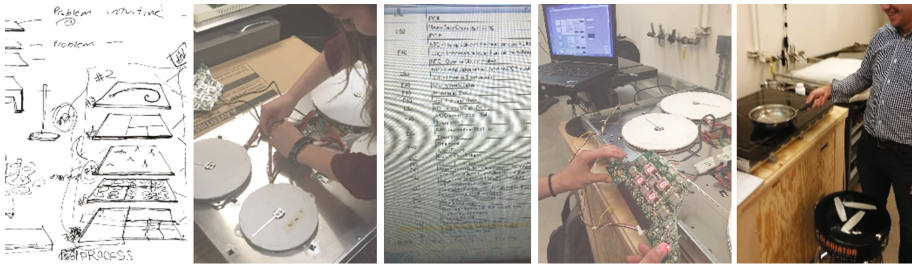
## 4.2 Black Flame: A Novel Human-Product Interaction

The contrasting experiences with the stovetop and the campfire resulted in a critical realization that the long internalized and accepted ways of cooking are not how things

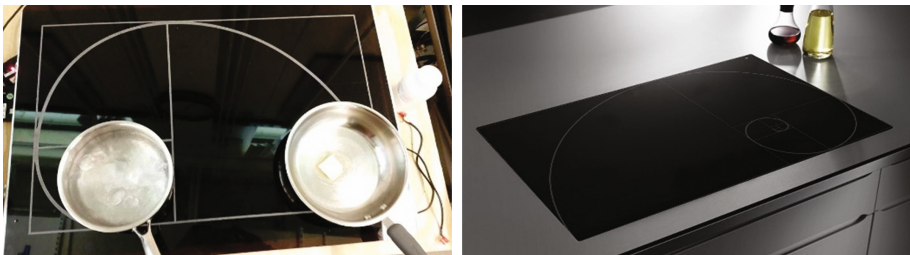
should be. While the self-experienced problems with the cooktop resulted in insights that most UCD methods could have captured; the campfire experience was unique in two crucial ways:

1. It offered designers a point of comparison that granted them the *empathy* to see and question the already normalized issues of current cooktops that they were so accustomed to in their everyday life.
2. It directly informed their *speculative alternative considerations* for the new cooktop design. It triggered a series of experimentations regarding form and embodied interactions that would have not been considered otherwise.

While the first hand campfire experience informed alternative ways on how to approach a potential solution, the tactics of sketching, prototyping and user testing remained the same when validating the speculative designs (Fig. 3). *Black Flame*, is a working prototype of an induction cooktop that uses the visual pattern of a Fibonacci spiral as an analogy to a real fire (Fig. 4): its dense center serves as the heart of the fire, while its widening curve correlates with cooling temperatures one would experience as they would pull their food away from the fire.



**Fig. 3.** *Black Flame* cooktop agile and user centered prototyping process.



**Fig. 4.** *Black Flame* prototype melting butter at different speeds and visual mock up.

Noteworthy features include:

- **Ergonomic motion:** The Fibonacci curve across the *Black Flame* cooktop allows users to conveniently leverage the natural and smooth left-right hand curvature to move their pots and pans between higher and lower temperatures (Fig. 4).



- **Spatial temperature control:** Instead of knobs, *Black Fire* emulates the campfire experience by leveraging the spatial positioning, guided by the Fibonacci curve, as proxy for temperature control. For instance, to melt butter the user would briefly place it at the heart of the curve (fast melt), and swiftly slide it to the other side to keep the butter melted without burning it (see Fig. 4 for an illustration).
- **Spatial temperature feedback:** There is no need to double check if the temperatures for each burner is correct at any given time. The position of the pots on *Black Flame* conveys that information via spatial layout. In general, most cooking would start on the high end and end all the way on the low end where the pots and pans could be ‘kept warm’, eliminating the trouble of having to lift pots and pans away from the cooktop because the burners are still too hot and would burn the food.
- **Maximised heating area:** Similarly to some existing induction cooktops, like Gaggenau, *Black Flame* was designed to leverage many small coils laid out in a honeycomb grid. As such, *Black Flame* is a cook anywhere surface where each coil would turn on efficiently when recognizing a pot or a pan above them.

### 4.3 UX Conundrum: Experiencing Experiences to Create Experiences

*Black Flame* serves as an unconventional innovation that stemmed from designers’ unique first hand experiences that triggered their empathetic feelings and critical speculations to simplify the currently complex ways and unnecessary social norms related to cooking. If to acknowledge human discourse not as a meaning framed in form, but rather, as an interaction [19], then experiences could be seen as a form of discourse. Drawing on *Black Flame*’s experience centric design, the two ways in which first hand experiences could inform designers and research about experiences include empathetic comparison and speculative design.

Experiencing situations first hand that are similar, but not the same as their users’ experiences, could grant designers an *empathetic comparison* to help them gain a “*deep[er] understanding of the user’s circumstances and experiences, which involves relating to, [...not] just knowing about the user*” [20] (p. 440). Such insight can help them create products that meet users’ more latent needs. While there is a widespread recognition in the UCD context, of the need for designers to be empathetic towards the users, their methods to achieve it have remained limited. The design literature discusses empathy as a limited quality of the designer (one’s intuitive ability to establish an ‘emotional connection’ with another [21]), or as a design process where such sensibility is trained [20] via communication (e.g., personas and storytelling) and role-playing techniques, such as ‘experience prototyping’ [22] that is supported by theatrical props and suggestive environments [23]. Since UX is less focused on the user and more interested in understanding their behavioral and experiential existence, experience-based empathy can help designers understand situations from fresh angles.

Indeed, varied experiences and especially their correlations can trigger critical curiosity and capability for “*speculative design [which] serves two distinct purposes: first, to enable us to think about the future; second, to critique current practice*” [24] (p. 11). Similarly, speculative design is currently a collection of exploratory design

efforts that commonly borrow experiences and references from unconventional sources to inform novel “*use[s] of technology, aesthetics, behavior, interaction and function of the designed artifact*” [24] (p. 11). In the case of *Black Flame*, designers were triggered by the initially unrelated campfire experience, which informed their speculative approach to alternative realities for the current cooktop solution. Designers are essentially called upon to part-take in design activism by experiencing situations and life as users and responding to it, whether pragmatically, philosophically or other means.

The current UX conundrum is the phenomenon of the design theory closing a full circle on its historic trajectory. What started as elite artistic concern about beauty, craft and form, had become increasingly democratized and methodical, through Modernism. The shifting focus from aesthetic artifacts to useable products that serve user needs is facing the already familiar artist-designer dilemma in design theory.

Concern for users’ overall experience with the product has shifted the designers’ attention to experiences, which are too complex and difficult to understand and design for with existing UCD methods. Dunne and Raby’s [25] call for designers to look to varying experiences, other disciplines and sources as artistic inspiration to speculate, is the latest effort to bridge the artistic ‘*Imagineering*’ and Norman’s usability. It is important to not entertain the pre-UCD definition of a designer who was seen as the all-knowing visionary and a creative talent who should define our lives for us [26].

When pursuing innovation, it is important to have an understanding of the end-users and their problems, via empirical, observational and other methods. At the same time, as cases from history have shown, designers should also be able to ignore customer inputs. Ford’s adherence to his speculative vision of the mass-market car was key to his early successes. It turned to his failure when he failed to respond to the changing marketplace, where people no longer wanted faster horses but desired different cars with financing options [5]. Ford’s failure was not his failure to listen or understand his customers, but in his refusal to keep testing his original vision against reality via UCD.

## 5 Conclusion

UX is facing a conundrum: while it seeks to serve the experiential needs of others, it has yet to embrace experiences as its source of insight and inspiration. Design practices at the periphery, namely empathetic and speculative design, have been exploring opportunities to better embed designers in experiential situations. But make no mistake, reducing the designer-bias and pre-empting false assumptions by user-validation has been a crucial journey in design history, one that has led to the success of many products and services that served real user needs, wants and desires.

As UX definitions, processes and thinking mature, so too, should its methods. There is a need for ways to understand, define, and study the ‘magical’ and ‘artistic’ of designers and their processes. Researchers have explored the differences between novice and expert designers [27] and traced links between UX frameworks and design practices [28]. But, questions about how to derive experiences from experiences have remained in need of an answer. Looking at experiences as a human discourse could point to possible ways forward.

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