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Reimagining the Role of Friction in Experience Design

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Abstract

Current definitions of friction in user experience generally advocate for reducing or eliminating friction in the pursuit of efficiency and ease of use. As the field of user experience design increasingly aims to develop highly personalized experiences for unique individuals, this narrow view of friction risks the vital role that friction plays in human life. This paper compares definitions of friction found in other fields and examines ways in which friction shows up in our day-to-day lives to suggest a working definition of friction that clarifies how the concept can be applied to the experience design challenges of tomorrow. To meet these challenges, researchers and designers need to shift from reflexively eliminating friction to intentionally designing friction, which requires asking deeper questions about human needs and goals in addition to examining how we might help people accomplish tasks quickly and easily.

Keywords

User experience, experience design, friction, cognitive friction, personalization

Introduction

Reducing friction has been a longstanding and widespread strategic goal in user experience. As designers, we are routinely tasked with making interactions seamless, painless, and effortless. These requests come from all corners of our industry and our organizations—from company leaders and colleagues to close collaborators and fellow designers. However, in the relentless pursuit of efficiency and ease of use, we run the risk of forgetting that friction plays an essential role in human life.

Friction is a fundamental aspect of embodied human existence, and it contributes to our sense of meaning. The resistance we feel when we manipulate or move objects provides information about their structure and affordances. The time delay as we wait for a meal at a restaurant evokes a pleasing sense of anticipation and initiates physiological processes that aid our digestion. These forms of physical and temporal friction help to ground us in the physical world and add texture to our lives. Yet, current definitions of friction in user experience tend to highlight the value of the reduction or elimination of friction. This paper compares definitions of friction found in other fields to uncover a working definition of friction that minimizes confusion about its role in user experience design. An examination of several ways in which friction shows up in our everyday lives reveals the value of intentionally designed friction, rather than reflexively eliminated friction.

Current Definitions of Friction in UX

As a general rule, when we reference the concept of friction in design contexts, we are typically referring to "cognitive friction." Consider the Interaction Design Foundation's (IxDF, 2022) definition of cognitive friction in the context of user experience:

> *Cognitive friction occurs when a user is confronted with an interface or affordance that appears to be intuitive but delivers* unexpected *results. This mismatch between the outcome of an action and the expected result causes user frustration and will impair the user experience if not jeopardize it. User research can help uncover such problems and generate friction-free design.*

Note that this definition includes an explicit assumption that the goal of user research and design is to "generate friction-free design." In addition to the reduced effort required to complete a task, the goal of reduced friction is also often synonymous with the reduced amount of time required to complete a particular task. This goal is certainly laudable when we are tasked to redesign "an interface or affordance that appears to be intuitive but delivers unexpected results," such as a Norman door: The design of a confusing door is improved by the clarification that it opens by either pushing or pulling, which helps people understand how to use the door properly (Norman, 2013).

However, let's examine a different scenario that designers increasingly face as they strive to develop more personalized products that reflect a broader range of human needs and goals. Imagine that we must design a financial product for someone who is actively trying to save money to purchase a home. The user is self-aware enough to realize that they sometimes make frivolous purchases that they later regret and that this behavior might interfere with their long-term financial goal of saving to buy a house. Most modern payment systems are designed to make transactions as fast and as frictionless as possible. In this case, the organization's product manages a user's credit cards and other methods of payment, and it currently enables them to pay for goods and services simply by swiping their phone in front of a device available on the counters of most retail stores. Because this payment method entails so little friction, it may be at odds with our user's goal of avoiding frivolous expenditures and saving money. As a result, introducing friction into the payment process could be valuable. This could be accomplished by, for example, allowing the user to enable confirmation dialogs that include a visual reminder of the user's long-term goal or a notification asking them if they are sure they want to make the purchase. These adjustments to the design introduce the friction needed to help the user achieve a personal goal.

The user experience field increasingly engages with design problems of this nature, driven in part by a general trend toward personalization. Yet the notion that we should create friction-free designs remains pervasive and influential in the field. I believe that this emphasis on friction-

free design has always been misleading. A revised definition of friction might clarify the concept of friction in user experience design.

Reconsidering the Definition of Friction in UX

In physics, friction refers to a "force that resists the sliding or rolling of one solid object over another" that is "directly opposed to the motion of the object" (Encyclopædia Britannica, n.d.). This physical view of friction has been applied to understanding the nature of human communication in the context of psychotherapy (Badalamenti & Langs, 1992). "Data friction" refers to the resistance encountered in moving data "between people, substrates, organizations, or machines" (Edwards et al., 2011). Taken together, definitions such as these suggest that we might modify the definition for user experience to emphasize that friction encompasses any form of physical or mental effort (or resistance). Defining friction in this way simply tells what friction is rather than prescribing friction-free design as the ultimate goal of user experience research and design. It also has the advantage of mirroring the close relationship between the behavior of the physical world, our own cognition, and our efforts to improve both physical and cognitive aspects of human experiences. This more neutral definition might encourage designers to consider not only the pain points and frustrations that arise from friction, but also the value of friction in certain types of experiences. Our decisions as to whether friction should be eliminated from or added to an experience are, in fact, extremely context dependent.

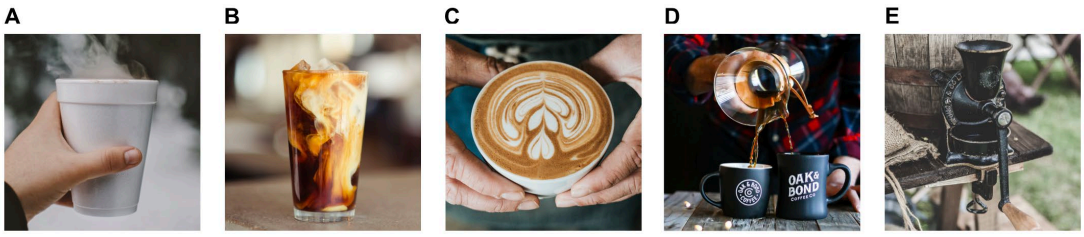
The Role of Friction in Everyday Experiences and Obsolete Technologies

Examples of friction in everyday experiences—including preparing a cup of coffee—reveal that a broader definition of friction makes our design experiences more precise and better suited to meet the unique needs and goals of individuals. Consider friction in a simple task such as preparing a morning cup of coffee.

Friction and Coffee

Numerous day-to-day tasks—including preparing a cup of coffee—present us with friction and require that we be alert and active enough to overcome that friction. Coffee is one of the most widely consumed beverages worldwide (Simon et al., 2022). While coffee is valued by many people for its taste, people also value coffee for its caffeine content. For example, caffeine can increase alertness (Zwyghuizen-Doorenbos et al., 1990), enhance mood and cognitive performance (Haskell et al., 2005; Smit & Rogers, 2002), reduce fatigue (Haskell-Ramsay et al., 2018), increase metabolic rates (Acheson, 1980), and improve physical endurance (Doherty & Smith, 2004). Thus, we value caffeine because it can help to reduce the friction associated with day-to-day tasks.

Coffee can be prepared and delivered in a variety of ways, and each method is marked by varying forms of friction. Some coffee preparation methods are purely utilitarian (Figure 1A), while others are intentionally designed to delight our senses (Figure 1B-D) or to engage us in a physical process to grind the beans (Figure 1E).



1A. Photo by Caleb Lucas on Unsplash 1B. Photo by Demi DeHerrera on Unsplash 1C. Photo by Nathan Dumlao on Unsplash 1D. Photo by Oak & Bond Coffee Co. on Unsplash 1E. Photo by Clem Onojeghuo on Unsplash

Figure 1. Methods of preparing and delivering coffee.

If our goal is to simply arrive at work on time and stay alert throughout the day, dutiful and unceremonious retrieval of a Styrofoam™ cup of coffee from a drive-through (Figure 1A) offers

a relatively low-friction coffee experience. Given the luxury of time, we might revel in the enchanting alchemical display produced by pouring cold cream into iced coffee (Figure 1B). Here, friction plays an important role: As the substances collide, the differing viscosities (internal friction between molecules) of the two fluids reveal the abstract mathematical wonders of fluid dynamics to the naked eye. Thus, it is not only the translucent glass and favorable lighting conditions, but also the frictional properties of the intermixing substances that contribute to an engaging visual experience.

Baristas will often add elaborate pictographic swirls to the tops of lattes and cappuccinos (Figure 1C). Physical friction plays a decisive role; this time it is the friction between the solid coffee stirrer and the liquid coffee that creates this ephemeral piece of drinkable art. Cleverly designed and elaborate pouring devices can be used to channel coffee into multiple mugs at once to add a layer of theatricality to the experience (Figure 1D).

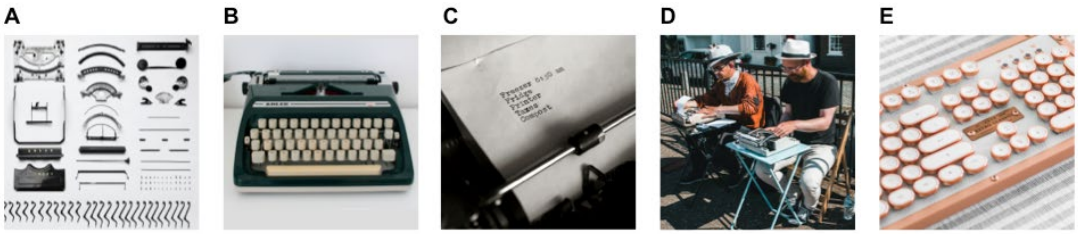
Coffee bean preparation requires that the beans be ground until they relinquish redolent oils and other compounds that contribute to the coffee's complex flavor profile. If the goal is to minimize friction and simply ingest caffeine as quickly as possible, people might be all too happy to transfer the burden of grinding to a service provider. Yet many intrepid coffee enthusiasts willingly take the helm of old-fashioned cast-iron coffee grinders in their search for a deeper connection with the materiality of the coffee-making process (Figure 1E). These massive devices, many of them practically medieval in appearance, require substantial physical effort to operate: One must slowly turn, by hand, an enormous and lumbering crank and wait patiently for the beans to reach the preferred level of coarseness. The tactile receptors in our hands and arms are remarkably sensitive to subtle qualities that go beyond what is captured in the one-dimensional concept of coarseness. The sounds produced by the interaction between beans, gears, and crank offer a complex and embodied coffee-making experience that is a keen reminder of how an expenditure of physical energy over time can contribute to deep feelings of accomplishment and pride. In this way, old-fashioned coffee grinders and other more manual ways to prepare coffee invite us to greater agency in the coffee-making process. It may even be the case that these so-called obsolete devices afford us greater precision in the grinding process than modern electric coffee grinders and enable us to feel when the beans have reached a particular level of coarseness, which encourages greater attention to the corresponding changes to our coffee's flavor profile.

At earlier times in history, when cast-iron grinders were the only available option, this grinding method was perhaps far less alluring than it might be today. But in a world that asks us to move faster, that obsessively caters to satisfying our base desires, and that continually confronts us with a dizzying array of new technologies, we might slow down and rebuild our connection with the physical environment through these supposedly obsolete tools.

Friction and the Typewriter

Modern society often seems to be both consciously and unconsciously engaged in the pursuit of information. We strive to develop technologies and algorithms, such as speech-to-text, that help us more rapidly translate our thoughts into tangible or digital media that can be shared with others. Approximately 2.4 billion YouTube™ users (Degenhard, 2021) engage in watching the roughly 30,000 hours of new video content that is uploaded every hour (Ceci, 2022). Over the course of the past several decades, there have been many improvements to technologies that mediate information recording and exchange including to computer keyboards. As a result, many of us undoubtedly regard the humble typewriter as an obsolete technology.

In contrast to the remarkably smooth and relatively low-friction experience of typing on a modern keyboard, with highly responsive, slim-profile keys, typing on a typewriter is anything but effortless. Early typewriters required a great deal of force to press the keys, and the potentially distracting inner workings of typewriters (Figure 2A) were displayed prominently until more advanced cases were designed to hide mechanical parts (Figure 2B). Despite subsequent innovations, heavy keys and the sounds they produced largely remained. In addition to the friction associated with the key mechanisms, typewriters themselves were once so heavy and unwieldy that they were sold with dedicated suitcases.



2A. Photo by Florian Klauer on Unsplash 2B. Photo by Sebastien Le Derout on Unsplash 2C. Photo by Nate Bell on Unsplash 2D. Photo by Andraz Lazic on Unsplash 2E. Photo by Alexandru Acea on Unsplash

Figure 2. Typewriters. A: Mechanical components of a typewriter. B: A typewriter designed to hide much of the complexity pictured in panel A. C: Slight imperfections in clarity and alignment characteristic of typewriters. D: Typewriters remain popular among writers today. E: An example of a keyboard with design elements inspired by typewriter design (such as raised circular keys).

The key mechanisms of many old typewriters have minor imperfections that can reduce the clarity of text and produce subtle misalignments of typed characters (Figure 2C). Yet research has shown that disfluency (friction in the form of visual imperfections, such as a degraded font) can actually result in deeper information processing (Alter, 2013; Alter et al., 2007). In the same way that disfluent fonts present friction that can positively impact cognition, might the various forms of friction associated with writing on typewriters actually increase our level of engagement with the material we write? For example, the elaborate metallic fireworks of the hammers striking the page, which can be incredibly satisfying to watch, may provide us with visual, auditory, and tactile evidence of just how hard we are working during the writing process.

Imagine that one's aim is to write a poem. One could write poetry in any number of frames of mind, and each frame of mind might be best supported by a slightly different form of friction. For example, we might want to transcribe our stream of consciousness, in which case a modern keyboard might be ideally suited to the task. Or, we might want to write poetry unhurriedly and cultivate a more contemplative frame of mind. In this case, a quill pen and paper or an old typewriter lit by candlelight might serve our purposes. Close observation of the nature of our own thoughts as we work with different writing tools helps to reveal the close relationship between the forms of friction that a tool provides and its effect on our cognition, mood, and behavior. A typewriter can be a wonderful interface to use when we want to slow down and engage in deeper thinking because it encourages us to consider our words carefully before committing them to the page.

Modern laptop keyboards are generally designed to eliminate potential cognitive friction associated with key sounds and the effort required to press the keys. The relatively low friction produced by these design features serves us well in a world that values rapid communication. Yet there is also a market for computer keyboards that borrow elements of the typewriter's design (Figure 2E), including keyboards that are specifically designed to be noisy or that deliver unique haptic sensations when the typist presses the keys.

Because modern computer interfaces have become incredibly cluttered and multipurpose, there is also a growing market for minimalist software tools for writers. The top bars of many word processing applications often harbor a broad range of features. This visual complexity can introduce considerable friction into the writing experience in the form of potentially irrelevant and distracting interface elements. In contrast, recent software-based tools for writers forego these potential distractions while simultaneously re-introducing historical forms of friction associated with typewriters. For example, Ommwriter™ is among the first modern word processing applications to provide a full-screen, toolbar-free writing interface that harkens back to the humble sheets of blank white paper used in typewriters, while it also offers the user the ability to choose minimalist pictorial background images. Keypresses can be configured to

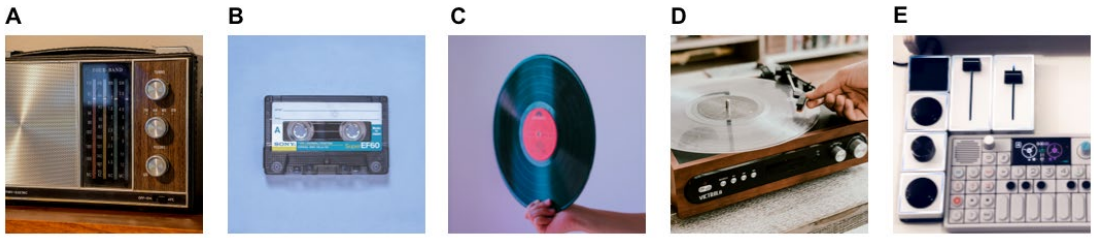
trigger the sounds of old typewriter keys, and some of the available fonts aim to preserve the indeterminate quality of the characters produced by typewriters.

In this way, Ommwriter aestheticizes characteristics of typewriters by reintroducing some of the typewriter's unique forms of friction and simultaneously leverages the unique affordances of digital media. Ommwriter—much like a typewriter—also helps to eliminate distractions by offering a curated set of thoughtfully selected affordances that are essential to the task of creative writing in particular.

As physical objects, typewriters have unique characteristics in comparison to modern computers. Typewriters have histories and stories, they become heirlooms, and people continue to purchase and care for these devices today. Contrast this with our attitude toward modern computers. Despite a laptop's usefulness and the incredible feats of engineering that enabled its production, we are unlikely to pass our laptops down to future generations.

Friction in Musical Media: Radios, Records, and Cassettes

Although manually tuning a transistor radio (Figure 3A) by turning its dials entails a certain amount of friction, it can also be an incredibly rewarding experience. The temporally extended process of seeking and ultimately finding a particular station, while also minimizing static, invites a great deal of agency, concentration, and engagement. And it is precisely these demands that contribute to the satisfaction one feels upon finding a particular station.



3A. Photo by Alan Rodriguez on Unsplash 3B. Photo by Gregory Wong on Unsplash 3C. Photo by KOBU Agency on Unsplash 3D. Photo by Victrola Record Players on Unsplash 3E. Photo by Adi Goldstein on Unsplash

Figure 3. Musical media, past and present.

Creating mixtapes on cassettes (Figure 3B) is also a high-friction process that involves a considerable investment of time and energy. It requires waiting for the right song to play on the radio and sometimes bravely diving across the room in a desperate effort to press the record button. To make a mixtape requires substantial effort, time, and care, and this is precisely why many people valued them so highly years ago. In comparison, creating a playlist on a music streaming platform is a relatively low-friction affair. Playlists created by other users or by algorithms are often featured prominently in music streaming apps, and it is this widespread availability and ease of access to playlists that can make them feel less meaningful than a mixtape. Given the comparative ease of creating playlists, how is a recipient to know that one invested any amount of effort during the creation?

Other forms of care and attention are evident in our relationships to the things we collect. Ask a record enthusiast to explain their love of records and record players. They'll likely describe a complex, ritualistic process: After a long day of work, they spend hours handling the records, feeling the vinyl records' heaviness, and reveling in the immersive visual experience of poring over the accompanying artwork. Far from being an unpleasant distraction, the scratchy sound produced by the needle drop signals that it's time to breathe, sit down, and relax. The sound serves as a pleasant reminder that the day is over. In a busy, technological age, these experiences can provide people relaxation and enjoyment rather than simply ease of use.

Some modern music interfaces reintroduce older hardware interface controls. For example, several companies now create external USB knobs and sliders that mimic the feel and resistance of controls found on older stereo systems and other types of musical equipment (Figure 3E). The popularity of these physical controls—despite the availability of corresponding digital

alternatives—is a testament to the value that many people still place on physical engagement with creative tools.

The unique forms of friction associated with the process of creating, sharing, and listening to music reveals a deep relationship between time, effort, and meaning. To the extent that we strive to simply make these processes easier, we may simultaneously miss opportunities to find deeper meaning in our lives and in our relationships.

Conclusion

Experience design increasingly aims to develop highly personalized experiences for unique individuals. Many of the conceptual tools that we rely upon to design experiences for average users are inadequate to this task, including our existing definitions of friction, which tend to emphasize efficiency and ease of use. A one-size-fits-all approach to design that ignores the relationship between friction and meaning will be inadequate to address the experience design challenges of tomorrow.

The future of design might be less about making things faster and easier for everyone to use and more about creating meaningful experiences tailored to the highly unique and specific needs of individuals. To effectively meet this challenge, designers will need to ask deeper questions about user needs and goals, consider the full range of human aspirations and experiences, and shift from a mindset of reflexively eliminating friction to one of intentionally designing friction. Explorations of uncomfortable interactions (Benford et al., 2013, 2012), exertion games (Mueller et al., 2011), and embodied cognition (Kirsh, 2013) in human-computer interaction represent encouraging and enlightening steps in this direction. The time is ripe to engage more deeply with these concepts in experience design education and practice. As the purview of experience design broadens to encompass both usability and user experience, designers need to transition from asking questions about what the average user wants to asking questions about which experiences in life individuals find most meaningful and why.

Tips for Usability Practitioners

1. It is important to critically evaluate widespread goals of UX design, such as reducing and eliminating friction or decreasing the amount of time required to complete a task.
2. Rather than reflexively eliminating friction, look for opportunities to design appropriate forms of friction based on deeper questions about human needs and goals.

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