PERSPECTIVES

BRIDGING UX AND PRODUCT SAFETY THROUGH HUMAN FACTORS RESEARCH

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Disclaimer: *The examples provided in this document are not meant to be prescriptive or comprehensive representations of industry standards for product research. They are only intended to be anecdotes that exemplify broader concepts.*

Insurance, finance, and legal professionals—particularly, attorneys/legal counsel representing companies with products in development or in the market, as well as attorneys involved in product-related litigation or disputes—should read this article to learn more about:

- How the field of human factors bridges user experience and product safety.
- Why separating UX and safety can create tensions.
- The importance of aligning user experience and product safety.
- Why design tradeoffs are common.
- How integrated research may lead to better outcomes.
- How early alignment can improve product success.

Executive Summary

This article explores the shared origins of user experience (UX) and product safety research, which both come from the field of human factors. Spawning from efforts to reduce user errors in systems (e.g., technology, machines, vehicles, medical devices), human factors emphasizes intuitive, user-centered design. Today, organizations often separate UX researchers (who often focus on things like user satisfaction and market appeal) from product safety researchers (who may focus on things like risk mitigation). This separation can create pain points for businesses, such as development inefficiencies or design conflicts, potentially compromising product outcomes and business success. This article highlights opportunities to integrate both perspectives through shared research methods and endorses a unified approach to product development research, which can optimize aspects of users' interactions with products that would typically be studied separately, in order to strengthen products' competitive advantages.

EXPERT VOICES

Robert Sall, PhD

Dr. Sall draws on his human factors expertise to examine how the separation between UX and product safety research can create unintended risks, and he argues for integrated approaches that optimize aspects of users' interactions with products that are often compartmentalized into separate teams of user-centered design researchers.

Introduction: How Wartime Technology Forged Human Factors

Innovations in science and engineering that occurred during the Second World War presented humans with new technology that permanently changed the landscape of battlefields and has continued to impact the landscape of human civilization after the end of the war. In some cases, though, introducing humans to those innovations was difficult. Many of those innovations resulted in people performing high-stakes tasks for the first time in history with brand new and often highly complex technology (e.g., releasing bombs from airplanes). As a result of being untrained for those new tasks and being presented with complicated and unfamiliar interface designs, some of the first users of those innovative technologies experienced catastrophic use errors (e.g., accidentally deploying bombs

while attempting to land an aircraft). Shortly thereafter, product manufacturers realized that the technology coming out of their factories needed designs that were not just intuitive to the engineers making the devices; they had to be intuitive enough to be used as intended by the people for which the products were designed. Thus, a new scientific discipline—human factors—was pioneered to study and optimize human performance and the ways that people interact with things, like technology. Like many of the wartime innovations that continued to impact humanity after the war, the scientific discipline of human factors continued to shape the world of product manufacturing (among many other aspects of society) by informing user-centered design research, which has allowed companies to conduct studies to improve their products' designs in ways that make them easier, safer, and more satisfying to use.

Two Sides of the Human Factors Coin: The Intersection of UX and Product Safety

Since the inception of human factors, many of the world's most successful product manufacturers have relied on user-centered design researchers to inform their products' designs. However, the specific nature of design researchers' objectives often varies from one product team to another. On the one hand, there are product teams with human-centered design researchers who focus on studying aspects of a product's design that can impact users' health and safety.[1] Some examples of these product safety researchers might be within organizations in highly regulated domains (e.g., medical devices); those developing products intended for relatively vulnerable users (e.g., products for children); those working on products where misuse are highly likely to cause substantial injury (e.g., industrial equipment or tools); for products that can introduce the possibility for harm when used in certain contexts (e.g., product that may be used by drivers)... the list goes on. Alternatively, many pockets of the product manufacturing industry also include separate groups of researchers who prioritize user-centered design research that selectively focuses on aspects of the design that influence more hedonic outcomes, such as satisfaction, enjoyment, consumer perceptions, and brand loyalty (researchers classified here as "user experience" or "UX" researchers). Conceptually, there can be some overlap in the scientific bases for UX and product safety research, as both have roots in the discipline of human factors. However, in practice, the scientific methodologies and practices used by many UX researchers deviate so much from traditional human factors that they seldom resemble the type of research conducted at the discipline's inception.

In recent years, many professionals with training and education in human factors have gravitated toward UX roles; something that is reflected in a survey of student members from the world's largest scientific association of human factors professionals—The Human Factors and Ergonomics Society[2]—which found that close to 80% of student members desired a career in UX.[3] The same publication also demonstrated a shift in available job openings toward UX jobs, with approximately 44,000 positions returned from a LinkedIn query using the term "user experience" and only 1,709 when using the term "human factors."[4] A follow-up query on LinkedIn at the time of writing this manuscript in May of 2026, yielded over 36,000 positions when using

[1] Carayon et al. (2014); McCarthy & Wallace (2016)
[2] HFES (n.d)
[3] Gonzalez et al. (2014)
[4] Ibid.

the term "user experience," approximately one-sixth as many (i.e., over 6,000) positions when using the term "human factors," and over 8,000 positions when using the term "product safety" (see: Figure 1).

Both types of user-centered design researchers (i.e., UX and product safety) are important to the success of products and the businesses that develop them. When the fields of user-centered design and human factors were initially pioneered, though, the priority of user-centered design research was arguably closer to what we might now consider product safety, and the application of this research was primarily for military and industrial products, which did not have the same market competition as many of the industries that have adopted some form of user-centered design research today, such as consumer electronics. More recently, UX has demonstrated a calculable return on investment in many products, and it can be particularly valuable to companies in markets where competing entities all have access to similar levels of technological sophistication. That is to say, one of the ways that businesses in those highly competitive markets can set themselves apart from the others is by having UX researchers help design products that are more enjoyable to use and offer users all the features that are desired, ultimately making those products more attractive to consumers than comparable ones on the market. This may help explain, at least in part, why businesses in today's landscape appear to prioritize hiring UX researchers and may end up with user-centered design research teams that are primarily or exclusively experienced in UX research practices.

Along with the trend toward prioritizing UX jobs over human factors or product safety jobs, there are also instances of companies prioritizing the hedonic aspects of user-product interaction, which are more closely associated with UX. A good example of product design led by UX-oriented insights can be found in the design of some technologies in contemporary motor vehicles. Drivers used to be able to complete many standard in-vehicle tasks, such as changing the radio or adjusting the air conditioning, by manually turning physical dials. More recently, manufacturers have replaced these controls with touchscreens that offer consumers an improved aesthetic appeal and the convenience of having more features offered within a single space. However, the aesthetic appeal and convenience (constructs that align more with the hedonic measures used in UX research[5]) of modern touchscreen infotainment systems can (but need not) come at the cost of user safety. Specifically, research has found that performing some tasks on touchscreen infotainment systems can (depending upon the specific design) be associated with drivers removing their eyes from the road more than when they perform tasks with manual controls.[6] Now, it is worth noting that touchscreen infotainment systems are capable of being designed with minimal or no discernible risk to drivers,[7] and some of those design features have also been used to design mobile phone applications that similarly reduce eyes-off-road time for drivers.[8] In reality, there are numerous design-related components of in-vehicle technology that can impact driver safety; in most cases, it is therefore worthwhile to involve product safety researchers throughout the entire product development process.

A potential limitation of many organizational structures within product development teams is the exclusive use of only one of these two aspects of user-centered design, or the creation of separate teams of researchers to study each aspect in isolation.[9] Though there may be some credible reasons for allowing these two

[5] Jiang et al. (2025); Van Schaik & Ling (2008)
[6] Zhong et al. (2024)
[7] Grahn & Kujala (2020); Eren et al. (2015)
[8] Monk et al. (2023)
[9] Blandford & Furniss (2006)

separate design-research teams to operate independently within an organization, there are potential risks faced by organizations that cannot bridge certain gaps between these two types of different user-centered design research: UX does not necessarily have to come at the expense of product safety, and product safety does not necessarily have to come at the expense of UX. Even when the compartmentalization of product safety and UX research teams does not compromise one of those two aspects of the final product's design, reconciliation of internal design disputes caused by separate agendas or different research findings from the two teams may lead to organizational inefficiencies that hinder the company's bottom line, delay product releases, or result in suboptimal final product designs. In many instances, it can be more beneficial to the organization's long-term success to use researchers whose backgrounds and expertise facilitate the simultaneous consideration of product safety and UX.[10]

Aligning User Experience and Product Safety in Research Practice

Despite the compartmentalization of these two types of user-centered design researchers within organizations, there are many instances in which the work of one can benefit or complement the other. At the end of the day, both types of researchers aim to enhance or preserve an organization's market position by optimizing users' interactions with products, and they often accomplish this by applying principles of user-centered design derived from the science of human factors. This overlap presents an opportunity for product managers and business leaders to more efficiently pursue research that simultaneously addresses users' safety and user experience.

One example of how product teams can leverage the overlap between product safety and UX researchers is by taking advantage of study designs that can accommodate measurements from both areas of user-centered design simultaneously. In much of their work, both types of researchers will often find themselves designing studies that involve recruiting samples of representative users from the larger population and asking them to complete tasks on the company's prototype and perhaps comparing those outcomes to users' interactions with comparable products or industry benchmarks. For example, in the development of an insulated beverage container intended to keep beverages hot or cold, either type of user-centered design researcher could invite a sample of users to a controlled environment where they pour a beverage into and drink from the prototype vessel. During this protocol, UX researchers may be interested in interviewing and/or surveying users about their impressions of the products' aesthetics, how the beverage tasted from the prototype, or users' comfort while holding and drinking from the insulated containers. Alternatively, and within the same research protocol, product safety researchers may ask the users to pour a beverage and drink from the vessel while wearing some form of sensor that measures the temperature at the surface of users' skin to make sure that hot beverages do not risk burning users' hands or faces (or to make sure that chilled beverages do not cause a comparable temperature-related harm or discomfort).[11]

The potential for synergy between UX and product safety research does not end with overlapping study designs. There may also be times when the two share a need to measure similar scientific constructs, such as those

[10] Carayon & Smith (2000); Desmet & Hekkert (2017)
[11] Chen et al. (2015)

related to a product's usability. Years of scientific publications on the topic of usability have provided countless definitions and taxonomies of this concept (usability);[12] within the context of user interactions with a product, however, most operationalizations will include familiar notions such as user friendliness, ease of use, or the extent to which users found the product to be intuitive, or how likely users are to experience errors in use.[13] Published research has measured and quantified a relationship between the usability of a product and a variety of desirable business-related outcomes, such as improvements in sales, frequency of using a product or visiting a website, consumer trust, consumer satisfaction, usefulness of a product, and brand loyalty[14]—aspects that UX researchers are likely to have spearhead their motivations behind usability testing. Measuring and improving usability may also be a priority for safety research teams, as usability of certain products can also affect users' health and safety (e.g., in-vehicle technology and medical devices), which can have its own impact on the overall success of a company.[15]

Minimizing Divergence Between UX and Product Safety Research

Even though there will be instances when a single usability study could meet some of the objectives for both UX and product safety researchers, as well as instances where both research teams would devise a study with similar protocols, this is likely where the potential for overlap ends. Within the context of measuring usability, the research from each team may have very different consequences for users, each team will have different thresholds for the acceptable levels of suboptimal usability, and their findings from studying usability may have very different implications for the subsequent iterations of the product's design. In addition, each team's unique agendas may lead to the discovery of completely different usability-related issues for the same product. A large portion of this divergence likely stems from the separate agendas of the two teams when pursuing their respective studies on user-product interaction, and, in some instances, it may also be attributable to differences in domain-specific training and expertise.

During the development of a vehicle's infotainment system, like the ones discussed previously, study designs from both UX and safety researchers would likely include recording the amount of time required to complete discrete tasks on the interface (e.g., changing the music), which is a common measure for both driving task demand and usability.[16] For both driver safety and UX, the general goal is that the total task completion time for newer iterations of the interface will be shorter than for previous iterations. What the two different types of researchers do with the same data, though, will likely differ entirely. For example, the UX researchers may also investigate subjective feedback from the users to assess how task times may be related to or impact perceptions of satisfaction or willingness to recommend the product to friends and family; whereas safety researchers will be more likely to analyze task time alongside psychophysiological measures to determine how or if task time is related to cognitive workload or the amount of time drivers remove their eyes from the road, or they may leverage vehicle kinematic data in order to assess how task times predict vehicle control. As a result, one user-centered design team may realize that the interface needs revision to

[12] Alonso-Ríos (2009); Lewis (2012)
[13] For detailed discussions, see: Alonso-Ríos (2009) or Bevan (2009)
[14] Davis (1989); Nielsen et al. (2019); Flaván et al. (2006)
[15] Pauszek (2025); Perrier et al. (2023)
[16] Blanco et al. (2005); Burns et al. (2010); McDonnell et al. (2021); ISO (2018)

reduce the time required to complete a certain task, even though the same data (i.e., task completion time) might not compel the other user-centered design team to make a similar recommendation.

Even though some organizations make an effort to staff both UX and product safety research teams, tensions may persist when work from one team undermines or (needlessly) complicates that of the other. Consider what may happen during the development of a new version of the (hypothetical) in-vehicle infotainment system recently discussed, if both the product safety and UX researchers found that the time required for drivers to change the music was greater for the new prototype than for the existing version of the product. The product safety research team may find that the new prototype did not meaningfully impact drivers' abilities to maintain lane position (which could be a potential adverse outcome), cognitive workload (another potential adverse outcome), or the amount of time drivers remove their eyes from the road (once more, a potential adverse outcome); and if the product safety team does not find a relationship between the longer task times and any of these potential adverse safety-related outcomes, they could dismiss the increase in task completion time as something benign. If, at the same time, the associated UX research study showed that subjective measures of driver satisfaction for the prototype were lower than for the previous version, and the longer task times were directly related to subjective measures of satisfaction, the UX research team would be likely to recommend a shortcut or alternative design that allows drivers to more quickly change their music.

Based on recommendations from the UX researchers, the prototype could receive a minor update intended to reduce the time required to change the music while also addressing aspects that simultaneously affect drivers' satisfaction. After receiving these updates, the UX team would likely subject the prototype to another round of UX testing to validate the intended impacts of their design recommendations. At this stage, there may be a temptation to move forward with production of the system without any additional research from the product safety team. After all, the latest research from the safety team found that safety-critical outcomes for the product, such as eyes-off-road time, were not meaningfully different from the previous version of the product, and the long task completion times from the earlier iteration of the prototype were not related to those safety-critical measures. Product managers may also rationalize a decision to skip additional safety research when considering that the only changes made to the prototype revolved entirely around reducing the time required for drivers to change their music. They may recall previous conversations with the safety research team that took place before their initial testing when they were told that long task completion times could introduce safety-related concerns. So, if the prototype only received changes that reduce the task completion times, why would they expect those changes to create new safety concerns? With their intuition telling them there is no reason to invest any more time or money in additional product-safety research, the product managers may feel confident that the revised prototype is ready for production. Intuitions often lead us astray, though, and without additional data from product safety researchers, those product managers would not be able to definitively assert that the new, more satisfactory version of the infotainment system was as safe as the previous iteration of the prototype.

Product managers may face similar conundrums during the development of any product, not just those used by drivers. Whether it is a result of UX teams (unwittingly) making potentially unsafe design recommendations or product safety researchers recommending sterile and bland product designs that users do not want to adopt, a product's overall success can be risked by recommendations

for a change to the product's design made by one of the two user-centered design research teams in isolation. Reconciling the divergent design recommendations is important, though, because the elements of a product's design can have a direct impact on users' beliefs about how they are able to interact with the product.

Conclusion: Feeding Two Birds with One Scone

Business leaders may ask themselves, "At what point do we need to consider UX and product safety together?" As with many things, the answer will depend on a variety of factors. Depending on which of the two aspects of user-centered design discussed here are overlooked, there can be substantial consequences for the business. A product design that is not supported by adequate UX research may fail to meet users' needs, underwhelm users, or frustrate them to the point of abandoning the product altogether. At the same time, a product designed without the support of sufficient safety research may harm users, potentially resulting in a loss of revenue from a decrease in sales or engagement, as well as lawsuits for the manufacturer. Given the risks faced by businesses, the most prudent strategy for managing the development of certain products is often to involve both UX and product safety in the early stages. When possible, product managers and business leaders may want to strive to optimize this balance and reduce inefficiencies by leveraging research teams who are capable of effectively studying both UX and product safety simultaneously and as part of one single program of research, effectively feeding two birds with one scone.

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