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Building Capacity for UX

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Introduction

What does it mean to design for usability and experience? This is a question that is regularly on my mind, especially with regard to design education. Graduates will face an ever-changing landscape of problems out in the world. In some respects, this has always been the case, but in others the complexities of modern problems are especially challenging. There are a number of opportunities to consider the toolbox of skills that a UX practitioner needs. What can practitioners do to better educate the wider world of the benefits of UX?

Some perspective is useful because UX can have different connotations depending on your background. My perspective comes from the point of view of product design. A product is a designed solution that is able to perform or help perform some kind of task or tasks for a user. This might consist of a physical device, a service, or some combination. In this view, the idea of a product is independent of the medium in which it is implemented but always has these common attributes. To paraphrase Sir Terence Conran, a good design should be a pleasure to use and improve our quality of life through products that work well and that are affordable and beautiful (Sheppard 2012). Additionally, a designer is someone, regardless of background or discipline, who creates and implements a product through an understanding of the user's problems, needs, and objectives.

Usability in Design

Let's talk a little about usability. The constructs of usability—effectiveness, efficiency, and satisfaction (ISO 1998)—are quite important to a designer's work. It gets right to the main concerns that a designer must keep in mind. First, a product must actually work; if functionality doesn't reliably and effectively perform the actions it is intended to, there is a good chance that the product won't get used at all. If the functionality is solid, the second goal is to ensure that the product can perform its tasks well. This doesn't necessarily mean faster, although it can be that, but performing a task should avoid unnecessary hassle that might detract from the user's objective. Finally, the product should do all of this in a way that the user likes.

If you consider evaluating a design moving up from effectiveness to efficiency to satisfaction, the constructs don't necessarily become more important, but one construct may not have a lot of relevance until the previous construct has been satisfied. It usually doesn't matter much if a product is really efficient to use if it doesn't perform, or perform consistently, the task that is expected. Similarly, it is difficult for a user to have a high level of satisfaction with a product that is a hassle to use or doesn't perform.

The constructs are a great conceptual foundation for a designer. It is rare that a final product will totally fail in every area. Usability takes into account that the way users perceive products in the real world is a combination of objective (effectiveness and efficiency) and subjective (satisfaction) components, which gives a framework for investigating the relative importance between them. There are certainly many examples of products that were successful because users found them to be highly satisfying to use despite some deficiencies in effectiveness or efficiency. Similarly, there have been highly effective products that failed because they were less than satisfactory to use.

I am always reminding my students to keep in mind the user, the task, and the environment. A product requires considering all three, and it is impossible to design a successful solution without each. Considering users (or more broadly, stakeholders) leads directly to Human/User Centered Design methods to understand the actual needs. Considering the task leads to the world of design thinking and problem-solving to determine which actions can be done to meet the needs and objectives. Considering the environment leads to how the needed actions can be implemented to meet the needs in a given circumstance.

When deciding how to implement a design in a way that is usable, designers benefit a lot from the closely related field of human factors and ergonomics (HFE). HFE is a multidisciplinary scientific discipline focused on understanding the interaction of humans and systems in order to optimize human well-being and overall system performance (IEA 2000). It provides many best practices and guidelines that have been validated over time that can help a product perform better with regard to the different components of usability. HFE helps in addressing many issues such as improving visibility of a control interface based on the physiology and limitations of the eye, changing product interfaces and interactions based on cognitive load and decision-making demands, or optimizing products for improved physical fit to help reduce the potential for injury. It is all grounded in inquiry and research methods which provide validated tools and guidelines. Designers may then use these with some confidence when making changes to a product to test that usability has improved. When a tool is used in new contexts or with new technologies—if expected improvements aren't observed—it can signal a need to study new or updated guidelines. The rigor helps improve both design practice and knowledge.

This firm foundation has helped to ensure that it is generally taken for granted that usability testing a product is a good idea and not a step that should be skipped. This wasn't always the case. During World War II, the instrument panel of the P-47 was re-designed. While under attack, a pilot scrambled unknowingly into one of the new cockpits and was greeted by a completely unfamiliar instrument panel. Instruments were not in the expected places; labels were inconsistent, and he had to spend time figuring out where everything was while bombs were falling around just to get the plane started (Casey 1998). These kinds of situations became the genesis of modern day HFE which began to inform the need for good usability. Over time this expanded to all manner of products. Usability is still one of the most widely used and important ways of evaluating product design (Lewis 2006). A designer who is practicing evidence-based design, regardless of whether they are coming from a form- or function-first

point of view, is likely already considering usability as a core part of the design decision-making process.

UX in Design

At its best, the idea of user experience takes the core of usability and expands it into broader contexts. UX should encompass all aspects of the end user's interaction with a company, its services, and its products (Norman & Nielsen, 2016). So, it is no longer just about the particular product and context of its use, but UX can include things like support, service updates, packaging, marketing communications, point-of-sale experience, and so forth. UX should inherit and benefit from the same kinds of rigorous inquiry that are at the center of usability.

In the minds of most of the students I meet these days, as well as many companies based on their descriptions in job postings, UX is often just shorthand for web-based service interface design. Instead of the more expansive view of what UX should encompass, this is almost narrower, focusing mainly on code development or technology issues. Sometimes this view and definition of UX are even used interchangeably with usability, potentially causing confusion around its benefit to web services.

The narrow view of UX is always a disappointment because the wider conceptualization is important. For some evidence, look no further than an unboxing video, which focuses not on using a product but on the experience of opening a product for the first time. Technology products are popular subjects, but there are examples covering all manner of products. These videos are very popular and more than idle entertainment. Apart from their own unique social influence, they highlight an aspect of a product that everyone has experience with: after purchase it gets unpacked. Even before experiencing the actual product, the design of the packaging presented through these videos can have a real impact on purchase intent (Kim 2020).

UX includes interactions that, like unboxing, are ephemeral. They contribute to the overall experience but do not necessarily influence day-to-day usage. Other interactions like software updates or trouble support have the potential for updating how a product works day-to-day but are much less frequent. It can be hard to measure the overall contribution of these experiences. They are different variables that a product designer may not consider but are important to other groups involved with the product. It is important for UX to continue developing rigorous tools, methods, and frameworks to describe and assess these variables. This provides a means of measuring improvements to UX, and for example, answers such as, "What was the real impact of a change in packaging?" It can also improve communications between different involved groups, increasing awareness of what variables are important and the impact they actually have. As the view of UX widens to more groups, there will be competing and even opposing priorities, making communication and ability to make objective, reliable evaluations critical.

Challenges and Opportunities

A grounding in usability will continue to serve product designers well. It provides a set of tools and methods that are an ideal fit for the discipline. However, as technology continues to advance and change, and as designers seek to tackle larger problems that are of greater consequence, there will be an ever-increasing need for a multidisciplinary approach.

This isn't necessarily a new thing. Technology advancements have never stopped, but the pace is ever quicker. The more diverse technology becomes, the more it tends to take a specialized expert to really understand it and make the most effective use of it. Over time, any individual designer can become less effective because there is no way to keep up.

Attempting to address bigger problems will only increase the need for collaboration. These are the problems that could be referred to as wicked problems. Alternately, we could say that we want to be able to design solutions for problems that exist within complex social-technical systems (Trist & Emery, 1960; Norman 2022). These are problems that exist in complex interactions between humans, machines, and systems that may be hard to define, hard to approach, and difficult to know if you, as a designer, have solved successfully. Part of what

makes it difficult to define and attack these problems is that a solution is unlikely to be found fully or within a single discipline. Just as usability helps a designer focus on user needs and goals to find innovative solutions, I hope UX can do the same to enable cross-disciplinary problem-solving in these more complex systems.

But this is unlikely to happen if a commonly held view is that UX mainly consists of testing application interfaces.

To address this misconception from the bottom up, UX principles should be introduced to a wider variety of students at undergraduate and graduate levels—not just to design or computing students—but also to engineering, marketing, business, and others. Most of the students may continue to go on to be a specialist in their field. The aim is not necessarily to turn everyone into a UX expert, but to give more students a greater awareness of larger needs and the impact that specialist work could have on achieving bigger goals as well as providing tools that would be helpful when applied within their own domain of expertise. This will gradually allow the capacity to be built for communication and cross-disciplinary problem-solving.

Here's an example. In the past, I have been part of a project to introduce engineering students to universal design. Typically, the students were brilliant at devising mechanical solutions that had reliable and solid functionality. What they hadn't fully taken into account were user needs and limitations. One of these teams had devised a compact machine for harvesting salad greens grown within a commercial greenhouse. It worked functionally but had some issues. They were the kind that would have caused the product to get sent back for a re-design. The harvester was heavy and would require a worker moving it between harvesting locations up to 30 times an hour. From an HFE standpoint, using the harvester was going to be exhausting and contribute to a very high risk of back injury. The other issue was that the harvester featured exposed blades, not far away from handles used for moving the harvester around. The problem with this was a tired worker was likely to get a hand caught up in the blades. The initial solution was "just don't put your hands there." After considering the user, the student could see how the design could have avoided the issues from the start.

To provide better instruction, we need to continue defining UX with good scholarship. In part this means continually working to validate foundational principles and guidelines within new contexts. It also means studying new tools and technologies as they become available to understand how they should best be utilized. It is almost human nature to focus on a new tool that looks promising and try to use it everywhere. Mixed reality technologies (virtual and augmented reality), for example, have a lot of potential uses for tools as product solutions or as aids and tools for evaluating usability. This is especially true as virtual reality/augmented reality (VR/AR) devices become more widespread as dedicated devices or components included in a smartphone that is in the pocket of nearly everyone. VR/AR are still being studied for things such as whether perceived usability can be reliably measured for them, or whether tried and true Human-Computer Interaction (HCI) guidelines for interface design still normally apply to them. As we develop new tools for assessing UX, such as through the System Usability Scale (SUS) (Brooke 1996, 2013) for usability assessment, the tools themselves should also be well studied and validated.

Studying UX as a discipline may be challenged by lack of funding. This has always been a challenge for studying usability as well. It can be hard to find the money needed to conduct a representative study. UX is not like a STEM subject in which there are large numbers of available grants from public funding sources. It can also be difficult to gain access to the kind of data that would be useful because the application of UX concepts usually happens within a company. Case studies that avoid competitive trade secrets can be useful, but it is difficult to set up independent, well controlled experimental studies.

Still, a solid foundation in research will make it easier to communicate the meaning and benefits of UX. For usability in product development, we are already past the point of convincing people that they should do it. Conceptually, most people would probably agree that studying UX will benefit products and services. Yet, unlike usability which is generally understood, UX doesn't always have a consistent definition. This seems like an important issue. Just because a task called UX testing was performed, it doesn't mean that any benefit was gained. Just as in a research study, the content of the test and method of execution matters. UX practice is not well served if there are large numbers of organizations doing UX evaluations in which, in reality,

they simply do user interface testing. Doing it right can take time, be expensive, and require experts. Because UX should involve a wider array of stakeholders, there will be competing priorities along with the general pressure to reduce costs and overall development time. It will be useful to develop tools that can be deployed more easily and provide valid information within a given context along with enabling more students across a wide range of disciplines with the capacity to understand and use those tools.

Final Thoughts

UX can be a central component in helping guide the development of solutions to very important and wide-ranging problems. It can help guide design thinking process in the way that usability helps with a more focused product case. Usability remains relevant in industry, but as a standalone practice, it is too narrowly focused for some of the big multidisciplinary problems. At the end of the day, even as the scope and landscape of problems change, with the right tools our designed solutions can continue to drive improvement individually and collectively into people's lives.

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