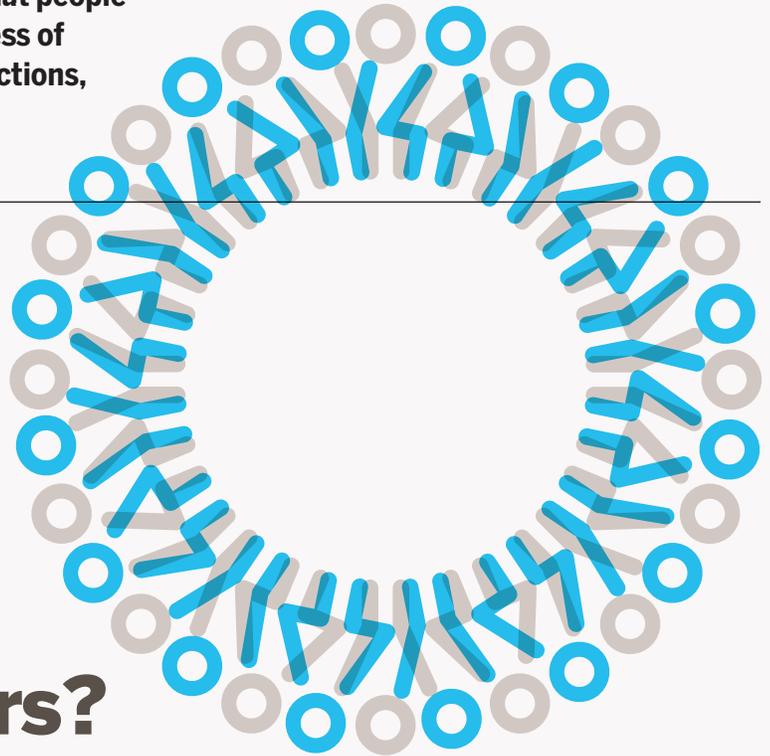


By Kenya Oduor, Ph.D. **Human Factors practices result in a better understanding of what people expect, their thought process of how to interact, and their actions, intended and real.**

Defining Human Factors/User Centered Design and Why it Matters?



MOST OF MY CHILDHOOD summers and holidays in the mid-seventies to late eighties, were spent with family in Pittsburgh, Pennsylvania. My memories of the massive, hilly terrain surrounding the city of Pittsburgh were vastly different from the fairly flat landscape of my hometown of Queens, New York. Travelling through Pittsburgh with cousins in the back of my grandmother's Cadillac Eldorado coupe was a bit like riding a rollercoaster without a restraint. I was much smaller than my cousins, so I was always sent to the middle seat in the back, with the hump between my feet. My vantage point from the front windshield was of vast bridges and homes strategically placed on hillsides and in nooks alongside the roads that spiraled upwards and around those hills. My grandparents lived on top of one of these steep hills. It required an ascent up a narrow, winding road to get to their house. Snowy winters were especially scary when we had to travel down into the valleys, where the shop-lined streets lived. I'll never forget the terrifying feeling of crossing the threshold where the flat road, on top of the hill, met the steep decline, with nothing but the horizon visible in the windshield ahead of us.

It was the awe-inspiring experience of these two very different landscapes that triggered my

interest in civil engineering. I set out to complete an undergraduate degree in engineering. During that time, I took an elective course in psychology. The course piqued my interest in human cognition and decision making. What followed was a desire to go beyond the cursory overview of the introductory content. After much introspection and what felt like endless career exploration activities, I discovered the field of Human Factors.

Defining Human Factors

Human Factors (HF) is the study of how we interact with tasks, tools, products, systems, environments, and other people in settings where we live, work, and play. Human Factors lives at the intersection of the social sciences, engineering, and the biological sciences.

People with HF training use scientific evidence and methods to create or improve the things people interact with. Human Factors practices result in a better understanding of *what* people expect, their thought process of *how* to interact, and their actions, intended and real. The ultimate goal of an HF professional is to participate in the creation or improvement of the things people interact with to make them more effective, safe, and reliable.

HF professionals have interdisciplinary backgrounds. Training can include any combination of psychology, industrial engineering,

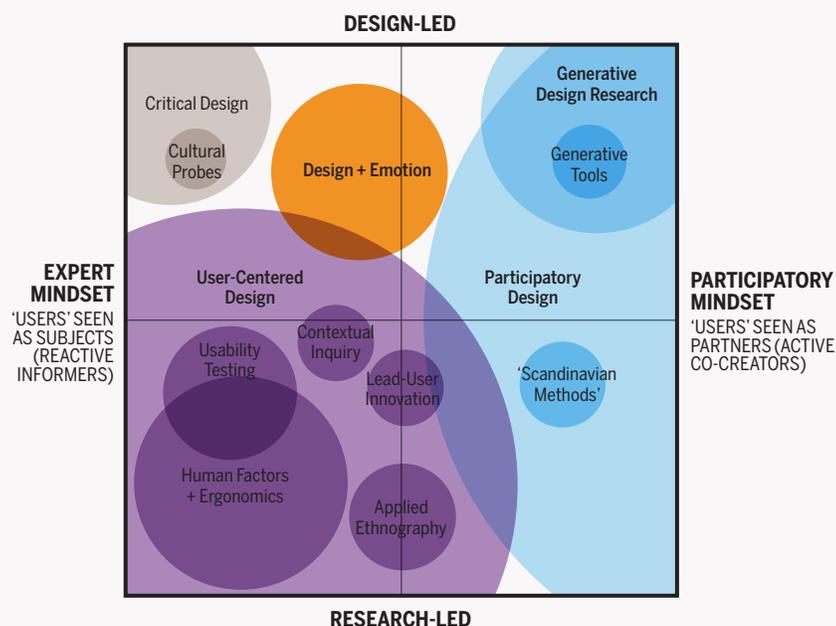


FIGURE 1
Landscape of Design Research.
 Source: Liz Sanders. "An Evolving Map of Design Practice and Design Research." *Interactions*, 15.6 (2008): 13-17.

biomechanics, industrial design, and anthropology, among others. Most of us agree that the terms “human factors” and “ergonomics” are synonymous, yet our areas of expertise may vary.

HF practitioners are responsible for partnering with solution owners and designers to help them gain the insights necessary to confirm what users need from a solution and how that solution complements that user’s existing personal or professional ecosystem. This involves leveraging techniques rooted in human subject research such as interviews, observations, eye tracking, and galvanic skin response, to name a few. A well-trained practitioner will have an array of tools and techniques in their toolkit to conduct expert led research. A highly skilled practitioner will systematically balance expert-led and participatory research activities, like those found in the Design Thinking methodology (see Figure 1).

Whether you are a fan of Design Thinking or not, there is value in the iterative aspects of the framework. The overall goal of Design Thinking is to help teams understand users, challenge

assumptions, redefine problems, and iterate on solutions to prototype and test. Design Thinking is more commonly termed by its five phases: empathize, define, ideate, prototype, and test. Design Thinking and its defined phases are rooted in HF or user-centered design.

I was introduced to the term, User Experience (UX) in the early 2000s, while working at IBM. It was during that time I discovered the array of specialties under the umbrella that includes roles such as solution strategist, user researcher, information architect, interaction designer, technical communicator, and visual designer. Individuals in these roles have a responsibility to advocate for the most optimal user experience for a solution, specifically in the context of their individual T-shaped skills. Because each role has a deep skill and knowledge in a particular specialization, it is important to understand and identify which of the specialties are necessary for the overall success of a solution. Navigating the sometimes slight differences between these disciplines is still a challenge for many hiring managers and placement agencies. Generic job descriptions that seek to employ what has been called a “unicorn” are one unintended outcome. These job descriptions describe an individual that has T-shaped skills in an unrealistic number of areas. Even if you are fortunate enough to find an individual with skills in all of these areas, it is likely they do not have the bandwidth to perform all of these capabilities concurrently, or the quality of their work in one or more of these areas fails to meet expectations. Years ago, while in a corporate UX leadership role, I realized the extent of this hiring challenge. I was spending way too much time educating placement agencies on the definition of UX and the varied roles under the UX umbrella. This became a critical precursor to my explanation of the specific needs of an open role. This left me frustrated, especially when the information I shared did not stick. It was at this point I realized the opportunity to start a business that works to fill the gap. I left my corporate leadership role and started Lean Geeks. Starting a company of this

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kind allowed me to use my own understanding and experience to fulfill the needs of UX hiring managers by identifying the appropriate UX talent.

Solutions that work

What are some ways one can ensure a solution makes sense to a user in context and can be used effectively in an intended manner?

When thinking about all of the products, tools, and systems we interact with every day, we have a specific context for use that influences our comprehension on how to take action. The HF perspective is unique in that informs best practices around the design of a solution that complements users' implicit assumptions, current behaviors, and mental models. HF professional training is rooted in cognitive psychology. This ensures that strategic activities and discussions start with an articulation of your users' understanding and motivation for use, as well as; their mental model. A mental model is a mental representation of someone's understanding of how something works in the real world. Mental models allow us to "get into one's head" and understand their perspective on the relationships between various parts of a system or solution, a person's perception of how to engage or act on those parts, and their understanding of the consequences.

Most of us own or have access to a vehicle. Say, for example, that vehicle is a car. What is your mental model in the context of driving the car? Your mental model is likely based on an understanding of the parts of the vehicle that help start the car and allow you to navigate to and from your destination safely. How does that differ from the mental model of an auto mechanic, where the focus is on servicing the car? A mechanic's perspective is more focused on the condition of the car's internal components that allow it to operate in a safe and efficient manner. An insurance agent's mental model of the car also differs and will include aspects of the car, such as its value and safety rating. The insurance agent will also care about the demographics of the driver that influence its insurance coverage rate. If the car is the solution in this case, the way in which each of these individuals interacts with the car is based on their

role in that moment, the goals of their interaction, and the context.

At the earliest stage of defining a solution, it starts with the organization's assumptions. Assumptions can originate from a number of places. They can include market research that identifies a white space opportunity in the market, a challenge with an existing solution, or a conversation with existing customers. Assumptions are sometimes framed in terms of the solution itself (e.g., a mobile application) or specific features of a solution (e.g., a graph of stock performance over time). When working to define a user-centered solution, assumptions framed in this way are not ideal. You want to consider framing assumptions in terms of *who* you are solving for, *what* opportunity or problem you are trying to solve, and the intended outcome you hope to help your user achieve (i.e., the *unique value*). An articulated assumption is essentially a hypothesis and should be tested and measured. This is not an exercise in planning and executing an extensive experiment. It is a mechanism for making sure the organization's assumptions are validated prior to designing and building the solution. Well-planned validation activities can save an organization a lot of time and money by avoiding costly design mistakes or the production of a solution that fails to compel the market to adopt it. In line with the Design Thinking framework activities, these validation milestones should occur once the assumptions have been crafted or defined, when solution prototypes have been created, and when the solution has been developed. Because context matters, each of these validation milestones should be framed or should occur in the context or environment where the solution will be consumed. Collaboration with HF professionals during these activities ensures that details about users' implicit assumptions, current behaviors, and mental models are identified and noted in a manner in which they can be addressed.

A healthcare payer sought our assistance in validating their internal assumptions about the functionality members were expecting in their



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mobile application experience. After determining the top four capabilities or opportunities to consider, we conducted collaborative validation sessions with recruits that reflected the demographics of their members. We discovered that what the client considered their highest development priority was something people actually performed by talking to trusted friends and loved ones, in combination with an Internet search. Therefore, this functionality fell off the list of capabilities to build into the mobile app and were instead considered for messaging in marketing and sales collateral. Can you imagine how relieved the client was that the design and development teams had done zero work on that “high” priority item?

Iterative solution validation does not stop after defined assumptions about what to solve for or create have been tested. On-going validation is key to ensuring the team does not go too far down the wrong path, making it too difficult to pivot or adjust. As the team begins concept design and prototyping, it is essential to incorporate validation milestones at critical junctures. This creates the opportunity to pull in HF partners, who will leverage their toolkit of capabilities to determine the best approach to validation testing. Insights gathered from these validation testing efforts can be used to adjust designs and prototypes prior to the more expensive process of making adjustments during development. These validation activities are typically known as formative testing or evaluation activities. In instances where formative testing activities have not been considered, conducting summative testing on the completed or deployed solution can be done. The downside to only conducting summative testing activities is that very little can be done to alleviate design flaws. It then becomes necessary to document these design flaws or challenges in the form of user training collateral or help documentation. Although these materials are a necessary component of most solutions, they alone do not take the place of designing out flaws that make it difficult for a user to interact with a product.

Take, for example, a client in the health and medical space who created a solution that introduced a new device and new procedure for

physicians and practitioners. After several years in the market, the adoption of this more effective and safer procedure and device fell short of the defined business goals. As a result, the company sought our assistance with understanding the patient journey that led up to the practitioners’ decision to employ the new device and procedure, or to continue with existing practices that were more costly and incurred higher risks for the patient. HF activities included interviews and observations of the various practitioners and referral sources, with particular focus on information hand-off, inputs to decisions, and potential workarounds. Because this research was conducted after the shipped product was in market, the insights gathered could only provide actionable recommendations to the client’s sales, marketing, and training teams. Insights that articulated challenges with the device design and use were delivered as well. However, the product roadmap made it prohibitive to implement these design recommendations in the near-term.

Historically, priority has been given to designing solutions that fit within a business’ model in terms of feature set and return on investment (ROI). As we consider levers to pull to increasingly drive profit and competitive advantage, it comes down to creating experiences that delight users. Individuals with HF training and skills can augment your team; by proactively employing research tools and activities that result in solution designs that complement users’ implicit assumptions, current behaviors, and mental models. ■

