

HCI education reflects the continual evolution of HCI, embracing the changing landscapes of technology, infrastructure, and technology use. This forum aims to provide a platform for HCI educators, practitioners, researchers, and students to share their perspectives, reflections, and experiences related to HCI education. — **Sukeshini Grandhi, Editor**

Educating for HCI at Scale

Daniel Rosenberg, San Jose State University

The artifacts of interaction design permeate our daily lives as both consumers and professional users. From mobile apps to digital entertainment to social media, along with enterprise cloud applications and medical solutions, we experience the results of HCI in practice daily. The best of these solutions delight and engage us. Particularly in the consumer market, where users themselves make the purchasing decisions, bad designs can't survive because products won't sell and services won't be used if they don't meet user expectations.

At the same time, our mission-critical enterprise and infrastructure systems still suffer from significant usability defects. I believe one reason this quality gap remains is that from an HCI education perspective, the majority of practitioners are not trained to work on "HCI at scale" for complex systems. As a profession, I believe we are failing at this most critical high-end sector of the market, whose products and services are indispensable to daily life.

Why does this gap remain and what can be done to close it? Part of the answer lies in understanding the plurality of approaches available to HCI education and that these different approaches do not have identical objectives nor do they produce equivalent results.

In this article, I address several trends driving HCI education today. I elucidate these educational trends and their relationship to the gap between the skill level of the typical UX practitioner and what is needed

to design complex systems. I bring a unique personal perspective to this topic. As a longstanding advisory board member of the Interaction Design Foundation (IDF), I have been actively involved in a nontraditional open source educational approach. This resource provides a comprehensive body of reference and course material for free or at minimal cost to anyone interested in HCI, anywhere in the world where there is Internet access. At the same time, I hold an adjunct professor position in a traditional human factors engineering program, where I teach graduate-level interaction design classes and advise students on their HCI thesis projects. Finally, during an executive-level HCI industry career spanning three decades, I hired more than a thousand professionals in 10 countries, which has provided insight into the global distribution of HCI skills and the maturity of HCI education available in the U.S., Canada, France, Germany, Israel, China, India, Bulgaria, and Brazil.

Insights

- A diverse set of HCI educational approaches have emerged to fill the supply/demand gap.
- Practitioners that emerge from these different approaches vary greatly in their ability to practice HCI at the scale of complex systems.
- Train and hire with an understanding of both the type of HCI practitioners you need in combination with the scale of the problem you need to solve.

Trend 1: The HCI job market is red

hot. There is a global imbalance in the supply of industry HCI professionals right now. Demand far exceeds supply. In the last super-hot hiring era, the dot.com phase of the late 1990s, the demand for UX talent was a fraction of what we see today, relative to the demand for programmers. In that period, hiring was technology-driven. Today, for the most part, it is customer-experience driven. In several global job markets, average salaries for UX designers exceed that of developers with comparable years of experience.

For the past four years, I have been conducting an informal analysis of the major job-posting sites my students or any UX professional would turn to in seeking employment. My choice of sources includes obvious Internet sites such as LinkedIn or Monster.com, specialized job boards like baychi.org (here in Silicon Valley), and UX recruiting and referral sites. On average there have been about one thousand unfilled UX positions advertised globally every week for the past two years. One week in particular I noted 13 open positions just in Pakistan.

Much of this demand is coming from traditional sources in the high-tech sector, which includes mid- to large-size companies. What is new is the high demand for UX talent coming from startups. In fact, venture capital firms like Khosla Ventures have an in-house UX strategy expert to work with their pool of funded startups because of the critical relationship between user experience design and early product success. Other venture firms rely on consultants to provide this expertise.



Another trend driving the increased demand for UX talent is the awakening of service industries such as banking and insurance to the value of user experience, particularly when there is no significant difference in the products offered among competitors. Many financial companies have had in-house UX teams, but to fill their recent talent gaps, several have resorted to purchasing prominent design firms as a way to build instant capacity. A recent example is the acquisition of Adaptive Path by Capital One. Similarly, large IT consulting firms such as Accenture have purchased global design firms, in this case acquiring Fjord Design in 2013 to integrate experience design into the overall service suite they offer their clients.

One unfortunate side effect of this market imbalance is that there are a lot of untrained volunteers stepping into these unfilled positions. This creates significant demand for short-duration HCI training programs as well as just-in-time education and mentoring networks. In general these short-term programs are process- and tools-focused, with little time available for learning the fundamentals of human

There is a global imbalance in the supply of industry HCI professionals right now.

factors and cognitive science from which general principles emerge and scale to new situations.

Trend 2: The plurality of HCI educational alternatives. Regulated professional fields like medicine cannot respond quickly to a supply-to-demand imbalance due to their heavyweight and consistent licensing requirements. Setting aside the controversial issue of a future requiring UX certification for practice (at least in some domains), HCI is not currently a regulated profession. This has opened the door for many different HCI educational models to emerge, many of which focus on quickly increasing the population of practitioners.

Ranging from the least to most traditional in format, the HCI

educational approaches available today can be categorized as follows:

- Open source self-directed education (e.g., Interaction Design Foundation)
- MOOCs' branded content from top universities (via Coursera or Udacity) that may carry some traditional academic course credit
- Certificate programs, typically 10 days (e.g., HFI International)
- UX boot camps, 10- to 16-week immersive programs (e.g., General Assembly). *Also note: some major companies such as IBM run similar boot-camp programs for their new HCI hires, regardless of degrees held*
- Alternative two-year degree programs (e.g., Center Centre, formerly Unicorn Academy)
- Universities offering bachelors and/or graduate degrees in specialty fields such as interaction design, visual design, cognitive science, and human factors engineering.

While these different educational approaches each fill a market need, they do not have identical goals; nor do they produce identical results.

At the extremes, an open source approach like IDF helps to raise design literacy worldwide for the entire product/service ecosystem, including engineers, product managers, and executives. It creates awareness that there is both best-practice process and real science underpinning a highly creative multidisciplinary specialty. In addition, IDF provides quality educational materials to parts of the world where such materials have been unavailable or remain unaffordable. It sees heavy usage by both individuals wishing to self-educate on HCI and university faculty using it as a complement to classroom instruction and traditional textbooks.

The opposite end of the HCI educational spectrum is found in the traditional, degree-granting, classroom-centric approach, filled with research, formal methods, collaborative projects, portfolio building, and design review exercises. The highest goal of this educational dogma has always been to prepare students with sufficient core knowledge that they will be able to solve the next generation of challenging problems that we don't even yet know exist. Big problems, hard problems, and typically systems-level problems that

impact the infrastructure and health of society at large.

Learning conceptual design techniques requires both the time and mentoring that in my opinion is available today only through traditional degree programs combined with structured internships and active mentoring, both while in academia and in the first decade of professional practice. In addition, tackling these large-scale systems designs always involves a multidisciplinary team comprised of UX *specializations* in interaction design, visual design, prototyping, usability testing, ethnographic research, and more.

In between the extremes noted here, the goals being met by the UX boot camps and alternative programs are to create a class of journeyman *generalist* practitioners, capable of doing an excellent job on mainstream small- to medium-scale problems. Every small business deserves a competent website. Every e-commerce experience should be a good one, and every single-purpose mobile app should have stellar usability.

One of the common criticisms of the shorter-duration programs is that they overly focus on tools such as Axure and Photoshop and teach cookbook usability methods. Being a Photoshop ace is not an indicator of interaction design skill, though it does lead to a much more polished-looking portfolio, which undeniably has real benefits during a job search.

The key question is not which approach is best, but rather if the quality versus quantity trade-offs driving these different HCI educational approaches are best serving both the growth of our profession and filling the market need for UX skills. The mainstream product and website market is where the peak volume of UX work lies. For every thousand mainstream UX projects, there are only a few medical apps or electric-power-grid control rooms that need to be designed.

It is important to clarify that design scale is not a direct function of size (or screen count).

Trend 3: MBAs in design strategy.

Several top business schools have deployed MBA specializations in design strategy. These are generally very high-quality programs. An unfortunate side effect of this approach is that it decouples UX ownership between the boardroom strategy level and those responsible for the detailed UX execution in the trenches.

On one hand, it is a testament to the business world's maturing appreciation for the power of design, mostly in response to the success of companies such as Apple and Disney. On the other hand, this trend further constrains UX practitioners to a lower rung in the corporate employment hierarchy. And the perception that this lower-value position is economically appropriate is reinforced when the typical CEO's perception is that anyone can learn all they need to know to produce a good UX in a 12-week boot camp. Taken to the extreme, UX as a dedicated profession could disappear as the generation of digital natives in product management and development roles participate in these same short-duration HCI programs and simply decide to do the design themselves. There is no evidence to suggest that this would lead to a lower-quality result in the mainstream of product experience as long as the difference between designing everyday things and complex systems is adequately recognized. Which leads us to the next—and in my opinion, most troubling—trend.

Trend 4: The Scaling Fallacy is typically ignored in HCI education.

In their book *Universal Principles of Design*, Lidwell, Holden, and Butler [1] provide an excellent example of the concept of the Scaling Fallacy. How a seed is carried on a breeze, how a bird flies, and how a 747 aircraft moves across the globe are simply not the same, even though all three are technically examples of flight in motion. The demands of scale change everything! Both bicycles and airplanes are legitimate "transportation" design fields. However, a portfolio of award-winning mountain-biking mobile apps is unlikely to impress during a job interview with the Boeing UX team.

It is also important to clarify that design scale is not a direct function of size (or screen count), as the flight

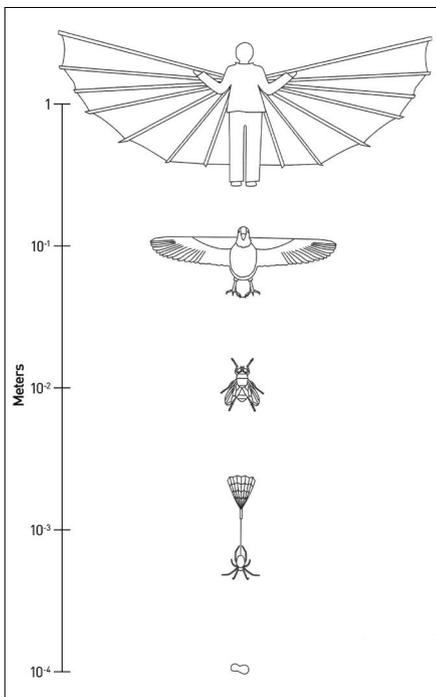


Illustration of the Scaling Fallacy from [1].

example might imply. It is more often correlated with complexity and innovation within both the business model and the underlying technology. The scale challenge frequently appears when designing something that has never been done before. For example, one of the most challenging applications I have consulted on recently is the first instance of digital medicine, the FDA-approved BlueStar type 2 diabetes solution, which is prescribed by doctors and reimbursed through insurance companies. This application with both mobile and Web experiences went through the same clinical trial process as a new pharmaceutical drug to prove its effectiveness. In fact, it outperforms several popular diabetes drugs in its ability to lower high-risk patients A1C (blood glucose level). It carries its own unique prescription drug code as a result. An app with the business model of a pill needs to be extremely easy to use but has an incredible level of complexity in both its creation and deployment. For example, it requires that the app subscription be refilled every 90 days and renewed by the physician once a year. It also requires the prescribing clinician to have a medication reconciliation experience to ensure correct dosing related to insulin calculations.

While the demand for UX talent is increasing across all domains as noted in trend 1, once we move beyond the bulk of mainstream products, the exponential complexity of the design challenges presented and the corresponding HCI skill level necessary to address them are not equivalent. Designing my personal favorite, the “find my car app,” or a flirting application for pre-teens in Korea are both single-use-case products. A 401K-retirement Web experience needs to be educational, actionable, and goal-driven. It contains multiple use cases but, like a tax application, all these use cases are deterministic in nature. Designing the UX for programming or creative tools contains an indeterminate number of use cases and flows, left only to the imagination and work style of the user. The design of medical applications carries the responsibility of patient safety above all other considerations. And in the world of service systems like ZipCar or Uber, there are a near-infinite number of potential failure points involving both people and machines, in addition to the digital artifacts that must combine flawlessly to deliver what is perceived as a seamless transportation experience from point A to B.

While in theory user-centered design (UCD), with its array of methods and iterative design approach, can be applied across this full spectrum of design challenges, in practice, as system complexity scales up non-linearly, innovation methods dedicated to conceptual-model design must precede by many cycles anything that looks like UX design. The pathways and opportunities to develop the required baseline knowledge and abstract skills to perform complex conceptual work are generally not available in the majority of HCI educational programs today, regardless of their duration.

This Achilles heel of HCI education can be summarized by one of many great quotes from famous baseball manager Yogi Berra, who said, “In theory there is no difference between theory and practice. In practice there is.”

When complex systems are created successfully, it is typically by a collection of highly trained specialists who can work well together. These specialists

often have to invent new methods of design, testing, and production in addition to the final system itself, in effect building the platform before they can build the product.

A popular notion in both education and management theory today is to foster the development of “T-shaped” individuals, who have good breadth in broad domains like HCI, combined with deep subject-matter expertise in one of its highly specialized sub-disciplines. The construction of this Jedi level of T-shaped HCI practitioner, like the creation of fine wine, takes time. It cannot be rushed. In fact, it could and should be considered a lifetime journey.

Wrapping it all up. For the foreseeable future there will be many approaches to HCI education filling the global HCI supply/demand imbalance. It is important to acknowledge that they all have a role to play in achieving a world where well-designed products and solutions are the norm and not the exception.

When debating the merits of any particular HCI pedagogy in this magazine or other forums, we should never ignore the *scale factor* as a unit of measure to avoid debating the differences between apples and oranges. The HCI educational approaches noted here, as well as those alternatives yet to emerge, should be evaluated relative to the level of scale at which its graduates are qualified to practice. An additional litmus test to be applied to these institutions themselves is the degree of “truth in advertising” with which they position themselves and their graduates’ understanding, both of what they know at the end of the program and what they have yet to learn.

ENDNOTE

1. Lidwell, W., Holden, K., and Butler, J. *Universal Principles of Design*. Rockport Publishers, 2003.

Daniel Rosenberg is an HCI professor, former HCI executive, and frequent author and keynote speaker. His UX strategy and IxD consulting is primarily in the medical and big data domains, though he occasionally designs consumer products for clients as well. He is the Business of UX forum editor for this magazine and also a board-certified ergonomist (BCPE).
→ dan@rCDUOX.com