Meredith Davis, Emerita Professor, NC State University

(1) (2) In 1962, historian Thomas Kuhn wrote a landmark book titled, *The Structure of Scientific Revolutions*. Prior to Kuhn's seminal work, historians described scientific progress as achieved through the accumulation of knowledge over time. Kuhn disagreed and held that science advances by replacing one paradigm with another; through revolution, not evolution.

Kuhn defined a *paradigm* as the theories, principles, and processes that are successful in solving problems that practitioners in a field agree are most acute. Over time, a paradigm is codified through professional discourse, journals, textbooks, and college curricula and eventually serves as a filter for selecting problems seen as appropriate to practice and research in the field, as well as the education of new practitioners.

(3) In design, the historical paradigm is one that developed following World War II to improve the function and the appearance of messages, products, and spaces. It reduces the complexity of problems to a few independent constraints seen as recurring and stable. Its eliminates sources of friction, one at a time, with a goal of making things as perfect as possible. It values individual authorship and designers as content producers who make decisions they deem in the best interest of the people for whom they design.

Over time, the field stretches the dominant paradigm to accommodate novel problems not originally seen as part of the practice, usually through a relaxation of standards. **(4)** Today, we apply the process for designing objects to problems in business under the concept of design thinking. Craftsmanship was a standard under the original paradigm, but we have no way to identify and measure *craft* with respect to business operations, so we drop that standard from the stretched design paradigm in the application to management.

Stretching the traditional paradigm can only go so far in addressing a changing context for practice. New problems and new insights introduce anomalies that challenge prevailing theories and practices. Think about debates over where design sits in the

business food chain, overlapping territory among disciplines in software design, and practice-based versus research-based PhD programs. The awkwardness of these conversations—their lack of clear resolution by the field—illustrates a struggle to match the established paradigm for design practice with contemporary research problems.

(5) Over time, these problem anomalies build up and become more frequent and more urgent. More and more, acute problems are less and less like the ones the paradigm was invented to address. To advance, the field needs a new paradigm.

So what are the anomalies for which the historical design paradigm is no longer adequate? And what do they tell us about things that are worth doing in design research?

I was asked by AIGA — the professional association that represents 26,000 communication designers in the US — to identify trends shaping professional practice over the next decade. The goal was to identify competencies for college and professional education, but these trends also reflect areas in need of research. We consulted analyses in a variety of fields, changes in the nature of work, and a group of high-level advisors in practice. We decided that trends should be those with long arcs that are likely to continue in their influence. They should be illustrated through concrete examples that are evidence of their effects. And their impact should extend from practice to design education and research.

> **(6) Complexity –** Today's design problems involve complex systems and address interdependencies that defy linear analysis. **(7)** They are situated in an infinite variety of settings that resist generalization and rulemaking. They call for the resolution of many competing priorities and demand tolerance for uncertainty, knowing that conditions and constraints are inherently unstable. And they require expertise in more than one discipline for their solution. There is ample evidence that an emergent design research culture, and the doctoral programs that support it, face topical and methodological questions more demanding than those of historical design practices.

> **(8)** Let me use a faculty dissertation to illustrate how a traditional, apprance-

oriented view of design research falls short under these conditions.

> The researcher's goal, in this instance, was to understand any differences in the interpretation of Cook and Shanosky's 1974 travel symbols for the US Department of Transportation between readers of idiographic and phonetic languages. Although the sample size was too small to be generalizable, the larger question was what significance the researcher thought findings held for the design of symbol systems, global communication, or designers' understanding of image processing. Why was recognition of these symbols important outside of their intended context and in what wayfinding situations was it possible to separate idiographic and phonetic readers? On what basis was it assumed that interpretation could be attributed solely to their native languages or that readers were innocent of all prior experiences with such communication approaches?

Today, there are very few issues we can truly understand as stand-alone, one-off problems. How we frame problems in recognition of this systems-level complexity — even when an individual component is the immediate focus — not only challenges traditional methods, but also public perceptions of the value of design research

(9) Aggregation and curation – Under aggregation and curation, third parties assemble and re-present messages, products, and services from different sources, giving them an afterlife very different from their initial intent. **(10)** Users trim aggregates based on needs and interests, often irrespective of origin or information integrity. This digital repurposing of information argues for evaluating the consequences of fragmentation as sources lose control over the contexts in their which messages are seen and heard. Divisive filter bubbles limit our exposure to a variety of ideas as algorithms select the information we see on the basis of location, search histories, or some past behavior.

(11) On the other hand, aggregation can also demonstrate the value proposition of design. For example, 3.6 million Americans forgo or delay healthcare each year because they can't get to their doctors' offices. A service design solution

aggregates ride sharing and 700 different healthcare programs for Medicare and Medicaid patients in 25 states. Its positive outcomes are demonstrated by a 95% show rate for doctors' appointments, 30% reduction in both average wait times and transportation costs, and 80% patient satisfaction.

(12) Bridging digital and physical experiences - People transition across devices and environments in continuous communication and service activities. **(13)** Users expect technology to provide seamless, unified experiences, even when moving among information and services from different sources. New digital platforms amplify experiences but also create gaps when people lose support between the digital and the physical. **(14)** Rather than simply testing discrete software and objects with fixed features and functions, we need research that informs the design of dynamic product and service ecologies. And consistent with ecological diversity in the biological world, these systems need to adapt to variety in user behavior over time. **(15)** And to use Kevin Kelly's metaphor, we need to think in terms of goal-oriented verbs rather than nouns.

(16) Resilient organizations - Resilient organizational structures respond flexibly to change and disruption through distributed responsibility for innovation. **(17)** Innovation in this sense addresses how organizations are configured, the products and services they offer, the delivery channels they use, and how they represent themselves in touch points with various stakeholders. Design strategist Hugh Dubberly warns that work in today's successful organizations must be built on agreement rather than deciding, stewardship rather than the ownership of ideas, continuous updating rather than editions, and a stopping condition that is "good enough for now" rather than "almost perfect." **(18)** We need new approaches for forecasting change, structuring strategic conversations, innovating business models, and making practical sense of research data as an essential toolkit for designers and management. Rick Robinson, professor of information sciences and principal in a number of design research-based firms, says, "By advocating that design be considered a strategic voice in product development, communications, and marketing, the field has been asked to play by the same rules and be measured by the same yardstick as other principal business activities. Designers must justify research in terms of its continuing

value in innovation, not purely on 'see what we found!'

Core values matter – (19) Audiences now evaluate organizations based on consistency between the messages and values expressed in their products and services, and their social behavior. **(20)** People connect emotionally with stories that are authentic reflections of an organizations' ethos. **(21)** As models of design practice diversify, some align the interests of business with those of global society and meet the highest standards of environmental responsibility and public transparency. These models demand new metrics for measuring the impact of design and alternative economic strategies for sustaining socially-responsible work.

(22) New forms of sensemaking - People seek meaning and clarity in an environment oversaturated with data and images. **(23)** Information migrates across devices and displays, demanding continuity in representation. Accelerating technological change diversifies people's experiences, expanding designers' responsibilities for data-aware research methods and systems. **(24)** We need tools for finding patterns in big data and discerning underlying stories.

(25) Connected smart products, cloud processing, and machine intelligence play increasing roles in the evolving "datafication" of everyday activities. These technological advancements argue for conversational models of interaction, rather than the asymmetrical relationships of an earlier internet paradigm. **(26)** At the same time, we need to better understand the human consequences of new technologies, which often arrive before we know what they are good for. Amidst the complaints of parents and child advocates, toymaker Mattel recently scrubbed its development of Aristotle, a voice activated device and camera for infant to adolescent bedrooms that would soothe a crying baby, read bedtime stories, and help with homework. Interviewed pre-schoolers believe Amazon's Alexa is a real person who simply lives in another apartment —they describe loving her. We need to study the impact of data-aware objects and systems that sense and respond to everything we do.

(27) Accountability for predicting the outcomes of design action – The

stakes for design research have gone up. Research is now seen as an essential service in many design companies and offices and clients are increasingly risk averse. But as the scale of investigation expands under the complexity of contemporary problems, design alone is insufficient in answering many of the most important questions about its effects. A shifting paradigm for design practice — illustrated through these trends — argues for collaboration among research disciplines.

(28) The Organization for Economic Co-operation and Development describes interdisciplinary work as arising from several forces, all of which apply to design:

> **First there is a perceived need to divide an overly rigid field into specializations.** The professional shift from designing messages, objects, and spaces to designing strategies, services, and interaction realign specializations in the field and undermine research efforts organized under traditional types of design practice. It is difficult, for example, to decide where a physical objects stop and communication begins in people's interactions with technology, or what field is responsible for auditory and gestural interfaces. How can we evaluate the design of service ecologies solely in terms of their brick and mortar facilities? And where in the university do we locate innovation strategy — a college of management or a college of design? New practices represent a reorganization of specializations in the field of design, yet many institutions address this by adding new degree programs while leaving the traditional disciplines largely intact.

> **In other cases, changes in surrounding conditions lead to the integration of previously separate fields.** As early as the 1930s, academic institutions argued for a "doctrine of correlation," for making connections among related areas of study. Today there are efforts to link design with other disciplines in research. Overlapping interests and creative tensions between the participating disciplines often define research that is very different from work in the separate fields. Otto and Smith, for example, describe the union of anthropology and design as

reconciling observation versus intervention, solo scholarship versus futures-oriented collaboration, and sustained cultural interpretation versus a limited history of theorizing. Topics such as *decolonizing design innovation* and *ethnographies of the possible* are unique to the interdisciplinary effort.

Another impetus for interdisciplinary work is protest by students and pioneering researchers against artificial subdivision of reality. Academic journals and university curricula reinforce traditional disciplinary boundaries that often outlive their usefulness in framing contemporary problems. To follow interest in territory that falls between the domains of academic departments, students and faculty negotiate research agendas and partnerships other than those of senior faculty whose work falls along more conventional lines of inquiry. But tenure and promotion procedures, cost sharing, and scheduling often represent obstacles to this type of work. Research centers often arise as the locus of resources and talent from demands for knowledge that lacks a home in traditional fields of study, from anomalies in the dominant paradigm. These centers frequently respond flexibly to the project-based engagement of faculty and sponsors, while academic programs are bound by time-intensive procedures for revising curricular offerings. In this way, university centers often represent the vanguard of a paradigm shift.

It is clear that design research is wrestling with the tension between history and a rapidly changing context for professional practice. It is also clear that what we choose to study tells the world what we value as the potential of our discipline. There are more than 2500 college programs that teach communication design at some level and most are based on a mid-twentieth century paradigm. Graduates of these programs struggle with questions to ask in practice and a much smaller percentage spends too much time as doctoral students learning how to frame research investigations that fall outside the traditional design paradigm. I encourage this gathering of accomplished researchers to extend their influence in areas with more limited research histories and to celebrate those things worth doing.