

## Design: The New Frontier

An increasingly well-articulated proposition is that the present macro-challenges we face—energy, environment, health care, manufacturing production, transportation, and security—all require linking our knowledge from the physical sciences and engineering with that from the social and behavioral sciences (see, for example, C. M. Vest's remarks to 2009 NAE Inductee Class, <http://www.nae.edu/18185.aspx>). This linking is the new frontier for sustainable growth and innovation, and design is the surest path to realizing it.

Design is the new frontier. Should we agree to this? What might it mean for JMD?

Design deals with the creation and execution of a purposeful plan. The term's ubiquitous use in many diverse disciplines and human activities, each with its own particular viewing angle, leads often to the term's dilution of meaning and to confusion of what design is as a discipline. Engineering design is perceived as emphasizing analytical proofs of functionality lest it be confused with fashion design. Industrial design is perceived as emphasizing a holistic, qualitative approach lest it be confused with unimaginative, unattractive products that function but do not please. Architectural design does probably the most credible job in attempting to make all the connections.

Business is quick to see value where it exists and has increasingly identified design with innovation, as exemplified in frequent references to design in the business press. In the pursuit for sustainable growth and innovation, design provides a unique avenue for achieving the integration of personal and social considerations with physical and engineering considerations. The nature of well-executed design is interdisciplinary, interconnected, and human inspired, no matter what we may emphasize when approaching it from different viewpoints. Design is not the only avenue to pushing the innovation frontier, but it is the one uniquely placed to succeed, building on its existing intellectual, business, and educational foundations.

Why is it then that design as a term and discipline has not entered the US national debate in any forceful manner? If one searches, say, reports by the President's Council of Economic Advisors or the Office of Science and Technology, one will find almost no explicit reference to design, with few exceptions design of complex engineered systems such as therapeutics, airplanes and automobiles. One may surmise that the ubiquitous use of the term in a great variety of contexts as mentioned above has prevented its close linking with science and technology. In fact, the point that

design is the path from science to technology creation seems completely missed. One may also surmise that as design deals with people, it gets distanced from the prevailing treatment of knowledge in the physical sciences and engineering research and education.

This has started to change. The emerging consensus that the problems of the 21st Century are global, interdisciplinary, interconnected and human centered demands design skills. Design thinking is being discussed as a way to study any such problem, not just to create products. Design courses are increasingly introduced throughout the undergraduate engineering curricula, not just in the token senior capstone course. Graduate degrees in design associated with innovation are appearing under engineering, business and art schools auspices. A new Singapore University of Technology and Design has just been founded. Indeed, the role of design is well understood and promoted in the countries with growing economies in Asia. The emphasis in wealth creation has been transitioning from manufacturing products designed elsewhere to designing new products and manufacturing them locally or at other Asian countries with lower labor costs.

In a sense, our research and education agenda must transition from a "pure" interpretation of the Vannevar Bush celebrated position of "Science as the endless frontier" (<http://www.nsf.gov/od/lpa/nsf50/vbush1945.htm>) to something closer to Donald Stokes's "Pasteur's Quadrant completion" (<http://www.dcc.uchile.cl/~cgutierr/cursos/INV/Stokes.pdf>). Bush's own statement that "Science can be effective in the national welfare only as a member of a team" is a good starting point for a new team-based research and education agenda for any nation. Design offers a natural path to formulate and execute such an agenda.

Is there a role then for JMD in all this? How do we mix "soft" stuff with "hard" machines? Should we just drop these adjectives as a first step? A glimpse into the just-published book "Built to Love" by Peter Boatwright and Jon Cagan (our JMD Associate Editor) can offer some clues: "When designing new products, companies often work really hard to make new products *work better* than existing ones, missing the opportunity to provide products that make customers *feel better*." Well, writing to you about all this makes me feel better already.

**Panos Y. Papalambros**  
Editor