Chapter LIX
Human-Factors Design for Public Information Technology

Vincent E. Lasnik
Independent Knowledge Architect, USA

INTRODUCTION

This chapter examines the realm of human-factors design for public information technology in the rapidly evolving postmodern knowledge age of the 21st century, with special focus on how new research and development into human cognition, perception, and performance capabilities is changing the design function for IT systems and products. Many "one size fits all" IT designs are neither adaptive nor adaptable—promulgating a top-down technological imperialism penetrating every aspect of their use. The communication, collaboration, and interaction infrastructure of IT organizations thus remains acutely challenged with enduring problems of usability, learnability, accessibility, and adaptability. As the function and form of products undergo increasingly rigorous scrutiny, one important design goal is emerging as a paramount priority: improving the usability of products, tools, and systems for all stakeholders across the enterprise. It is therefore important to briefly describe emerging human-factor design knowledge and practices applicable to organizations that invent, incubate, innovate, prototype, and drive the creation and application of public IT. The findings here suggest the most effective strategies to manage and augment user-centered design (UCD) endeavors across a wide array of public IT products and organizations.

BACKGROUND

In the context of 21st century industrial and information product design theory and practice, user-centered design is an iterative, systematic process that focuses on constructing a user experience and responsive environment with physical and virtual affordances that are identifiable, manipulable, controllable, customizable, and adaptable from the intrinsic, subjective perspective of the conceptual model of the user (Mayhew, 1999; Moggridge, 2006; Preece, Rogers, & Sharp, 2002). This means carefully and systematically taking into account both (a) the user's subjective metamodel of his or her own experiences, actions, and information-seeking cognitive and perceptual processes, and (b) the designer's ostensibly more objective model of the user and alignment mapping to the physical

affordances of the product or tool environment. Thus, in UCD, the conceptual model of the user becomes the superordinate principle guiding the IT design process for software user interfaces (UIs; Saffer, 2006; Stone, Jarrett, Woodroffe, & Minocha, 2005).

Usage-centered design is different: It focuses primarily on (a) the empirical (i.e., observable and measurable) goal-based behavior and task-driven performance requirements of users' activities, procedures, and processes, and (b) the corresponding information architecture required to optimize the effectiveness of the user-system dynamics to efficiently accomplish those functional goals (Constantine & Lockwood, 1999, 2003; Morrogh, 2003). By integrating human-factors engineering systems approaches, it may be possible to optimize the beneficent design quality of products and services from the perspective of the user's operational and instrumental task-oriented needs (Constantine, 2001; Constantine & Lockwood, 2002; Kuniavsky, 2003; Wickens, Lee, Liu, & Becker, 2004).

From the technology management perspective of the new science of user-experience design (UXD), intensive, hands-on project management is vital to the training of knowledge-age designers (Pinto, 2006). The development team needs an original design philosophy that is pliant, change embracing, and facilitates collaborative techniques, models, and skills that respect the proclivities of individual and group human behaviors (Henderson, 2000; Henderson & Harris, 2000; Kumar, 2006). To achieve this new paradigm of organizational dynamics, designers must become leaders in promoting and advocating approaches such as moving away from common functional units and rigid roles (i.e., using the agrarian-age container metaphor of silos) to cross-disciplinary, synergistic, intra-organizational open channels. According to Hughes (2003), running an organization as a collection of separate silos "can cause duplicate efforts, discourage cooperation, and stifle cross-pollination of ideas" (p. 9). For a channel model to work, however, the IT design team must first embrace user-centered human-factor methods and the collateral reorganization of the IT design process and product.

USER-CENTERED IT DESIGN PROCESSES IN HUMAN-FACTORS ENGINEERING

The cross-disciplinary field of human factors recognizes that every new IT media product is ostensibly a dynamic form of person-person and person-technology interaction that expands our communication capabilities by reframing what we know and how we act (i.e., human knowledge and behavior). The underlying three core subdomains—information design, interactivity design, and media design—each need to become integrated within a unifying architecture derived from an object-oriented, modular infrastructure organized within an evolving taxonomy of digital affordances.

Human-factors engineering recognizes (a) the holistic, ecological, and cross-disciplinary nature of human-technology system design, (b) the sociocultural, economic, and geopolitical importance of information utilization and knowledge generation, and (c) the dynamically hybrid, human-centered, user-centered, and usage-centered nature of the product form factor and interface design (Burns & Hajdukiewicz, 2004; Hofstede, 1991). Human-factor approaches strive to deeply integrate existing multidisciplinary domains including (a) systems theory, change management, and computer and information science, (b) cognitive informatics, learning, and performance, (c) philosophy, law, and ethics, (d) human physiological psychology, cognition, and perception, and (e) usability testing, industrial design, and ergonomics (Lehto & Buck, 2007; Rubin, 1994; Salvendy, 2006; Stanton, & Young, 1999; Ware, 2004; Wickens et al., 2004).