

Human Factors in Product Design

Overview

Devices or systems are more likely to be used as intended, safely, and effectively when user capabilities are reflected in their design. Users of a product, of equipment, or a system often vary along many dimensions. Consideration of basic physical and sensory capacities, including vision, hearing, manual dexterity, strength, and reach, can aid in designing safer and more "user-friendly" products. Cognitive functions, such as attention, memory, information processing, appreciation and understanding of hazards, and problem solving, as well as developmental changes that occur during the aging process, can also influence the safety, effectiveness, and ease of product use. The environment in which a product is used also may have an impact on people's ability to interact with products and equipment, or to follow procedures. The legibility and clarity of displayed symbols, detection and distinctiveness of alarms, strength required to use the product, and requirements for reaching or operating controls may be shaped by the space in which users function.



Exponent scientists and engineers have studied human abilities and limitations. We have gained an understanding of the impact of environmental conditions on human behavior. Population data on the physical dimensions of males and females exist that we apply to issues of product design. We test the usability of products with human subjects to better understand user/product interactions. We examine records of injury events associated with the use of products to determine whether their designs contribute to any unique accident pattern or pose a risk of injury.

These types of methodologies have been applied to many product-user design questions that involve products and systems for the home, workplace, recreation, health care, and transportation. We have analyzed aspects of human factors in the development of new products, product components or features, design changes, and processes for product and equipment use. We have applied human factors analyses to the consideration of whether products should be recalled, and whether a design change is appropriate to address issues of safety or customer complaints. We have also considered the abilities and limitations of users with respect to issues raised about a specific product, equipment, or process involved in an accident.

Our services include:

- » Task analysis of product use, cleaning, maintenance, service, and disposal
- » "Out-of-the-box" usability testing of products
- » User adaptation to design changes
- » Design specification development based on target user population's perceptual, cognitive, and physical capabilities and limitations
- » Risk/hazard analysis
- » Application of data on human perception (e.g., visual, auditory, tactile) to product displays and signals
- » Comparison of product-associated injury events with background rates for the population

- » Assistance with development of internal product design standards
- » Training on the application of human factors to product and process design
- » User testing of types and layouts of controls and displays
- » Analysis of user errors during product use
- » Review of design features to reduce product use by unintended users
- » Comparison of the use of old and new designs of products