

ABSTRACT

The Construction of Preference in Engineering Design and Implications for Green Products

by

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This dissertation incorporates the construction of preference into engineering design methodology. Currently, engineers view customer preferences as existing a priori, evoking metaphors such as “need-finding.” For some product design activities this perspective is sufficient, but for others it is limiting. Behavioral psychology research asserts that individuals construct preferences on a case-by-case basis when called to make a decision. Decisions about products that are both psychologically and functionally complex are likely subject to inconsistent preference construction and dependent on context. This is problematic; for example, customer preferences exhibited during design-research interactions may be different from preferences exhibited in the market. This dissertation investigates green products, which resonate with people’s environmental values, yet are difficult to evaluate in terms of environmental impact. A literature review suggests eight cognitive reasons why preference for green products may be highly inconsistent.

Three contributions are provided: (1) A framework for identifying and representing decision context in preference models and a related case-study of modeling preference inconsistency versus heterogeneity. It is found that modeling both is useful to designers; and that only some people have inconsistent preference for green products. (2) A design optimization that includes construction of preference as an uncertain parameter and as a variable. It is found that a green product’s success in the market increases when preference is actively controlled, for example, through design, education, and advertising efforts. (3) A design method that uses manipulations of preference construction to identify customer-perceived relationships between product attributes. The crux-sentinel attribute relationship is formally defined, and specific relationships between product attributes are identified in a case-study demonstration.

People have an ever-increasing amount of choice in their product decisions, and interpreting and reacting to the nuances of their preferences is crucial to product design success. Manifold psychological issues have become important during product purchase and use, such as concern for the environment, safety, morality, and individualism. This dissertation demonstrates that issues of psychological import can have unanticipated effects on product decisions, via the construction of preference. Designers can use the design methods presented here to address these effects and shape the product decisions of the future.