

## Chapter 2.1

# Measuring the Human Element in Complex Technologies

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### ABSTRACT

Measuring satisfaction can provide developers with valuable insight into the usability of a product as perceived by the user. Although such measures are typically included in usability evaluations, it is clear that the concept itself is under-developed. The literature reveals a lack of cumulative, systematic research and consequently the field is in “disarray” (Hornbæk, 2006). Clearly, the area needs a strong theoretical foundation on which to base research. This paper reviews the literature on user satisfaction and proposes a conceptualisation and definition of the concept that will aid researchers in the development of valid measures.

### USER SATISFACTION AS A USABILITY PARAMETER

The ISO 9241-11 standard suggests assessing usability in terms of performance by measur-

ing *effectiveness* and *efficiency*, and in terms of internal state by measuring *satisfaction*. It recommends that at least one measure of each parameter should be included in usability evaluations. Despite this, Lindgaard and Dudek (2003, p. 430) have observed that the:

*Human-computer interaction literature has traditionally concerned itself almost exclusively with effectiveness and efficiency with satisfaction being regarded (as) mainly a by-product of great usability.*

Although satisfaction is a central concept in HCI it has been described as “underdeveloped” (Tractinsky, 2004, p. 352). It is the criterion most often included in usability evaluations (Kirakowski, 2002) but there is little understanding on the part of evaluators of what exactly they are measuring, and often the tools they employ are poorly developed. This article will illustrate the consequences of the lack of a cumulative, systematic approach to research that is evident in the

literature on user satisfaction (Hornbæk, 2006). It will be shown that much of what is known about satisfaction is based on relatively little empirical work and represents opinion rather than fact. The diversity of adjectives used in satisfaction measures is symptomatic of the lack of a cumulative, systematic approach to research in the field. Hornbæk (2006, pp. 90, 91) observes that “comparisons across studies become difficult because of this diversity, as does the understanding of distinct dimensions of subjective satisfaction.”

Clearly, the field needs a theoretical foundation on which to base research beginning with a sound conceptualisation of the construct and a suitable definition.

There are very few definitions of satisfaction to be found in the HCI literature. Possibly the closest the field has to a standard definition is that provided by ISO 9241-11, where satisfaction is defined as “freedom from discomfort and positive attitudes towards the product.” However, this is quite a broad definition that gives little insight into the nature of the satisfaction construct. Although there is no widely-accepted definition, there seems to be a number of common elements that most researchers agree on. Satisfaction is:

1. A response (either cognitive or emotional) on the part of the individual (Chin, Diehl, & Norman, 1988; LaLomia & Sidowski, 1990; Lindgaard & Dudek, 2003)
2. To an interactive system
3. Based on the degree to which the user feels the device facilitates the completion of a particular goal (LaLomia & Sidowski, 1990; Bevan & MacLeod, 1994; Kirakowski, 1999)
4. That is linked to usage (Lund, 2001; Kirakowski, 2002)

These characteristics are similar to those of the attitude construct in social psychology. Indeed, satisfaction is often described in the literature as an attitude (Melone, 1990; Nielsen, 1993; Kei-

nonen, 1998; Shneiderman, 1998). Melone (1990) suggests that conceptualising satisfaction in this way provides the necessary theoretical foundation for research and “retains the essential elements embodied in the user satisfaction construct.”

This article starts by reviewing attempts to measure and uncover the structure of user satisfaction from early HCI, research on Information Systems, and from recent HCI. Checklist approaches to usability in general (e.g., Reiterer & Oppermann, 1993; Ravden & Johnston, 1989) will not be reviewed here as they are too broad in scope; neither will the influential research of Dzida, Herda, and Itzfeldt (1978) for the same reason. Although each of these approaches creates methods of assessment which involve questionnaires, they only look superficially like satisfaction questionnaires; they are closer to checklists.

The measurement of satisfaction would greatly benefit from the provision of a sound theoretical base for research (Melone, 1990; Hornbæk, 2006). Melone (1990) suggests that this would be best achieved by conceptualising satisfaction as an attitude. Although HCI uses the term *attitude* regularly in discussions on satisfaction, rarely are the implications of this way of conceptualising satisfaction addressed. This article will go on to illustrate how this conceptualisation does indeed retain satisfaction's essential elements while also clarifying some theoretical issues facing researchers, specifically (1) determining the nature of the user's response (i.e., whether it is cognitive or emotional), (2) conceptualising satisfaction as a characteristic of the interaction (quality in use) rather than as a product attribute (quality of features) and (3) understanding the relationship between satisfaction and usage behaviour. Following conceptualisation of satisfaction as an attitude, a definition of the construct in keeping with its character as a usability parameter is offered.

Finally, four proposals are made for the future development of measuring instruments for satisfaction.

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