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Chapter V

System and Training Design for End-User Error

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Errors are a major problem for users. In the distant past, the users of computer technology often were limited to computer professionals with extensive technical training. With the growth of personal computers and the Internet, millions of people without technical backgrounds use computer technology on a daily basis, both at work and for leisure activities.

Because errors can be such a problem for the end user, it is important to examine the causes of error, as well as different approaches for assisting the end user. This chapter presents definitions of error, as well as a taxonomy of user error. There are two general approaches for assisting the end user in responding to errors: system design and training design. Both of these are discussed in-depth in this chapter. The purpose of this chapter is to describe the current situation of end-user error and suggest ways to improve the end -user experience.

WHAT IS AN ERROR?

Defining an error can be challenging, since several different definitions of errors have been proposed in the literature. These definitions generally fall into two categories (Arnold and Roe, 1987). One set of error definitions is *user-centered*; the other set of definitions is *system-centered* (Arnold and Roe, 1987).

User-Centered Definitions of Error

Users want to complete their tasks successfully. User-centered definitions consider errors from the point of view of the user. User-centered definitions of error view an error as when a user's desired action is not carried out (Norman, 1983).

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Users are concerned with reaching their goals, and from the users' point of view, errors keep them from reaching those goals. Some of the user-centered definitions of error that have been presented in the literature are:

- when a user's intention or goal is not attained (Arnold and Roe, 1987, p. 204)
- the non-attainment of a goal (Frese and Altmann, 1989).

User-centered definitions do not blame users for errors. User-centered definitions of error only state that errors keep users from reaching their goals. Zapf et. al. point out that for an error to be defined as such, a specific program or system must be designed to perform the task that the users want (Zapf et al., 1992). If the user has a specific goal, but the program or system is not designed to perform the tasks to reach such a goal, then this is called a functionality problem (Goodwin, 1987). For instance, if a user attempts to use a statistics program to browse the Web, this would be considered a functionality problem, not an error, because the application (the statistics program) was not designed to meet the user's task goal (browsing the Web). The applications and systems should be designed to perform the tasks to reach the users' goals.

System-Centered Definitions of Error

System-centered definitions of error view errors from the system's point of view; user goals are not addressed. System-centered definitions of error are more technically oriented. From the system's point of view, if something cannot process successfully, it is due to an error on the user's part. System-centered definitions of error blame the users (Lewis and Norman, 1986). Some of the system-centered definitions of error in the literature include:

- an action that violates a rule (Frese and Altmann, 1989).
- something that the system cannot respond to (Lewis and Norman, 1986, p. 411).
- actions that are inappropriate (Booth, 1991).

User Perception Of Error

Although system-centered definitions of error blame the user for errors, it is not useful to blame a user (Zapf et al., 1992). In human-computer interaction research, the focus is on assisting and designing for the end users of technology (Dix et al., 1998; Preece et al., 1994; Shneiderman, 1998). We postulate that an error occurs whenever a user *perceives* that an error occurs. If the user perceives that an error occurred, it does not make a difference whether system designers classify it as an error or not. The end user is not concerned with theoretical differences in classifications. Instead, the end user is frustrated because they are not able to reach their task goal. Inexperienced end users frequently tend to blame themselves for making an error (Carroll and Mack, 1984; Lewis and Norman, 1986). Errors intimidate less experienced end users. More experienced end users tend to be confident in their abilities (Carroll, 1990).