THEORIES THAT APPLY TO TECHNICAL DOCUMENTATION

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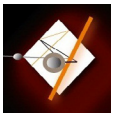
Written instructions govern, guide, and control user actions on a daily basis in tasks that range from operating industrial equipment, installing a wireless router, to using computer software. These instructions must be accurate and clear, because omissions or ambiguous procedures may lead to incomplete tasks or mistakes (Moore, 1996). Incomplete tasks may result in inaccurate accounting or reporting, which could have economic consequences. Furthermore, mistakes or an accumulation of mistakes might have consequences that are more serious (Moore, 1996). For example, comprehensive and accurate procedures are critical to the safe and effective operations in a nuclear plant. Errors encountered in following procedures can lead to permanent shutdown of a multimillion dollar investment as experienced at Three Mile Island in



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1979, and can result in catastrophic events as experienced at Chernobyl in 1986 (Wieringa & Farkas, 1991).

Written instructions such as emergency procedures and software documentation are a genre of technical communication. For software, documentation is a descriptive extension of the software product. The implications of poorly developed information can be catastrophic for financial reasons. For example, there is a potential liability in defective documentation because statements can become "express warranties, guarantees that the product will work as described" (Kaner, 2004, p. 194; Smith & Shirk, 1996). If the product does not perform as described in the documentation, the "vendor has breached the contract and the customer can demand compensation" (Kaner, 2004, p. 194).

Studies of the role and value of documentation have shown that high quality documentation can reduce after-sales costs, and in many cases can pay for itself (Mead, 1998). In many organizations, documentation is taking the place of some employee training, as businesses search for ways to reduce costs (Fontelera, 2009). Whether documentation is an extension of the product or is a replacement for training, documentation is a learning medium that can transform the user experience, providing useful and practical information presented in a context-sensitive format.

The expanding role of technical documentation as a learning instrument suggests that a broad application or adaptation of learning theory could be beneficial. When instruction and learning occur in the workplace, often software and the accompanying documentation are involved. Readers of documentation "read to do" (Redish, 1989, p.

289) and "read to learn" (p. 289). The goal of *reading to do* is to "extract information for immediate action" (Redish, 1989, p. 289) and the goal of *reading to learn* is to "absorb information for future recall" (p. 289). How these goals are accomplished depends on the approach used to design and develop the documentation.

As a learning medium, technical documentation must transmit, translate, and articulate the meaning of software (Scott, Longo, & Wills, 2006). The documentation writer's responsibility is to design and develop content that promotes learning rather than simply presenting information. It is not enough to transmit and translate the information from the expert to the user; rather, the writer must negotiate the flow of information from the perspective of the user and draw upon the expert's knowledge (Slack, 2003).

The enigmatic process of technical writing is an art and science that requires writing talent and the capacity to translate abstract concepts and technical jargon into usable content (Slack, 2003). Technical writing involves the design and construction of documentation that "accommodates technology to the user" (Dobrin, 2004, p. 107). Effective writing enables learning, because it is "a kind of semipermeable membrane that lets understanding leak through at a controlled rate" (p. 107).

Designing content to support this process may be frustrating and challenging for writers because most users treat documentation as a tool, reading it only when a problem arises or when an explanation is needed. The reader decides what to read and how much to read and interprets the meaning based on his or her background, experience,

and knowledge (Sun, 2006). Readers do not necessarily pick up a guide to read from front to back; reading is sporadic, which means that the design and packaging must meet their needs.

This is the enigma of technical communication—how to convey effective information that meets the user's needs, compels the user to act upon the new information, and invites the user to return to the documentation.

Theories for Technical Documentation

Technical communication is a multidimensional and multidisciplinary field; it is comprised of visual presentation, artistic and creative expression, typography, information technology, and writing (Carliner, 2001). Technical communication is crossdisciplinary because it overlaps and has synergy with instructional design, usability, and information design. Moreover, the technical communication genre of technical documentation promotes learning, just as do these other disciplines (Coe, 1996).

Effective writers bridge the gap between the expert and the end-user–non-expert; therefore, the writer must know *how* to bridge the gap, which may be very wide and murky. Furthermore, theory gives the writing approach its credibility, and it is theory that enables the writer to design and develop content that will serve the user (Hubbard, 2006).

Principles of learning that apply to the design and development of documentation include cognitive load and constructivism. Cognitive load is concerned with long-term memory, working memory, and

contextual relevance. Cognitive load is about balancing the amount of information, structuring the delivery into manageable chunks, and maintaining content relevance for the learner (Sweller & Chandler, 1994). Constructivism focuses on how the learner interacts and processes the information, because knowledge is constructed rather than acquired (Ormrod, 2008).

Design practices that support working memory and contextual meaning adopt a task-oriented style that originates from the early 1980s with the rise of cognitive psychology (Mirel, 1998). A task-oriented approach allows the user to think about how to use the software to accomplish work with a real world context. Meaningful task-oriented headings designed in the context of the workplace signal user action (Redish, 1993, 1997, 1998). For example, a software menu with labels of *Users*, *Roles*, *Privileges*, and *Skills* must be presented in the context of user tasks within the documentation. Without context, the user may not be inclined to read the documentation, because these labels do not necessarily inform. Conversely, the documentation can present these labels as *Administering User Accounts*, *Assigning Roles to User Accounts*, *Assigning Privileges to Roles*, and *Defining User Skills*. These labels are action-oriented and they inform the reader.

To further illustrate this point, a task labeled *Refreshing the System* matches the *Refresh* command of the software interface but it may not indicate any relevance to a user. It introduces more questions such as what, why, and when. However, the label *Monitoring the System* is more descriptive, and may provide a clue to a relevant activity in the workplace. *Monitoring* connotes watching over something, whereas *re-*

freshing connotes to revive or restore (Visual Thesaurus). *Monitoring* may be more descriptive and applicable than *refreshing*. The writer's challenge then is to use terms and phrases that are meaningful to the workplace, and to avoid using software labels that may be unsuitable for the user's situation. This is an example of what a constructivist approach can do for user comprehension; the design must address and represent the variables and the relationships to provide the user with a context that fits the dynamics of daily workplace practices (Mirel, 1998).

Are these principles of learning consciously applied in the design and development of software documentation? Has the research community evaluated these principles for documentation? A study by Johnson (1997) suggested that writers with a higher level of education were more likely to address user needs through task orientation, which is a key attribute of a user-centered focus that supports learning. Johnson's observations may also suggest that principles of learning could relate to instructional documentation.

There is recognition within the field of technical communication that certain attributes of theory are important. Although the mention of theory is infrequent, there seems to be little debate about the value of theory in technical communication. The mention of theory by authors is seldom explicitly discussed through the lens of the principles of learning. "Technical communication practices and curricula have always bore the marks of influential, though not always explicit, theory" (Hart-Davidson, 2001b, para. 3). Grice (2001) acknowledged, "Members at all levels of STC and of the profession at large have bemoaned

the lack of theoretical basis for what we do as professional technical communicators" (para. 2). Nonetheless, we have the works of theorists such as Karen Schriver (1997) and Janice Redish (1993) who have contributed theoretical underpinnings of technical communication in document design and cognitive processes.

Yet, there is a theory gap in the field of technical communication in which "the ranks of working professionals *and* academics in technical communication should participate in activity that makes the core expertise of technical communication explicit" (Hart-Davidson, 2001a, p. 147). Moore (1997) proposed a theory of instrumental discourse for technical communication that focuses on content directed to the workplace, places emphasis on context of the material, focuses on relating how to accomplish a task, considers how to explain complex procedures, and empowers the user by teaching how to perform a series of actions. The instrumental aims of technical communication are "governance, guidance, control, or execution of human activities" (Moore, 1997, p. 166). These aims are carried out in product documentation, reference manuals, installation instructions, laws, policies, and forms.

Mehlenbacher (2008) addressed theory in terms of cognitive learning and information spaces in his discussion about communication design. He too admitted that the instructional and communication design community conducts much research; however, researchers have focused very little on their "audiences as *learners* first and foremost, who engage in complex *learning* activities whenever they interact with information" (p. 140). There has been limited "interaction between

researchers studying communication design and researchers studying instructional design and learning theory" (p. 144).

How can learning theory be introduced to practitioners to show relevance toward the design and development of quality documentation? We need case studies of documentation sets that have been redesigned for the purpose of reducing cognitive load and enhancing learning. ■

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