Preface to the Special Issue: Considering the Warning Context—New Research Methodologies and Advances

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In the last two decades, a large body of research has been published on warnings. There have been hundreds of research-based articles written in various journals as well as several comprehensive books.

This special issue of *Human Factors and Ergonomics in Manufacturing & Service Industries* (*HFEMSI*) concerns the topic of warnings. Although there have been special issues on warnings in several human factors/ ergonomics journals, this is the first for *HFEMSI*. Warnings are relevant in the sectors of manufacturing and service because hazards are embedded in most contexts today. For example, in manufacturing, there are dangers in the production side of product and equipment, as well as hazards involved in the actual use. There are diverse contexts in which warnings are used as a means to disseminate safety information for the purpose of reducing hazard-related harm to people and property. Examples include warning labels on products, signage in environments, and admonitions in operator's manuals for industrial equipment.

Co-occurring with the growing body of warning research has been the development of models to conceptualize the cognitive processing involved when people encounter effective warnings (e.g., Edworthy & Adams, 1996; Lehto & Miller, 1986; Rogers, Lamson, & Rousseau, 2000). A recent iteration of the communication-human information processing (C-HIP) model (see Wogalter, 2006) can be used to conceptualize much of the body of research on warnings.

The C-HIP model depicted in Figure 1 has two main sections, each with several component stages. The first section of the framework uses a communications framework to focus on a warning message being sent from one entity (i.e., the source) to another (i.e., the receiver) through some channel(s). The second section of the model focuses on the receiver and how people internally process information. This section interfaces with the first through effective delivery of the warning to individuals who are part of the target audience. When warning information is delivered to the receiver, processing may be initiated, and, if not blocked in some way, will continue across several stages—from attention switch, attention maintenance, comprehension and memory, beliefs and attitudes, motivation, and possibly ending in behavior.

Unlike most previous warnings models, the current C-HIP model explicitly references the influence of other environmental stimuli on warning effectiveness. Environmental influences are a broad classification of aspects, other than the product warning itself, which could affect how the warning is processed. These extrinsic influences can include other nonwarning information on a label, adequacy of lighting, and other people's involvement when the warning is encountered. C-HIP also places great emphasis on the receiver's personal characteristics, such as demographic factors that might affect the processing of warning information. Environmental influences are part of the context in which the warning is processed. Contextual influences also include the co-occurring internal aspects of the individual who is processing the warning.

The current special issue is composed of five research-based articles. At first glance, they may seem to address widely diverse topics. Closer inspection, however, reveals that each article addresses how the context in which a warning is encountered might influence its effectiveness. Several of the articles introduce methodological innovations that could enhance future investigations of warnings. These works include the observations of Goldsworthy, Mayhorn, and Meade on the issue of tailoring warning content to prevent the hazardous behavior of sharing and borrowing prescription

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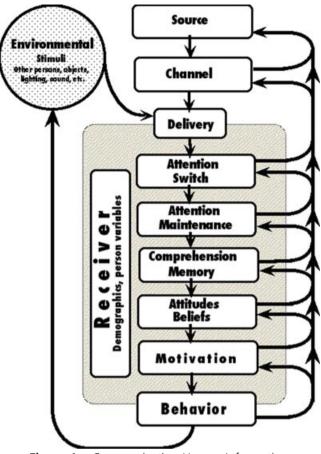
Figure 1   Communication-Human Information Processing (C-HIP) Model.

medications. Goldsworthy and colleagues introduce an analytic technique known as latent class analysis (LCA) as a means to effectively communicate with a demographically diverse target audience. In another article, Wogalter and Feng describe a laboratory procedure for investigating the transmission of warnings through social communications (i.e., warning information received indirectly from other people as opposed to directly from the source manufacturer) in the context of a computer-memory installation task. In the third article, Smith-Jackson, Wogalter, and Quintela describe how cultural differences can influence how farm workers interact with pesticide safety warnings. Furthermore, they provide useful methodological guidelines for assessing the cultural usability of risk communications, such as warnings. In the laboratory, Duarte, Rebelo, and Wogalter describe the potential for virtual reality systems to enable the exploration of behavioral compliance without placing users at risk for physical harm, which is one of the main difficulties in doing

research that measures actual behavioral compliance. Finally, Tam and Greenfield explore how indirect alcohol warnings produce cultural and gender differences in the likelihood of intervening to prevent others from driving while intoxicated.

This special issue brings together a set of studies investigating various factors that might impact safety behavior in diverse settings and domains where warnings are likely to be encountered. These studies are important because they address the relatively unexplored areas of warning context, including social and demographic factors. Moreover, a number of methodological innovations are described. These methodologies take the form of analysis techniques, experimental procedures deployed in the laboratory, and cultural usability guidelines that can be used to evaluate safety communications in the field. These techniques represent new approaches to improving warning effectiveness. Although there is considerable diversity of method and findings across the specific articles, they generally fit within the global or unified C-HIP model. It is our hope that readers of the articles within this special issue will be assisted in developing new ideas regarding warning design and applications to ultimately improve safety (Sanders & McCormick, 1993).

Finally, we wish to make a few acknowledgments. All of the articles in this special issue originated from a subsection of presentations given at the Applied Human Factors and Ergonomics Conference 2008 Warning Symposium in the 2nd International Conference on Applied Human Factors and Ergonomics held in July 2008 in Las Vegas, Nevada. All of the articles in this issue were peer reviewed by the main editor of journal, Professor Waldemar Karwowski, and decisions of acceptance were made by him. Thus, to avoid conflict of interest, the editors of the special issue were *not* part of that process. We wish to thank Professor Karwowski and the blind reviewers who assisted in making excellent suggestions for improving the articles from the time they were originally submitted as manuscripts to their final acceptance. We would also like to thank Laura Abell, the journal's editorial assistant, for helping in the administration of the issue.

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