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DESIGN OF ECOLOGICAL INTERFACES

Kim J. Vicente

Cognitive Engineering Laboratory

Department of Mechanical & Industrial Engineering

University of Toronto

Toronto, Canada

benfica@mie.utoronto.ca, www.mie.utoronto.ca/labs/cel/

This session is the second of three to examine the implications of an ecological approach for interface design. The goal for this session will be to consider how the general ecological approach discussed in the first session can be applied to the specific problem of interface design. Several examples of ecological interface design will be presented, and the importance of transferring this technology to practical problems industry will be discussed.

In human factors engineering (HFE), design is where "the rubber meets the road". Because of the inherently applied nature of our discipline, even basic research should be informed by, and work towards, practical problems faced by industry. As David Meister and others have repeatedly pointed out, HFE has not been as successful as it could be at transferring results, methods, and theories from basic research to applied practice. Some of us (e.g., Flach, 1990; Vicente, 1990) believe that the reason for this is that HFE has adopted the information processing paradigm as a basis for research, a paradigm that emphasizes people's internal constraints (e.g., storage capacity) and tends to ignore environmental constraints (e.g., a particular work context). Since design is all about creating a fit between people and their work environment, it should not be surprising to find that research that under-emphasizes half of the equation is not so useful in designing artifacts to fit environments.

Partially in response to this state of affairs, a growing number of researchers have adopted an ecological approach to HFE (e.g., Flach, Hancock, Caird, & Vicente, 1995; Hancock, Flach, Caird, & Vicente, 1995). This approach puts a greater emphasis on the critical role that the environment has in influencing human behavior. As a result, the hope is that there will be greater success in transferring research results to applied practice.

Interestingly, the strong coupling between the ecological approach and practical design problems was readily apparent from the start. Gaver (1986) appears to have been the first to adopt an ecological approach to interface design. His work on auditory icons was motivated by a practical problem that designers in the computer industry were facing at the time, namely how to communicate information using sound. Gaver adopted the ecological approach as well as specific findings from the study of ecological acoustics to inform his design. His efforts eventually resulted in technology transfer to industry in the form of SonicFinder, an auditory interface developed and implemented at Apple (Gaver, 1989).

The works presented by Beltracchi and by Yamaguchi & Tanabe in this symposium continue this tradition. Both of these papers show the importance of building interfaces that reflect both human information processing constraints and the functional constraints of the work ecology -- in this case,

nuclear power. The result in both cases is innovative human-computer interfaces that promise to improve safety. Beltracchi's Rankine cycle display has already been empirically shown to lead to improved performance for professional operators, and Yamaguchi & Tanabe are in the process of evaluating their novel displays in a full-scope nuclear power plant simulator facility. These efforts demonstrate another dimension of the ecological approach – a commitment to evaluate designs under representative experimental conditions.

While the available empirical evidence suggests that there are many reasons to be optimistic about the value of the ecological approach to designers in industry, many questions remain unanswered and there is a great deal of room for improvement (Vicente, 1999). The work presented by Stappers et al. and by Pejtersen in this symposium illustrate this point well. Stappers et al. present a new methodology for searching databases using criteria such as intuition and taste, a problem that has been relatively ignored in the literature. Similarly, Pejtersen points to the importance of expanding the types of models that serve as the basis for ecological interface design, thereby addressing a limitation of previous work in this area.

Collectively, these efforts show that the ecological approach to interface design has a strong connection to practical design problems and that this connection is only likely to grow, both in breadth and in depth.

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