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Real-Time Decision Support: Development and Assessment of a Real-Time Knowledge-Based System Embedded within a Real-Time Group Decision Support System

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REAL-TIME DECISION SUPPORT: DEVELOPMENT AND ASSESSMENT OF A REAL-TIME KNOWLEDGE-BASED SYSTEM EMBEDDED WITHIN A REAL-TIME GROUP DECISION SUPPORT SYSTEM

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ABSTRACT

This research investigates the effects of a decision support system in the context of real-time, small group decision making. Following the March 1989 *Exxon Valdez* oil spill, development of a real-time expert system (called the Shipboard Piloting Expert System, or SPES) was begun. The SPES is a prototype decision aid designed to add knowledge-based decision support functionality to the integrated bridge system GDSS previously developed and fielded for Exxon Shipping Company.[1] The SPES is a representative application of automated decision aids to hazardous real-time decision making situations (Grabowski and Sanborn 1992).

The multi-disciplinary approach utilized in this research draws on decision support concepts and group process theories to form a framework for development and evaluation of real-time decision aids in terms of effectiveness (i.e., group output and group process) and efficiency (i.e., real-time performance). The research is based on the group performance models proposed by researchers such as McGrath (1984), Hackman and Morris (1975), DeSanctis and Gallupe (1987), and Foushee and Helmreich (1988), and on the real-time knowledge-based systems concepts of Chandrasekaran, Bhatnagar, and Sharma (1991), and Paul, et al. (1991).

This paper describes the group output assessment of the SPES, performed as an experimental study aboard the VLCC *SeaRiver Benicia*. The *Benicia's* bridge watch team was observed performing with and without the SPES over 24 transits of Prince William Sound in Alaska. The watch team performed in the natural shipboard setting while exposed to a variety of piloting situations and stress factors. Following the suggestions of Williams and Goldberg (1982), Cooper, Bertsche, and McCue (1981), and Kristiansen, Rensvik, and Mathiesen (1989), the Valdez harbor transit was divided a priori into meaningful legs and the environment factors for each leg combined into a unitary single measure of voyage stress.

The research contribution of this work is focused on adding to the body of knowledge concerning the impact of automated decision aids to small group operational decision making situations. This will contribute to improved understanding of bridge watch team decision making in the maritime domain, improved understanding of small group decision making under stress, and improved understanding of embedded real-time decision aids' functional and performance requirements.

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[1] In August 1993, the name of the Exxon Shipping Company was changed to SeaRiver Incorporated.

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