

Optimizing cognitive task load in naval ship control centres: Design of an adaptive interface.

M. Grootjen^{a,b}, E.P.B. Bierman^c, M.A. Neerincx^{b,c}

^a *Defense Materiel Organization, Directorate Materiel Royal Netherlands Navy, Department of Naval Architecture and Marine Engineering, P.O. Box 20702, 2500 ES The Hague, The Netherlands*

^b *Technical University of Delft, P.O. Box 5031, 2628 CD Delft, the Netherlands*

^c *TNO Human Factors, Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, the Netherlands*

Abstract

In the last 2 decades, major changes in information technology have taken place. In process control, the ongoing automation and the application of new technologies caused a radical change in the position of the operator. Combined with manning constraints, and the ever increasing pressure to maximize the operational capability, navies stand for a huge challenge. Because of this new situation, operators need personalized support which can differ in time: the system should accommodate the user with the right task support at the right time. This paper presents the design and first user evaluation of an adaptive interface. A method for cognitive task analysis and 4 support concepts, which were validated for static function allocation and interface design, were taken as starting point. Specific instances of the resulting adaptive interface are the possibility to redirect the alarm (system or operator initiated), and the changing functional layout (e.g. buttons, alarm categories). A first user evaluation of the interface with 64 navy students shows promising results. The method for cognitive task analysis and the 4 support concepts prove to be useable for adaptive support as well. Evaluation shows very positive results on the support system, specifically on the task allocation functions.

Keywords: human-computer interaction, adaptive interface, mental load, cognitive engineering, dynamic task allocation, ship control centre.