A simple minded model for levels of automation

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Abstract

The lack of a common theoretical and methodological framework for describing Levels of Automation (LOA) makes it difficult to compare results from different studies. Starting from this consideration, previous studies showed that automation could be effectively defined in terms of the amount of information traded by humans and machines. However, the automation aids employed in those studies were always 100% reliable, and it is well know that imperfect automation can affect the operators' reliance, mental workload and performance. Therefore, a critical issue for testing and improving the model is to investigate the differential impact of unreliable automation aids. A new study has been devised for testing human performance and workload in different LOA conditions by changing the reliability of the automation aid during a visual search task. Results showed differential effects of LOA and reliability on performance and mental workload.

Introduction

The pervasive implementation of automated functions into highly complex systems led to the need of examining the nature of the interaction between humans and the automatic tools they use.

The classical definition of automation refers to "the execution by a machine agent (usually a computer) of a function that was previously carried out by a human" (Parasuraman & Riley, 1997 p. 231). Automation may be introduced to reduce costs, to prevent errors, and/or to relieve the human operator of parts of the task. However, the integration of automated functions in the system can change the nature of the interaction between humans and machines, imposing new and unexpected demands on the operators. Despite this, the so-called "technological imperative" impels to automate tasks as full as possible. Of course, this is not always achievable (due to technological limitations), not considering that a vast corpus of studies showed that automation is not always beneficial. Automation can impair performance due to well documented phenomena such as increase of mental workload, decrease of situation awareness, degradation of skills and complacency effects (Parasuraman et al., 1993; Sarter et al.1997). With the aim of minimising the costs and maximising the benefits, automation aids might be conceptualized as different levels (Levels of Automation: LOA) that are flexibly implemented during system operations.

In D. de Waard, F.O. Flemisch, B. Lorenz, H. Oberheid, and K.A. Brookhuis (Eds.) (2008), *Human Factors for assistance and automation* (pp. 301 - 312). Maastricht, the Netherlands: Shaker Publishing.