Examining shared mental models of Air Traffic Controllers: what do they entail and what is shared?

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Abstract

Air traffic control is a very dynamic and complex team task which requires a high degree of coordination and information exchange. Future modifications foreseen in Air Traffic Management will result in more automation, pre-flight planning and electronic communication. This novel situation increasingly requires controllers to anticipate information requirements and meet team and task demands in circumstances when time is of the essence. Shared mental models enable a team to take appropriate actions and fulfil teammates' needs by ensuring a common understanding of the task and team. Therefore, the current research explored shared mental models of air traffic controllers which have been shown to contribute to efficient team performance. By means of a cognitive task analysis the mental models controllers have were identified and resulted in an air traffic control specific framework of shared mental models. In order to validate the framework and assess the degree of sharedness of controllers' mental models, a web-based card sorting task was undertaken recently. Several teams of two air navigation service providers in the Netherlands participated in the research including Tower/Approach Controllers (N=15), Area Controllers (N=22) and en-route controllers (N=63). The results are presented and discussed in terms of their importance for future air traffic management.

Introduction

Shared mental model theory is an extension of the mental model theories and research that started in the '80s to accommodate a need for richer knowledge constructs than simple facts (e.g., "radio frequency of Schiphol = 123.9"), concepts ("aircraft separation"), or rules ("During a peak period 2+1 runway is applied"). Mental models (MMs) are meaningful integrations of such simple knowledge structures and as such they can function as "mechanisms whereby humans generate description of system purpose and form, explanation of system functioning and observed system states, and prediction of future system states" (Rouse & Morris, 1986, p. 360). Research into mental models often focuses on the development of

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