

Cognitive Work Analysis of a Sensor to Effector System: implications for network structures

Daniel P. Jenkins, Neville A. Stanton, Guy H. Walker,
Paul M. Salmon, & Mark S. Young
Brunel University, Uxbridge, UK

Abstract

This paper presents a Cognitive Work Analysis of a command and control experimental environment. The network facilitates the exchange of information between agents in the field and a series of centrally located commanders. The environment developed allows the manipulation of dependent variables to establish the most efficient network structure for a variety of different scenarios. Cognitive Work Analysis has been used to analyse and model the experimental system and hypothesise the implications of changes to the network structure and the resulting influence this will have on the system and the agents contained within. The analysis uses a *Work Domain Analysis* to capture the purpose of the system. A *Control Task Analysis* outlines the task required to fulfil the purpose of the system. This task is broken down in a *Strategies Analysis*, which explains the possible ways that the system can be configured to enable the same end state. A *Social Organisation and Co-operation Analysis* elucidates which of the actors within the system can perform the tasks required. Finally a *Worker Competencies Analysis* describes the resulting behavioural characteristics the actors will exert depending on the level of tasks they are assigned.

The domain

The system consists of two distributed teams located in an urban environment of approximately 20 hectares. The first team is made up of a number of reconnaissance units known as 'sensors'. Sensors have the ability to sweep a geographic area and identify targets that need to be neutralised. The second team is made up of effectors who are responsible for neutralising identified targets. In this simple experimental model sensors are the only actors that can detect targets and effectors are the only actors who can neutralise previously identified targets.

There are a number of ways that information can be transmitted between the sensors and effectors based on the way the system is configured. The system can be set up to enable information to be sent via the commanders with information travelling up the hierarchy and then back down to the units in the field, alternatively information can be sent peer to peer.