Cognitive Work Analysis: Research and Applications

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COGNITIVE WORK ANALYSIS: RESEARCH AND APPLICATIONS

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This symposium describes research motivated by cognitive work analysis, a framework for the analysis, modeling, design, and evaluation of complex sociotechnical systems. This discussant's overview describes some of the themes that cut across the four papers in the symposium.

Cognitive work analysis (CWA) is a framework for the analysis, modeling, design, and evaluation of complex sociotechnical systems (Rasmussen et al., 1994; Vicente, 1999). CWA is relatively unique in that it deliberately tries to identify the requirements associated with events that are unfamiliar to workers and unanticipated by designers, a problem of increasing importance in many business sectors. In short, the goal of CWA is to design for worker adaptation.

Recently, more and more people are using CWA as a framework to tackle both research and design problems. The papers in this symposium provide a representative sample of the research being conducted from this perspective. In this discussant's overview, I identify and discuss several themes that cut across the four papers in the symposium.

One theme is that complex problems require systematic solutions. CWA was developed for the relatively unique demands associated with complex sociotechnical systems (e.g., nuclear power). These multi-faceted problems present a challenge to the capabilities of designers. Iterative, trial-and-error or prototype-and-test methods alone are far from sufficient for problems of this scale. It seems that this complexity must be tackled with a systematic framework that provides structure and coherence to what might otherwise be an overwhelming challenge. CWA offers one set of concepts that can be used for this purpose.

A second theme to emerge in this symposium is that all of the papers are driven by practical problems (e.g., designing better training systems, evaluating prospective designs). This characteristic contrasts with research that is driven by new technology, pet theories, or convenient methodology. Problem-driven research is more likely to lead to technology transfer, and these papers provide evidence for this assertion. For example, the fact that work domain analysis was used as part of a military procurement project and was found to be useful illustrates a level of influence on applied practice that is all too rare in the human factors community. This achievement bodes well for the practical relevance of CWA.

A final emerging theme that has implications for future research is that CWA is not a panacea. In some cases, it must be complemented by other techniques (e.g., training methods). In other cases, the CWA framework itself needs to be expanded (e.g., to account for temporal coordination across tasks). These points could be interpreted as limitations, or they can be interpreted as a sign that CWA is a productive paradigm for conducting research that is making a positive contribution to the generation of new, useful knowledge.

Being a discussant for this symposium, I will take the liberty of describing how we are approaching some of the "unresolved" issues surrounding CWA (Vicente, 1999). The overarching goal of our research is to try to improve safety, productivity, and worker health. To do that, we need to transfer our research results to industry. There seem to be several criteria that need to be considered in achieving this secondary goal: clarity, utility, consistency, and reduction of effort. If people in industry are to buy into using CWA, then they need to understand the framework. To facilitate this process, we have sometimes used terms that are familiar to those in the domain in which we are working (e.g., medicine). If we are to show that CWA is useful to people in industry, we also need to demonstrate that we can solve their problems. To facilitate that process, we have sometimes tailored the way we do an analysis to the characteristics of the problem we are trying to solve (e.g., interface design). Despite these attempts at contextualizing CWA, it is also important to be consistent at some level, otherwise we are not really using one framework to tackle many applications. Instead, we would be making ad hoc changes resulting in a different framework for each application. We have addressed this issue by adopting a common set of concepts and definitions that we use as analysts to ensure consistency. Finally, and perhaps most importantly of all, if CWA is going to be adopted by industry, we need to vastly reduce the creativity and effort it currently takes to conduct an analysis (Lind, 1999). Potential, but as yet unexplored, ways to address this issue include defining a realistic process that can be followed to conduct a CWA and defining industry-specific templates that can be used to bootstrap an analysis efficiently. Unless we tailor our research results to the needs and constraints of our intended customers, we cannot expect them to adopt what we have to offer.

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