Cognitive Systems Engineering

A workshop over two days (with a one-day option)

Presented by Dr. Gavan Lintern

San Diego: March 11-12, 2014

Fee: $750 ($375 student)

Fee for one-day (first-day) option: $450 ($225 student)

Venue: Mission Valley Training Room, 2815 Camino Del Rio S., San Diego

Brief Description

The first day of the workshop involves an in-depth discussion of cognitive task analysis and its methods from the perspective of naturalistic decision-making. Topics to be discussed include individual and team cognition, and macro-cognition as they relate to decision making and planning.

The second day covers the more general cognitive systems engineering topics of cognitive assessment, cognitive design, return on investment, risk perception and design of future cognitive systems.

The workshop is delivered in an interactive presentation format with brief participatory exercises. An experiential information-management exercise undertaken early on the first day provides a basis for delegates to develop a situational appreciation of the central ideas. The experiences gained by delegates during that exercise, together with documented narratives of counter insurgency operations by US Marines, are used throughout the seminar as source material for collaborative analysis and design activities.

To register or for more information

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Introduction

Cognitive systems engineering is a design discipline that addresses the way we interact with technology and the way we use technologies to interact with each other. Drawing on contemporary insights from cognitive, social and organizational psychology, cognitive systems engineers seek to design systems that are more effective and more robust. The focus is on amplifying the human capability to perform cognitive work by integrating technical functions with the human cognitive processes they need to support and on making that cognitive work more reliable.

Cognitive systems engineers assist with the design of human interfaces, communication systems, training systems, management systems and teams. They employ principles and methods that bear on the design of procedures, processes, training and technology.

Examples of systems that will benefit are military command and control, civil air traffic control, transportation, communication, process control, power generation, power distribution, health care, management, and large-scale project infrastructure.

Workshop Objective

This two-day workshop introduces the fundamental concepts of cognitive systems engineering and offers an in-depth treatment of selected and relatively straight-forward analytic and modelling methods.

Having completed this workshop, delegates will understand the nature of naturalistic decision making and macro-cognition and will have developed some skill with basic techniques, specifically the critical decision method and decision-centered design.

Training Methods and Materials

The workshop is delivered primarily in an interactive presentation format with brief participatory exercises. An experiential information-management exercise undertaken early in the first day provides a basis for delegates to develop a situational appreciation of the central ideas. The experiences gained by delegates during that exercise, together with documented narratives of counter insurgency operations by US Marines, are used throughout the workshop as source material for collaborative analysis and design activities.

Frequently Asked Questions

Why does it matter? If we do the engineering right, humans will adapt.

Humans are, indeed, adaptable. The more resourceful members of our species can make anything work for them. However, it takes effort. When the human operators have to struggle with a system to get it to work for them, they have less time and energy for productive work. Furthermore, any system that is difficult to use demands more extensive training, which is an additional cost. Most troubling, clumsy systems induce human error, which can result in huge costs in time, material, and human life.

Humans are the problem. Can't we avoid all this by automating everything and getting rid of the human?

Those who think this ignore the fact that human errors are typically induced by poor design. Additionally, this sort of attitude assumes implicitly that systems are always well-designed and well maintained and that design engineers can anticipate all contingencies. The extensive record on industrial disasters shows otherwise. Indeed, human adaptability and resourcefulness are strengths, without which, complex modern systems could not work.

Automation is the holy grail of human systems integration. However, humans are inevitably participants as designers, managers and benefactors. The idea of a fully automated system that can deal with all contingencies without human intervention is a science-fiction fantasy. Once we retreat from that ideal and allow humans some interventionist role, the interface between the machine and the human must be configured on the basis of cognitive systems engineering principles. The cognitive systems engineering course deals with this issue and offers a sensible perspective on the way that automation can be used to good effect.

What is the added value?

What is the added value for anything? If you add insulation or double-glazed windows to your home to save energy costs, you can calculate the costs and estimate the savings. That is straightforward enough. Large-scale engineering projects are not as straightforward. To assess the added value of cognitive systems engineering, we would have to track and compare projects that used no cognitive systems engineering versus those that used a minimal amount versus those that used a decent amount, and even then, we would have to assess the quality of the cognitive systems engineering that was used. Those sorts of data are not available anywhere. The course does, however, discuss a small set of selected projects in which a modest amount of cognitive systems engineering saved many times its cost. The course also covers incidents in which flawed cognitive performance has resulted in huge costs in terms of loss of productivity and loss of human life.

I am not an engineer. How could this be useful for me?

The emphasis in this one day workshop is more about how people think, plan and make decisions and how teams and organizations can work effectively than it is about how to design technology. There are a huge number of misconceptions in these areas, all of which go under the general heading of *commonsense*. Malcolm Gladwell is one who has made something of a career out of pointing out the flaws in *commonsense* thinking, but he has barely scratched the surface. This workshop provides a systematic overview of seemingly counter-intuitive ideas that can enhance cognitive performance for individuals, teams and organizations.