Human Systems Integration

A workshop over five days

Presented by Dr. Gavan Lintern

Adelaide: 12-16 May 2014

Fee: $4566 (Early-Bird Fee: $4109)

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Brief Description

Human Systems Integration is a Systems Engineering strategy. It enhances system performance by integrating technical functions of subsystems with human work processes those technical functions need to support.

This workshop focusses on the cognitive aspects of Human Systems Integration and introduces delegates to powerful methods of cognitive analysis and cognitive modeling. The final two days of the workshop are devoted to describing how these analysis and modeling tools can be applied to human systems integration within system design, development and acquisition. Delegates spend approximately half of their workshop time on exercises that give them experience in the use of the analysis and modeling tools.

To register or for more information

The workshop is administered by Project Performance International, a company that delivers training worldwide on systems engineering and related disciplines.

For more information on this workshop and the venue, please visit the Project Performance International website at www.ppi-int.com, or contact Gavan Lintern at glintern@cognitivesystemsdesign.net

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Introduction

Human Systems Integration is a systems engineering strategy that enhances system performance by integrating technical functions of subsystems with the human work processes those technical functions need to support. Human Systems Integration addresses the design of technological support systems such as interfaces and decision aids. It also addresses human resource issues such as team design, organizational design, staffing, selection and training. The goal of Human Systems Integration is to establish a robust system in which the human capability to perform work is optimized.

This world-leading workshop focuses on cognitive issues, which are particularly challenging for Human Systems Integration because standard engineering methods do not capture the essential complexities of cognition. This workshop introduces delegates to specialized methods of human systems analysis and design, and illustrates how those methods can be used to enhance performance and safety within large-scale socio-technical systems. The course, while standing alone, complements Project Performance International's 5-day systems engineering course.

Workshop Overview

The analysis and modelling techniques to be introduced in this workshop have been developed to address the challenge of designing system functionality that will support human participants as they interact with technological functionality to perform cognitive work. This five-day workshop covers two complementary frameworks of analysis and design. The basic tools of each are described and then demonstrated, to illustrate how they can be applied to enhance human systems integration within systems development and acquisition. Interactive design exercises are used to give delegates practical experience with the techniques.

Training Methods and Materials

Being an overview workshop, this course is delivered primarily in an interactive presentation with exercises.

A specific, but fictitious, problem is posed at the beginning of the workshop. Exercises relevant to that problem are introduced for each of the analytic tools covered in the workshop. These exercises progressively develop the cognitive work requirements for the system under consideration. The intent is to demonstrate how the suite of analyses discussed in the workshop contributes to a comprehensive treatment of cognitive work within the design and acquisition of a complex, socio-technical system.

Frequently Asked Questions

There are standards for this. Can't we rely on them?

Cognitive work is a problem area for standards. The human cognitive system is nonlinear and contextually dependent. There is currently insufficient knowledge to write meaningful standards that will guide a designer towards the development of effective cognitive support systems such as, for example, decision support systems and situation awareness support systems. Even where standards name a relevant problem area, such as workload, they offer no meaningful advice beyond the homily that workload should not be excessive. They offer no useful advice about how to assess whether or not workload is excessive or how to design so that it is not. My 5-day Human Systems Integration course deals with this issue.

Can't we adapt standard engineering analysis and modeling tools for this?

The engineering professions have many powerful analysis and modeling tools that find valuable service in other disciplines. However, context dependence and nonlinearity were once largely ignored in the engineering disciplines and even now, remain as challenging problems. Human Systems Integration needs to confront context dependence and nonlinearity.

Additionally, humans are powerful, multi-function systems. Few engineering tools address the human in any way but those that do, typically treat the human as a user or operator rather than as a functional part of the system. Such an approach fails to take advantage of the unique capabilities that a human can contribute to system performance.

The analysis and modeling tools covered in this course deal with those issues.

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 does take 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 cognitively oriented analysis and design principles. My 5-day Human Systems Integration 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 Human Systems Integration, we would have to track and compare projects that ignored Human Systems Integration to those that paid it some attention and those that paid it considerable attention. Even then, we would have to assess the quality of those efforts. These sorts of data are not available anywhere. My 5-day Human Systems Integration course does, however, discuss a small set of selected projects in which a modest amount of human systems analysis and design saved many times its cost. The course also covers incidents in which flawed human performance as induced by poor design has resulted in huge costs in terms of loss of productivity and loss of human life.

Can we afford this? Won't it increase costs and delay system delivery?

A well planned Human Systems Integration effort is more likely to decrease costs and to speed design. The real issue is whether the human interfaces and the cognitive work supports are done well or poorly. It will certainly cost more and delay system delivery if they are done poorly at first and then have to be redone.

Systems engineering already has the 9 domains for Human Systems Integration. Isn't this already covered there?

Yes, it is covered there but the analysis and modeling tools are not well described, particularly in relation to cognitive issues. To illustrate, noise suppression can be modelled by standard linear algorithms but the cognitive processing associated with gathering, interpreting and acting on information cannot. Cognitive analysis can be deployed to good effect in any information-intensive work domain. Health care, military command-and-control and industrial power generation are just three work domains that can benefit from the systematic analysis and design of cognitive work. The focus is on helping workers think more effectively by design of support technologies, work processes or training.

Does human systems integration link in any way to systems engineering?

Yes, human systems integration is just one piece of systems engineering but it has an important role to play. A module in the course covers this in extensive detail.