



Institute of
Ergonomics &
Human Factors

Contemporary Ergonomics and Human Factors 2014

Editors:

Sarah Sharples & Steven Shorrock

Contemporary Ergonomics and Human Factors 2014

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
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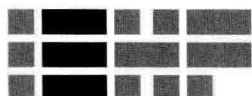
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Human Factors**

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A framework for human assessment in the defence system engineering lifecycle

J. Astwood, K. Tatlock, K. Strickland & W. Tutton

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Development of a Human Factors assessment framework for land vehicles

R. Saunders Jones, K. Strickland & W. Tutton

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Preface

This book contains the proceedings of the International Conference on Ergonomics and Human Factors, held in April 2014 at the Grand Harbour Hotel, Southampton. The conference is a major international event for ergonomists and human factors professionals and attracts contributions and delegates from around the world.

Papers are subject to a peer review process before consideration by the Programme Committee. The Programme Committee selects papers for publication in proceedings as full or short papers, as well as identifying the groupings of papers to form dedicated sessions at the conference. In addition to the open call for papers, many authors respond to calls for symposia – these papers are still subject to peer review but are included within dedicated specialist sessions. This conference included symposia on *Human Capability*, *Human Factors in Product Design*, *Human Factors in High Value Manufacturing Systems* and *Systems: Preparing for the Future*.

This is the first year that we have acted as editors of *Contemporary Ergonomics & Human Factors*. The diversity of topics within the papers is apparent and demonstrates not only the breadth of areas to which human factors is applicable but also the range of skills now exhibited by practising ergonomists. The diversity is reflected in the target domains of the papers, which include transport, defence, manufacturing, consumer products, health and wellbeing. The activities considered within each domain are similarly diverse, reflecting the roles of front-line operators to managers and leaders. The methods used and reported in the papers cover all aspects of ergonomics – physical, cognitive, social, organisational and societal.

Papers on *human factors in high value manufacturing systems* include some important themes such as lean ergonomics, human factors analysis in risk assessment, and the ‘next manufacturing revolution’. More specific applications include assembly work stations, robots and intelligent automation, aerospace manufacturing and hand fabrication. The issues explored in the papers are diverse, and include posture and musculoskeletal risk, skill, trust and safety.

Lifelong health and wellbeing has emerged as an increasingly important concern to society and therefore to ergonomics and human factors. This year, specific hospital-related papers include the design of patient information, information to support managers’ decision-making regarding shift design, and retained guidewires in central venous catheterisation. The conference also included a workshop on human factors and healthcare. Other papers consider device accessibility and ageing with respect to recreation, work and life generally. Turning to the future, a smart kitchen environment was simulated to consider how malfunctions in ‘smart environments’ affect user performance. More broadly, the need for sustainability was explored, considering the need to create a lasting commitment for sustainable living.

Product design was another theme addressed by authors. Papers explore a number of general issues such as the role of human factors and the relationship between

human factors and product design, and human factors contributions to consumer product safety. Specific issues include the concept of referability (or making things easy to refer to), the design and function of bicycles, and design of location based games for children. During the conference, there were also presentations for a student design exhibition. The role of human factors in user experience design was also the theme of a keynote presentation by David Gilmore this year.

A major theme on *systems* emerged. The papers will be of interest to many practitioners in safety-related industries, and consider several frameworks, approaches and methodologies, including human factors integration, user systems architecture, MODAF and ISO standards, and methods for investigating social, information and task. Specific issues addressed of concern to industry include decommissioning and the robot lifecycle. During the conference, there was also a workshop on human factors for systems of systems.

Transport has been a consistent theme in *Contemporary Ergonomics & Human Factors* over the years, and this year is no exception. Most sectors are represented, including road, rail, aerospace and maritime. Automotive ergonomics papers include many forms of transport, including car, motorbikes and pushbikes. Emerging themes include the journey experience (e.g. autonomous vehicles, lift and car sharing, measurement), vehicle design, and motorcycle ergonomics. Rail remains a strong sector for ergonomics and human factors. Papers address safety systems for train driving such as driver advisory systems and the European Rail Traffic Management System. Other activities addressed include rail incident handling and user interfaces for decision support. The UK's 'High Speed 2 Project' also featured in papers on functional architecture design and the use of pictures and visual metaphors to explore complex problems. Key human factors concepts addressed include workload, drivers' allocation of visual attention and vigilance. In the maritime domain, decision making during critical incidents in dynamic positioning is considered, while in aerospace, papers consider aerospace manufacturing, as well as automation failures and human factors in flight operations.

Defence-related papers included learning conflict resolution lessons from industry to counter insider attacks in Afghanistan, and human assessment in the defence system engineering lifecycle. *Manufacturing* also features as a domain in many papers, covering traditional musculoskeletal considerations as well as interactions with robotics and intelligent automation.

Across all domains, workload, vigilance and human error remain key concepts in ergonomics and human factors. Papers this year include speaking under workload in first and second languages, the detection of workload overload, alarms, vigilance and noise. There was also a workshop on the concept of human error in human factors and society.

Collectively, the papers cover a range of key ergonomics criteria, including safety, health, wellbeing, comfort, productivity, efficiency, and sustainability, demonstrating the continued wide applicability of ergonomics and human factors

and the range of domains for which we must ensure there are appropriate methods and tools.

Editors

Sarah Sharples & Steven T. Shorrock, January 2014

Invited and Plenary Lectures

Donald Broadbent Lecture: “Human Capability”, Karen Carr

Keynote Lecture: “Socio-technical thinking and practice – Being braver!”, Chris Clegg

Plenary Lecture: “The Global Economic Recession: Impact On Workplace Safety And Health”, Jason Devereux

Institute Lecture: “Ergonomics, Resilience and Reliability – to ERR is human . . .”
Jon Berman, Greenstreet Berman Ltd

Keynote Lecture: “Making better things: The role of human factors in user experience design”, David Gilmore

Workshops

Several workshops were held, reflecting the need to maximise interactivity and engagement at conferences. This year, there were workshops and debates on the following:

- Human factors for systems of systems (Huseyin Dogan)
- Human capability: science, engineering, art and imagination (Glenn Hunter & Emma Sparks)
- Quick tricks in psychometrics (Bob Bridger)
- Human factors and healthcare (Patrick Waterson)
- Behaviour change (Claire Williams)
- Is ‘human error’ the handicap of human factors? (Steven Shorrock)
- Continual professional development (Adrian Wheatley)
- Hazards, risk & comfort (Ken Parsons)
- Design debate (Eddy Elton & Laurence Clift)

Programme Committee

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James Walton, Tina Worthy

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DONALD BROADBENT LECTURE

HUMAN CAPABILITY

Karen Carr

Cranfield University

This lecture will explore ways of thinking about ourselves and the systems we create and use, and what they mean for Ergonomics and Human Factors.

During the last century, interesting developments in understanding the world have arisen from the embracing of uncertainty. Rather than avoiding uncertainty in a deterministic fashion, these world views are non-deterministic, non-linear and holistic. Such ways of thinking and understanding help us to deal with complexity. How does the discipline of Ergonomics and Human Factors work in such worlds?

The late Professor John Wilson recognised the implications that a 'Systems' world view has for the Ergonomics and Human Factors development teams. In order to develop a system that has non-deterministic or emergent properties, the team developing it has to have certain properties such as flexibility and interconnectedness in order to recognise emerging interdependencies. Yet we know that many organisations that are tasked with developing complex systems are not structured in a manner that is amenable to working in this way.

The MOD has the task of developing many complex systems – or at least managing the development of them. They have taken a 'Capability' approach in order to achieve the agility necessary for dealing with complex needs and uncertain contexts. Does this mean the MOD organisation allows the sort of flexibility and inter-connectedness needed to take a systems approach? This issue will be explored, and some potentially useful ways of thinking about people and Defence Capability presented. This has implications for MOD's organisational and process infrastructure, in order for military capability to gain maximum value from its people and the attributes they can bring to the whole Defence enterprise.

