



A. IAN GLENDON, SHARON G. CLARKE  
AND EUGENE F. MCKENNA

# HUMAN SAFETY AND RISK MANAGEMENT

SECOND EDITION

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# Preface

Much has happened in the 10 years or so since the first edition of *Human Safety and Risk Management* was published. New journals on risk and safety have appeared — for example, *Health, Risk & Society*; *Journal of Risk Research*; *Policy and Practice in Health and Safety*; *Risk, Decision and Policy*; *Risk Management: An International Journal*; and *Transportation Research Part F: Traffic Psychology and Behaviour*. Longer established journals in the risk and safety field have gone from strength to strength, including: *Accident Analysis and Prevention*, *Journal of Safety Research*, *Risk Analysis*, *Safety Science*, and *Work & Stress*. The large amount of recent research literature that has been generated in the risk and safety field is reflected in two completely new chapters in this second edition. Over 56% of more than the 300 works referenced in Chapter 2 have appeared since the first edition of this book was published, while well over 70% of the 200 referenced works in the new chapter on safety culture have appeared since the publication of the first edition. Nearly 500 references cited within the book have appeared since 2000. In addition to including the new substantive chapters in this edition (though it is inevitable that our attempts to access and include the considerable volume of potential new material fall short in many areas), we have updated our text in numerous ways and have reworked material from the earlier edition. In these endeavors, we are delighted that Dr. Sharon Clarke joined the author team, adding her expertise and knowledge to that of the authors of the first edition.

The greatly increased volume of relevant material has been accompanied by changes in the way in which some concepts associated with risk and safety have been understood and presented. Controversies that have developed since the first edition was published include use of the term accident. While still in widespread public use, many authorities and sources increasingly eschew this term as being value laden and potentially prejudging blame through ascribing exclusive or prime personal agency at an event's location by attribution of emotional content. Workplace accidents typically involve one, or occasionally more, workers being injured as a result of encountering some energy force — for example, gravity, pressure, and heat — often exacerbated by other factors. We consider a more objective referent to be injuries — an undesired outcome that is frequently the object of prevention activity. Personal injuries can usefully be distinguished from incidents (a broader term that could involve plant or equipment damage), disasters — which are large-scale and could involve multiple fatalities, and near-hits (also called near-misses). The term accident has similarly come under critical scrutiny in the road transport domain, where it is increasingly being replaced by the more accurate and less emotive term crash. Wherever possible in this edition, we adopt this terminology. Exceptions include occasions when we describe the work of others whose use of the term accident cannot readily be reassigned.

This book's orientation is primarily, though not exclusively, psychological. Understanding risk and safety issues inevitably involves many disciplines, as does their effective management, and we acknowledge that an approach from any single discipline will be inadequate in addressing the full gamut of relevant issues. Thus, in Chapter 2, we explore a

wide range of approaches to risk, only some of which have their origins within psychology and cognate fields. In subsequent chapters, individual differences, but also some of the many ways in which human beings are alike, are explored within a risk and safety context. Throughout the book we draw on a range of disciplines as appropriate, with the overriding aim of increasing understanding of this important field of scientific study and professional practice.

We have identified the core audience for this book by the generic term scientist practitioner, primarily, although not exclusively those who work in safety, risk, and related fields. This term is used in the United States, Australia, and elsewhere to refer to those who straddle the divide between research and practice, and whose orientation has been considered as under threat within the broader organizational psychology domain, particularly within the United Kingdom (Anderson et al., 2001). Our reference to safety and risk scientist practitioners throughout the book should be taken to imply that all those who consider themselves to be, or who aspire to become, scientists or researchers in the broadest sense, and those who have an interest in health, safety, risk, and related topics are also to an extent practitioners — again in the broadest sense, including for example, the practice of teaching and writing as well as other forms of practice, such as training and consultancy. Similarly, practitioners in any field of health, safety and risk, in whatever form, should have the option of basing their practice upon scientific findings, even if they themselves do not consider themselves primarily to be scientists. To this extent, the term could encompass all those who work in the health, safety, and risk field, in whatever guise. We occasionally use an alternative synonym health and safety professional. One of our hopes is that the combination of scientific evidence, practical examples, and case studies presented in this book will go some way toward bridging the practitioner–researcher divide described by Anderson et al. (2001), at least within the safety and risk domain of organizational psychology.

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## About the Authors

**Dr. Ian Glendon** is associate professor in the School of Psychology, Griffith University, Queensland, Australia. His research interests include driver behavior/driver stress, OHS/risk management, and safety climate/culture. He has supervised over 20 research higher degree students to completion and has over 100 refereed publications, including three previous coauthored books. He has consulted for over 60 clients on OHS auditing, safety culture/climate analysis, accident/incident analysis, task analysis, and human error/reliability analysis. He is a registered psychologist in Queensland, a chartered occupational psychologist (U.K.), a Chartered Fellow of the Institution of Occupational Safety and Health, a member of several other professional bodies and president (2006–2010) of the International Association of Applied Psychology Traffic and Transportation Psychology Division.

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# Glossary

<b>AA</b>	Automobile Association (U.K.)
<b>ABS</b>	Advanced braking system
<b>ACAS</b>	Advisory, Conciliation, and Arbitration Service (U.K.)
<b>ACSNI</b>	Advisory Committee on the Safety of Nuclear Installations (U.K.)
<b>ACTH</b>	Adrenocortico tropic hormone
<b>AET</b>	Affective events theory
<b>AIDS</b>	Acquired immune deficiency syndrome
<b>ALARA</b>	As low as reasonably achievable
<b>ALARP</b>	As low as reasonably practicable
<b>AS</b>	Australian Standard
<b>ATP</b>	Automatic train protection
<b>AUD</b>	Australian dollar
<b>AVM</b>	Air vibration monitor
<b>AWA</b>	Australian workplace agreement
<b>AWS</b>	Automatic warning system (for trains)
<b>BACT</b>	Best available control technology
<b>BBC</b>	British Broadcasting Corporation
<b>BBS</b>	Behavior-based safety
<b>BRPM</b>	Basic risk perception model
<b>BS</b>	British Standard
<b>BSI</b>	British Standards Institution
<b>BSP</b>	Behavioral safety process
<b>CASA</b>	Civil Airline Safety Authority (Australia)
<b>CBA</b>	Cost benefit analysis
<b>CBI</b>	Confederation of British Industry
<b>CBT</b>	Cognitive behavior therapy
<b>CEO</b>	Chief executive officer
<b>CFIT</b>	Controlled flight into terrain
<b>CFQ</b>	Cognitive Failures Questionnaire
<b>CHD</b>	Coronary heart disease
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>COSHH</b>	Control of Substances Hazardous to Health (U.K. legislation)
<b>CRM</b>	Crew resource management
<b>CST</b>	Climate safety tool
<b>CT</b>	Cultural theory

<b>dB</b>	Decibel
<b>DSE</b>	Display screen equipment
<b>DTA</b>	Dynamic task allocation
<b>EAP</b>	Employee assistance program
<b>EC</b>	European Commission
<b>EC-JRC</b>	European Communities Joint Research Centre
<b>EEC</b>	European Economic Community
<b>e.g.</b>	For example
<b>EPI</b>	Eysenck Personality Inventory
<b>ESP</b>	Extra sensory perception
<b>et al.</b>	et alia (and others)
<b>EU</b>	European Union
<b>f</b>	Feet
<b>°F</b>	Degrees Fahrenheit
<b>FA</b>	Football Association (England)
<b>FFPI</b>	Five-Factor Personality Inventory
<b>FMEA</b>	Failure modes and effects analysis
<b>GB</b>	Great Britain
<b>GDP</b>	Gross domestic product
<b>GEMS</b>	Generic error modeling system
<b>GFT</b>	General failure type
<b>GHQ</b>	General Health Questionnaire
<b>GSK</b>	GlaxoSmithKline
<b>h</b>	Hours
<b>H</b>	High
<b>HAM</b>	Hierarchy of abstraction modeling
<b>H&amp;S</b>	Health and safety
<b>HAZOP</b>	Hazard and operability study
<b>HBM</b>	Health belief model
<b>HFIT</b>	Human Factors Investigation Tool
<b>HGV</b>	Heavy goods vehicle
<b>HIV</b>	Human immuno deficiency virus
<b>HMSO</b>	Her Majesty's Stationery Office (U.K.)
<b>HPWS</b>	High performance workplace system
<b>HR</b>	Human resources
<b>HRA</b>	Human reliability assessment
<b>HRM</b>	Human resources management
<b>HRO</b>	High reliability organization
<b>HSC</b>	Health and Safety Commission (U.K.)
<b>HSE</b>	Health and Safety Executive (U.K.)
<b>HSG</b>	Health and safety guidance
<b>HSL</b>	Health and Safety Laboratory (U.K.)
<b>HTA</b>	Hierarchical task analysis
<b>Hz</b>	Hertz

**IAEA** International Atomic Energy Agency  
**ICT** Information and communications technology  
**i.e.** That is  
**ILO** International Labor Organization  
**INSAG** International Nuclear Safety Advisory Group  
**IPO** Inputs, process, outputs (model)  
**IQ** Intelligent quotient  
**IR** Industrial relations  
**ISO** International Standards Organization  
**IWO** Industrial, work, and organizational (psychology)

**JCQ** Job content questionnaire

**KB** Knowledge based  
**kph** Kilometers per hour  
**KSA** Knowledge, skills, abilities

**L** Low  
**LMX** Leader–member exchange  
**LoC** Locus of control  
**LPC** Least preferred coworker  
**LTIFR** Lost time injury frequency rate

**m** Meters  
**MAO** Monoamino oxidase  
**MAUT** Multi-attribute theory  
**MBE** Management-by-exception  
**ME** Myalgic encephalomyelitis  
**MIV** Main inlet valve  
**MLQ** Multifactor leadership questionnaire  
**MMR** Mumps, measles, and rubella (vaccine)  
**MORT** Management oversight and risk tree  
**MRI** Magnetic resonance imaging

**N** Number  
**NA** Negative affectivity  
**n-Ach** Need for achievement  
**NASA** National Aeronautical Space Administration  
**n.d.** No date  
**NHS** National Health Service (U.K.)  
**NIOSH** National Institute for Occupational Health and Safety (U.S.)  
**NNC** National Nuclear Corporation (U.K.)  
**NOHSC** National Occupational Health and Safety Commission (Australia)  
**NPV** Net present value  
**NSW** New South Wales (Australia)  
**NZS** New Zealand Standard

<b>OBMod</b>	Organizational behavior modification
<b>OCB</b>	Organizational citizenship behavior
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>OHS</b>	Occupational health and safety
<b>OHSC</b>	Occupational health and safety committee
<b>OHSM</b>	Occupational health and safety management
<b>OHSMS</b>	Occupational health and safety management system
<b>OIM</b>	Offshore installation manager (company)
<b>OPQ</b>	Occupational Personality Questionnaire
<b>OSCI</b>	Organizational and safety climate inventory
<b>OSHA</b>	Occupational Safety and Health Administration (U.S.)

<i>p</i>	Probability
<b>PA</b>	Positive affectivity
<b>PBR</b>	Payment by results
<b>PE</b>	Person–environment (fit)
<b>PhD</b>	Doctor of Philosophy
<b>PHEA</b>	Predictive human error analysis
<b>PIF</b>	Performance influencing factor
<b>PP</b>	Precautionary principle
<b>PPE</b>	Personal protective equipment
<b>PR</b>	Public relations
<b>PRA</b>	Probabilistic risk assessment
<b>PRP</b>	Performance related pay
<b>PSB</b>	Pumped Storage Business (U.K.)
<b>PSF</b>	Performance shaping factor
<b>PSV</b>	Public service vehicle
<b>PTSD</b>	Post traumatic stress disorder

<b>QC</b>	Queen’s Counsel
<b>QHSE</b>	Quality, health, safety, and environment

<i>r</i>	Correlation coefficient
<b>RA</b>	Risk assessment
<b>RAAF</b>	Royal Australian Air Force
<b>RAF</b>	Royal Air Force
<b>RB</b>	Rules-based
<b>RBR</b>	Risk-based regulation
<b>RET</b>	Rational emotive therapy
<b>RHT</b>	Risk homeostasis theory
<b>RM</b>	Risk management
<b>RMS</b>	Risk management standard
<b>RMT</b>	Risk motivation theory
<b>RP</b>	Risk perception
<b>RR</b>	Risk resolution
<b>RSI</b>	Repetitive strain injury
<b>SARF</b>	Social amplification of risk framework
<b>SB</b>	Skills-based
<b>SCT</b>	Social capital theory
<b>sec</b>	Second (time unit)
<b>SEM</b>	Structural equation modeling

<b>SHE</b>	Safety, health, and environment
<b>SIOP</b>	Society of Industrial and Organizational Psychology
<b>SME</b>	Small and medium-sized enterprise
<b>SMS</b>	Safety management system
<b>SPAD</b>	Signal passed at danger
<b>SS</b>	Sensation seeking
<b>SSD</b>	System state diagram
<b>SSS</b>	Sensation seeking scale
<b>TA</b>	Task analysis
<b>TABP</b>	Type A behavior pattern
<b>TAFEI</b>	Task analysis for human error identification
<b>TAT</b>	Thematic Apperception Test
<b>THERP</b>	Technique for human error rate prediction
<b>TMI</b>	Three Mile Island
<b>TPB</b>	Theory of planned behavior
<b>TRA</b>	Theory of reasoned action
<b>TRRL</b>	Transport and Road Research Laboratory (U.K.)
<b>TSC</b>	Total safety culture
<b>TV</b>	Television
<b>UCL</b>	University College London
<b>U.K.</b>	United Kingdom
<b>UKAEA</b>	United Kingdom Atomic Energy Authority
<b>UN</b>	United Nations
<b>UQ</b>	University of Queensland
<b>U.S.</b>	United States
<b>USAF</b>	U.S. Airforce
<b>USS</b>	U.S. ship
<b>UWIST</b>	University of Wales Institute of Science and Technology
<b>VALS</b>	Values and lifestyle
<b>VDU</b>	Visual display unit
<b>vs.</b>	Versus
<b>16PF</b>	Sixteen personality factors (Cattell)





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