HFESA Human Factors & Ergonomics Society of Australia Inc.

PROCEEDINGS OF THE 59 ANNUAL CONFERENCE OF THE HUMAN FACTORS & ERGONOMICS SOCIETY OF AUSTRALIA CONFERENCE 2024

Brisbane, Queensland, Australia
25-27 November 2024

Editors: Elise Crawford, Sharonne Phillips and Nektarios Karanikas

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Entire e-Book

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Conference Chair's message

Over 2.5 days in beautiful Brisbane, we explored how human factors and ergonomics have been shaping our technological future. From world-first robotic cardiac ultrasound to groundbreaking AI applications, we discovered how our field has been transforming the way we work, live, and innovate.

Whether you joined us in person at the Brisbane Convention and Exhibition Centre (BCEC) or virtually, I hope you took advantage of every opportunity to connect with global leaders, emerging scientists, and passionate practitioners, share ideas, challenge assumptions, and contribute to creating more human-centred futures.

Thank you for making those 2.5 days count!

A/Prof Nektarios Karanikas

Conference Chair, HFESA 2024

Introducing HFESA 2024

This year marked the 60th birthday of the Human Factors and Ergonomics Society of Australia, a milestone during a time of rapid technology advancement shaping our future. The conference theme, *Human-Centred Futures: Technology, Transformation and Tomorrow's World* reflects current trends and underscores the importance of human-centred design in shaping the future.

HFESA 2024 hosted both virtual and in-person attendees, offering diverse knowledge-sharing opportunities. We invited submissions for long and short/poster presentations, workshops, and round table discussions. All contributions showcased the rigour and excellence our community is known for, with a strong emphasis on interdisciplinary, cross-sector approaches that prioritise human-centred designs and positive transformative outcomes.

We thank all authors and presenters for their submissions and patience throughout the review process. We extend our special gratitude to the reviewers and session chairs for their invaluable support in preparing and delivering a seamless event.

The programme featured keynote addresses, guest speakers, and industry and research-based presentations. Themes spanned a wide range of Human Factors and Ergonomics domains, including healthcare, transportation, AI, environmental ergonomics, psychosocial and musculoskeletal health, and advanced technologies. Truly inspiring, all sessions addressed pivotal topics such as designing for humans in an age of AI, ensuring safety using generative AI in the public service, and groundbreaking innovations in rural health.

Dr Elise Crawford, Sharonne Phillips, and Professor Paul Salmon

Conference Scientific and Programme Convenors, HFESA 2024

HFESA 2024 Conference Committee

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Qld University of Technology
Convenor

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Central Queensland University
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Jenny Fuller
Queensland Health
Communications

Dr Zohre Abedi CPE
University of Sunshine Coast
Social Programme

Assoc Prof Gemma Read
University of Sunshine Coast
Social Programme

Venue

Brisbane Convention & Exhibition Centre, Merivale St, South Brisbane, QLD.

Abstract Reviewers

1. Dr Zohre Abedi, University of the Sunshine Coast
2. Catherine Andrew, University of Wollongong
3. Prof Melissa Baysari, The University of Sydney
4. David Caple, David Caple and Associates P/L
5. A/Prof Carlo Caponecchia, University of NSW
6. Robyn Coman, Wollongong University
7. Mark Corbett, Boeing
8. Dr Elise Crawford, Central Queensland University
9. Fadzai Katsande, ARCH Artifex
10. Jenny Fuller, Queensland Health
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12. Yvonne Hinch, Transport for NSW
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16. Donna Lee, Workplace Health and Safety Queensland
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19. Valerie O'Keefe, Flinders University
20. Dr Sara Pazell, ViVA Health at Work
21. Sharonne Phillips, Occupational Ergonomics P/L
22. Wendy Pietrocola, Ergonomica
23. Kate Ponton, Defence Science and Technology Group
24. A/Prof Gemma Read, University of the Sunshine Coast
25. Shane Richardson, Delta-V Experts
26. Prof Paul Salmon, University of the Sunshine Coast
27. Dr Brian Thoroman, John Holland Group
28. Dr Haroun Zerguine, SafeWork SA

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Pre-Conference Site Visits & Workshops

MONDAY November 25 2024

8:00AM - 1:00PM	**Air Combat Centre/Airline Training Solutions - F/A-18 Super Hornet simulator** Pre-conference site visit with transport	
9:30AM - 11:30AM	**CARRS-Q Road Transport Research Facilities, QUT, Kelvin Grove** Pre-conference site visit	
	Clinical Skills Development Centre, Royal Brisbane and Women's Hospital, Herston Pre-conference site visit	
	Cross River Rail Experience Centre, CBD Pre-conference site visit	
	Transurban Control Room, Kedron Pre-conference site visit	
12:00PM - 1:00PM	**CONFERENCE REGISTRATIONS** **Brisbane Convention Centre - Plaza Level**	
	WORKSHOP ROOM 1 **ROOM P9**	**WORKSHOP ROOM 2** **ROOM P10**
1:00PM - 2:30PM	**Developing capability in work re-design for psychosocial risks** A/Prof Carlo Caponecchia	**NSW's regulatory approach to managing MSD risks** Ms Wenwan Lu
2:30PM - 3:00PM	**AFTERNOON COFFEE AND TEA BREAK**	
3:00PM - 4:30PM	**WhyWork Podcaster-for-a-day: Serious learning done playfully** Dr Sara Pazell, Dr Trajce Cvetkovski and Mr Alan Girle	**Welcoming AI in a medical setting: a Systems Thinking approach** Dr Magali Goirand
5:00PM - 6:30PM	**WELCOME RECEPTION** **Brisbane Convention Centre - Plaza North Terrace**	

Keynote Speakers

Professor Catherine Burns

Designing for humans in the world of AI

Human factors have never been more important than it is now, as we face revolutionary change with the growth of artificial intelligence enabled technologies. We must actively work for a human-centered approach to AI, where humans are appropriately in the loop. AI has the potential to dramatically augment human decision making, or to increase risk, error and bias. I will draw on several examples, from our work and potentially that of others, to demonstrate the importance of a human factors approach to AI. I am hoping this will kick off a broader discussion in the human factors community, and a recognition that we have a very important role to play in the AI future.

Professor Catherine Burns

Professor in Systems Design Engineering University of Waterloo, Canada

Catherine M. Burns is Professor in Systems Design Engineering at the University of Waterloo, Canada and Associate Vice President, Health Initiatives at the Office of Research at the University of Waterloo. In her past administrative roles she has been engaged with institutional and tri agency funding programs, research partnerships, Waterloo's equity in research action plan, and research computing. Catherine was the founder of the Centre for Bioengineering and Biotechnology at Waterloo and led the centre from a faculty to an institutional centre over 8 years.

In 2020 she chaired Waterloo's Health Initiatives Task force to develop a health strategy in response to Waterloo's 2025 Strategic Plan. In her role as AVP, Health Initiatives she is responsible for advancing Waterloo research in health and health technology. Catherine holds a Tier 1 Canada Research Chair in Human Factors and Healthcare Systems, has contributed over 300 publications and is the co-author of seven books and the PI on an NSERC CREATE Training program in biomedical technology and entrepreneurship which has trained over 40 graduate students from various faculties across campus.

Dr. S. Kate Conroy

The Safety of Generative AI in the Public Service

General purpose artificial intelligence (GPAI), particularly generative AI using LLMs are being used by Australian public servants to do government work. This keynote will discuss human factors and safety issues for human-generative AI teams in the public service. There are a diverse range of risks using generative AI in government as well as potential benefits to stakeholders across dimensions of wellbeing, autonomy and justice. Mica Endsley's paper Ironies of Artificial Intelligence (2023) notes generative AI's deceptively convincing prose may lead to paradoxical outcomes, such as lower quality work, less understanding, increased workload, cognitive atrophy, and overreliance by users. The NSW AI Workplace Health and Safety Scorecard (2021) helps teams assess the hazards and risks to workers using artificial intelligence (AI) in a workplace. The Scorecard looks particularly at risks to worker wellbeing and the impact of AI on relationships and workflow in the workplace. Used without care, generative AI may have sociological impacts including reducing the quality of human-human relationships as well as psychological impacts reducing worker job satisfaction leading to reduced commitment, disconnection, evasion and withdrawal. However, the risks and benefits of generative AI use are bespoken to context, user and domain, meaning broad-brush risk controls are unlikely to capture the nuance of their use. In 2024 there have been a slew of policies and frameworks released by both the federal government and state governments to balance the risks and benefits of generative AI in the public sector, such as the National Framework for the Assurance of Artificial Intelligence in Government, Queensland Government Foundational AI Risk Assessment (FAIRA) and the Australian Voluntary Safety Standard. This presentation will connect the human factors and ergonomics community to these frameworks and indicate opportunities to enhance worker experiences using generative AI in the public service.

Dr S. Kate Conroy

Dr S. Kate Conroy is an Adjunct Professor QUT Centre for Robotics and Adjunct Associate Professor Human-Centered Computing ITEE, UQ

Dr S. Kate Conroy is an Adjunct Professor QUT Centre for Robotics and Adjunct Associate Professor Human-Centered Computing ITEE, UQ. She is a specialist advisor AI safety and assurance for the Queensland Government and Responsible AI Lead Royal Australian Air Force (Specialist Reservist). She will speak in a personal capacity.

Dr S. Kate Conroy (née Devitt) is a specialist in building trustworthy, ethical, and assured robotics, autonomous systems, and artificial Intelligence (RAS-AI) systems in both military and civilian domains. Kate currently works as a Special Advisor AI Safety and Assurance Queensland Government and Specialist Capability Officer (Lead Responsible AI), Jericho Disruptive Innovation, Royal Australian Air Force. She has a PhD in philosophy (epistemology, cognitive science and applied ethics) and graduate certificate in cognitive science Rutgers University NJ USA and a BA (Hons) History & Philosophy of Science Melbourne University (philosophy of statistics). She is Adjunct Professor QUT Centre for Robotics and Adjunct

A/Professor Human-Centred Computing ITEE, University of Queensland. She is one of ‘100 Brilliant Women AI Ethics 2023′ and ’50 Women in Robotics You Need to Know About 2021’. Dr Conroy has been a member of TTCP AI Strategic Challenge Ethics & Law Working Group (2020-2023) and NATO HFM-322: Meaningful Human Control of AI-Based Systems (2021-2024).

Professor Anjum Naweed

Navigating the Nexus: Simulation, Artificial Intelligence & the Human Experience

People interact with numerous simulations every day and have done so since time immemorial—it is in the DNA of the human experience. Artificial intelligence has now found itself in this relationship, forming a triad. This keynote will delve into the intersection of A.I. and simulation, revealing insights that go beyond the familiar, completing the arc laid down by the other two conference keynotes. It will explore how A.I. enhances simulations to create more realistic, complex, and adaptive environments, but also how simulations, in turn, shape the development and testing of A.I. systems. These technologies are transforming the human experience, redefining how we interact with the world, make decisions, and envision our future. As we navigate this nexus of technology and humanity, the possibilities are boundless, but the challenges demand our deepest attention, creativity, and ethical reflection.

Professor Anjum Naweed

Professor Anjum Naweed is an applied researcher and current Australian Research Council Future Fellow. He is internationally regarded for his applied and theoretical advancements in transport human factors, though his work crosses into many domains. Anjum's research interests include complex decision-making and knowledge representation in skilled work, job design, creative and cultural applications of simulation, safety science, and systems thinking. His expertise is in understanding the relationship between people, technologies, tools, environments, and systems, and practically translating this across the complex domains.

Anjum has co-edited books, written over 150 peer reviewed articles and secured over $6 million in research funding. At the Appleton Institute—CQUniversity Adelaide, Anjum leads the Human Factors and Operational Readiness research cluster. He currently serves as a Scientific Editor for Applied Ergonomics, an international journal aimed at all those interested in applying ergonomics and human factors in the design, planning and management of technical and social systems. Anjum has been a Scientific Convenor for the Australasian Simulation Congress on five consecutive occasions, and for the Annual Conference of the Human Factors and Ergonomics Society of Australia twice.

Anjum's research has received numerous accolades. In 2012, he was awarded the Body of Knowledge prize from Simulation Australasia and the John Lane Award from the Human Factors and Ergonomics Society of Australia (HFESA). He has twice been a recipient of Vice-Chancellor's Award for Outstanding Researcher of the Year (2013; 2018), recognising his excellence in research activity, publication, and engagement. In 2022, he received the Simulation Achievement Award for clear and unambiguous, outstanding contributions to science, technology, and education, and Simulation Australia's Lifetime Membership Award.

Ron Cumming Memorial Lecture Recipient: Carlo Caponecchia

Centring the psychosocial in HFE

Details: The Ron Cumming Memorial Lecture is awarded annually at the HFESA Annual Conference for highly esteemed HFE-related research or application in a relevant area of HFE. The Ron Cumming Memorial Lecture will be presented at the conference on Tuesday 26th November 2024.

Associate Professor Carlo Caponecchia

Carlo Caponecchia is an Associate Professor in the School of Aviation at The University of New South Wales (UNSW) Sydney and Co-Associate Dean Equity Diversity and Inclusion in the Faculty of Science UNSW. He has a background in psychology and works in Human Factors and Safety. He has particular interest and expertise in psychosocial risks and safe systems of work. Carlo is a member of the Standards Australia committee on Occupational Health and Safety Management and was part of the ISO TC283 working group responsible for the development of ISO45003. He is the Past President of the International Association on Workplace Bullying and Harassment.

Guest speaker: Cathy West

Robotic Ultrasound – relieving Musculo-skeletal burden in sonography

Queensland Health has partnered with RMI Oceania to validate and utilise the new technology within the Royal Brisbane and Women's Hospital (RBWH) Tele-Cardiac Investigation Services, for patients living in Longreach and Cloncurry. RBWH Director of Cardiac Sciences, Dr Adam Scott said the new technology will transform rural healthcare, reducing rural disparity and removing barriers, giving patients the right treatment at the right time in the right location. This new technology not only benefits regional and rural cardiac patients, but can also transform the work of the sonographer, who perform the physically demanding echocardiograms.

Cathy West

Royal Brisbane and Women's Hospital

Cathy West is an accredited cardiac sonographer with extensive experience in the clinical, educational and service management aspects of echocardiography. Cathy has served on the Board of Directors for several professional societies in Australia, the United Kingdom and the United States and has a keen interest in improving both career longevity for sonographers and access to care for patients residing in rural and remote areas.

Entertainment speaker: Keir Beck

Master Adrenaline: The nexus between technology and stunt performance

There is a dynamic, agile, evolving relationship between new technologies and Hollywood movie stunt performance design and execution. These strategies include previsualisation, virtual planning, motion capture, animation, safety simulation and analysis, remote camera applications, wire and rigging systems, protective gear and equipment, systems analysis, intentional leadership, and state-of-art communication and coordination tools.

Keir Beck

Fin River Pictures

Internationally, award winning, Australian stuntman and film director based on the Gold Coast. He has won numerous awards for his stunt work, including the prestigious Screen Actors Guild Award for his Outstanding Performance by a Stunt Ensemble in a motion Picture and two Taurus Awards for Best Stunt Rigging and Best Stunt Coordination. Keir is known for his work on Mad Max: Fury Road (2015), Casino Royale (2006) and The Fall Guy (2024).

Best Paper Awards

Ken Provins Best Paper Award

About Ken Provins (1923-2013)

Ken Provins was educated at Wimbledon C.S., Brasenose College, Oxford in BA (Hons, Psychology & Physiology), MA (Oxon), and PhD (Reading). He completed War Service 1942-1946 in the Royal Air Force as a Pilot and Flying Instructor.

Ken was a member of the Physiological Research Unit at Royal Aircraft Establishment, Farnborough in 1949-1952, and member of the Medical Research Unit at Royal Aircraft Establishment, Farnborough in 1952-1962.

He was a Reader in Psychology at University of Adelaide in 1962-1968, then a Professor of Psychology at the Australian National University in 1968-1975. Ken was then the Deputy Vice-chancellor at University of Adelaide in 1975-1980, and University Professor until his retirement in 1983. He was appointed as an Honorary Visiting Research Fellow at University of Adelaide (Emeritus Professor) until moving to Brisbane in 1989. Ken then worked as an Honorary Research Consultant at University of Queensland in 1990-1999.

Ken was the organiser for the first Ergonomics Conference in Adelaide in 1964 and Secretary of the Steering Committee leading to the formation of the Ergonomics Society of Australia and New Zealand in 1966. He was elected to be one of the first four Fellows of the Society and served as the President in 1968-1970.

The honour of winning the *Ken Provins Best Paper* is awarded to:

- Recipient of the combined highest score for
- Paper/abstract (50%)
- Presentation (50%)

HFESA 2024 Recipient: Nichole Liddell

Paper: *The Perceived Impacts of Stressful Events on Train Driver Performance*

Nicole is a Research Assistant and PhD Researcher at the Centre for Human Factors and Sociotechnical Systems at the University of the Sunshine Coast.

Student Best Paper Award

The honour of winning the *Student Best Paper* is awarded to:

- A student member of the HFESA
- Recipient of the highest scoring submitted paper/abstract/poster
- Will be (or is) presented at the HFESA 2024 conference

HFESA 2024 Recipient is: Nicki Newton

Paper: *Dynamic Interactions Influencing Clinical Decision Support System Acceptance and Use*

Nicki is a PhD Candidate in the Digital Health Human Factors group and Research Officer in the Research in Implementation Science and eHealth group at the University of Sydney. Her research focuses on improving the acceptance and use of clinical decision support systems and other digital health technologies, across the system lifecycle.

HFESA 2024 Conference Program

TUESDAY November 26 2024

8:30AM - 9:00AM	REGISTRATIONS, WELCOME COFFEE/TEA & EXHIBITION		
9:00AM - 9:40AM	CONFERENCE OPENING AND WELCOME TO COUNTRY		
9:40AM - 10:30AM	DESIGNING FOR HUMANS IN THE WORLD OF AI Keynote Presentation: Professor Catherine Burns Chair: Professor Paul Salmon		
10:30AM - 11:00AM	MORNING COFFEE AND TEA BREAK & EXHIBITION		
		Transport SIG Room P9	
	ADVANCED TECHNOLOGIES CHAIR: BELINDA COX ROOM P10-11	ENVIRONMENTAL ERGONOMICS CHAIR: KEN HORRIGAN ROOM P9	TRANSPORTATION CHAIR: HELEN MOODY ROOM P8
11:00AM - 11:20AM	Wearable Augmented Reality for Telehealth: A Simulation-Based Evaluation Dr Chiara Santomauro	Identifying built environment hazards through HFE analyses of in-situ simulations Dr Natália Ransolin	A Systems Thinking Toolkit to Address Driver Distraction Dr Zohre Abedi
11:25AM - 11:45AM	Safeguarding Cognitive Well-being in an AI-Augmented Workplace Ben Kereopa-Yorke	Effects of dynamic thermal indoor conditioning on cognitive performance Amelie Reitmayer	Feasibility of a VR hazard perception task for older pedestrians Dr Ann Carrigan
11:50AM - 12:10PM	Adoption of Generative Artificial Intelligence Chatbots by the Health Workforce Mia Nazir	Cool neighbourhoods: a systems ergonomics approach for urban heat resilience Dr Nicholas Stevens	The perceived impacts of stressful events on train driver performance Nicole Liddell

TUESDAY November 26 2024

12:15PM - 12:35PM	Barriers and enablers when introducing and embedding cobots as coworkers Marina Vitale	Acoustic Vehicle Alerting System Sound Design for Electrified Buses Dr Christina Kirsch	Examining air travel accessibility information for people with disability Dr Vanessa Huron and A/Prof Carlo Caponecchia
12:35PM - 1:15PM	LUNCH BREAK AND EXHIBITION		
	PAB AGM ROOM P10-11	ESC SIG ROOM P9	
1:15PM - 2:05PM	ROBOTIC ULTRASOUND - RELIEVING MUSCULO-SKELETAL BURDEN IN SONOGRAPHY Guest Speaker: Cathy West Chair: Sharonne Phillips		
	HEALTHCARE CHAIR: JOLENE COOPER ROOM P10-11	HUMAN FACTORS LESSONS CHAIR: BRONWEN OTTO ROOM P9	WELLBEING CHAIR: PROF JODI OAKMAN ROOM P8
2:10PM - 2:30PM	Learning from workarounds related to digital technologies in healthcare Professor Tarcisio Saurin	Perspectives on the role of HF/E Experts in tomorrow's world Dr Elise Crawford	Optimising design through empathy building: Personas and Technology Dr Claire Greaves and Reece Cook
2:35PM - 2:55PM	Identifying design related risks in an older theatre complex Dr Thy Do	HF vs UX, what can we learn from the two? Peter Ha	Stop Lagging and Start Leading With Ergonomics Process Metrics Alison Heller-Ono
3:00PM - 3:20PM	Clinical Incident Investigations in the Age of Safety Management Dr Madeline Wu	Enhancing Incident Investigations: Bridging Jurisprudence and Work Design Strategy Dr Sara Pazell and Dr Trajce Cvetkovski	Understanding Psychosocial Risks in the Mining Workforce Amid Technology Advancements Dr Eden Li

TUESDAY November 26 2024

3:20PM - 3:50PM	AFTERNOON COFFEE AND TEA BREAK & EXHIBITION		
		Office SIG Room P9	
	ROUNDTABLES CHAIR: DR ELISE CRAWFORD ROOM P10-11	**KNOWLEDGE SHARING** CHAIR: MARINA VITALE ROOM P9	**FAB 5'S** CHAIR: SUZANNE JOHNSON ROOM P8
3:50PM - 4:10PM	**Special Interest Knowledge Sharing Tables** Join the roundtable discussions with our Nano Sponsors and HFESA SIG representatives	**A Public Speaking Approach to Scientific and Business Presentations** Sharonne Phillips	**1. Fab 5's** Jasper Vermeulen, Karen Davies, Dr Joseph Tully, Reece Cook and Mackenzie Evans
4:15PM - 4:35PM		**Lessons from First Time Human Factors Authors - Publishing your case study** A/Prof Nektarios Karanikas	**2. Fab 5's** Dr Andrew Petersen, Dr Karen Davies, Sharonne Phillips, Dr Sara Pazell
4:40PM - 5:40PM	HFESA AGM		
6:30PM - 11:30PM	CONFERENCE GALA DINNER Guest Speaker: Keir Beck Master Adrenaline: the nexus between technology and stunt performance Rooftop Level 12 - Rydges South Bank		

WEDNESDAY November 27 2024

8:00AM - 9:00AM		Healthcare SIG	
8:30AM - 9:00AM	WELCOME, COFFEE/TEA, REGISTRATIONS & EXHIBITION		
9:00AM - 9:45AM	THE SAFETY OF GENERATIVE AI IN THE PUBLIC SERVICE Keynote Presentation: Dr S. Kate Conroy Chair: Dr Elise Crawford		
	ADVANCED ANALYSES CHAIR: DR ANDREW PETERSEN P10-11 ROOM	**HEALTHCARE** CHAIR: KAREN DAVIES P9 ROOM	**AVIATION** CHAIR: PHILIPPA DODSHON P8 ROOM
9:50AM - 10:10AM	The Ironies of artificial general intelligence Professor Paul Salmon	The Assertive Statement Framework; explicit communication for improved patient safety Anthony Lock	Innovation Ecosystems: Lessons from the RAAF Professor Luke Houghton
10:15AM - 10:35AM	A meta-analysis of Human Factors in NSW Mining safety occurrences Kylie Newton	Dynamic Interactions Influencing clinical decision support system acceptance and use Nicki Newton	IRA/IRR for NTS assessment of Pilots in Indian commercial airlines Captain Nitya Jain
10:35AM - 11:00AM	MORNING COFFEE AND TEA BREAK & EXHIBITION		

WEDNESDAY November 27 2024

	MUSCULOSKELETAL CHAIR: BARBARA MCPHEE ROOM P10-11	DESIGN FOR HEALTH CHAIR: A/PROF MARGARET COOK ROOM P9	PSYCHOSOCIAL CHAIR: DR DANELLIE LYNAS ROOM P8
11:00AM - 11:20AM	Tackling MSD risks in sonography through improved work design Jenny Fuller and Chloe Robbins	Investigating Unplanned Intubation in the Neonatal Intensive Care Unit Rebecca Wang	Evaluating systems thinking resources for preventing work-related violence in hospitals A/Prof Gemma Read
11:25AM - 11:45AM	Managing the Risks of Musculoskeletal Disorders in NSW Local Government Wenwan Lu	Validation of a novel Intercostal Catheter Insertion (ICC) Part-Task Trainer Dr Jeffrey Kim	Stages of Change model in workplace interventions: a scoping review Elise Condie
11:50AM - 12:10PM	Insights from forty years of investigations into litigated personal injuries Dr Pujitha Silva	Evaluating a patient portal's usability: What do older adults think? Dr Adeola Bamgboje-Ayodele	Building Work Design Capabilities Using the PHRed-T: An Evaluation Study Professor Tim Bentley
12:15PM - 12:35PM	Comparison of ergonomic interventions on shelving practices within public libraries Nerilee Watts	Human Factors approach to redesigning proning pillows in the ICU Dr Kirsty McLeod	The Silent Struggle: Impacts of Serious Incidents across the Workplace Dr Clare Dallat
12:35PM - 1:15PM	LUNCH BREAK AND EXHIBITION		
1:15PM - 2:15PM	RON CUMMING MEMORIAL LECTURE: CENTRING THE PSYCHOSOCIAL IN HFE A/Prof Carlo Caponecchia Chair: Sharon Todd		

WEDNESDAY November 27 2024

	WORK DESIGN CHAIR: DR KAREN KLOCKNER ROOM P10-11	HEAVY INDUSTRIES CHAIR: DR TRAJCE CVETKOVSKI ROOM P9	STRATEGIES CHAIR: DR BRIAN THOROMAN ROOM P8
2:20PM- 2:40PM	Clarity Amidst Complexity: Workload Management in the Education Sector Dr Sara Pazell and Jill Lowry	Introducing Human Factors to a Truck Manufacturing Company A/Prof Nektarios Karanikas	Safety Climate Surveys: Integrating AI and Pulse Survey Methodologies Mackenzie Evans and Dr Claire Greaves
2:45PM - 3:05PM	A Human Factors Toolkit to Evaluate Workflow Management Systems Dr Zohre Abedi	HCD of an attractive, healthy, safe and inclusive minerals industry Dr Danellie Lynas	An industry case study in participative & data-driven ergonomics Dave Harry
3:10PM - 3:30PM	Identifying opportunities for AI in science workflows Dr Jessica Irons	Participatory ergonomics in action at a minerals processing pilot plant Professor Robin Burgess-Limerick	Improving workplace safety in gig work: Perspectives of key stakeholders Alice Cheng
3:30PM - 4:00PM	AFTERNOON COFFEE AND TEA BREAK & EXHIBITION		
4:00PM - 4:45PM	NAVIGATING THE NEXUS: SIMULATION, ARTIFICIAL INTELLIGENCE & THE HUMAN EXPERIENCE Keynote Presentation - Prof Anjum Naweed Chair: Kath Jones		
4:45PM - 5:00PM	WRAP UP AND CONFERENCE CLOSE Awards and 2025 HFESA Conference Announcement		
6:00PM	SOCIAL EVENT - NOSTIMO RESTAURANT HFESA QLD Branch invites you to a conference closing social event.		

Poster Presentations

PP. 1. Silent = Safe. Assessing Cavitation Prevention Procedures in Anti-Submarine Warfare

Julian Steinke, Band G[1], Van de Ketterij R[2] ;[1]Leiden University, Leiden, Netherlands, [2] Royal Netherlands Military Academy, Den Helder, Netherlands

Julian Steinke, Leiden University, Leiden, Netherlands

After focusing on unconventional naval engagements against irregular forces for years, anti-submarine warfare (ASW) re-emerges as an urgent topic within the defence community. The submarine still poses one of the largest threats to any naval or civilian vessel and modern submarines put surface ships at a disadvantage. Listening for underwater radiated noise (URN) is one of the most common methods to locate a vessel covertly. Cavitation, the largest contributor to URN, therefore, offers a prime opportunity for detecting surface ships while staying hidden.

This study aims to (1) assess the current procedures to detect and prevent cavitation on board naval ships and (2) to formulate recommendations for a potential cavitation management interface for ships of the future. We performed a functional resonance analysis (FRAM) using observations of multi-ship ASW missions on board a frigate of the Royal Netherlands Navy during a NATO exercise in the Atlantic. The data provides a broad picture of the interactions both within the crew and between crew and ship. The inclusion of a two-week exercise offers a unique opportunity to explore the effects of multi-day ASW operations in varying conditions on operator fatigue, workload, and readiness. The generated model creates an overview of the current processes on board. In addition, it identifies possible brittleness and indicates where a cavitation management interface could be integrated to support the crew most effectively.

This research project presents a strong base for advancing ASW methods and ensuring that naval forces can effectively counter submarine threats in the future. By improving our understanding of current cavitation management, we can develop more sophisticated tools and strategies to maintain naval superiority and safeguard maritime operations.

PP. 2. The Future of Primary Healthcare: Exploring AI for Non-Clinical Tasks

Alexis Wray

Artificial Intelligence (AI) is increasingly common in clinical or diagnostic tools, however the application of AI to relieve non-clinical or administrative burden in primary healthcare has received less attention. Evidence suggests that administrative burden is a contributing factor to GP burnout. The project explores opportunities and barriers to AI uptake and use by clinicians in general practice to reduce non-clinical or administrative burden.

A four-phased, mixed methods approach was designed to explore the problem space. Phase 1 involved semi-structured interviews with subject matter experts from government, academia and the private sector. Phase 2 involved semi-structured interviews and observations with primary healthcare professionals to understand what tasks they undertake, attitudes towards AI and opportunities for AI to improve workflow design. Phase 3 involved focus groups with consumers to

explore their attitudes toward AI use in primary healthcare. Phase 4 involved futures thinking activities, including identifying axes of uncertainty and developing future scenarios for the year 2035, exploring possible outcomes of both low and high government interventions.

Key-points:

1. AI is likely to present opportunities to improve efficiency in clinician workflows, leading to possible time savings, improved job satisfaction and increased patient throughput.
2. The discussion of AI is often a springboard into discussions of interoperability, fragmentation and information sharing failures in the current healthcare system. The benefits of AI solutions may be limited without addressing those challenges.
3. The classification of clinical and non-clinical tasks is challenging but will shape the regulatory landscape and risk-appropriate solutions.
4. AI is likely to change the composition of jobs, education and training in healthcare. The impact of increased AI usage is unclear, particularly on roles, scope of practice and how primary healthcare will be delivered in the future.

PP. 3. Performance Shaping Factors in Human Autonomous Agent Teaming

Vincent Galea, Institute for Intelligent Systems Research and Innovation

Measurement of performance shaping factors (PSF) (such as trust) in human autonomous agent (AA) teaming (HAT) has typically used metrics that originated from human robotic and human automation interaction/integration (HRI and HAI) applications. These constructs have been shown as prone to bias or other psychometric issues such as face validity when applied to HAT PSFs due to lack of calibration to the context.

Such gaps will become increasingly problematic in the application of artificial intelligence (AI) to HAT. Individual personality attributes, for example, significantly influence dispositional, situational and learned trust which help determine input-mediator-output parameters. Targeted AI should increase the accuracy of AA teaming behaviour to match individual human team member characteristics, expectation and confidence, with the potential for optimal human/AA dynamic reliability, calibration and HAT operational performance.

The aim of this project is to establish a ‘human profile’ metric and extend it to the paired AA team dynamic – ‘tailoring’ the AA swarm to the human team member.

Repeated measures/longitudinal assessment of human participant operational search task and AA state awareness will be combined with personality, other psychometric, physiological and neurological measures to produce an individualised profile. This profile will feed into AI learning data for paired AAs. Situation awareness, workload and team performance accuracy and response time measures will be compared with alternate HAT models to assess team predictability, reciprocity, calibration, agile response and novel scenarios.

The derived tailored operational profile metric should allow more accurate and transparent application of AI to AA team member behaviour learning models whilst allowing incremental and predictable changes in the HAT dynamic. It should help calibrate overall team PSFs and

promises more granular, repeatable measures that avoid the issues reported with traditional approaches.

PP. 4. Validating Shared Awareness through the Lens of Human-AI Team

Mohamed Farghaly, Hettiarachchi I, Bhatti A, Jui J, Institute for Intelligent Systems Research and Innovation (IISRI), Deakin University, Newtown, Australia

Mohamed Farghaly, Institute for Intelligent Systems Research and Innovation (IISRI) - Deakin University, Newtown, Australia

Human-AI Team (HAT) has been trending due to the rapid advancement in AI, leading to superhuman performance. With the trend of HAT, the research community identified several factors that affect HAT. Situation awareness (SA) acts as the central factor that connects all other factors, including trust and coordination. Degree of complexity in SA increases within a team, as each individual needs to collect information from others and the environment. This collective awareness required is referred to as, team SA, and a channel of information exchange needs to exist and be maintained to a certain degree, known as shared SA. Shared SA is essential for maintaining coordination among team members.

However, shared SA for HAT has only been theorised based on human-team science, and there needs to be valid proof that this applies to HAT. Studies to date in HAT have focused on how AI would affect shared SA, however only from the perspective of the human members of the team. There is a need to measure shared SA based on the communication of the information and its correctness between the members and the performance of the members due to the differences between the human and the AI agent when working toward a goal.

To achieve this, a task analysis method, like Goal-Direct Task Analysis (GDTA), can be utilised. GDTA holds immense potential in deepening the understanding of shared SA in HAT by identifying all relevant SA information required to achieve the task's goal. Shared SA can be quantified by manipulating the information and communication channel between the agents as GDTA will influence AI's design. By doing so, the performance of each member and the outcome of the task will reflect on shared SA and will help in validating the definition of shared SA in HAT. Figure 1 provides an overview of the differences between team SA and shared SA.

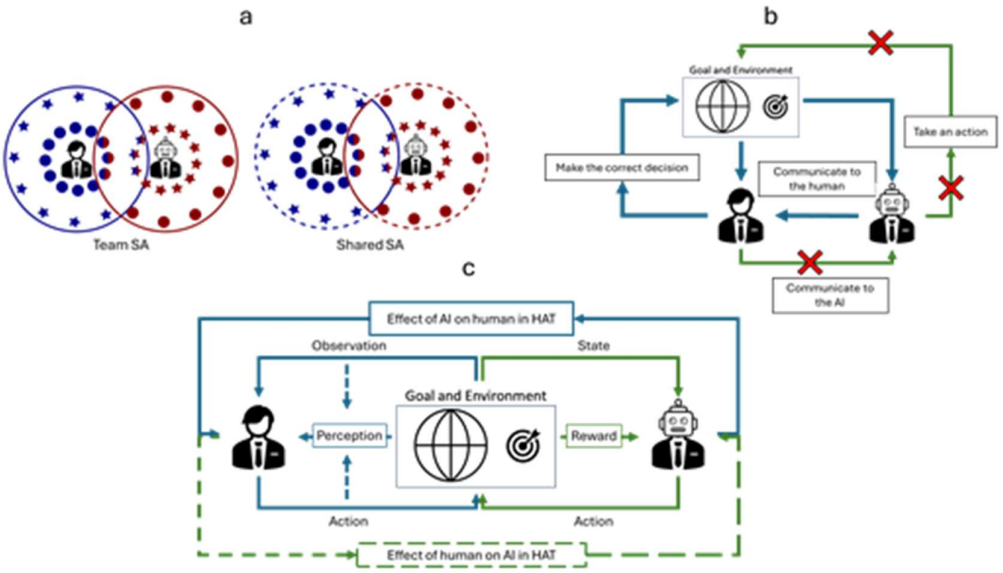

Figure 1: (a) The differences between team SA and shared SA. Shared SA is the overlap region where one agent knows what information needs to be communicated to the other agent. (b) Visualize what is missing when one measures shared SA in HAT. Currently, shared SA is measured based on the AI communicating with the human agent, and the human agent makes the correct decision based on the communicated information. However, HAT performance is not only about the human agent's action. Performance is about both agents being able to communicate and perform correctly based on communicated information that is related to the situation. (c)Visualization of how the human and AI agents work towards a goal in an environment differently in HAT. To measure shared SA, the loop needs to be closed. Shared SA needs to be measured based on the two-way effect between AI and humans due to information communication.

PP. 5. Physiological Signals for Measuring Trust in Automation: Towards Objective Measures

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Trust is a critical factor in human-automation interaction (HAI), influencing the effectiveness and safety of collaborative tasks. Traditional methods of measuring trust, primarily through self-report questionnaires, have limitations such as interrupting the task flow and being subject to bias. Integrating physiological signals offers a promising alternative, providing real-time, objective data on trust dynamics.

We aim to develop a comprehensive approach to measuring trust in automation with objective measures derived from physiological signals and using machine learning algorithms for real-time classification. The study seeks to enhance the accuracy and reliability of trust assessments in HAI. Participants will complete a Trust/Distrust Elicitation word task, which aims to measure their trust in automated systems. Real-time data is collected using various physiological sensors: Electroencephalography (EEG), Galvanic Skin Response (GSR), and Electrocardiography (ECG). Offline analysis will be conducted to derive various measures from the collected signals. Statistical methods will be applied to examine the relationship between the trust indicators and the trust levels. Machine learning algorithms will be applied to classify trust and distrust.

Physiological signals offer continuous data without disrupting task performance, capturing dynamic changes in trust. Advanced machine learning algorithms enhance the capability to classify trust and distrust accurately in real-time. By addressing the gaps in current trust measurement

methodologies, this approach aims to advance the field of HAI, promoting more effective and trustworthy interactions between humans and automated systems.

Presentation Abstracts

Parallel Session A1: Advanced Technologies

A1. 1. Wearable Augmented Reality for Telehealth: A Simulation-Based Evaluation

Chiara Santomauro, Griffith University

Telehealth is crucial to the provision of high-quality treatment of critically unwell patients in rural areas. Moving towards more advanced telehealth models of care that require precision advice and greater collaboration comes the need for new features and technologies. Emerging augmented reality technologies show promising functionality that could meet these future requirements. The aim of this study was to explore the benefits and limitations of a head-worn augmented reality (AR) device that can offer further support to rural clinicians through live visual annotations in 3D space.

Twenty-five clinicians trialled a head-worn AR device and evaluated it against a trolley-based telehealth device used in current practice. Each participant trialled the devices from one of two perspectives: the rural clinician accessing support or the advising clinician providing support. Participants completed two blocks of the same four scenarios, trialling one device in each block.

The advising clinicians had higher ratings of usability and self-efficacy, and lower ratings of mental workload, when providing support via the AR device compared to the trolley-based device (ps<.035). However, the rural clinicians rated the AR device lower on usability compared to the trolley-based device (p=.020) and rated their self-efficacy and mental workload equally when using both devices (ps>.253). Participants generally preferred to use the AR device over the existing device. On average, scenarios took 1 minute longer to complete when using the AR device (p<.001).

The findings revealed crucial insight into the benefits and limitations of wearable AR technology for telehealth; however, it may benefit those dialling in to the device more than those wearing the device. Wearable AR technology has the potential to improve the quality of support provided to rural clinicians, but there are various factors that, if not adequately considered, may limit its safety and efficiency.

A1. 2. Safeguarding Cognitive Well-Being in an AI-Augmented Workplace

Ben Kereopa-Yorke, Telstra, Australia.

This study examines the consequences of incorporating artificial intelligence (AI) into business work environments, using a socio-technical systems approach. We analyse AI's potential to enhance productivity and its risks to human autonomy, skill resilience, and algorithmic accountability. Our research combines knowledge from cognitive ergonomics, cybersecurity, ethics, and organisational behaviour, examining 127 scholarly articles and 15 industry reports from 2018 to 2023. The study's main contributions include a comprehensive understanding of AI's effects on cognitive well-being in the workplace, the introduction of the Cognitive-AI Symbiosis Model explaining the interaction between human cognition and AI systems, and evidence-based policy recommendations for ethical AI integration.

Our analysis reveals deficiencies in existing literature regarding the long-term cognitive effects of AI collaboration on human workers. We establish guidelines for creating AI systems compatible with human capabilities, emphasising multidisciplinary frameworks to address integration challenges. The research highlights the need for participatory governance frameworks and value-sensitive AI design aligned with cognitive ergonomics awareness to prevent unintended negative effects of automation. These findings offer organisational leaders, policymakers, and AI developers a roadmap for responsible AI integration that enhances productivity and promotes human well-being in the evolving digital landscape.

A1. 3. Adoption of Generative Artificial Intelligence Chatbots by the Health Workforce

Mia Nazir, The University of Sydney

Generative Artificial Intelligence chatbots (AI) are applications that process audio, text, or images to generate new outputs, with popular models like ChatGPT and Llama. These user-friendly tools are increasingly adopted in various professions, including software development and law, and are likely finding innovative uses in healthcare. However, there is no existing research on their use by health professionals. Our research aims to understand how health professionals are using emerging AI tools such as ChatGPT4 in their work, and their perceptions on the role of generative AI in healthcare in the coming years.

A qualitative methodology was used for the study. Data was collected via semi-structured with health professionals and other stakeholders in order to understand how the health workforce might be using Generative AI Chatbots in their workflows and wider perspectives of the use of these technologies in multidisciplinary practice. Data analysis will be undertaken using reflexive thematic analysis to identify key themes.

A total of 10 interviews have been undertaken as part of this study. Emerging themes from preliminary analysis include: 1) Health professionals varied use of Gen AI products in their workflows 2) Minimal organisational and educational supports for best-practice use of GenAI in healthcare. A number of different use cases for how Generative AI Chatbots could be used to support health professionals' workflows are also evident in the data.

Our research will contribute new knowledge on how health professionals are using generative AI chatbots like ChatGPT4, Bard and Claude to support their jobs. In addition to addressing a knowledge gap, the research may have practical implications as findings will help organisations understand adoption of technologies by their workforce in order to establish governance to respond to current usage, and future trends.

A1. 4. Barriers and Enablers when Introducing and Embedding Cobots as Co-workers

Marina Vitale, Human Factors Ergonomics Specialist, La Trobe University

Adoption of industrial collaborative robots (cobots) in the manufacturing sector is growing globally, as a low-cost solution to remove hazardous manual work and improve business efficiencies. Strategic elements necessary for successful adoption of cobots are not well understood, particularly in Australian workplaces. Research into human-robot collaboration (HRC) has focused on technical development to manage potential physical risks, with little attempt to understand the impacts of introducing cobots on workers' health, safety, and wellbeing. Researchers warn there may be major barriers to acceptance and other organisational challenges without consideration of these human factor (HF) elements.

This study aimed to explore the barriers and enablers for HRC implementation including knowledge and processes to improve trust in and acceptance of cobots, and workforce health and safety. Using a phenomenological interpretative qualitative methodology, six participants from an Australian aerospace manufacturer were interviewed. Participants had either experienced industrial cobot implementation or were anticipating introduction of cobots to their assembly line. Interview questions were based on the Storm et al (2022) SHELLO systems model.

The results identified more enablers than barriers when introducing and embedding cobots as co-workers. Enablers were predominantly at the organisational level – resourcing enabled skills, engagement, and participation to support design and implementation of trusted and reliable cobots. Emerging psychosocial risks identified were associated with automation engineering roles. Results informed a revised SHELLO model for successful HRC implementation providing a holistic view of the risks and attributes required. The revised model incorporates HF research and identifies system contributions and inter-dependencies necessary to achieve safe and healthy work design and optimal system performance. Recommendations for future cobot implementation and research include integration of HFE approaches to best enable cobot system design, support workplace health and safety risk management capability and psychosocial risk management for all stakeholders in the work system as HRC intensifies.

Parallel Session A2: Environmental Ergonomics

A2. 1. Identifying Built Environment Hazards Through HFE Analyses of In-situ Simulations

Natália Ransolin, Macquarie University & Matthew Wooler, CNE – Advanced life Support and Simulation

In-situ simulations of work in health settings have been adopted to proactively identify hazards and manage risks related to the built environment (BE). In particular, video-recorded simulations allow repeated reviews and debriefings of scenarios by clinical and human factors and ergonomics (HFE) professionals.

This study evaluated BE hazards influencing clinical performance and patient outcomes based on video in-situ simulation of emergency scenarios before BE occupation. Four retrospective in-situ simulation videos (approximately 10 minutes each) regarding two emergency scenarios (i.e., ventricular fibrillation and acute myocardial infarction) in a hitherto new environment of resuscitation bay of an Emergency Department (ED) in Australia were analysed according to the Hazard Assessment Remediation Tool (HART) and Functional Resonance Analysis Method (FRAM). Simulation videos were analysed by independent HFE researchers. Each 10-second video fragment was associated with FRAM functions (i.e., tasks performed), aspects (e.g., input, output, preconditions), agents and variabilities of FRAM outputs to identify latent and active hazards according to the HART categories (i.e., slip/trip/fall/injury risk; impaired access to patient or equipment; obstructed path; poor visibility; and infection risk). FRAM models of each emergency scenario were developed according to the simulation videos and feedback from current staff. HART categories were useful in identifying latent and active hazards, translated into potential and actual variabilities of the FRAM function outputs that arise from the suboptimal BE conditions.

Recommendations to the ED BE were linked to the precondition aspects of FRAM functions as a strategy to mitigate the output variabilities. Methodological contributions on using HFE methods to analyse video simulations and identify BE implications were discussed. Moreover, this study highlighted recommendations for ED workflows and design. Findings will be presented at the conference to guide insightful discussions on how in-situ and video-recorded simulations of clinical scenarios have gained attention in healthcare HFE practice and the implications for BE design.

A2. 2. Effects of Dynamic Thermal Indoor Conditioning on Cognitive Performance

Amelie Reitmayer, University of Queensland

Office environments are often constantly air-conditioned throughout the day at overcooled and static temperatures. It is still believed that cool temperatures are necessary for optimal performance. Recent research suggests that cognitive performance can be maintained over a much wider temperature range and might even depend on the time of day.

The effects of dynamic temperature conditions on cognitive performance and subjective workload are largely unexplored. Our aim is to explore time effects of temperature exposure on task performance during drifting temperatures. The development of dynamic thermal indoor conditioning

in office environments could enhance human wellbeing, cognitive performance and energy efficiency of buildings.

An experiment was conducted investigating a dynamic cooling scenario and its temporal effects on cognitive performance and subjective workload. Cognitive and workload assessments were implemented at four times during the simulation of a typical workday from 9.00 am to 4.30 pm. During the morning, the temperature of the room was kept between 27°C and 29°C with natural ventilation, while after lunch an air conditioning system with a set temperature of 22°C was used to cool the room down to 26°C for two hours. In the afternoon, the room warmed up again naturally.

Results showed that the cognitive performance of the participants stayed stable throughout the dynamic thermal conditioning. The findings challenge conventional studies that have not considered time-of-day effects in the relationship between temperature and cognitive performance and have favoured the regulation of indoor spaces to narrow and cool temperature ranges. This highlights the need to reassess the link and the potential between dynamic thermal environments and task performance as well as subjective workload. Changes in human performance due to time and temperature could fundamentally reshape building operation methods.

A2. 3. Cool Neighbourhoods: A Systems Ergonomics Approach for Urban Heat Resilience

Nicholas Stevens, University of the Sunshine Coast

This research has established a systems ergonomics description of green infrastructure (GI). It has then operationalised this GI systems model for the design of cool neighbourhoods. GI is the network of natural, semi-natural and artificial ecological systems that exist within and around urban areas.

The aim of this study was to inform strategic decision-making for the establishment of Cool Urban Neighbourhoods, within a case study of a 2032 Olympic site in Kawana on the Sunshine Coast, Queensland, Australia.

In collaboration with the Sunshine Coast Council, the project involved a mixed methods approach across four research tasks. These included, establishing the systems ergonomics (work domain analyses) measures for cool neighbourhoods; the development of a user-friendly assessment tool; and two interdisciplinary workshops to apply and co-design a site masterplan.

The resulting Cool Urban Neighbourhoods audit and co-design tool consisted of nine priority measures applied to the Kawana case study in Workshop 1. These measures (and system related indictors and activities) were 1. Heat reduction, 2. Emission reduction, 3. Urban forest integration, 4. Healthy soils & water, 5. Active mobility, 6. Healthy neighbourhoods, 7. Infrastructure allocations, 8. Economics & value, and 9. Governance & cooperation.

Workshop 1 resulted in a draft masterplan of Kawana, and the identification of system activities which supported multiple priority measures. Including, for example - green and shady streets; urban cooling; environmental systems, and transport and mobility. Workshop 2 validated the draft masterplan, confirming project priorities and any minor adjustments. A conceptual masterplan for Kawana as a Cool Urban Neighbourhood is now established.

This collaborative research underscores the importance of systems-thinking approaches in urban planning, offering a practical framework for exploring urban heat resilience in cities. The emphasis on data-driven decision-making, interdisciplinary collaboration, and sustainability principles positions this initiative at the forefront of contemporary systems ergonomics and urban development strategies.

A2. 4. Acoustic Vehicle Alerting System Sound Design for Electrified Buses

Christina Kirsch, Transport for NSW

Transport's Zero Emission Buses (ZEB) Program aims to transition its 8,000+ bus fleet to zero-emission technology by 2047, prioritising sustainability and environmental responsibility. However, the quiet nature of ZEBs poses safety concerns, particularly for vulnerable road users (VRUs) such as those with vision impairments. In response, Transport introduced a new road safety standard requiring all ZEBs to be fitted with an Acoustic Vehicle Alerting System (AVAS), emitting a sound up to 20 km/h and launched an initiative to produce a sector-specific AVAS sound for ZEBs. A standardised AVAS sound will enhance people’s safety by making it easier for people to identify an approaching bus and distinguish it from other road vehicles.

The project objectives are to produce a standard, sector-specific AVAS sound for Transport's growing fleet of ZEBs that complies with current standards, improves road safety for VRUs, and meets the needs and requirements of a diverse group of stakeholders.

Through a human-centred design approach, stakeholders, including transport Subject Matter Experts (SMEs), VRU groups, people with disability and their advocates, bus operators, drivers, residents, and manufacturers, collaborated to define AVAS sound requirements.

The approach involved risk workshops, empathy mapping, user journey mapping, and sound ideation workshops, culminating in a comprehensive understanding of stakeholder needs and preferences. Insights gathered highlighted the importance of the safety and effectiveness of the AVAS sound as an alert, as well as desired affective qualities such as calmness, positivity, politeness, and vibrancy.

While acknowledging the complexity of addressing all requirements with a single AVAS sound, the project underscores the flexibility of alerting systems to craft sounds more effective than those emitted by diesel buses. The outcomes serve as a foundation for future sound testing and implementation, emphasising the pivotal role of collaboration in advancing road safety and sustainability in public transportation.

Parallel Session A3: Transportation

A3. 1. A Systems Thinking Toolkit to Address Driver Distraction

Zohre Abedi, University of the Sunshine Coast

As technology advances in vehicles and mobile devices, distracted driving poses an increasingly critical safety challenge. Through a system thinking lens, this research aims to develop an innovative multi-stakeholder toolkit to manage driver distraction in Australia.

This research comprised three phases. (1) developing and validating a System Theoretic Accident Model and Process (STAMP; Leveson, 2004) control structure model to identify the stakeholders, controls, and feedback mechanisms involved in managing driver distraction in Australia, (2) conducting a distracted driving management requirement analysis with key stakeholder groups, and (3) developing driver distraction management toolkit materials required by stakeholders. Stakeholders involved in managing distracted driving (e.g., technology developers, telecommunications companies, policing units, and road safety authorities) participated in the research.

Thirty-one stakeholders reviewed the STAMP control model. Approximately 97% of the participants (n=30) agreed or strongly agreed that the model comprehensively described the system currently in place to prevent and manage the risks of distracted driving. The STAMP control structure model identified 146 stakeholders, 74 control mechanisms, and 47 feedback mechanisms for managing distracted driving. 24 stakeholders participated in interviews regarding the requirements analysis. Participants identified seven categories of requirements for effectively managing driver distraction, including: (1) policy and planning, (2) regulation and compliance, (3) education and awareness, (4) data collection and analysis, (5) technology and innovation, (6) funding and resource, and (7) collaboration and engagement. 16 stakeholders (mean = 4.3) attended six online/in-person workshops to co-design 7 tools, including in-vehicle technology integration guidelines and guidelines for driver distraction reporting system.

Findings underscore the need for a multi-pronged approach uniting stakeholders across domains. Technology advancements necessitate updated controls and feedback processes to ensure roadway safety amid transformative applications like in-vehicle systems and mobile connectivity. Future studies should evaluate the impact of the toolkit on managing driver distraction.

A3. 2. Feasibility of a VR Hazard Perception Task for Older Pedestrians

Ann Carrigan, Australian Catholic University

Despite comprising 18% of the population, older adults account for 40% of pedestrian fatalities. Age-related decline in perceptual, physical and cognitive function may contribute to these deaths. Hazard perception and gap acceptance have been identified as important street-crossing skills and are associated with safety. To date, these skills have been understudied and would benefit from being examined using immersive technologies such as virtual reality (VR).

This study determined the feasibility of using a VR pedestrian street-crossing test (VR-PSCT) and protocol that included perceptual, cognitive and motor tasks, to understand older adult hazard perception and gap acceptance.

Data were collected from 14 younger adults (25-45 years) and 14 older adults (>65 years) in Sydney and Melbourne. Participants completed tasks that measured perceptual capacity (e.g., visual acuity), cognitive capacity (e.g., attention), and motor ability (e.g., balance). Hazard perception and gap acceptance were measured using a VR headset where a series of 360-degree video clips captured from real-world pedestrian situations were presented (Fig. 1). Data captured during the VR task included looking behaviour, head movement, start-up time, hazard perception accuracy and postural sway during hazard detection tasks.

The VR-PSCT was well tolerated with some instances of mild simulator sickness and motor instability for the older adults. The protocol enabled us to capture expected performance results; older adults were less accurate and slower on cognitive, motor and VR tasks than younger adults ($n=28$, $p>0.05$).

This study has established the feasibility of our VR-PSCT task and protocol, providing support for its appropriateness for testing with a larger cohort of older adults in a subsequent study.

By using the latest immersive technologies, we can obtain a greater understanding of older adult pedestrian behaviours and the factors that predict these behaviours. This will allow us to develop targeted training programs designed for the needs of older adults.

A3. 3. The Perceived Impacts of Stressful Events on Train Driver Performance

Nicole Liddell, Centre for Human Factors and Sociotechnical Systems, University of the Sunshine Coast

Train driving is considered a high-risk occupation for stress and work-related mental health disorders. While person-under-train events, collisions, and derailments are known to contribute to driver psychological trauma, other sources of acute stress (i.e., signals passed at danger, near miss incidents, and altercations with members of the public) can impact a drivers' capacity for safe train operation.

From a systems thinking perspective, safety is a responsibility shared by actors across the rail transport system. The flow of information up and down rail system hierarchies, known as vertical integration, is critical to safe system functioning. In relation to the impacts of driver stress, this requires that system stakeholders understand train drivers' exposure to stress and the subsequent impacts on driver performance. However, the extent to which broader stakeholders currently understand acute stress impacts on train driver performance is unknown. Using Rasmussen's risk

management framework, this research aimed to investigate and compare rail stakeholder perceptions on impacts of acute stress on train driver performance and explore suggestions for reducing negative impacts and improving driver wellbeing.

Data were collected via anonymous online surveys distributed to train drivers and rail stakeholders. The surveys featured a combination of open-ended and rating scale questions focused on three hypothetical scenarios. Participants were asked to describe and rate impacts on performance for each scenario.

The analysis revealed some evidence for vertical integration, with themes indicating some agreement across actors from different system levels (e.g., across drivers/guards, supervisors, and management). Cognitive impacts were the most reported impact type, with themes relating to alertness, situation awareness, and attention. These impacts were largely perceived to have either neutral or enhancing effects on performance. Concerns regarding organisational culture and current support for driver wellbeing were also identified. Practical implications for mitigating negative impacts of stress on train driver performance will be presented.

A3. 4. Examining Air Travel Accessibility Information for People with Disability

Vanessa Huron & Carlo Caponecchia, University of NSW, Sydney.

People with disability have a right to access travel. The significance of addressing accessibility in air travel has been noted both by the International Air Transport Association and in the recent Australian Aviation Green Paper.

For people with disability planning air travel, being able to find information about how accessible the various aspects of the journey will be within the airport and the plane is extremely important. This includes knowing about navigating the airport, its amenities and processes for embarking.

This study aimed to understand information required to facilitate air travel for PWD, and test their quality, availability, and usability in an online environment.

Interviews with 20 PWD and/or carers were conducted to understand what should be considered when planning and undertaking domestic air travel. Qualitative data analysis of the interviews identified features necessary for the undertaking of air travel by PWD. These features were used to create testing parameters for assessing the accessibility of key online information for the planning of domestic air travel, both in Australian urban and rural contexts.

Interviews identified key features that informed the assessment of online information accessibility for PWD. Analysis of online information suggested multiple barriers for PWD accessing information including unavailable information or insufficient detail related to key features, and difficulty of navigation or redirection to other vendor sites when sourcing the required information.

The aviation industry has an opportunity to improve accessibility for PWD planning and undertaking air travel by providing clearer information on the presence and absence of key features. More systematic processes and streamlined and consistent guidance between aviation vendors who share responsibility for key features related to air travel (e.g. airlines and airports) could improve the experience for PWD.

Parallel Session B1: Healthcare I

B1. 1. Learning from Workarounds Related to Digital Technologies in Healthcare

Tarcisio Saurin, Federal University of Rio Grande Do Sul, Brazil

A workaround is a deviation from an intended work process in order to overcome an obstacle. Prior studies indicate that workarounds related to the use of information technology (IT) in healthcare are commonplace, and that they tend to produce both desired and undesired results. Thus, despite of not causing harm to patients most of the time, workarounds reflect failures in work system design and therefore they offer learning opportunities. However, such learning requires psychological safety, enabling the transparent and fair discussion of workarounds at the workplace. To develop guidelines for learning from IT workarounds. A study of the preparation and administration of medications (PAM) in two wards of a large hospital was conducted. At this hospital, caretakers conduct core PAM activities at the patient bedside, using a workstation on wheels equipped with a computer and scanner for electronic checks and records. Data collection involved two stages. First, the identification of workarounds was based on 30 hours of non-participant observations, interviews with six caregivers, analysis of standardised procedures, and six focus groups with caregivers. Second, caregivers assessed the risk of each workaround and psychological safety at their units based on questionnaire survey. Twenty-seven workarounds were identified, and they had clearly different risk profiles. Psychological safety was low regarding openness to discuss problems at the unit and possibility of risk-taking behaviour. Based on this, five guidelines were devised for learning from workarounds, including the identification of work constraints (e.g., unreliable IT, large walking distances), and fostering psychological safety. Changes in work system design, prioritisation of workarounds based on their risk level, and psychological safety are expected to support learning from workarounds.

B1. 2. Identifying Design Related Risks in an Older Theatre Complex

Thy Do, Royal Perth Hospital

The need for early inclusion of Human Factors / Ergonomics (HFE) specialists in the design phase of hospital clinical areas is becoming better understood. Healthcare staff are meeting the challenge of significantly increased demand for services while dealing with outdated clinical spaces. New technologies, equipment, and complex procedures grow quicker than the infrastructure housing them. Investment into the design and build of new clinical environments is both time-consuming and expensive. The use of HFE concepts can assist in identifying shortfalls in design and functionality whereby timely, cost-effective solutions can be implemented for improved patient care and worker experience.

To identify and address design-related risk factors in an older operational theatre complex using HFE concepts. Observations and structured interviews, guided by Contextual Inquiry principles, are carried out to assess and compare two operating theatres and a day-case procedure unit in an outer metropolitan health institution. Each area is observed for the duration of a full day shift (10 hours). Observed participants include members of the theatre team. Transcripts from the contextual interviews are analysed to identify risk factors. Field notes are recorded in addition to photographs of equipment locations. Historical floor plans and measurements of the theatres were obtained and compared to existing standards including the Australasian Health Facility Guidelines.

Key-points:

- Data collection is ongoing and expected to be completed by July 2024.
- Preliminary findings suggest that limited space and increasing equipment size hinder anaesthetists' ability to access patient and present difficulties when performing practical procedures or managing emergencies.
- An immediate identified solution is to replace the existing doors, which open into the operating theatre, with sliding doors. This would have a positive effect especially during patient emergencies. The current study adopts a proactive approach to identify immediate risks minimising the potential for adverse events.

B1. 3. Clinical Incident Investigations in the Age of Safety Management

Madeline Wu, Royal Perth Hospital

Safety Science in Healthcare has currently evolved to The Age of Safety Management, where Safety-1 (reactive) and Safety-2 (proactive) approaches are integrated. This integration provides a system-based understanding towards more sustainable solutions in clinical incident management, which appears to be lacking in contemporary safety management. The predominant safety management approach adopted by hospitals appears to be Safety-1, which entails identifying the cause and contributory factors using reactive techniques e.g. RCA and Action. Conversely, accident investigations based on Safety-2 Approach requires establishing an understanding of how things usually go right using proactive safety management techniques e.g. Systems Engineering Initiative for Patient Safety (SEIPS). The SEIPS framework describes how contributing factors interact to create successes from an Appreciative Inquiry perspective. Royal Perth Hospital is the first Australian hospital to pilot SEIPS in clinical incident management and the world's first to apply SEIPS to inpatient falls.

This presentation aims to demonstrate the integration of Safety-1 and Safety-2 approaches through the development of resource bundles tailored for each stakeholder group (e.g. Safety and Quality Team and Senior Leaders, panel chairs and members) based on literature reviews, clinical incident data and interview data from Safety/Quality Team. The outcome task from this review is the elaboration and refinement of incident analysis guiding questions of each contributing factor feeding into RCA and Action and SEIPS, formulating system-based recommendations and human-based actions. Each recommendation/action is assigned a strength criterion based on Hierarchy of Intervention Effectiveness. These recommendations/actions presented in a SEIPS diagram provides assurance that a balanced spread of evidence has been considered across the whole work system. A Safety-2 approach recognises the complexity of sociotechnical systems and responds by developing resilience engineering strategies – employee empowerment to develop employee agility, building team situation awareness, positive relationship building and providing collegial support, as well as task management behaviours.

Parallel Session B2: Human Factors Lessons

B2. 1. Perspectives on the Role of Human Factors/Ergonomics Experts in Tomorrow's World

Elise Crawford & Karen Klockner, Central Queensland University

Today's working landscape is experiencing unprecedented change. Technological advancements, the rise of artificial intelligence, and shifting workplace norms are reshaping how we work. Current challenges impacting work are multifaceted and complex. Amidst transformations, concerns about job security, economic shifts, and sustainability persist. In this climate of pervasive artificial intelligence, knowing where and how to make a positive impact is losing clarity. To address this issue, this study aimed to identify the role of the Human Factors and Ergonomics profession towards better working futures.

This comparative study engaged four large language models to explore mainstream perspectives on the role of Human Factors and Ergonomics experts in shaping better working futures. The qualitative data collected were thematically analysed. Study findings showed that perspectives across the models were mostly consistent. Alarmingly, when asked what profession is best situated to create better working conditions in the future, human factors and ergonomics was not identified, at least not until explicitly included in the following prompt. This led to several opportunities, including optimising worker performance, designing user-friendly systems, reducing errors, supporting technology integration, ethical practice, and promoting sustainable manufacturing. Skills needed into the future were also noted.

Study outcomes have significant implications for the Human Factors and Ergonomics profession. Greater business reliance on large language models in the future may lead to gross underrepresentation of this essential profession. The lack of recognition for improving work design is confronting and suggests greater online recognition is imperative if the human factors and ergonomics profession is to be appreciated as a work design specialist field. Nevertheless, the opportunities and skills identified for the future can help discipline experts target practice towards positive working futures.

B2. 2. HF vs UX, What Can We Learn from the Two?

Peter Ha, Systra Anz

Human Machine Interface (HMI) design in HF and User Experience (UX) are often seen to be the same. Both are focused on improving interface design using similar principles, such as improving usability, simplicity and error prevention. However, despite the similarity, the two fields differ significantly in terms of approach and perspective. While HF focuses more on HMI design and optimising systems to fit human abilities and limitations, UX tends to focus on emotive elements and improving user experience and user pleasure. Given these differences, it is perhaps no surprise that the two fields have vastly different requirements, skillsets, industries, stakeholders and techniques.

Presenting from a perspective of an early career consultant with experiences in UX and HMI design projects, this presentation examines the differences between the two and compares an experience of working in a commercial consulting environment against an experience in a railway government

project. While both projects similarly started with interviews and user observations, one project focused on product development with no deadlines while the other on defect identification with a tight scope. Additionally, one utilised Nielsen Norman's heuristic principles and focused on high value/low effort changes while the other followed ISO standards and required resolving all potential issues, resulting in two very different outcomes.

The purpose of this presentation is to ask ourselves how we may learn and apply from both respective fields as HF professionals. How may we find further opportunities in HF to go beyond focusing on error rates to further improving a user's experience, and how may we capitalise on the increasingly evolving standards of UX?

B2. 3. Enhancing Incident Investigations: Bridging Jurisprudence and Work Design Strategy

Sara Pazell[1] and Trajce Cvetkovski[2]

[1] ViVA health at work, [2]Australian Catholic University.

This study aims to examine statutory obligations for incident investigations across various Australian industries and contrast them with common tools used for this purpose within organisations. The investigators sought to explore the alignment or disparity among tools, processes, and legal mandates.

The researchers employed legal research methodology and narrative literature review to inform this study. This combined an examination of laws, regulations, statues, and legal precedents with a critical synthesis of scientific papers to establish a position. The analysis covered 11 Queensland State Acts and three Commonwealth Acts (and their corresponding regulations), resulting in a statutory cross-sectional analysis (n = 14). The researchers undertook a two-tiered evaluative review of 18 common incident investigation and event analysis tools (n=18), followed by an internal peer-review process. Three Tier-1 tools for elaboration to explain their applications and how they influence investigative processes.

Inconsistencies in legislative terminology were found across Queensland Work Safety statutes. There were no legal mandates requiring the use of specific investigative tools. The language used in the tools also varied, with no uniform alignment across jurisdictions. The researchers categorised the investigation tools based on their principal methodologies: sequential, epidemiological, or sociotechnical. These orientations significantly influenced the investigative process.

The evaluation of the 18 tools suggested that the choice of tools depends on factors such as incident complexity, industry, organisational preferences, budget, technical capacity, and legislative requirement s, rather than industry standards or guidelines. Despite common assumptions around 'root cause' principles, a deeper understanding of sociotechnical systems and contributing factors can alter both investigative outcomes and the recommended actions to prevent recurrences and regulate systems.

Figure 1: The triad of regulations, the business purpose, and the investigation approach

Parallel Session B3: Wellbeing

B3. 1. Optimising Design Through Empathy Building: Personas and Technology

Claire Greaves, Reece Cook & Finian Ralph, Tactix Sener Group

Creating customer profiles (also referred to as personas) for individuals with disabilities is essential for developing inclusive and accessible products, environments, and experiences. These profiles help identify barriers, pain points, and needs of users with disabilities, ultimately benefiting all users. In a transport project, customer profiles were utilised to guide the design team in designing engineering solutions that meet or exceed the standards set by the Disability Standards for Accessible Public Transport, as the standard has limitations regarding the disability user groups it considers and may not fully address their diverse needs. Customer profiles foster empathy and enable a broader range of user requirements to be integrated into projects that aim for more than mere compliance. When enhanced with technologies like augmented reality, these profiles provide designers with deeper insights into the lived experiences of people with disabilities. Additionally, they were instrumental in developing tailored assistance solutions for the operator, allowing for the redefinition of processes and procedures to better serve individuals with disabilities.

The requirements identified through customer profiles should be viewed alongside disability standards and adopted industry-wide to ensure comprehensive consideration of all user groups in product and design development. The solutions derived from these profiles have proven to be innovative and multifaceted, encompassing engineering, technology, and customer service improvements. Future applications of customer profiles and supportive technologies that enhance understanding and empathy for user needs will be explored, covering various industries, scenarios, and avenues for research. This holistic approach promises to drive inclusive design and elevate user experiences across the board.

B3. 2. Stop Lagging and Start Leading with Ergonomics Process Metrics

Alison Heller-Ono, Worksite International, Inc.

In this Systems Analysis presentation, audiences will glean the value of an ergonomics (evaluation) process approach applicable to computer users, impacting organisational and employee health and well-being.

This presentation will focus on several tested ergonomics process models (3) and a software program used to track leading indicators for an organisation to measure the metrics, costs, and ROI of their ergonomics process for injury prevention, claim avoidance, and employee wellbeing.

The presentation is a summary of decades of practice implementing ergonomics process design and management for small to mid-size employers.

Key Points: Participants will gain valuable insights into:

1. The ergonomics process influence model.
2. The six essential pillars of good ergonomics process design.
3. Notable gaps employers struggle with in implementing an effective ergo process.

4. How an ergonomics manager or practitioner can easily monitor, track, measure, and report on the results of an ergonomics evaluation process demonstrating continuous improvement and sustainability.
5. A focus on tracking leading indicators and a Pareto analysis formula to measure ROI of workers' compensation claim avoidance will be discussed.

B3. 3. Understanding Psychosocial Risks in the Mining Workforce Amid Technology Advancements

Eden Li & Tim Bentley, Edith Cowan University

While the introduction of advanced technology and automation offers benefits, its effect on psychosocial risks in the mining industry are double-edged. On the one hand, automation and AI can make the mining workplace safer - for instance, unmanned vehicles such as drones and remotely piloted aircraft could replace human jobs and reduce injuries in dangerous mining sites. On the other hand, these digital advancements may also exacerbate psychosocial risks, manifesting as heightened job insecurity, information overload, and increasing concerns over security and privacy. This study explores automation's impact from the mining perspective and identify strategies to mitigate psychosocial risks within the Western Australian mining sector.

Using a bibliometric literature review approach to understand the impact of emergent technology on shaping changes in the current and future mining industry, this study had a particular focus on new ways of working resulting from enhanced automation. The bibliometric review comprised three phases: Phase 1 selected relevant articles using defined inclusion and exclusion criteria. Phase 2 provided a descriptive summary of the articles, including journal sources, scholar details, citations, theories, and methods. Phase 3 conducted a thematic analysis of psychosocial risks to develop an

integrative framework. We identified several key themes of technology advancements (i.e. AI, wearable technology, and virtual reality) and their transformative applications and impact on psychosocial-related aspects, while also recognising factors strengthening or weakening the relationships.

The analysis of the literature underlined the need for a more future-oriented approach toward the identification and evaluation of psychosocial impacts, pointing to future streams of research. The study provided both academic and practical contributions, through analysing the current knowledge and offering insights to address ongoing health and safety issues in the mining industry amid technology advancements.

Parallel Session C1: Roundtables

LIVE EVENT: ROUND TABLE DISCUSSIONS

ViVA Health Group:

Sara Pazell: sara@vivahealthgroup@cqu.edu.au
SPONSORED TABLE by ViVA health at work:
TOPIC: Shaping Work for Impact: A Round Table on Transformative Work Design & Work Design Practice

CQUniversity:

Elise Crawford: e.crawford@cqu.edu.au
SPONSORED TABLE by CQUniversity, Australia
TOPIC: AI in HFE: Current Practices, Pitfalls and Future Skillsets

The University of Queensland:

Margaret Cook m.cook4@uq.edu.au
(Jolene Cooper, Melinda Browning, Loreto Codoceo)

Parallel Session C2: Knowledge Sharing

C2. 1. A Public Speaking Approach to Scientific and Business Presentations

Sharonne Phillips, Occupational Ergonomics, Sydney, Australia

The ability to share information in an accessible and even enjoyable fashion can impact the way that information is learned and retained. Public speakers are used to influencing their audience, not just by sharing their thoughts, but often, their talks are structured to entice their audience to buy a product. That product may be an idea, or a course, a program, a book etc. Science professionals are used to disseminating highly technical information that can be alienating to a lay audience. There is a happy medium between the two styles.

This talk aims to highlight easy to use techniques to assist science-based professionals to structure talks and share information in a way that aids communication and understanding with their audience.

This talk will outline a process used to identify key points in a presentation, and some of the methods used by Public Speakers to engage with their audience and create memorable experiences. Your talks will never be the same again.

Key points:

- Clarify your message
- Structure your talk
- Reach your audience - no matter how they like to receive information
- Leave a lasting impression

C2. 2. Lessons from First Time Human Factors Authors – Publishing Your Case Study

Nektarios Karanikas, Queensland University of Technology

Several professionals might have thought "Someone should write about this" while working on an interesting project. The editors of the *Workplace Insights* book series have helped dozens of first-time authors in sharing their case studies—and discovered that most practitioners initially doubt their ability to write for publication.

This presentation shares practical insights from the journey of supporting professionals transform their real-world experiences into published case studies. Through three successful books currently under the series featuring stories on safety, ergonomics, and healthcare, the editors have learned that the most compelling chapters often come from practitioners who never imagined themselves as authors.

The presentation discusses how first-time authors overcame common challenges like "I'm not a good writer," "My story isn't interesting enough," or "I don't have time to write." It is about how professionals can turn their experiences into engaging narratives without getting stuck in academic jargon or formal writing styles.

The first-time authors found confidence in telling their stories—including both successes and failures—and discovered surprising benefits through the reflection process. The presentation also provides practical tips for potential authors and addresses common concerns about writing and publishing. Whether a frontline practitioner, consultant, or manager, everyone’s experiences matter and deserve to be shared. Everyone can contribute to our profession's knowledge base while helping others learn. This presentation will show how achievable publishing can be with the right support.

Parallel Session C3: Fab 5'S

C3. 1. A Human Factors Approach: Enhancing Human-Robot Collaboration in Robot-Assisted Surgeries

Jasper Vermeulen, Queensland University of Technology

Human-Robot Collaboration is an area of increasing interest in both academic research and practical applications. It involves humans working closely with robots on shared tasks, leveraging the capabilities of robots to enhance human performance. For example, robots can improve precision or reduce physical strain in various settings. Despite these advantages, there is limited research on real-world user experiences and a comprehensive understanding of the human factors involved in practical applications.

In my doctoral research, I address this gap by investigating real-world experiences with the Mako Robotic Arm System, widely used in orthopaedic surgeries such as knee and hip replacements. While the Mako system has demonstrated significant benefits, including improved surgical precision and reduced patient recovery times, the human factors within these surgical environments remain underexplored.

I conducted three studies to investigate how users experience collaboration with the Mako robot. First, I analysed video recordings of entire knee and hip replacement surgeries to assess teamwork dynamics and spatial factors. Second, I conducted interviews with Mako Product Specialists, the trained professionals who facilitate collaboration between the robot and surgeons, to understand their experiences during Mako-assisted surgeries. Lastly, I will conduct observational research by immersing myself in surgical settings to observe the real-world use of the Mako.

Key findings highlight the significant physical and cognitive strain experienced by Mako Product Specialists, the importance of teamwork and trust, and challenges in navigating human-human and human-robot interactions.

By synthesising insights from these studies, I aim to provide a comprehensive understanding of the human factors in Mako-assisted surgeries. These findings will inform the design of future Human-Robot Collaborative systems beyond surgical contexts, potentially significantly enhancing safety, effectiveness, and user well-being. In sum, this doctoral research underscores the importance of human-centered approaches, ensuring that robotic technologies offer substantial benefits without compromising the well-being of their users.

C3. 2 The Hierarchy of Risk Controls and Re-Design of Pre-Hospital Work

Karen Davies, La Trobe University

A participatory ergonomics project conducted in an ambulance service using the APHIRM toolkit, generated actions which aimed to address physical and psychosocial hazards related to risk of musculoskeletal disorders. Their quality was evaluated using the hierarchy of risk controls.

Key points:

- Ambiguity was identified in the Codes of Practice about the allocation of risk controls as higher (re-design) or lower order (administrative), when the risk control relied on human systems of work.
- Human service industries rely on the actions of people to create optimal conditions.
- Better clarity in regulatory material will assist duty holders to identify opportunities to re-design work.

C3. 3. Improving Process Flow within a Healthcare Simulation-Based Training Facility

Joseph Tully[1,2], Jeffrey Kim[1, 2], Mia McLanders[1, 2, 3]

[1]Clinical Skills Development Service, Royal Brisbane and Women's Hospital, Brisbane, Australia, [2]School of Psychology, The University of Queensland, Brisbane, Australia, [3]Safety Science Innovation Lab, Griffith University, Brisbane, Australia

Healthcare simulation-based training facilities require efficient organisation to maximise educational potential, yet digital systems used within these facilities typically exhibit inefficiencies. One approach that can be used to identify problem areas and suggest solutions is the MARC method (i.e., Map, Assess, Recognise, Conclude); a continuous improvement approach that evaluates the components of a complex system holistically to guide optimisation. In this paper we demonstrate how the MARC method can be applied to determine inefficiencies and suggest areas of improvement for the client booking system of a large, healthcare simulation-based training facility in Queensland.

First, we Mapped the human elements of the booking system through stakeholder consultation. **Second**, we assessed inefficiencies of the booking system and suggested areas of improvement through process flow map generation. **Third**, we recognised the current booking system did not capture appropriate information, requiring further communication between staff and clients. **Fourth**, we presented our conclusions to leadership, resulting in a booking form re-design that captures this missing information.

We identified that the booking form did not allow clients to adequately specify their requirements, and that the form did not provide information about the layout or capacity of possible room choices.

This process inefficiency was linked with booking delays and miscommunication between staff and clients.

We applied the MARC method to better understand the unique process flow concerns of a client booking system in a Healthcare simulation-based training facility. We identified that critical information about available vacancies and user needs were not conveyed appropriately, and we were able to provide specific solutions that would meet the needs of both staff and clients. In so doing, we demonstrate the value of the MARC method for quality improvement initiatives particularly in complex adaptive systems such as Healthcare environments.

C3. 4. Wearable Technology to Inform Accessible Design for People with Disability

Reece Cook & Mackenzie Evans, Tactix Sener Group, South Bank, Australia

Wearable technology such as virtual/augmented reality headsets and eye tracking devices have been used to inform design across numerous sectors, however, wearable technology to inform design in the built environment for people with disabilities (e.g., wayfinding) is not often considered. I will discuss opportunities and scenarios in which the use of wearable technology can inform the optimisation of design in the built environment for people with disability. For instance, people who use mobility devices typically have lower visual perspectives due to their proximity to the ground. The use of wearable technology may help understand their design needs to remove barriers for inclusive design.

C3. 5. SciFi Guide to Future Designs

Andrew Petersen, Well Australia, Gold Coast, Australia.

Science fiction (SciFi) frequently crafted ideas that later became reality. Since Cyrano de Burgerac's 1657 description of space rockets, imaginative concepts materialised with Jules Verne's electric submarine, Mark Drinkwater's android robot, Edward Bellamy's credit card, H.G. Wells's automatic door, E.M. Forster's social media, Isaac Asimov's calculator, Philip K Dick's personalised advertising, Arthur C. Clarke's oral contraceptive, Ray Bradbury's earphones, William Gibson's internet, and Douglas Adams's instantaneous language translation device, to mention only a few. This talk reveals five SciFi creations becoming reality within health, office, transport, home, and infinity and beyond.

C3. 6. Participatory Ergonomics, Risk Controls, Systems Thinking and Pre-hospital Work Design

Karen Davies, La Trobe University

A participatory ergonomics project conducted in an ambulance service using the APHIRM toolkit generated 79 proposed actions from nine workgroups of Paramedics. Participants suggested ideas about how to address the physical and psychosocial hazards identified through a survey, to address their risk of musculoskeletal disorders. Proposed actions were grouped into themes and mapped on a model of risk management and actor map.

Key points:

- The proposed actions centred around consistent themes, including equipment and systems re-design.
- The proposed actions were largely outside the control of the work groups.
- This required a systems thinking approach to understand how to move toward implementation.

C3. 7. Risk of Work-Related Injuries in Horse Care Professionals and Other Horse Caretakers

Sharonne Phillips, Occupational Ergonomics

Horse care professionals, such as, veterinarians, dentists, farriers and handlers face significant injury while working with horses. These injuries often involve direct trauma, such as being bitten, kicked, trod on, or head butted, affecting the worker's limbs, torso or head. Overload injuries, particularly to the lower back are also common. Although most publications focus on horse riders, anecdotal evidence suggests that work-related injuries among horse caretakers are relatively common. However, without a serious injury, these incidents often go underreported. This presentation will provide an overview of factors contributing to the risk of work-related injuries among horse care professionals and other caretakers.

C3. 8. Mastering the Equation of Innovation, Technology Adoption, and Human Readiness

Sara Pazell, ViVA health at work, Sunshine Coast, QLD

The rapid pace of technological change often overwhelms employees, leading to resistance and negative impacts from otherwise beneficial innovations. A person-centred, systems-oriented approach is crucial for successful technology adoption, ensuring that new tools enhance work and meet business goals. Human Readiness Levels (HRLs) offer a structured pathway for this process.

Key Point:

This presentation highlights how a human factors research team collaborated with industry and mining maintenance teams to trial visual remote guidance head-mounted tablet technology, using HRL standards to guide the three stages and nine levels of technology integration.

HUMAN READINESS LEVELS SUMMARISED BY PHASES, STAGES, AND CENTRAL QUERIES

Overarching question: What is the purpose and context of the technology adoption?

PHASE 1	PHASE 2	PHASE 3
IS THERE A WAY?	CAN YOU PLAY?	WILL YOU STAY?
BASIC HUMAN RESEARCH & DEVELOPMENT	TECHNOLOGY DEVELOPMENT	PRODUCTION & DEPLOYMENT
STAGE 1 Basic Human Research	STAGE 4 Part-Task Testing	STAGE 7 Human Systems Design Fully Tested
Central question: Will it fit?	Central question: Does it satisfy basic focus group trials?	Central question: Does it work when tested in live scenarios?
STAGE 2 Human-Centred Design Guidelines	STAGE 5 Prototypes in Mission-Relevant Simulations	STAGE 8 Human Systems Design Verification and Approval
Central question: Who does it include or exclude?	Central question: Does it make sense?	Central question: Does it enrich our lives?
STAGE 3 Human-Centred Requirements	STAGE 6 Human Systems Design Fully Matured	STAGE 9 Operational Use and Monitoring
Central question: Can you interact with it?	Central question: Will it support our tasks?	Central question: Can we continually integrate, manage, and/or improve its use once deployed?

Table 1: Human Readiness Levels[1] Summarised by Phases, Stages, and Central Queries

ViVA health at work

[1] J. E. See, "Human Readiness Levels Explained," Ergon. Des.: Q. Hum. Factors Appl., vol. 29, no. 4, pp. 5–10, 2021, doi: 10.1177/10648046211017410.

Parallel Session D1: Advanced Analyses

D1. 1. The Ironies of Artificial General Intelligence

Paul Salmon[1], Scott McLean[1], Chris Baber[2], Tony Carden[1], Brandon King[1], Jason Thompson[3], Neville Stanton[4], Gemma Read[1]

[1]University Of The Sunshine Coast, Sunshine Coast, Australia, [2]University of Birmingham, [3]University of Melbourne, [4]University of Southampton

Bainbridge's 'Ironies of automation' outlines a series of critical issues surrounding the use of automation in sociotechnical systems. Though published over 40 years ago, the ironies continue to represent key considerations in system design. As we move closer toward artificial general intelligence (AGI), the next evolution of AI, it is pertinent to question whether the ironies will remain relevant, or whether super-intelligent AI will create new, more dangerous ironies. In this paper we explore this using the findings from a program of work which aimed to identify the risks that could emerge within future AGI systems.

The STAMP (Leveson, 2004), Work domain analysis (Vicente, 1999), and EAST (Stanton et al., 2018) methods were used to identify the risks associated with two 'envisioned world' AGI systems: an uncrewed combat aerial vehicle system and a road transport management system. Identified risks were classified according to Bainbridge's original ironies.

The risks were organised into the following categories: sub-optimal performance, goal alignment, super-intelligence, enfeeblement, over-control, malicious use, organisational, and sociotechnical system risks. Whilst many of the risks could be classified according to the original ironies, new ironies were identified, as well as instances where consequences are more severe with AGI-based automation.

The findings suggest that the original ironies remain relevant for future AGI systems, but that the consequences of failing to consider them will be far greater and could include existential risks. Further, a new set of 'ironies of AGI' were identified. The implications for AGI design are discussed.

D1. 2. A meta-analysis of Human Factors in NSW Mining Safety Occurrences

Kylie Newton, NSW Resources Regulator

The New South Wales (NSW) Resources Regulator recently commissioned The Keil Centre to conduct a meta-analysis of all Human and Organisational Factors analyses conducted by the Resources Regulator on safety incidents occurring between August 2018 and May 2023. The review encompassed 267 individual behaviours contributing to incidents and accidents, across surface and underground mines.

Each analysis was conducted using The Human and Organisational Factors analysis tool (S-HOF). Specifically designed for the NSW Resources Regulator, the S-HOF tool enables the analysis of behaviours associated with safety incidents and accidents, covering errors and intentional non-compliances with established processes or rules. The tool seeks to evaluates the Performance Shaping Factors which were found to influence these behaviours, from individual factors through to Organisational factors.

Results of this review provide valuable insights which can enhance industry understanding of common factors affecting human performance. By leveraging these insights, industry leaders and safety practitioners can guide future strategies, initiatives, and leadership practices in Human and Organisational Factors, fostering systemic changes aimed at mitigating unsafe behaviours, and ultimately reducing adverse safety events.

This paper aims to showcase the work conducted by the NSW Resources Regulator, highlighting key lessons, trends, and their applicability to the wider mining industry.

Parallel Session D2: Healthcare II

D2. 1. The Assertive Statement Framework; Explicit Communication for Improved Patient Safety

Anthony Lock[1] & Thy Do[2]

[1]Director ASCEND Human Factors & Leadership Development, [2] Royal Perth Hospital

WHO Global Patient Safety Action Plan 2021-2030 advocates reducing hierarchical structures throughout healthcare settings, promoting a 'speak up culture' to mitigate patient harm. Steep team hierarchies are identified as a significant contributor in failed communication and adverse clinical incidents. The Executive Team at East Metropolitan Health Service (EMHS), WA, understands the impact of effective communication and supports a culture of continuous learning. The Assertive Statement Framework strengthens communication by making the implicit, explicit.

Assertiveness training empowers staff to successfully and respectfully challenge the actions/decisions of other colleagues when those actions/decisions may lead to undesirable outcomes i.e. patient harm. To maximise assertive communication via the Assertive Statement Framework (ASF) to achieve precise communication, improve patient safety and promoting a 'speak up culture'.

Since 2018, over 4000 staff have been taught the ASF via the Nexus Foundational Human Factors Training. In addition, bespoke tailored ASF workshops are delivered demonstrating and simulating the use of ASF to specific disciplines in the organisation.

Topics include:

- Examples of non-clinical and clinical situations where assertiveness is required to achieve safety critical outcomes.
- Leadership support to 'speak up' and address patient safety concerns in a psychological safe environment.
- Discuss the traditional models of assertive communication taught in healthcare versus the ASF.
- Demonstrate how the use of porous and vague verbal exchanges ('hint and hope') can lead to substandard patient care.
- Simulate and practice using the ASF to achieve timely and precise communication in various clinical situations.
  Provide feedback by experienced Faculty.

This novel framework for assertive communication is more robust than existing traditional models taught in healthcare such as PACE and CUSS. When staff are trained, equipped with the right tools and supported to achieve precise communication, safety improves, and efficiencies are gained.

D2. 2. Dynamic Interactions Influencing Clinical Decision Support System Acceptance and Use

Nicki Newton[1], Adeola Bamgboje-Ayodele[1], Rowena Forsyth[1], Amina Tariq,[2] Melissa Baysari[1]

[1]Biomedical Informatics and Digital Health, School of Medical Sciences, Faculty of Medicine and Health, University of Sydney, Sydney, Australia,

[2]Australian Centre for Health Services Innovation and Centre for Healthcare Transformation, Queensland University of Technology, Brisbane, Australia.

Clinical Decision Support (CDS) systems aim to improve patient safety and care efficiency by presenting clinicians with targeted information at the point-of-care. Though CDS is widely implemented in hospitals, it is often poorly used by clinicians. Improving CDS use requires a comprehensive understanding of the barriers and facilitators that clinicians experience in practice, including how these issues emerge and evolve over time. We aim to shed light on this complex process, building on existing research that takes a static, cross-sectional approach.

In this presentation, we reflect on findings from a systematic review that identified factors influencing clinicians' acceptance and use of CDS over time. To validate and expand upon themes arising in the review, we utilise a case study comprising of interviews with users, managers, and vendors of a CDS system implemented in 2 departments of a rural hospital.

Sixty-seven studies met inclusion criteria for the systematic review and 11 interviews were conducted. Our findings suggest that acceptance and use of CDS is underpinned by dynamic interactions between users, systems, and organisations that occur over time. For example, users' familiarity with and self-efficacy to use CDS increases, and CDS is increasingly adapted to meet users' needs. Despite this, design and workflow issues can continue to be experienced long after CDS is implemented. In our case study, users and vendors worked together to increasingly adapt CDS to clinicians' needs, however key barriers that were unable to be resolved due to resource constraints, hindered use over time.

Improving clinicians' acceptance and use of CDS systems requires a tailored, longitudinal approach to address barriers and facilitators as they emerge and evolve over time. Our findings can be used to guide the design and implementation of CDS and other technologies in health service settings.

Parallel Session D3: Aviation

D3. 1. Innovation Ecosystems: Lessons from the RAAF: A Speculative Digital Transformation Case Study

Luke Houghton[1] & Jennifer Loy[2]

[1]Griffith University, Nathan, Australia, [2]Digital Business Innovation

Innovative thinkers are often stymied in large bureaucracies, unless structures can be made to support them. With the challenges of the modern world, such as pandemics, supply chain problems, and other complexities, creative thinking within large organisations is critical. The fundamental issue is finding how to design work so that innovators can be encouraged to test ideas and experiment, even within a structured environment.

For Defence, innovating in response to the changing operational environment and decentralised warfare, is challenging as embedded hierarchical behaviours are not designed to foster alternative thinking. How can innovators in Defence, be encouraged to produce creative solutions that provide the next product or service? What systems can be put in place to ensure Defence does not miss out on innovating.

The proposed research framework discussed in this presentation prioritises building a structured innovation ecosystem, that enables creative people to produce innovative practices. This is a challenge, as by its very nature, adding structure to creative practices can stifle the very creativity it is designed to enable. The pitfalls and opportunities involved are outlined, and examples of practice illustrating the approach. Drawing on findings from a research project the paper explores the concept of a distributed creative network, designed for emotional as well as practical reasons in support of innovators and innovation. Defence, and other similarly structured organisations, can unlock the potential of its creative workforce through a new approach to the facilitation and management of creatives.

This work builds on a foundation of research conducted by a cross-university team with the Royal Australian Air Force (RAAF). The research outlines the potential of a system for ‘Innovators Work Design’, designed to enable creativity and innovation at scale.

D3. 2. IRA/IRR for NTS Assessment of Pilots in Indian Commercial Airlines

Nitya Jain, Coventry University

The evaluation of human performance in highly skilled jobs, such as commercial flying, is still largely a human activity and, as such, retains an inherently subjective component. Different evaluators assess trainees’ performance based on a framework to ensure highest level of safety and best possible quality of training. As seen by Mavin and Dall'Alba (2010) that despite good efforts to address variation through training for reliable and valid pilot performance assessment, it continues to be a difficult area in the aviation industry to make it an integral aspect of global quality assurance.

The Indian civil aviation regulator utilises the International Civil Aviation Organisation (ICAO) framework for assessment of all flight crew training sessions. This research was designed to analyse the level of inter-rater agreement/reliability (IRA/IRR) of the ratings given by an Indian demographic population of evaluators for assessment of non-technical skills (NTS).

Participants were asked to complete a survey including a video and rate the 5 non-technical skills of one specific pilot in the video. All participants were of Indian nationality with the minimum designation of a Captain/commander in a commercial airline in India. The participants were categorised in four groups based on their training experience and type of exposure to classroom training (see Table 1.) as attached.

The data was analysed with 3 statistical tests namely, Cronbach's Alpha, Kendall's coefficient of concordance and Chi-square test of independence.

The analysis indicated the highest IRA of the ratings given by the DE group and the lowest by the TRI group. These results are consistent with the highest IRA of the ratings given by the AIRLINE+REGULATOR group and the lowest in the AIRLINE group.

Table 1.
Categories of participants

S.No.	Designation	Training Experience	Classroom Training Exposure
1	CAPT	None	None
2	LTC (Line Training captain)	CAPT < **LTC** < TRI < DE	Airline– CAPT < **LTC** < TRI < DE
3	TRI (Type Rating Instructor)	CAPT < LTC < **TRI**< DE	Airline– CAPT < LTC < **TRI** < DE
4	DE (Designated Examiner)	CAPT < LTC < TRI < **DE**	Airline plus Regulator CAPT < LTC < TRI < **DE**

Parallel Session E1: Musculoskeletal

E1. 1. Tackling MSD Risks in Sonography Through Improved Work Design

Jenny Fuller & Chloe Robbins, Queensland Health, Brisbane, Australia.

This presentation will summarise a collaborative and strategic approach taken to address risks for musculoskeletal disorders (MSD) in Sonographers working in Queensland public hospital and health services. As a background, Sonographers are responsible for performing specialised diagnostic examinations (i.e. ultrasounds). A review of Sonographer musculoskeletal health was conducted as part of a statewide project, to better understand the MSD risk profile of sonographers, and to identify strategies for more effectively preventing and managing these risks. The review was facilitated by a working group comprising ergonomics subject matter expertise, sonographers, managers and union representatives.

A key finding of the review was the contribution of both physical and psychosocial risk factors impacting the risk of MSDs in sonographers. Recommendations arising from the review have emphasised the opportunities for improved work design for sonographers in order to address the problem of MSD risk.

This presentation will outline the collaborative approach taken from the perspective of the ergonomist, including their role in promoting good work design and evidenced-based approaches to addressing MSDs. The key activities underpinning the review will be discussed, including the risk analysis, consultation processes, exploring solutions, and communicating findings and recommendations.

E1. 2. Managing the Risks of Musculoskeletal Disorders in NSW Local Government

Wenwan Lu, SafeWork NSW

Musculoskeletal disorders (MSDs) are the most common work-related injuries and diseases in NSW, with local government ranking among the top five industries with the highest number of MSD workers' compensation claims. Between 2016 and 2021, local government in NSW reported over 8,000 MSD workers' compensation claims, resulting in costs of approximately $130 million. These disorders not only impact workers' quality of life, causing pain, discomfort, and mobility limitations, but also affect overall well-being and productivity. In response to the high number of claims, SafeWork NSW launched an MSD Prevention Program aimed at creating positive change in how local government manages MSD risks.

From 2021 to 2022, SafeWork NSW inspectors visited over 80 local government areas, representing two-thirds of all areas in NSW, to assess MSD risk management strategies, provide education, and enforce compliance where necessary. In this presentation, practical examples of MSD risk management from high-risk areas, such as parks and garden services, engineering and road construction, childcare centres, and aquatic centres, will be shared. The learnings and challenges from this program will assist employers in addressing ongoing and emerging MSD risks. Key topics include meeting due diligence obligations for senior leaders, consulting workers during the MSD risk management process, and designing tools, jobs, tasks, and work environments to better fit workers.

E1. 3. Insights from Forty Years of Investigations into Litigated Personal Injuries

Pujitha Silva, Edward Dohrmann, Bill Contoyannis, Dohrmann Consulting, Travancore, Australia

Ergonomics should play a crucial role in preventing and reducing injury. Study of incident and injury investigation is essential to inform future efforts in the application of ergonomics. This study analyses forty years of incident and injury data obtained from ergonomists' expert opinions in litigated personal injury matters. This unique data set is focused on serious (permanent) injuries across various industries, jurisdictions, and incident types. The paper will discuss trends emerging from this analysis, including the effectiveness of ergonomic interventions, and offer guidance for future policy developments.

Data from over 10,000 personal injury cases classified into "manual handling," "slips, trips, and falls," "product failures," and "machinery/plant" were analysed. Comparative analysis by gender, age, industry, type of work, and other demographics was conducted against publicly available injury data to identify trends. Preliminary examination indicates that serious injuries from manual handling or slips, trips and falls, are predominant. Significant ergonomics risk factors associated with specific job roles, equipment, and public environments.

Further comparative analysis done between states and industries reveals some significant differences in the likelihood of certain injury types occurring depending on the workplace or state in which it occurred.

The findings emphasise the need for tailored ergonomics interventions specific to workers, age groups, industries, regions, and public spaces.

This research provides unique insight into the causes of serious injuries, identifying who is injured and in what circumstances. It provides a foundation for future interventions. It offers crucial insights into long-term injury patterns, highlighting the importance of continuous improvement in ergonomics practices and policies to enhance community safety. It is critical that such insights are communicated clearly to stakeholders within industry to enable development and implementation of effective risk management strategies.

E1. 4. Comparison of Ergonomic Interventions on Shelving Practices within Public Libraries

Nerilee Watts & Nektarios Karanikas, Queensland University of Technology, Brisbane, Australia.

Musculoskeletal Disorders (MSD) have been the second highest burden of disease in Australia since 2003. With library staff routinely undertaking manual handling activities and repetition of task, a study was undertaken to compare ergonomic solutions to improve shelving tasks. Three public libraries were engaged with engineering or administrative controls introduced. The engineering control of raising shelf heights was compared to the administrative control of awareness presentation regarding manual handling. The third location combined the two controls. The baseline conditions were assessed with pre and post implementation surveys conducted to identify any changes to shelving task load, or any MSD related issues. Rapid Entire Body Assessments (REBA) were undertaken at each library at three separate time-points during the study.

The results within two weeks of the implementation of controls revealed a significant improvement in the REBA results. However, at the seven weeks' time point, there was a lapse towards pre-

intervention baseline measurements for the library that received only the administrative control. The two libraries exposed to the engineering control, maintained their post control implementation results. The survey findings suggested there were no statistical changes pre- and post-implementation. In conclusion, all implemented solutions had a short-term positive effect, however the libraries that implemented the engineering risk control measures sustained more lasting improvement.

Parallel Session E2: Design For Health

E2. 1. Investigating Unplanned Intubation in the Neonatal Intensive Care Unit

Mia McLanders[1], Melissa Lai[2], Chiara Santomauro[2], Rebecca Wang[1], Karen Hose[2], Kellie McGrory[2], Jackie Clement[2]

[1]Clinical Skills Development Service, Metro North Health, Herston, Australia, [2]Royal Brisbane and Women's Hospital, Herston, Australia

The Grantley Stable Neonatal Unit (GSNU) at the Royal Brisbane and Women's Hospital (RBWH) identified that the rates of unplanned extubation of ventilated neonates occurring in this unit needed improvement.

This project to explore the factors that impact decision making by clinicians at the bedside, when caring for an extremely low birthweight (ELBW) infant who requires an endotracheal tube (ETT) for ventilation.

Multiple factors critically affect the final position of the ETT tip, including 1) clinicians' ability to calculate the depth at which the ETT should be taped, 2) how nominated depth is assessed at the time of taping, 3) taping method and security, 4) ability to retain the ETT in a 'neutral' position once taped, 5) ability to assess ETT depth accurately after ETT tip position confirmation x-ray, and 6) early recognition of ETT malposition. Current literature acknowledges that the usual techniques used to calculate optimal ETT depth translate poorly to ELBW infants.

The investigation comprised two parts: (1) a survey questionnaire, and (2) a simulation component with a neonatal manikin.

Approximately 25 clinicians, including neonatal consultants, fellows or registrars, neonatal nurse practitioners, and nurses, were asked to participate in the exploration.

Key Points:

- Initial explorations of problem identification revealed evidence of process ambiguity, including the following:
- ETT depth markers lack the sensitivity to guide correct placement or ETT adjustment after x-ray.
- Confirmation of tip position may be subject to parallax (visual perception) error, depending on the angle of viewing.
- Variability between clinicians in their tolerance for final position between the thoracic inlet and the carina.
- Variability in understanding of where taping "at lip" as instructed in clinical guidelines (e.g. top/bottom of lip, gum) is as a reference point for tube depth.

Future interventions will be designed to address the ambiguity in practice.

E2. 2. Validation of a Novel Intercostal Catheter Insertion (ICC) Part-Task Trainer

Jeffrey Kim[1,2], William Nancarrow[1], Kirsty McLeod[1], Mia McLanders[1,2,3]

[1]Clinical Skills Development Service, Royal Brisbane & Women's Hospital, Brisbane, Australia, [2]School of Psychology, The University of Queensland, Brisbane, Australia, [3]Safety Science Innovation Lab, Griffith University, Brisbane, Australia

Intercostal Catheter Insertion (ICC) is a critical medical procedure performed to manage conditions like pneumothorax and hemothorax. Adequate training is essential to ensure proficiency and patient safety, yet traditional training methods often lack realism and training devices are particularly costly. There is a need for novel part-task trainers to provide realistic and effective simulation-based education while being cost effective and easy to create. This study validates the effectiveness of a novel part-task trainer for ICC through assessment of system usability and participant experience.

We designed a bespoke part-task trainer for performing ICC within medical simulation training that incorporates an ICC Insert Pad to be placed within manikins. We collected ratings of the usability of this trainer from The System Usability Scale (SUS), a valid and reliable measure of a system's usability, as well as qualitative user feedback from 12 individuals, comprising responses from both consultants and registrars.

Our trainer exhibited excellent usability as indicated by responses on the SUS scale. Our part-task trainer was assigned a usability score of 86.3, a score that is well above average (M = 63.0). Analysis of qualitative data revealed participants viewed the trainer as practically useful, realistic, simple, and gave good feedback for pleural procedures. In regard to improvement, one participant referenced the need for more time to repeat practical components of the task, and another participant referenced making the foam deeper to house the saline bag.

Training an ICC procedure with our novel part-task trainer was shown to exhibit excellent usability and received positive user feedback, with helpful suggestions for future improvement. Our device is cost effective ($26.10), and 30 trainers can be created in under 25 minutes, demonstrating an effective and practical solution for teaching ICC.

E2. 3. Evaluating a Patient Portal's Usability: What do Older Adults Think?

Adeola Bamgboje-Ayodele, Research Fellow, University of Sydney

Patient portals can support care delivery but have demonstrated mixed impacts on patients, clinicians and health services, largely due to poor uptake and implementation challenges. Patient portals can inadvertently result in widening inequalities in access to healthcare, especially for the elderly, as portals may not be designed to accommodate their needs and preferences.

The aim of this study was to evaluate the usability of a patient portal in a real-world setting, with a particular focus on older users. The study was conducted at a public dental hospital in New South Wales, Australia. The patient portal, called Florence, is a web-based application for managing patient appointments, including functions for confirming upcoming appointments, sending messages to or from clinics, requesting cancellation or rescheduling of appointments. This mixed methods study comprised an online survey (Simplified System Usability Scale (SUS) for cognitively impaired and older adults), interviews and usability testing. Qualitative data were analysed using

thematic analysis. The survey data were analysed, and a general linear model ANOVA was used to test whether age predicted the SUS scores.

Of those invited, 10% (159 respondents) provided data. Most were male (N=84, 52.8%) and 45.9% were >65 years. The overall mean SUS score was 63.8 (95%CI: 61.0–66.6) indicating a usability level of below average. Younger patients (<65 years; SUS score 67.9) found the portal easier to use than older patients (SUS score 59.1; F=10.0, p=0.002). Interviews and usability tests are ongoing, but suggestive of areas where redesign may better support an older population (e.g. layout concerns, poor navigation).

The study has provided valuable insights into older patients' experiences of using the Florence portal (e.g. layout concerns such as difficulty locating the "send message" function). Findings will inform Florence improvement to ensure this patient cohort is not excluded from the potential benefits of a portal.

E2. 4. Human Factors Approach to Redesigning Proning Pillows in the ICU

Kirsty McLeod, Senior Research Fellow, Clinical Skills Development Service

Caring for a patient in the "prone" (face-down) position can be beneficial for managing acute respiratory distress. Following the onset of the COVID-19 pandemic, use of the proning technique increased dramatically across intensive care units (ICUs) worldwide. However, the type of pillow used to manage proned patients can significantly impact their risk of airway dislodgment and disfiguring pressure injuries. With little understanding of the usability issues associated with proning pillows in the ICU, optimal redesign remains challenging.

The first aim was to identify and document the barriers and facilitators associated with proning patients in the ICU, using the SEIPS framework to understand how the pillows interact with the people, tools, tasks, environment, and organisation. The second aim was to use this information to identify and consider design opportunities for proning pillows and other system improvements to reduce the risk of pressure injuries and other complications.

Thirty-six ICU clinicians from Australian public metropolitan hospitals reported their experiences with proned patients and the prevention of injury. Seven ICU clinicians then completed journey mapping activities to document the key workflows, critical incidents, considerations, and personnel involved in managing proned patients in the ICU.

Multiple barriers and facilitators to injury prevention were identified, including interactions between various tools (e.g., pillows with one side opening limits the management of several medical devices), the tasks (e.g., high frequency of repositioning), the people (e.g., clinical inexperience, patient features), the environment (e.g., limited tool availability), and the organisation (e.g., limited staff to support tasks).

This holistic approach revealed several opportunities for the redesign of proning pillows and associated systems. Key takeaways include the limitations of a one-size-fits-all approach to proning in the ICU context, and the need for flexibility and customisation to improve proning pillows, associated medical devices, prophylactic dressings, aids, and processes.

Parallel Session E3: Psychosocial

E3. 1. Evaluating Systems Thinking Resources for Preventing Work-Related Violence in Hospitals

Gemma Read, University of Sunshine Coast

Preventing and managing work-related violence in hospitals is a significant and complex issue within Australian and international healthcare research, policy, and practice. To date, there has been extensive efforts to address the issue through establishment of policies, standards, and staff training initiatives. Despite these efforts, work-related violence continues to be a key risk and concerningly, assaults on healthcare workers worldwide have been increasing over the past two decades.

The aim of this study was to test a set of systems thinking resources to assist stakeholders to take a systems approach to the prevention and management of work-related violence in hospitals. The three systems thinking-based safety management resources were: (1) Multi-level Risk Assessment Toolkit; (2) Systems Thinking in Incident Investigation Guidance; and (3) Reporting Culture Improvement Roadmap. The three resources were evaluated during a series of stakeholder workshops. In total, thirty-eight stakeholders participated across the workshops. During each workshop, participants were presented with a resource and facilitated discussions gathered feedback. Following this, participants rated the usability and practical utility of the resource and answered open-ended questions.

Overall, participants rated usability as ‘good’ to ‘excellent’, however there was variability in the ratings for some aspects of the resources. Scores regarding potential utility in practice also showed a general acceptance for the tools. Open-ended questions were themed into strengths, weaknesses and suggested improvements, and implementation barriers and considerations. The findings suggest that the resources are considered practical and appropriate for implementation in the hospital sector. Based on the results and feedback from stakeholders, the resources were finalised and released via the SafeWork NSW website: https://www.safework.nsw.gov.au/your-industry/health-care-and-social-assistance/hospitals.

Acknowledgements:

This project was funded by SafeWork NSW. We thank Kate Podryhula, Amy Bournes and members of the Action Against Violence in NSW Hospitals Working Group for their contributions to the project.

E3. 2. Stages of Change Model in Workplace Interventions: A Scoping Review

Elise Condie, Woolworths Group

The Stages of Change model proposed by Prochaska and Di Clemente (1982) is proposed as an approach to improve intervention design, by improving the alignment between the subjects' readiness to change and the intervention design. The model states that change in behaviour occurs as people move through the stages of pre-contemplation, contemplation, preparation, action, and maintenance.

This scoping review aims to evaluate available peer-reviewed research, in a workplace setting, that incorporates the Stages of Change model as part of intervention design. It examines the

implications for designers of interventions aimed at facilitating organisation level change, particularly in respect of interventions aimed at improving work design.

A literature search was conducted to identify all peer reviewed articles which discussed the application of Stages of Change to interventions conducted in a workplace setting. Seven databases were searched to obtain papers for review. Thirty-six studies were identified which met the eligibility criteria.

Twenty-nine of the eligible studies were focused on changing health behaviours of individual workers. These included interventions relating to smoking cessation, exercise patterns, and nutrition choices. The remaining seven studies used the Stages of Change model to facilitate change affecting whole work groups or organisations.

This scoping review suggests that there are few interventions which have applied the Stages of Change model to the design of an intervention aimed at eliciting change at the organisational or workgroup level. Further research needed, to test whether such an approach is more effective than those which do not consider an organisation or workgroup's readiness to change in relation to the intervention's aims. This would require tailoring an intervention to management and the workforce's stage of change, and making comparisons with outcomes based on a non-tailored intervention.

E3. 3. Building Work Design Capabilities Using the PHRed-T: An Evaluation Study

Tim Bentley[1], Carlo Caponecchia[2], Leigh-Ann Onnis[3], Kate Blackwood[1], Azadeh Shafaei[1], Beth Mayland[4], Nicola Green[5], Ben Farr-Wharton[1], Abid Hussain[1]

[1]Edith Cowan University, Perth, Australia, [2]University of New South Wales, Sydney, Australia, [3]James Cook University, Australia, [4]Western Sydney University, Sydney, Australia, [5]Ergonomics, Work & Health Ltd, Christchurch, New Zealand

Given the need to address psychosocial workplace hazards through a risk-based, systems approach, proactive methods for doing so are essential. One such approach is through the re-design of work. The present study utilises a novel tool developed by these applicants for the NSW Government, the Psychosocial Hazard Work Re-Design Tool (PHReD-T), to guide work re-design to address psychosocial hazards in the mining sector.

The PHReD-T was evaluated to determine its efficacy to enhance work re-design capabilities and in re-designing mining work to eliminate or mitigate worker exposure to psychosocial hazards. Three Western Australian mine sites were recruited to participate in the evaluation. Champions from each participating mine site established a steering group of 8-12 organisational members involved in the management of psychosocial risk in some way, who together worked through the PHReD-T process. Each Steering Group member was asked to complete a brief online survey to assess their current level of work re-design knowledge and capability before and after their participation. The research team provided support for the steering groups as they worked through the various stages of PHReD-T. Following each Steering Group session, the researchers asked a small number of process evaluation questions.

At the conclusion of the final session, the research team reviewed the output of the PHReD-T sessions to determine the quality of the work re-design planning and general engagement with the tool. Finally, follow-up interviews with Champions from each participating mine site were undertaken after two months to understand whether the work re-design action plans had been implemented.

The study addressed both research and practice gaps by demonstrating the efficacy of a novel tool to promote work re-design competencies within workplaces and guide the task of work re-design through a systematic approach. Implications for psychosocial risk management are discussed.

E3. 4. The Silent Struggle: Impacts of Serious Incidents Across the Workplace

Clare Dallat[1], Denise Mitten[2]

[1]Centre for Human Factors and Sociotechnical Systems, The University of Sunshine Coast, Sippy Downs, Australia, [2] Prescott College, Arizona USA

Serious incidents continue to occur in workplaces. Findings from studies within domains such as healthcare and emergency services confirm that professionals can experience emotional distress, often long lasting, from their involvement in serious incidents. Known as “second victims,” these professionals commonly report reactions such as fear, guilt, shame, self-doubt, anger, and disappointment. To date, much of the research focus into second victims has centred around those professionals directly at the scene and involved in the incident. This presentation will share findings from a study of led outdoor recreation practitioners involved in injury incidents that included participants from across the led outdoor recreation system.

Participants completed a survey describing the role they were in at the time of the incident, a description of the incident, and using a list generated from the literature review, they were asked to identify the impact the incident had on them. Participants were also encouraged to add other reactions they experienced. A total of 147 respondents reported 171 incidents, 73 of which were fatal. Respondents occupied a range of roles during these incidents, including instructor, coordinator, manager (both on and off-scene), senior directors, and off-duty responders. A range of personal and professional impacts were reported, the most common being hypervigilance in risk and safety management practices on return to work. Further, involvement in serious incidents had negative impacts on the personal relationships for over 50% of respondents.

Findings suggest that serious incidents can have a significant impact on the wellbeing of practitioners across the whole work system and that they primarily cope with their feelings on their own. Notably, many are reporting performance-inhibiting constraints when they return to the field or office following their involvement in a serious incident.

Parallel Session F1: Work Design

F1. 1. Clarity Amidst Complexity: Workload Management in the Service Professions

Sara Pazell & Jill Lowry, ViVA Health at Work

Workload is a significant determinant of psychological health in service professions, such as education. High mental workload is correlated with job stress and burnout, resulting in negative organisational outcomes, including reduced staff engagement, increased turnover, and negative impacts on educational outcomes.

This initiative presents a practical methodology for evaluating psychosocial work factors, particularly workload management, by integrating scientific models with real-world applications. Presenters will demonstrate how various analytical filters can shift perspectives on data and inform strategic decisions. Using theoretical data sets, they applied a two-stage, consensus-based thematic analysis, incorporating multiple models: the salutogenic model, the Job Demand-Control-Support (JDCS) model, the SMART model (stimulating, mastery, agency, relational, and tolerable demands), and neurobehavioral drivers. Additionally, they used five design tools—personas, empathy maps, journey maps, design statements, and design philosophies—to communicate findings to organisational teams. This approach led to further empirical studies using software solutions to identify work efficiencies and pathways of psychosocial hazard exposures among teaching staff.

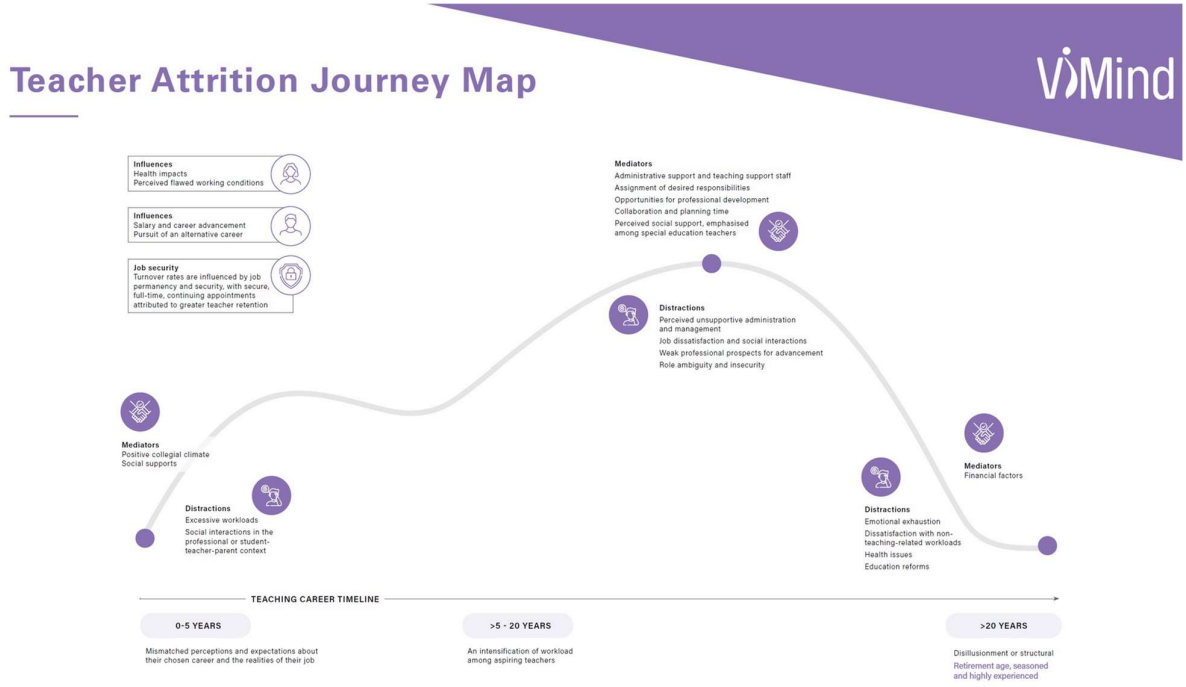
The literature review identified vulnerabilities in teaching populations, highlighting distinct workload impacts and retention trends. The desktop review of data through various epistemological lenses uncovered key factors influencing teacher engagement and wellbeing. Understanding these needs is essential for designing meaningful solutions to real-world challenges in education.

Efficiency data contributed to the development of strategies worth millions in potential annual savings for school districts through targeted job-redesign strategies, while addressing workplace stressors.

Key points:

- Scientific approaches enhance the rigor of work re-design to solve real-world problems.
- Multiple analytic lenses clarify complex issues and inform re-design strategies.
- Agile, customised data collection leads to solutions for both work efficiency and employee wellbeing.

The study provides a strategy to address occupational psychosocial risk factors in the education sector and devise work efficiency solutions.



F1. 2. A Human Factors Toolkit to Evaluate Workflow Management Systems

Zohre Abedi, Joshua Williams, Paul Salmon, Gemma Read

Centre for Human Factors and Sociotechnical Systems, University of the Sunshine Coast, Brisbane, Australia

Workflow Management Systems (WMS) are essential for enhancing operational efficiency in modern workplaces, yet tools for assessing their impact on employee satisfaction and performance are lacking. This research aimed to address this issue by evaluating a Human Factors Workflow Management Systems Evaluation Toolkit (HF-WoMSET) developed to evaluate WMS's impact on users' job satisfaction and performance.

The study evaluated the HF-WoMSET via qualitative and quantitative analyses. First, the HF-WoMSET was applied through data collection with users (n=7) of a specific WMS within an organisation. Subsequently, the collected data was used by Human Factors and Ergonomics (HFE) experts (n=7) to evaluate validity, scalability, generalisability, and usability of the HF-WoMSET using NASA TLX, System Usability Scale (SUS), and 7-point scales. Thematic analysis and descriptive statistics were employed for data analysis.

HFE experts reported high usability (SUS: 68.5 ± 15.4, 0-100; NASA TLX: 33.5 ± 14.5) and validity scores (face validity: 5.5 ± 0.7, 1-7; construct validity: 5.5 ± 0.5, 1-7). Generalisability to other industries was perceived to be moderate (4.4 ± 2.3, 1-7), while scalability to various organisation sizes was high (5.2 ± 1.1, 1-7) and to different WMS was moderate (4.5 ± 2.2, 1-7). Thematic analysis provided three key themes: the benefits and limitations of the HF-WoMSET, and recommendations for its improvement. Findings demonstrated the toolkit's ability to capture information needed to assess WMS in terms of key HFE-related issues, including usability, mental workload, error management, trust in technology, team communication, and job satisfaction.

The HF-WoMSET offers a robust framework for evaluating WMS impact on job satisfaction and performance. Future research should explore its scalability across different WMS and organisations, aiming to enhance operational efficiency and employee satisfaction in diverse workplace settings.

F1. 3. Identifying Opportunities for AI in Science Workflows

Jessica Irons, CSIRO

Artificial intelligence (AI) tools are becoming increasingly prevalent in many knowledge work domains, including science. To ensure AI provides genuine benefits for workers, it is crucial to understand when and how different AI tools should be integrated into specific workflows. This includes understanding AI's role in the workflow: whether a task should be fully automated, AI should augment human work (e.g. providing advice), or the AI and human should work collaboratively.

This study explores the utility of a cognitive task analysis (CTA)-based "workflow mapping" process for identifying AI opportunities in science work. We applied the process to two case studies: genome annotation and biological specimen curation.

Scientists from the two case study domains (genomics researchers and collection curatorial team members; N = 12 each) were interviewed. We used CTA prompts to gather information on current workflows, including tasks, challenges, expert knowledge and decision-making strategies. Additionally, we elicited information on potential automated or AI solutions to mitigate existing challenges. The results were represented in a flow diagram mapping challenges, expert knowledge/strategies and AI opportunities mapped to relevant stages.

Opportunities for AI were identified at multiple stages in both case studies. Using the information mapped to each AI opportunity, we categorised opportunities as full automation, augmenting human work, or human-AI collaborative solutions. Both case studies revealed a preference for automated solutions early in the workflow (e.g. initial data processing) and augmentation or collaborative solutions late in the workflow (e.g. quality control).

Findings support the use of CTA-based approaches for identifying both when in workflows AI is appropriate and what form of AI solution will be most beneficial. They also highlight differences across science domains in challenges and priorities, underscoring the need for context-driven AI solutions over one-size-fits-all tools.

Parallel Session F2: Heavy Industries

F2. 1. Introducing Human Factors to a Truck Manufacturing Company

Nektarios Karanikas, Queensland University of Technology

The Australian truck sector generates over 200,000 direct and indirect jobs and moves more than $200 billion worth of products annually. To meet the high demands of the sector, the truck manufacturing company studied in this project operates with increased flexibility and continual adaptations of the production processes, supported by workers trained in different tasks.

The company had never studied human factors in its work environment to identify necessary improvements by understanding weaknesses and strengths. Therefore, this study was conducted to investigate how workers perceive the effect of human factors on their safety, health, wellbeing, and performance. The aim was to support the company in comprehending the state of various human factors in their manufacturing process, understanding any differences across its three production lines, and identifying opportunities for exchanging good practices amongst those lines.

The research employed a paper-based survey with two demographic questions, 16 Likert-type questions covering physical, cognitive and organisational human factors, and three qualitative questions to invite workers to state improvement ideas and current challenges and strengths. The median across the 70 completed surveys for all human factors areas investigated was M=3 out of 4 maximum, except for the quality of instructions (M=2), physical load demands (M=2) and job variety (M=4).

Statistically significant differences amongst the three production lines were observed for four human factors aspects. The years of work experience in the company were found significantly and negatively correlated with three human factors aspects. Most of the improvements suggested by the workers were related to organisational and procedural aspects. A similar focus was revealed for the challenges met, whereas collegial relationships were appreciated as the strongest area.

F2. 2. HCD of an Attractive, Healthy, Safe and Inclusive Minerals Industry

Danellie Lynas, Minerals Industry Safety and Health Centre, Sustainable Minerals Institute, University of Queensland

The mining industry is encountering difficulty attracting and retaining skilled workers. The loss of experience and knowledge, combined with rapid advancements in technology changing the nature of the roles required, threatens the ability of the industry to mine safely and productively. Increasing the attractiveness of working in the industry for a maximally diverse population will reduce this risk. The attractiveness of work (work that people both like having, and aspire to have) along with safety, health, and productivity, are emergent properties of the interactions between the social aspects (individuals and teams) and the technical aspects (e.g., equipment and work organisation) of the joint system.

The research examines the issue through treating the problem as one of how to design mining work that is human-centred; and thus attractive, healthy, safe, and productive for a maximally diverse population. This presentation discusses the preliminary results of a current pilot project funded by Resources Safety and Health Queensland, through the office of the Commissioner for Resources

Safety and Health. The research technique adopted is based on an appreciative inquiry framework, where the attention of diverse mine workers is directed to: Appreciating the best of what is; and Envisioning what might be. Utilising a participatory ergonomics process based on principles of human-centred design, 9 focus groups (total 74 participants) were conducted with current mine employees across 7 different mine operations (company, mine age, location, mining material and method), with a diversity of people on each site, and an emphasis on early to mid-career employees identifying opportunities for improved work design. These opportunities will have the potential to improve safety, health, and well-being, as well as attractiveness of the industry to a diverse range of current and future employees. The results will be used to inform discussion with senior level mine management.

F2. 3. Participatory Ergonomics in Action at a Minerals Processing Pilot Plant

Robin Burgess-Limerick & Tyron Cronin, The University of Queensland, St Lucia, Australia.

This industry project was conducted in a university research facility that undertakes characterisation and analysis of mineral samples. Rocks are delivered in a variety of containers. The samples are split into smaller quantities, transported to crushers and sorted, before being transported to a laboratory for testing. The process involves considerable manual handling, and several injuries have been reported.

The aim of the project was to implement a participatory ergonomics process to identify ways of reducing musculoskeletal injury risk at the pilot plant.

A participatory ergonomics process (Burgess-Limerick, 2018) was implemented. The workers who undertake the manual tasks were engaged in assessing the risks associated with the range of tasks involved. The tasks included: lifting bags of samples out of drums; transporting buckets of material; loading rotary splitter and decanting; loading large and small jaw crushers; handling core trays; operating screening machine; operating filter press; operating manual drum lifter. A range of control measures were identified including an electric drum lifter to replace the current hydraulic drum lifter; moving crushers closer to the loading dock to reduce transport; conveyers to reduce manual tasks during sample transport.

The tasks undertaken at the pilot plant posed a high risk of musculoskeletal injury because of the exertion required, in combination with awkward postures, repetition and long duration exposure to the tasks. The risk was exacerbated in summer by high heat exposure. The wide range of anthropometry of workers impacted the risks to individuals.

With support from their supervisors and site management, the workers engaged fully with the participatory ergonomics process and were able to effectively analyse the musculoskeletal risks associated with the tasks; and to generate a large range of opportunities for control measures to reduce injury risk.

Parallel Session F3: Strategies

F3. 1. Safety Climate Surveys: Integrating AI and Pulse Survey Methodologies

Mackenzie Evans & Claire Greaves, Tactix Sener Group

Regular Safety Climate surveys enable organisations to effectively monitor initiatives and adjust strategies based on data-driven insights. Metro Trains Melbourne (Metro) utilises the Health and Safety Laboratory's (HSL) Safety Climate Tool (SCT) for their triennial, organisation-wide safety survey, comprising 40 items across eight factors. Following their 2021 survey, Metro sought to gauge the effectiveness of their initiatives with a shortened, quarterly Pulse survey. Confirmatory Factor Analyses (CFAs) were conducted using Metro's 2021 survey data to confirm the model fit of the original survey and identify avenues for the shortened version. Based on the analyses and Metro's requirements, a 14-item shortened SCT was adopted (CFI = 0.98, RMSEA = 0.053, SRMR = 0.019). This project provides the first CFA of the SCT within the Transport Sector (Rail) and demonstrates the viability of shortened surveys within the industry.

The findings underscore the utility of pulse surveys for monitoring initiatives and enabling early intervention if results fall short. Regular pulse surveys help sustain a robust safety culture by proactively addressing concerns, reducing incidents, and enhancing employee well-being. Additionally, this project utilised an AI Tool (WhyHive AI Text Analysis) to assist in the Thematic Analysis of open-ended responses in the 2024 full SCT. Multiple AI tools were evaluated to identify the most suitable option. Consultants then conducted a comparative analysis of themes identified by the AI tool against those identified through manual sampling. The results revealed a high degree of concordance between AI-identified themes and those recognised by consultants. This key finding illustrates that AI-assisted analysis significantly enhances the efficiency and accessibility of conducting safety climate surveys across organisations, greatly reducing the manual effort required to process large qualitative data sets.

F3. 2. An Industry Case Study in Participative & Data-Driven Ergonomics

Dave Harry, Amazon, Melbourne, Australia

Topic Areas discussed include Participative ergonomics, iterative design, data driven decision making, deep dive ergonomics methods

Learning Outcomes:

- Drawing on multiple data points to prioritise ergonomics issues
- Leveraging worker expertise and feedback to improve equipment design
- Celebrating success as a key ingredient in project deployment and successful change management

The industry case study presentation will use the example of a cart used in a number of processes across a number of Amazon AU sites. The presentation will discuss the mechanisms by which worker feedback was gathered about the cart during pre-pilot, pilot and deployment stages for the interim solution as well as how the prototype of the long-term solution has been informed by worker feedback.

The case study will also discuss how worker input was celebrated during the deployment of the interim solution.

F3. 3. Improving Workplace Safety in Gig Work: Perspectives of Key Stakeholders

Alice Cheng, Safe Work Australia

Globally, research on the gig economy has often focused on food delivery and rideshare work. There continues to be limited studies about workplace safety in gig work across sectors.

This study aims to examine the perspectives of key stakeholders within Australia, including safety regulators and government agencies, industry peak bodies, gig companies, and consumers of services.

This study complements a previous study conducted by the research team, which used an online cross-sectional survey to collect data from 377 Australian gig workers. It revealed that there is a diverse range of workers across gig sectors, that musculoskeletal injuries are commonly experienced, and that gig workers are concerned about psychosocial hazards.

The research team undertook semi-structured interviews to collect data from 25 participants and used a qualitative data analysis software. Themes identified included participants understanding of the gig economy, perceptions and observations of gig workers' demographics, hazard exposures, and recommendations to improve health and safety. Our findings indicated that there appears to be no one-size-fits all term or descriptions that are used for the gig economy. This may be associated with the uncertainty of employment relationships or the WHS laws, which may impact key stakeholders' perspectives in risk management.

Various factors such as workforce diversity and limited understanding of gig companies' systems may contribute to the risk of gig workers sustaining both physical and psychological injuries. WHS duties could also be shifted to others in the workplace. A holistic view that considers transdisciplinary perspectives are recommended to better understand how changes at different levels are required (ranging from government agencies to gig companies) to make gig work safer. Future research may also be required to better understand how consumers of services may play a role in workplace safety.

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