WORK HEALTH AND SAFETY RESEARCH HORIZON SCAN, SCOPING REVIEW AND EVIDENCE GAP MAPPING PROJECT

Scoping review and case study findings: Advances in technology

A report prepared for Safe Work Australia

ACADEMY OF THE SOCIAL SCIENCES IN AUSTRALIA

ATSE

About this project

This project was commissioned by Safe Work Australia, and it maps the existing landscape of work health and safety and workers' compensation research across the five Safe Work Australia *Research and Evaluation Strategy* initial priority areas to provide a data driven understanding of the current evidence base, gaps, and emerging research areas.

This report was developed with guidance from an Expert Working Group of experts from across work health and safety research and related areas. The Academy of the Social Sciences in Australia and the Australian Academy of Technological Sciences and Engineering gratefully acknowledges the Expert Working Group for their contributions.

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Introduction

This report is part of a series of five reports presenting the consolidated findings from a scoping literature review, horizon scan, and evidence gap mapping undertaken by the Academy of the Social Sciences in Australia for Safe Work Australia (SWA) as part of the 2025 Horizon Scan & Evidence Gap Mapping Project. Each report in the series focuses on one of five research priority areas from SWA's Research and Evaluation Strategy, supported by a case study looking into a known and related driver of change for Work Health and Safety (WHS) in Australia over the coming decade.

The purpose of the project is to ensure future research development, policy and regulatory decisions are evidence informed. To achieve this, each report brings together the results from three integrated research methods. A scoping literature review that maps the depth, breadth and characteristics of Australian WHS and workers' compensation research for a research priority area, a horizon scan which, using a case-study based approach, evaluates research related to a known driver of change to examine how it is manifesting in relation to WHS research, and an evidence gap mapping that integrates insights from the scoping literature review and the horizon scan to show where the evidence is absent, sparse, or misaligned between the evidence base, priority area and case study.

Together, these methods help us understand what evidence currently exists, how it is distributed across research priority areas and case studies, and how well positioned the Australian research evidence base is to respond to future WHS challenges. The following sections present a summary of key findings that integrates insights from the scoping literature review, horizon scan, and evidence gap mapping. The remainder of the report then unpacks these findings in detail.

Research Priority Area	Case Study	
P1: Psychosocial harm prevention and recovery	C1: Psychological injury and increasing time off work	
P2: Advances in technology, including both the risks and opportunities posed by technologies	C2: GenAI and work design	✓
P3: Shifting mindsets around WHS fundamentals	C3: Respect@Work	
P4: Effectiveness of systems and frameworks	C4: Electrification and emerging hazards	
P5: Changing nature of work	C5: Algorithmic management in gig platforms	

Advances in technology

This report focuses on the research priority area of advances in technology, including both the risks and opportunities posed by technologies, identified in SWA's *Research and Evaluation Strategy.*

The advances in technology research priority area focuses on research that seeks to understand how technological changes are reshaping WHS and workers' compensation systems in Australia. As outlined in SWA's Research and Evaluation Strategy, the aim is to strengthen the national evidence base on how digitalisation, automation, AI and related technologies influence hazards, controls, organisational practices, and equitable outcomes across the workforce.

Research in this priority area centres on examining new and emerging technological risks, the potential for innovations to improve safety, the impacts of technology on vulnerable or precariously engaged workers and the extent to which WHS regulatory and compensation frameworks are able to keep pace with rapid innovation. It also includes understanding how technology affects work design, capability requirements and the broader distribution of work and responsibilities within organisations. This research focus is essential for anticipating system-level changes and ensuring policy, regulation and practice remain effective and responsive as technological transformation accelerates.

Advances in technology represent an established and growing component of the Australian WHS evidence base. The scoping review identified 563 records within the 7,027-record dataset as directly relevant to this priority area (collectively referred to as P2), indicating a substantive body of research examining the implications of technological change for work health and safety.

Taxonomy analysis shows that research activity is concentrated around established technologies that directly affect physical tasks, equipment operation and human–machine interaction. High-frequency terms relate to productivity, ergonomics, machinery, wearables and automation. These patterns suggest that technological change is being examined through familiar WHS lenses such as task execution, exposure control and efficiency within existing work structures.

In contrast, concepts associated with advanced digital technologies such as artificial intelligence, algorithmic systems and data-driven management tools appear infrequently across the dataset. Where such terms do occur, they rarely appear with concepts relating to work design, organisational decision-making or worker autonomy. This indicates that while technological change is well represented in the evidence base, its examination remains anchored in established industrial and physical risk contexts.

System-generated concept clustering reinforces this interpretation. Technology-related concepts are positioned within existing industry and health-focused clusters rather than forming a distinct or rapidly expanding domain centred on digital transformation. Overall, the evidence base for this priority area reflects a mature literature on physical and industrial technologies, with limited attention being paid to emerging digital and cognitive technologies.

Generative AI (GenAI) and work design

The case study of generative AI (GenAI) and work design (designated C2) was selected for horizon scanning to examine technological disruption driven by generative AI within WHS research in Australia.

This case study focuses on research that seeks to understand how GenAI is being introduced into Australian workplaces and how this reshapes work design, WHS risk management and workers' compensation contexts. GenAI is altering task allocation, decision-making processes, cognitive load and autonomy, while also redefining expectations around skill development and the interaction between humans and digital systems. These dynamics may introduce emerging psychosocial and technological risks, including increased monitoring, algorithmic bias, role ambiguity and over-reliance on automated outputs, alongside opportunities to reduce hazardous tasks, enhance learning, and improve hazard detection.

Within workers' compensation systems, GenAI-driven changes to job design may influence psychological injury patterns, return-to-work processes and assessments of work-relatedness, particularly where human and machine decision-making become blended. Understanding these impacts is essential because GenAI adoption is occurring rapidly and unevenly across industries, and this emerging driver of change is set to impact WHS in Australia over the next decade.

The case study of GenAI and work design provides a focused lens on emerging technological change. The horizon scan identified 10 publications within the dataset that directly address GenAI in work contexts, indicating that this is a recent and still-forming area of research within the Australian WHS literature.

Publishing pattern analysis shows that GenAI-related publications appear only in the most recent years of the dataset, with no historical footprint prior to 2022. This reflects the rapid emergence of GenAI as a workplace technology and its comparatively recent incorporation into WHS research. Conceptually, GenAI-related publications are clustered around governance, accountability, privacy and organisational practice, rather than physical task modification. Taxonomy tagging shows relatively low co-occurrence with WHS topics such as work design or psychosocial risk.

The case study therefore highlights a divergence between established technological research, which focuses on physical systems and automation, and newer forms of cognitive and decision-support technologies that reshape how work is allocated, sequenced and evaluated.

Evidence gap mapping

Evidence gap mapping integrates findings from the scoping review and the horizon scan to identify patterns of absence, sparsity and alignment.

At the level of absence, advanced digital technologies and AI-related concepts appear infrequently within the priority area dataset and are largely absent from system generated topic clusters. While established machinery and automation technologies are well covered, research explicitly examining how artificial intelligence reshapes work design, authority structures and evaluation processes is limited.

Sparsity is evident in the small number of publications directly addressing GenAI in work contexts. The horizon scan indicates that workplace applications of GenAI are emerging rapidly, yet the WHS-focused literature addressing these applications remains minimal. This contrasts with the extensive and mature coverage of other technological domains within the priority area.

An alignment gap is also observed between the framing of technology within the established WHS literature and the forms of technological change surfaced through the case study.

Existing research conceptualises technological risk primarily in relation to physical interaction and exposure pathways. In contrast, GenAI-related developments influence cognitive workload, task sequencing, performance monitoring and organisational decision-making. These indirect and system-level effects are not yet being addressed in the WHS evidence base. Taken together, the findings indicate that the Australian evidence base is well developed in relation to incremental and task-level technological change, but comparatively less developed in relation to digital and cognitive technologies that reshape work design. The horizon scan suggests that this gap may become increasingly significant as GenAI adoption accelerates across industries.

Key findings

The evidence base for advances in technology within Australian WHS research is substantial and well established. The scoping review demonstrates that technological change is a recurring and growing focus within the 7,027-record dataset, with sustained publication growth over the past fifteen years. However, the distribution of research activity indicates that this domain is primarily oriented toward established technologies that affect physical work processes, machinery, ergonomics and exposure management. Research attention is concentrated on how technologies modify task execution and immediate work environments, rather than how they reshape organisational structures or decision-making processes.

The case study of GenAI and work design highlights a divergence between this established focus and emerging forms of technological change. Only a small number of publications within the dataset directly address GenAI in workplace contexts, and these publications appear exclusively in recent years. Where GenAI is examined, it is framed primarily in terms of governance, accountability and organisational practice rather than physical hazard modification. This indicates that GenAI is entering the research landscape as a boundary technology situated between technical, regulatory and social domains, rather than as an extension of established machinery-based safety research.

Comparison between the scoping review and the horizon scan suggests that the existing evidence base provides limited insight into how digital and cognitive technologies reshape work design. While the literature is mature in its treatment of physical automation and industrial technologies, it has not yet fully incorporated technologies that influence task allocation, monitoring, performance evaluation and cognitive workload. The integration of AI-related concepts with work design and psychosocial risk constructs remains limited.

Taken together, the findings indicate that Australian WHS research is well positioned to understand incremental and task-level technological change, but comparatively less developed in relation to technologies that alter the structure and governance of work. As GenAI adoption accelerates across industries, the current evidence base offers a strong foundation in technological risk management but provides more limited guidance on the indirect and system-level implications of cognitive automation for WHS.

Scoping literature review

This scoping review draws on the full dataset of 7,027 records to provide an overview and synthesis of the WHS research landscape for the research priority area of advances in technology. The 563 records screened by the AI panel form a focused subset of this dataset, which are compared and contrasted with the full dataset to understand priority area research and taxonomy coverage.

Tagging

Across the taxonomy, 63 taxonomy terms were operationalised to tag the 7,027 records in the full dataset (a record may have multiple tags). Of those, 30 terms were associated with at least one publication, while 33 terms were not associated with any publications.

Table 1 shows that a total of 593 tags were applied to records in this priority area, 232 of those tags were from the taxonomy. The number of records tagged with the priority area's taxonomy terms exceeds the number of records in this priority area's dataset, indicating that many publications reference related concepts without being classified as primary sources for this priority area. Records for this priority area hold the majority of related tags (232), aside from unscreened records (388), suggesting strong alignment between the taxonomy and priority area (Table 1).

Appendix 3 presents the distribution of publications across this priority area's taxonomy terms for the screened dataset, ordered by total publication count. It shows that a small number of taxonomy terms account for a large proportion of publications and a long tail of terms with relatively low counts. The most frequently observed taxonomy terms for this priority area were *productivity* (279), *ergonomics* (160), *machine learning* (44), *wearables* (43), and *usability* (31). Together, these relatively high-frequency terms account for the majority of taxonomy-tagged publications.

In contrast, many taxonomy terms were associated with relatively small numbers of publications. Twenty-nine taxonomy terms appeared on fewer than 10 publications, and many appeared only once or twice. This comprised a diverse set of terms, such as *industry automation, responsible AI, virtual and augmented reality, algorithmic management,* and *predictive maintenance*.

Thirty-three taxonomy terms were not associated with any publications, indicating an absence of explicit coverage for these concepts within the dataset. Absence in this context refers to a lack of explicit taxonomy tagging in the dataset and does not imply the absence of research on these subjects more broadly. Examples include terms such as *data sovereignty, technostress, internet of things,* and *UAVs.*

Tags applied	Screened record categories							
	P1	P2	P3	P4	P5	Unscreened	Multi***	Total**
P1	2079	140	625	183	138	1843	678	4330
P2	63	232	49	24	28	388	66	718
P3	68	40	77	41	19	183	58	370
P4	130	144	226	97	29	477	126	977
P5	150	37	55	26	45	406	71	648
Total*	2490	593	1032	371	259	3297	999	7043

Table 1: A matrix showing the number of tags applied to screened records across the 7027-record dataset. P2 tags are highlighted. The Y-axis is priority area tags and X-axis is the screened record categories, e.g. cell P2/P2 shows the number of P2 tags applied to P2 screened records. The table also includes columns with the number of unscreened records that were tagged, the number of tags that were counted multiple times (Multi) and the total tags applied. Figures reflect total tag counts, tagging is not exclusive and a term might appear on records in each priority area, records can also be screened into more than one priority area – hence tag counts are higher than the number of records in the dataset.
** Total tags on P1, P2, P3 etc. records, **Total P1, P2, P3 tags on all records. ***The number of terms that are counted more than once.*

Patterns over time

Time-based analyses of the 563 screened records show consistent growth in output across the period covered by the dataset (Table 2), with higher volumes observed in more recent years, and consistent year-on-year growth over the fifteen-year period. Figure 1 shows the top ten terms over the period, and the number of publications tagged in the full dataset. This highlights the consistent and stable growth of research on key topics within the dataset for this priority area. When it comes to related terms, coverage growth over time aligns with the publication growth observed.

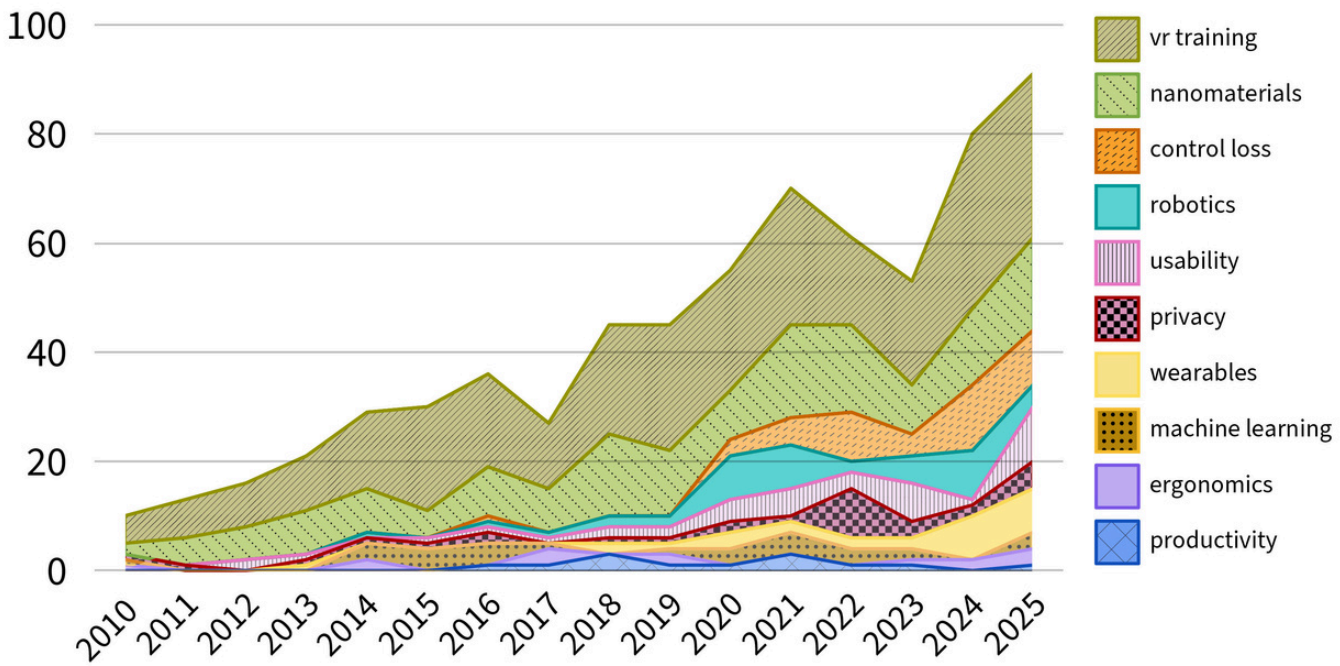

Figure 1: Stacked area chart of the top ten terms by year and number of publications tagged in the full dataset.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Pubs	13	9	16	20	26	21	22	27	35	31	47	53	56	50	74	63
Tags	10	13	16	21	29	30	36	27	45	45	55	70	61	53	80	91

Table 2: Table showing the number of P2 publications, and records with P2 tags by year of publication.

High-level concept clusters derived from VOSviewer

To complement taxonomy-based tagging, high-level concept clusters were generated using VOSviewer[1] based on co-occurrence of key terms in titles and abstracts within the screened dataset for this priority area. This approach provides an inductive, data-driven view of how concepts are organised in the dataset, enabling comparison between emergent research themes and the deductively defined taxonomy for this priority area.

Alignment between taxonomy terms and system-generated concepts was examined for taxonomy terms. The concept network shows that technology-related terms occupy a boundary position within WHS research, consistently sitting between environmental conditions, worker activity, and health. Technologies such as AI, machine learning, motion capture, sensors, and digital systems co-occur most strongly with mining, construction, healthcare, and exposure-related concepts. This indicates that they are being studied as mediating elements within established hazard and work-setting frameworks. This positioning suggests that technological change in WHS is being understood through how it reshapes environments, tasks, and worker–health relationships. The average publication year reinforces this interpretation: AI, computer vision, and machine-learning concepts are among the most recent in the dataset, showing that digital technologies are entering the field at the edges of traditional WHS research domains. The clusters are presented in Table 4, and Table 5 lists the top 5 concepts. The cluster/concept network is visualised in Appendix 4 Figure 2.

#	Cluster	Concepts	Description
1	Construction, industry settings, and safety management systems	80	This cluster reflects a mature body of industry-focused safety research emphasising operational risk, safety systems, and organisational controls, with construction as the dominant empirical context
2	Health, mental health, and intervention outcomes	55	A health-outcomes-oriented cluster linking physical health, mental health, psychosocial risks, intervention studies, outcome measures, controlled trials, and participant-based research.

[1] *Nees Jan van Eck and Ludo Waltman, "Software Survey: VOSviewer, a Computer Program for Bibliometric Mapping," Scientometrics 84, no. 2 (2010): 523–538, https://doi.org/10.1007/s11192-009-0146-3.*

#	Cluster	Concepts	Description
3	Healthcare workers, ergonomics, and musculoskeletal risk	45	A cluster focused on healthcare and care workers, nurses, hospitals, musculoskeletal disorders, posture, physical load, injury risk, and patient safety.
4	Digital technologies, AI, and intelligent safety systems	40	A technologically oriented cluster dominated by artificial intelligence, machine learning, deep learning, computer vision, neural networks, sensors, motion capture, and co-design.
5	Mining, environmental monitoring, and exposure control	30	A sector-specific cluster centred on mining and extractive industries, including coal mines, dust monitoring, particulate matter, environmental monitoring, exposure assessment, ventilation, and combustion risks.
6	Digital technologies, AI, and intelligent safety systems	15	A small, specialised cluster focused on occupational radiation exposure, radiation dose, dose reduction, coronary angiography, and interventional procedures.

Table 3: The clusters resulting from VOSviewer analysis, number of concepts included, and summary descriptions.

Concept	Occurrences	Cluster
Construction	44	1
Workers	38	1
Construction industry	33	1
Construction sites	32	1
Industry	24	1

Table 4: The top five concepts by the number of occurrences, and their associated cluster.

Sources and contributing organisations

The scoping review shows that research addressing advances in technology is concentrated within a relatively small number of established publication outlets (Table 5) and academic institutions (Table 6). The most frequent sources are long-standing safety science and occupational health journals, indicating that technological change is primarily examined within existing disciplinary frameworks, not through emerging digital or technology-focused venues.

A similar concentration is evident in contributing organisations and authorship, with publications dominated by a small group of Australian universities and recurring research collaborations (Table 7). This reflects a strong and stable research base and that perspectives on technological change in WHS are shaped by established research approaches and focus areas.

Source Title	Publications
Automation in Construction	16
Accident Analysis & Prevention	13
Annals of Work Exposures and Health	11
Occupational and Environmental Medicine	10
medRxiv	10

Table 5: The top five publication sources by the number of associated publications.

Organisation	Publications
Queensland University of Technology (QUT)	59
Monash University	57
University of Queensland (UQ)	52
UNSW Sydney (UNSW)	40
Curtin University	39

Table 6: Top five affiliated organisations noted on publications, by number of publications they are listed on.

Author	Publications
Heng Li	17
Martin R Skitmore	15
Mark Erskine Howard	9
Saeid Nahavandi	8
Shantha M W Rajaratnam	8

Table 7: Top five authors, by the number of publications they are listed on.

Summary of taxonomy-based evidence coverage

Taxonomy-based analysis indicates that new technologies are commonly examined through familiar lenses such as ergonomics, machinery safety, and exposure management. Research is strongly concentrated around established technology-related concepts, particularly machinery safety, automation, ergonomics, human–machine interaction, and productivity-related interventions.

These high-frequency tags suggest that technological change in WHS is most often examined in relation to physical systems, task design, and efficiency improvements within existing work structures. In contrast, concepts associated with advanced digital technologies, including artificial intelligence, algorithmic decision-making, and data-driven management systems, appear infrequently across the dataset. Where such terms do occur, they are rarely co-tagged with concepts related to work design, organisational decision-making, or worker autonomy, indicating limited integration of technological and organisational perspectives in Australian WHS research

The taxonomy tagging also shows relatively strong coverage of individual-level and task-level impacts, such as workload, usability, and human factors, but much weaker coverage of higher-order impacts on job design, role boundaries, and management practices. This pattern suggests that while the evidence base is well developed in relation to incremental technological change, it provides a limited foundation for understanding technologies that reshape how work is allocated, supervised, or evaluated.

Horizon scan

The horizon scan was conducted following a case-study based deductive approach that recognises existing research on the future of work health and safety and known drivers of change. Drivers of change identified by leading international institutions and global WHS research programs were used as an organising frame for the horizon scan and to help manage its scope. These drivers represent well-established and emerging trends on the global WHS horizon. A case study approach was then used to examine how these identified drivers are manifesting within the Australian WHS research evidence base. Case studies were selected through literature review and in consultation with SWA and the project's Expert Working Group (EWG).

Case Study	Drivers of change	Rationale	Time frame	Publications	Publishing	Status
GenAI and Work Design	Artificial intelligence and cognitive automation in work design	Captures the transformative impact of AI on cognitive workload, human–machine collaboration, and new WHS models. Foreseen as a decade-long driver with cross-system effects	Decade (6–10 yrs)	10	Very recent	New

This section presents the results of analysis for the case study of GenAI and Work Design, which reflects the growing importance of artificial intelligence and cognitive automation in work design and work arrangements for Australian WHS. The case study topic was selected for this priority area because it captures the transformative impact of AI on cognitive workload, human–machine collaboration, and new WHS models. This driver of change is foreseen as a decade-long driver with cross-system effects and implications.

Overview of results

The case study dataset comprises 10 publications identified through the panel screening method. Records were tagged with terms from the full taxonomy of 304 terms across the five priority areas. The purpose was to examine the cross-cutting nature of the research and related concepts across the priority areas.

Across these 10 records, all were tagged with at least one taxonomy term from the full taxonomy of 304 terms (Table 8). Table 9 shows the most frequently observed taxonomy terms within case study records. These were *privacy* (4 publications), and *productivity* (4), *accountability* (3), *responsible AI* (2) and *surveillance* (2).

Measure	Number of publications
Publications in the case study	10
Publications with ≥1 taxonomy tag in the matrix	10
Publications with no taxonomy tags in the matrix	0

Table 8: Summary of the publications included in the case study and taxonomy tagging results

Taxonomy term	Priority area	Publications
Privacy	P2	4
Productivity	P2	4
Accountability	P3	3
Responsible AI	P2	2
Surveillance	P1	2

Table 9: Top five taxonomy terms by the number of publications tagged, using the full taxonomy of 304 terms.

Patterns over time

Time-based analyses showed annual publication counts growing over time but only started appearing since 2022. This pattern is consistent with results seen in the scoping review and that makes sense given the emerging significance of GenAI.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Freq	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	4

Table 10: The number of publications per year in the case study dataset.

High-level concept clusters from VOSviewer

System-generated concept clusters derived from VOSviewer provide a complementary, high-level overview of concept co-occurrence. They show that generative AI is positioned squarely at the intersection of governance, organisations, and workers, not just technology. Core AI concepts (artificial intelligence, AI systems, AI tools, generative AI) co-occur most strongly with regulation, HR practices, recruitment, employment rights, and workplace surveillance. With average publication years clustered around 2024–2025, the network reflects an emerging field where GenAI is being absorbed into WHS research as a boundary technology, simultaneously technical, regulatory, and social. These results are presented in Tables 11 and 12, and visualised in Appendix 4 Figure 3.

#	Cluster	Concepts	Description
1	AI governance, regulation, and employment practices	35	A dense cluster centred on AI governance, ethics, regulation, and organisational practice.
2	Organisational behaviour and worker outcomes	20	Focused on how GenAI reshapes workplace dynamics and worker experience.
3	Generative AI capabilities and data foundations	25	A technically oriented cluster capturing generative AI, AI tools, language models, training data, datasets, explainability, image generation, and users.
4	AI systems, ethics, and human-in-the-loop control	15	A bridging cluster linking AI systems, algorithmic bias, adaptive AI, human-in-the-loop models, emotion recognition, and data privacy.
5	Labour market perspectives and media discourse	5	A small contextual cluster including job displacement, media use, and perspective, capturing broader societal and labour-market narratives surrounding GenAI.

Table 11: The clusters resulting from VOSviewer analysis, number of concepts included, and summary descriptions.

Concept	Cluster	Occurrences
artificial intelligence	4	5
AI systems	4	2
AI tools	3	2
generative AI	3	2
job displacement	5	3

Table 12: The top 5 concepts and the associated cluster.

Comparison of scoping literature review and horizon scan results

The comparison between the scoping literature review and the horizon scan highlights a divergence between the established focus of the priority area evidence base and the topics emerging through the case study. The scoping review is dominated by research examining technology in relation to physical work processes, task execution, and human–machine interaction, with a strong emphasis on machinery, automation, and ergonomics. This body of evidence reflects a mature literature concerned with how technologies affect safety at the level of tasks, equipment, and immediate work environments.

In contrast, the horizon scan for GenAI surfaces a set of topics that are only weakly represented in the scoping review and are largely absent from its dominant concept clusters. These include the use of artificial intelligence in decision support, task allocation, performance monitoring, and content generation, as well as emerging applications that influence how work is designed, sequenced, and evaluated rather than how it is physically performed. The horizon scan indicates that these developments are recent and not strongly represented within the dominant WHS concept clusters identified in the scoping review. GenAI-related publications show limited co-occurrence with established WHS taxonomy terms, suggesting that their incorporation into core WHS research frameworks remains limited.

The comparison suggests that the existing evidence base provides limited insight into how these emerging uses of GenAI intersect with WHS considerations. While the scoping review captures extensive research on technology-related hazards and controls in established contexts, it shows research has not yet incorporated the kinds of work design and decision-making changes highlighted by the horizon scan.

Signal scanning

Signals represent observable directional patterns and configurations within the existing evidence base that may warrant monitoring or further investigation. Signals were identified using the horizon scanning questions and criteria specified in the horizon scanning methodology, focusing on: changes in volume or concentration of research activity; shifts in conceptual emphasis; recombination or co-occurrence of concepts; boundary-crossing across domains or priority areas; and consolidation or dispersion of the evidence base. The signals identified in Table 13 do not, in themselves, constitute evidence gaps. Rather, they provide structured inputs for evidence gap mapping.

Signal	Measure	Insight
GenAI influencing work design rather than task execution	Low frequency of GenAI-related taxonomy terms in the scoping review. GenAI concepts appearing primarily in recent horizon scan records.	The evidence suggests that GenAI is emerging less as a physical or task-level technology and more as a tool shaping how work is planned, sequenced, and supported. This marks a shift from technologies that alter how tasks are performed to technologies that influence how work itself is designed in ways that may introduce or amplify psychosocial hazards.

Signal	Measure	Insight
Decision support and content generation as early workplace applications	Horizon scan concepts related to decision support, automation of knowledge work, and generative outputs. Absence of corresponding terms in dominant scoping review clusters.	Early GenAI applications in workplaces appear to focus on supporting decision-making and generating work outputs, rather than replacing physical tasks. These uses introduce new forms of interaction between workers and technology that are not well captured in existing WHS research focused on machinery or ergonomic risk.
GenAI research positioned at the periphery of core WHS literature	GenAI-related publications are few in number (n=10), appear only in recent years (2022–2025), and show limited co-occurrence with established WHS taxonomy terms.	Research examining GenAI in work contexts is emerging within the dataset but is not yet strongly integrated into dominant WHS research clusters. This suggests that WHS-specific framing of GenAI-related risks and opportunities is still developing.
Emergence relative to the existing evidence base	Recent average publication years in horizon scan data. Minimal historical presence in scoping review dataset.	GenAI appears as an emerging topic with little historical footprint in the WHS evidence base. The speed at which GenAI-related publications are appearing suggests that research attention is still forming, with implications for how quickly evidence can accumulate around its effects on work and workers.

Table 13: Table of horizon scanning signals.

Evidence gap mapping

This evidence gap mapping brings together results from the scoping review and the horizon scan case study to systematically document gaps in the evidence base, drawing on patterns in taxonomy tagging, temporal patterns of publication, and concepts and clusters emerging from VOSviewer.

Three kinds of evidence gaps were observed in results from the scoping literature review and horizon scan case study:

- **Absence:** taxonomy terms or concept areas with no explicit coverage;
- **Sparsity:** concepts represented by very few publications relative to the size of the evidence base; and
- **Alignment:** mismatches between conceptual centrality (as indicated by system-generated concept clusters) and explicit taxonomy coverage.

Absence

At the level of priority area, the taxonomy analysis shows strong coverage of technologies that directly affect physical tasks, equipment operation, and human–machine interaction. In contrast, there is a clear absence of research explicitly examining technologies that primarily influence how work is designed, allocated, or evaluated. Concepts associated with artificial intelligence, algorithmic decision-making, and generative technologies appear infrequently in the scoping review and are largely absent from the dominant concept clusters.

For the case study, this absence is most evident in the limited number of studies that explicitly consider how GenAI reshapes work design features such as task boundaries, sequencing, decision authority, or responsibility allocation. While related technological concepts are present within the broader dataset, explicit integration of GenAI with established WHS topics is limited. GenAI-related terms show minimal co-occurrence with work design, organisational decision-making, and psychosocial risk concepts within the retrieved evidence base. As a result, there is little direct evidence addressing how GenAI-enabled changes to work design intersect with established WHS concerns such as workload or accountability.

Sparsity

Where the literature does begin to engage with GenAI-related concepts, the volume of evidence is limited. Within the priority area evidence base, GenAI-related terms appear in a small number of publications, typically without sustained attention across multiple studies or sectors. This sparsity contrasts with the extensive coverage of other digital and automated technologies, which are supported by a larger and more mature body of WHS research.

For the case study, the horizon scan indicates that GenAI applications in workplaces are emerging quickly, yet the corresponding WHS-focused literature has yet to emerge. Existing studies focus on isolated applications, such as decision support or automation of knowledge work, without broader examination of how these applications affect different roles, industries, or patterns of work organisation. This sparse coverage limits the ability to identify consistent themes, assess variability across contexts, or build cumulative understanding of GenAI-related risks and opportunities for work design.

Alignment

A further gap concerns the alignment between the dominant framing of technology in the existing priority area evidence base and the forms of technological change highlighted by the horizon scan. Much of the scoping review literature conceptualises technological risk in relation to physical interaction, task execution, and immediate exposure pathways. In contrast, the case study highlights technologies that act indirectly, shaping how work is planned, supervised, and assessed rather than how tasks are physically performed.

The taxonomy analysis shows limited co-occurrence between GenAI-related terms and concepts associated with work design, organisational decision-making, or psychosocial risk. This suggests that while relevant concepts exist within the taxonomy, they are not yet being integrated in ways that reflect emerging patterns of GenAI use. The alignment gap therefore lies in the focus of research, with established approaches to research on technology and safety not yet fully adapted to capture the more diffuse and indirect influences of GenAI on work and workers in Australia.

Appendix 1: Screening and data

This section reports on the method and approach followed to conduct the horizon scan, scoping literature review and evidence gap mapping.

The dataset of 7,028 WHS research publications (see Note below) was screened for records relevant to the research priority area of advances in technology, including both the risks and opportunities posed by technologies and the case study of GenAI and work design. Screening was conducted by a panel of four large language models (LLMs) which included Chat GPT4.1 Mini, Claude 3 Haiku, Gemini 2.5 Flash and Grok 4.1 Fast Reasoning.[2]

The LLMs were asked to classify records into three categories using a schema: primary research, secondary research or irrelevant, and to provide confidence scores along with their decision. This information was used to calculate inter-panel agreement following an established method which led to records being labelled as green (high confidence and agreement), amber (intermediate) or red (low confidence and agreement). Only records categorised as primary, where the panel showed a high level of confidence and agreement, were selected.

The panel identified 563 records (Table 1) potentially relevant to the advances in technology priority area and 10 records (Table 2) relevant to GenAI (Generative AI) and work design case study. For the case study, amber and secondary records were included to expand the dataset from 3 to 10 records. This provided a broader analytical base for analysis and is in keeping with the objectives of the horizon scan. Results were then tagged with taxonomy terms and described using bibliometrics. The results of this analysis are presented and discussed in the following scoping literature review, horizon scan and evidence gap mapping.

[2] *Zhilong Zhao and Yindi Liu, A Confidence–Diversity Framework for Calibrating AI Judgement in Accessible Qualitative Coding Tasks (Guangzhou: School of Journalism and Communication, South China University of Technology, 2025). https://doi.org/10.48550/arXiv.2508.02029.*

	Green	Amber	Red
Primary	563	336	47
Secondary	22	146	37
Irrelevant	3999	1817	61

Table 14: Model ratings and risk matrix for the priority area in the set of 7,028 records (Green – low risk, Amber – medium risk, Red – high risk).

	Green	Amber	Red
Primary	3	3	4
Secondary	0	4	0
Irrelevant	5621	1393	0

Table 15: Model ratings and risk matrix for the case study in the set of 7,028 records (Green – low risk, Amber – medium risk, Red – high risk).

Note: Tables 14 and 15 contain an extra record, which was removed after screening was completed, making the total 7,027.

Appendix 2: Schema and instructions

This appendix presents the instructions provided to large language model (LLM) panel members when reviewing records, and the specific categorisation schemes that were used.

Scheme P	Shifting mindsets around Work Health and Safety (WHS) fundamentals
Instruction	You are identifying research that seeks to understand how technological change is reshaping WHS risks, controls, systems and practices. Classify each text as Primary, Secondary, or Irrelevant based only on what the text explicitly states.
Primary category	The publication's main focus is on new or emerging technologies and their implications for WHS. The title or abstract explicitly examines how technology creates or modifies WHS risks, how technology enables WHS controls or data systems, or how technology changes WHS governance, practice or regulatory considerations.
Secondary category	Technology is discussed in the title or abstract but is not the central focus of the WHS contribution. WHS implications may be mentioned briefly or indirectly, or the technological component may relate to work or organisations in general without a clear or substantial WHS emphasis.
Irrelevant category	Technology appears in the title or abstract without meaningful WHS relevance. WHS is absent, or only implied, or the research focuses on technology for other domains (e.g. general computing, economics, education, or IT design) without identifiable WHS implications.

Scheme C	GenAI and work design – emerging innovation theme
Instruction	You are identifying research that seeks to understand how generative AI (GenAI) or closely related AI systems are being introduced into work and how they reshape work design, tasks, job roles, skills, workflows, or WHS risks. Classify each text as Primary, Secondary, or Irrelevant based only on what the text explicitly states.
Primary category	The title or abstract indicates that the main focus of the publication is GenAI (or a closely related generative AI system) in work or workplaces. GenAI is clearly linked to changes in work design, tasks, job content, job roles, skill requirements, workflows or organisational practices, or to emerging WHS risks or opportunities such as monitoring, cognitive load, job insecurity, or role redesign.
Secondary category	GenAI or related AI appears in the title or abstract but is not the central focus. GenAI may be discussed briefly, mentioned as one example within a broader examination of technology and work, or included as a minor component of a larger study without substantial attention to work design or WHS effects.
Irrelevant category	There is no substantive focus on GenAI in work or workplace contexts. GenAI may be absent, unrelated to work design, or discussed in a context that does not involve workplaces, tasks, jobs, or WHS implications.

Appendix 3: Tagging results

This appendix lists taxonomy terms for the research priority area, ranking them by the total number of records tagged in the full dataset of 7,027 records and providing a breakdown of tagged records in the priority area and case study datasets.

Rank	Normalised term	P2 records tagged	C2 records tagged	Total tagged
1	productivity	41	4	279
2	ergonomics	35	0	160
3	machine learning	29	0	44
4	wearables	35	0	43
5	privacy	12	4	40
6	usability	9	0	31
7	robotics	25	0	29
8	control loss	3	0	29
9	nanomaterials	11	0	14
10	VR training	12	0	13
11	industrial automation	4	0	4
12	responsible AI	1	2	4
13	virtual and augmented reality	4	0	4
14	algorithmic management	2	0	3
15	predictive maintenance	1	0	3
16	collaborative robots cobots	2	0	2
17	artificial intelligence in work	0	0	2

Rank	Normalised term	P2 records tagged	C2 records tagged	Total tagged
18	algorithmic bias	0	1	2
19	platform surveillance	0	0	1
20	wearable technologies	1	0	1
21	smart PPE	1	0	1
22	GPS tracking	0	0	1
23	telematics	1	0	1
24	CCTV	1	0	1
25	additive manufacturing	1	0	1
26	engineered nanoparticles	1	0	1
27	digitalisation of work	0	0	1
28	digital fatigue	0	0	1
29	cognitive overload	0	0	1
30	automation bias	0	0	1
31	automation and robotics	0	0	0
32	predictive analytics	0	0	0
33	AI assisted safety systems	0	0	0
34	people analytics	0	0	0
35	AI ethics and bias	0	0	0
36	biometric monitoring	0	0	0

Rank	Normalised term	P2 records tagged	C2 records tagged	Total tagged
37	exoskeletons	0	0	0
38	powered suits	0	0	0
39	industrial exosuits	0	0	0
40	AR assisted work	0	0	0
41	remote monitoring and surveillance	0	0	0
42	3D printing	0	0	0
43	rapid prototyping	0	0	0
44	nanotechnology	0	0	0
45	biotechnology in workplaces	0	0	0
46	synthetic biology	0	0	0
47	bio manufacturing	0	0	0
48	digital twins and smart systems	0	0	0
49	smart factories	0	0	0
50	industry 4 0	0	0	0
51	drones and autonomous vehicles	0	0	0
52	UAVs	0	0	0
53	automated guided vehicles AGVs	0	0	0
54	cybersecurity and WHS	0	0	0
55	cyber physical risks	0	0	0

Rank	Normalised term	P2 records tagged	C2 records tagged	Total tagged
56	critical infrastructure attacks	0	0	0
57	internet of Things IoT	0	0	0
58	hazard monitoring systems	0	0	0
59	technostress	0	0	0
60	human factors in technology	0	0	0
61	human machine interaction risks	0	0	0
62	ethical legal frameworks for tech	0	0	0
63	data sovereignty	0	0	0
	Total	**232**	**11**	**718**

Appendix 4: Network visualisations

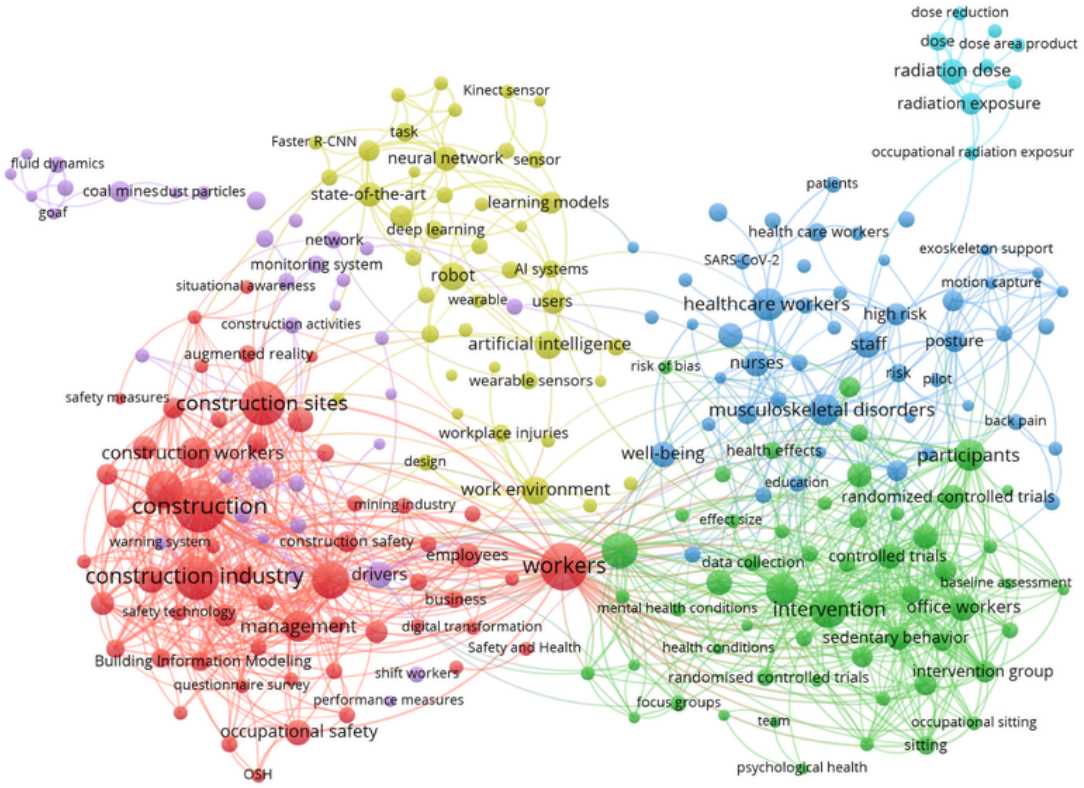

Figure 2: Co-occurrence network map for 250 concepts derived from titles and abstracts in the priority area dataset using VOSviewer. Cluster 1: red, Cluster 2: green, Cluster 3: blue, Cluster 4: yellow, Cluster 5: purple, Cluster 6: teal/light blue.

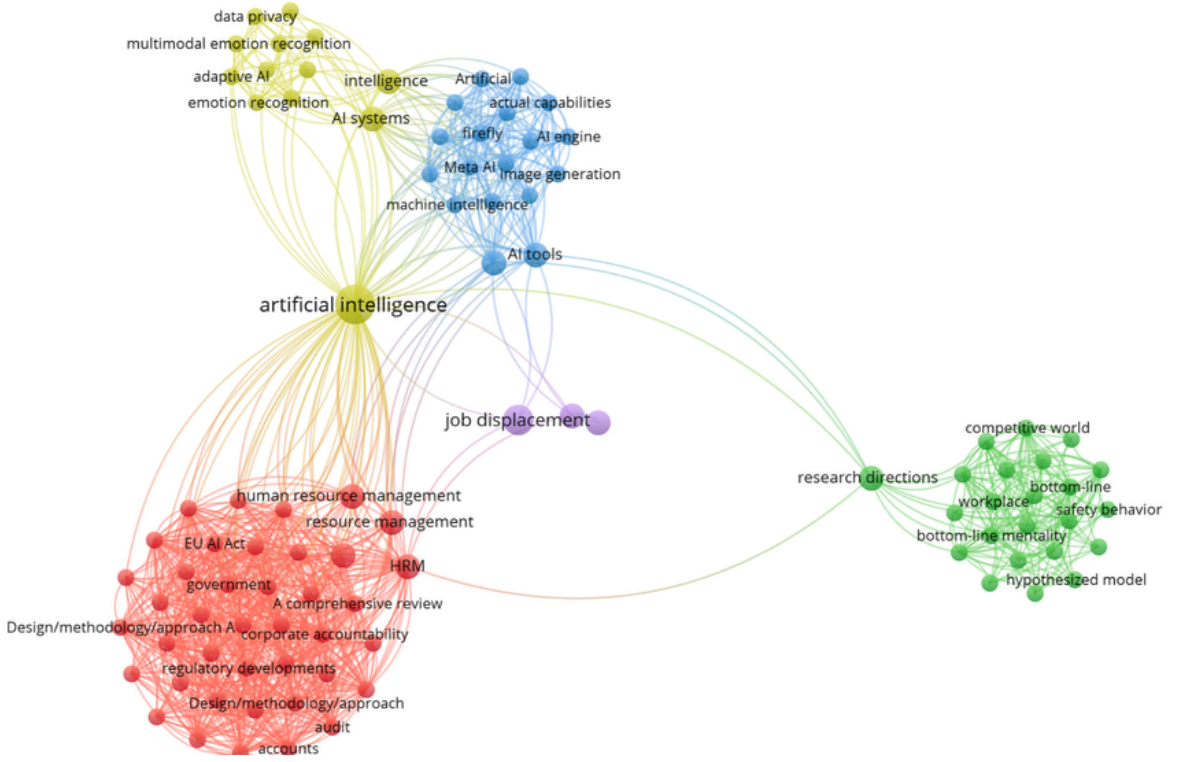

Figure 3: Co-occurrence network map for 250 concepts derived from titles and abstracts in the case study dataset using VOSviewer. Cluster 1: red, Cluster 2: green, Cluster 3: blue, Cluster 4: yellow, Cluster 5: purple.