DESIGN FOR SAFETY AND MENTAL WELLBEING: ADDRESSING SKILL AND KNOWLEDGE GAPS IN CONSTRUCTION AND ENGINEERING IN EGYPT

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Abstract

Attention to workers' safety, health, and well-being (SHW) in construction and engineering (particularly in developing countries) is growing gradually. Areas such as designing for safety (DfS) and mental health and wellbeing (MHW) remain under-prioritised despite their potential to significantly enhance SHW. Using Egypt as a case study, this research investigates the challenges associated with DfS and MHW in the construction and engineering sector and explores industry skill and knowledge needs, and the roles of universities and industry in addressing these issues. Data were collected through focus group discussions and an industry panel involving university staff, practitioners, and students, and analysed thematically. The findings indicate that inadequate regulation and enforcement, weak safety culture, university-related knowledge gaps, and self-inflicted knowledge gaps are major barriers to implementing DfS and MHW. The industry emphasises the need for soft skills such as collaboration, risk management application, and technical competence and expects graduates to have practical experience in SHW. Stakeholders urge universities to integrate these topics into curricula and to strengthen industry engagement for practical experience. Although integrating DfS and MHW into academic programmes is challenging, incremental approaches, such as embedding DfS concepts into existing modules, are recommended. Universities should improve student well-being through spacing assessments.

Keywords: Safety and Health (SHW), Safety Culture, Risk Management Skills, Curriculum Development, Industry-University Collaboration

1. INTRODUCTION

Safety, health, and well-being (SHW) is a key project and business performance indicator in construction and engineering (Gurmu 2019; Umeokafor 2018; Umeokafor et al. 2024). Industry performance is therefore closely linked to achieving excellent or optimal SHW outcomes. However, SHW performance has consistently been poor across many sectors globally, including construction and engineering, with negative implications for industry performance (Umeokafor 2018; Umeokafor et al. 2024).

Although several strategies exist to improve SHW, such as early consideration of SHW in procurement (Umeokafor et al. 2024), adoption of digital technologies (Kasirossafar et al. 2021), and safety climate improvement (Williams et al. 2019), designing out hazards remains one of the most strategic and effective approaches for addressing SHW risks throughout the project lifecycle (Che Ibrahim and Belayutham 2020). Design for safety (DfS), also known as prevention through design, targets construction and post-construction risks through design optimisation (Yu et al. 2015; Lawani et al. 2020; Toole and Erger 2018). Similarly, workplace mental health interventions and support strategies can reduce mental health risks such as bullying, workload, and job insecurity (Pamidimukkala et al. 2015). Poor mental health and wellbeing negatively affect productivity and construction project performance (Fisher et al. 2024; Kazar and Rahmanzadeh 2024).

Despite the strategic roles of DfS and mental health and wellbeing (MHW) in improving SHW and, by implication, business and project performance, limitations and knowledge gaps remain (Manu et al. 2018; Duckworth et al. 2024). DfS and MHW are insufficiently considered, and adoption is low in construction and engineering (Manu et al. 2019; Arena et al. 2026). Skills requirements and stakeholder roles, including industry and universities, remain poorly understood in developing countries such as Egypt. The same applies to MHW, as demonstrated by the literature review. Using Egypt as a case study, this research investigates the challenges, skills requirements, and stakeholder roles relevant for integrating DfS and MHW into construction and engineering practices. The objectives are to:

- Identify and assess the challenges of design for safety and mental health and wellbeing in the sector or industry.
- Evaluate industry skills, knowledge, and experience for design for safety and mental health and wellbeing.
- Examine the roles of stakeholders (universities and industry) in addressing the DfS and MHW challenges.

This is the first Egyptian study examining construction and engineering discourse on DfS and MHW. It offers policy-relevant, interpretive insights by synthesising multi-stakeholder evidence on regulatory conditions, skills and knowledge gaps, institutional roles, curriculum development, industry–university collaboration, and graduate preparedness, informing policy, education, and practice.

2. LITERATURE REVIEW

2.1. Related studies on design for safety and mental health and wellbeing

Design for safety involves preventing or reducing work-related hazards and risks associated with the buildability, usability, and maintainability of structures throughout the project lifecycle (Lawani et al. 2020). Toole and Erger (2018) identify DfS as one of the most effective approaches for ensuring safety, health, and wellbeing (SHW) across the project cycle. With respect to MHW, Kazar and Rahmanzadeh (2024) report that mental health disorders have a significant and moderate effect on workers' job performance. Low-skilled workers, such as manual trades construction workers, report substance misuse and high levels of anxiety, depression, and suicidality (Duckworth et al. 2024). Similar evidence of poor mental health among construction workers is presented by Arena et al. (2026).

Despite increasing interest, urgency, and stakeholder attention on MHW, recently implemented MHW strategies in construction have been found to be ineffective or their effectiveness remains inconclusive (Duckworth et al. 2024). This is despite ongoing efforts by construction organisations to improve MHW outcomes. Comparable levels of interest and effort are reported for improving SHW through DfS (Manu et al. 2019; Umeokafor et al. 2021). Nevertheless, DfS remains under-adopted, overlooked, or constrained by persistent challenges that limit its effectiveness.

Although DfS and MHW have been widely discussed, and their adoption is influenced by skills, knowledge, and experience, these dimensions remain poorly understood. Poghosyan et al. (2018) found that 60.37% of 164 DfS studies focus on design awareness or knowledge, with no studies addressing DfS skills. A review of SHW research in developing countries similarly reports limited attention to DfS skills and MHW (Umeokafor et al. 2022). Umeokafor et al. (2023) identified inadequate DfS technical skills and knowledge as major barriers to adoption, supporting findings that DfS uptake depends on skills, knowledge, and awareness (Che Ibrahim and Belayutham 2020). A pilot study of a DfS competency assessment tool in Malaysia also revealed limited DfS skills (Ibid). More broadly, skills shortages contribute to poor construction industry productivity (Fisher et al. 2024). Research on SHW, including DfS and MHW, remains limited in developing countries (Manu et al. 2019; Poghosyan et al. 2018; Umeokafor et al. 2021, 2022, 2023). Countries such as Egypt and Nigeria lack country-level studies examining DfS skills, knowledge, and experience, despite repeated calls for context-specific research.

2.1.2. Design for safety and mental health and wellbeing skills, knowledge, and experience requirements

Design for safety competency studies have examined knowledge, skills, and experience (e.g. Che Ibrahim and Umeokafor 2024). Che Ibrahim and Umeokafor (2024) align these three competencies with designers' duties under the Occupational Safety and Health in Construction Industry (Management) (OSHCIM) Guidelines 2017, issued by Malaysia's Department of Occupational Safety and Health, the country's main SHW regulator. Similar to the UK Construction (Design and Management) Regulations 2015, the guidelines assign shared responsibilities to clients, designers, and contractors to reduce construction accidents through proactive measures, demonstrating the strategic role of SHW legislation in driving DfS. Knowledge competencies include DfS legislation and guidance, contracts and procurement, construction design and management, and hazard control concepts (Che Ibrahim and Umeokafor 2024). Skills competencies cover these areas and additionally include financial and cost–

benefit analysis skills (ibid). Experience competencies encompass learning and professional experience, design and site experience, collaborative project delivery, design process dynamics, construction practice, and DfS activities, processes, and tools. For MHW, required competencies include mental health support needs, communication, peer support, intervention knowledge, and leadership skills (Fisher et al. 2024; Saraji and Mehany 2025).

2.2. Safety, health and wellbeing in Egypt

Just like other developing countries, SHW in construction and engineering in Egypt is poor (Ellaban et al. 2018). The work environment is hazardous, with high levels of injuries; workers have a low perception of multiple risks, and lack of safety training is found to be a key cause of poor safety (ibid). There is no legislation that adequately and statutorily supports DfS strategy characteristics (for example, placing shared responsibilities on clients, designers, and contractors to reduce accidents in construction through proactive measures) as seen in countries such as South Africa, the UK, Malaysia, and Singapore (Che Ibrahim et al. 2022).

2.3 Synthesis and research gap

Although DfS and MHW are globally acknowledge as critical for improved SHW in the construction industry, there are still important knowledge gaps. For example, a deep empirical understanding of the skills and knowledge for DfS and MHW and experience requirements, and the role of universities and instructions stakeholders in addressing DfS and MHW issues is limited in developing countries including Egypt. An applied multi-stakeholder qualitative investigation is employed to address these gaps.

3. METHOD

Following an extensive literature review, data were collected through a two-day workshop held in Egypt. Convenience and purposive sampling techniques were used to recruit academics, students, and industry practitioners. The workshop consisted of several activities, including an industry panel discussion and focus group discussions involving participants from all stakeholder categories. A qualitative research approach was adopted because addressing the research aim required an in-depth understanding of a social phenomenon, and qualitative methods are suited to answering why, how, and what research questions (Eriksson and Kovalainen 2008). Ethical approval for the study was obtained from the University of Wolverhampton and Fayoum University. Ethical considerations were addressed by obtaining informed consent from all participants through consent forms and ensuring anonymity throughout the study.

Following data collection, Braun and Clarke’s (2006) six-phase thematic analysis was adopted, as it is appropriate for qualitative data from focus group and panel discussions involving multiple stakeholder perspectives. The phases included familiarisation, initial coding, theme development, theme review, defining and naming themes, and writing up. The first author read transcripts and workshop notes to familiarise himself with the data and deductively coded them against ideas from the literature review. Codes were iteratively compared, collated into candidate themes, and reviewed against the full dataset. Themes were refined to avoid overlap and excessive complexity, ensuring internal coherence and clear distinction.

To ensure trustworthiness, triangulation was undertaken across focus groups, panel discussions, and comparisons of emerging themes. Discussions were facilitated by experienced academics using open-ended prompts and probing to encourage depth and clarity. Participation was managed to balance contributions and reduce group dominance. The involvement of participants from diverse organisational and disciplinary backgrounds, along with assurances of anonymity, helped reduce social desirability bias. The panel discussion provided strategic-level perspectives, while focus groups generated detailed experiential insights, enhancing the credibility of the findings.

4. FINDINGS

4.1 Overview of participants

There were 71 attendees in the two-day workshop where 10 were industry experts, 40 students and 21 were members of staff (including academics). However, for Day 1 when the relevant workshop activities reported in this paper occured, there were 61 participants (face-to-face and online) of which 18 were female and the rest men. There were 10 experts from industry, 6 staff and the rest are students. The industry practitioners are from civil engineering and construction engineering, the academics from mechanical engineering, civil engineering, and computer science. The students are from the same disciplines as the staff.

4.2 Challenges of design for safety and mental health and wellbeing in construction in Egypt

The challenges of SHW in construction and engineering, found in terms of DfS and MHW, can be categorised into three themes and five sub-themes (Table 1). There is a strong convergence across the three groups of participants (industry experts, students, and academics) in terms of DfS and MHW challenges, especially in regulatory weakness, skills gaps, and safety culture. However, there were differences in the emphasis they participants placed in responsibility and solutions across the groups. Poor regulation and compliance is straightforward and encapsulates the inadequate regulatory framework of SHW within which DfS and MHW sit. Even where regulations exist, they are not fit for purpose, resulting in practices such as tick-box compliance. Participants (industry experts and university staff) also noted that some SHW laws function merely as tick-box requirements.

The findings indicate a clear connection between culture and lack of compliance with SHW regulations, which is reflected in the theme of poor safety culture. This is explained by issues such as limited awareness of MHW. The challenge of inadequate skills, knowledge, and experience focuses mainly on the dependence on universities as the primary sources of DfS and MHW knowledge and skills. The summary of the findings in Table 1 summaries the challenges of DfS and MHW in Engineering in Egypt. Some of the quotations that support the findings (Table 1) are covered below:

> '*There are regulations, but they were translated or transposed from international ones hence far from our reality' (Industry expert A)*
> '*There are not qualitative and quantitative means of checking compliance with SHW regulations in the country to ensure it in line with the written version'. (Industry expert A)*
> *'There are no performance indicators for measuring compliance' (Industry expert A)*

Table 1: Challenges of DfS and MHW in Engineering in Egypt

Themes	**Subthemes**	**Evidence**
Poor Regulation and compliance	Inadequate regulation	• Lack of adequate local regulations on SHW • Unclear regulations • Tick box laws • Existing regulations are not applied
	Inadequate enforcement	• Lack of effective enforcement for SHW regulation • Lack of compliance measurement mechanism
Poor safety culture	Poor Culture	• MHW is not common in Egypt
		• Poor safety culture
Lack of skills knowledge and experience	University induced knowledge gap	• Ill-prepared graduates from universities • Graduates who lack industry required skills • Graduates with little or not practice experience e.g., internship
	Self-afflicted knowledge gap	• Graduates did not learn on their own • Students tend to priority other aspects of safety e.g., structural safety

4.3 Industry skills, knowledge and experience requirements for design for safety and mental health and wellbeing

This section covers the industry skills, knowledge, and experience requirements of construction and engineering graduates for SHW. In terms of the skills and knowledge requirements in Table 2, while the three groups (industry experts, students, and academics) agree that there is skills and knowledge gap in SHW, the nature of experience differ. In particular, the industry priorities practical competence and work-ready graduates. The industry needs technically proficient graduates with soft skills such as communication, along with a good understanding and application of risk management. Further, they expect graduates to have practical experience from the universities, for example, through internships, and to have engaged in self-study of SHW, indicating a special interest in the subject. They also expect that graduates have corporate social responsibility experience and interest. The extract below supports the theme (Table 2), 'Prior knowledge of SHW and interest':

'Students need to learn on their own before the start work, things have changed. It is before that you learn in the industry, now you need to self-study before you get on site' (Industry expert A)

While the students acknowledge the gap in practical experience and the implications, together with academics they highlight gaps in curriculum and various experiential learning opportunities. The quotations below are in support.

'*Most of what we do are in class, we need to go to sites. We do not get enough time to work in the industry to learn about safet*y' (Civil Engineering Student D)

'*We need to go to the factories to learn safety not just learning only theories in class', (*Mechanical Engineering Student A)

Although these point the need to equip graduates with the relevant skills to increase their chances of employment, the views of the three groups differ in terms of who has the responsibility and its nature.

Table 2: Summary of industry skills, knowledge, and experience for DfS and MHW

Topics	**Themes**	**Evidence**
Skills and requirements	Soft skills	• Communication, teamwork, and leadership abilities • Stakeholder engagement skills: convey the important of safety to stakeholders • Problems-solving skills: ability to identify safety issues and address them proactively
	Technical proficiency	• Strong foundation of engineering and design principles with emphasis on safety • Risk management: hazard recognition and control measures management • Regulatory compliance: familiarity with local laws, and the international standards and ability to apply them. • Awareness of MHW
	Risk management knowledge application	• Preventive measures: identify potential hazards before they become issues.
		• Strategic planning: integrate safety into the initial stages of project design
		• Continuous improvement: using feedback to enhance safety protocol over time
	Perceived safety priorities	• No mention of information technology as an enabling tool for DfS or MHW. • No mention of financial analysis/cost-benefit analysis • No mention of psychosocial risk recognition. • No mention of mental health literacy and support pathway
Experience expectations from graduate	Internship experience	• Practical exposure to real-world engineering projects
	Team working experience	• Experience working collaboratively, preferably on safety -related initiatives
	Prior interest and knowledge of SHW	• Students should learn SHW before coming to site. • Graduate who are ready for the market
	Community engagement experience	• Involvement in community projects that show local engagement and connectedness with their safety and wellbeing

The theme 'perceived safety priorities' in Table 2 shows key aspects of the skills and knowledge that were not covered by the participants in the panel discussion and focus group discussions. While areas such as communication, leadership skills, and awareness of relevant legislation for MHW were mentioned, areas such as mental health literacy, support pathways, and psychosocial risk recognition were not covered in relation to MHW. Similarly, although the aforementioned soft skills, and technical proficiencies (such as design principles and hazard recognition) were addressed for DfS, there was no mention of financial analysis/cost–benefit analysis or information technology as an enabling tool for DfS.

4.4 The roles of universities and industry in SHW improvement through DfS and MHW

Here are the findings on the role of universities and industry in SHW education. This is covered in two themes, 'direct industry involvement' and 'universities' lead role', and five sub-themes: 'collaboration', ‘financial support’, ‘DfS and MHW in the curriculum’, ‘practical experience opportunities’, and ‘engage with industry’ (Table 3). For industry support, the role of construction and engineering organisations in supporting SHW centres around ‘financial support’ and ‘collaboration’ with universities in research, education, and training, and ensuring compliance with relevant SHW legislation (Tabel 3). The attendees stated:

> *‘Although MHW is not common in Egypt, new and young professionals are starting to shed light on safety, especially the MHW’. (Industry expert A)*
>
> ‘*Start educating the future engineers before the enter the market’ (Industry expert B)*
>
> *‘We show workers how to design out hazards’ (Industry expert A)*
>
> *‘We get the client to support compliance with OSH regulation’ (Industry expert A)* The expert narrated how safety was compromised in the preliminary works of a project and the steps they took.
>
> *‘We provide SHW training to new staff’ (Industry expert A)*

Table 3: Summary of industry and universities’ role in SHW improvement through DfS and MHW

Themes	**Subthemes**	**Evidence**
Direct industry involvement	Collaboration	• Share real work experience with students e.g., through guest lectures • Collaborate with universities through research to address industry challenges
	Financial support.	• Provide financial support for workers’ SHW research
Universities’ lead role	DfS and MHW in the curriculum.	• Integrate DfS and MHW topics in courses • Students want to be taught SHW, including DfS
	Practical experience opportunities.	• Provide internship opportunities for students • Students stress the need for practical experience • Too much emphasis on theory but little practical or site experience
	Engage with industry	• Provide platforms for students to learn from industry experts

In terms of the roles of universities, this is covered in three subthemes, ’DfS and MHW in the curriculum’, ‘practical experience opportunities’ and ‘engage with industry’ (Tabel 3).There is a consensus among students and academics that universities must act as a facilitator of practical experience for students instead of the overemphasis on theory which students currently experience. The quotations below support the theme, ‘role of universities’. The students stated:

> ‘*We need to have partial experience while studying before we go to the site’ (Civil Engineering student A)*
>
> *‘We need to be taught safety’ (Civil Engineering student C)*
>
> *We need to go to sites and take pictures and learn (Civil Engineering student B)*

Students from other disciplines support this, a Mechanical Engineering student stated:

> ‘*We need to go to the factories to learn safety not just learning only theories in class’, (*Mechanical Engineering A)

Another civil engineering students stated that

> ‘*Some of the lecturers do not expose us to industry experience. We need to have this throughout the programme, not just on one year’ (*Mechanical Engineering B)

Another Mechanical Engineering student stated

> *‘We need to know how digital technology is also used in safety, including design for safety’*

Lack of practical experience remains a key limitation that students covered and addressing this is one of the main supports they expect from the university. The students also stated that they want guest lectures from the industry practitioner as some of the lecturers have limited knowledge of some topics, at least from the practical perspective (Civil Engineering Student A).

5. DISCUSSION

This section interprets the findings in terms of extant literature on DfS and MHW. In particular, it highlights the ways that contextual factors, skills expectations, and the role of stakeholders collectively and causally infer SHW outcomes, providing educational- and practice-relevant insights and not standalone thematic findings. In doing so, the section elaborates the applied policy and educational framework that emerge from the findings by interpreting how regulatory context, skills and knowledge development, and stakeholder roles collectively link in causally infer DfS and MHW.

5.1 Key challenges of improving safety, health, and wellbeing through design for safety and mental and wellbeing

The poor regulation of SHW, identified as a key challenge to implementing DfS and MHW, aligns with prior studies such as Umeokafor et al. (2023), which found that inadequate SHW regulation is a major barrier to DfS. Existing research (Umeokafor et al. 2023, Umeokafor 2017) offers explanations for this regulatory weakness. The SHW regulatory systems of many developing countries are complex and dysfunctional (Umeokafor, 2017). Current legislation is deficient in relation to DfS and MHW; for example, it fails to allocate DfS-relevant responsibilities to clients and designers, even though such responsibilities are pivotal for effective DfS implementation (Umeokafor et al. 2023).

Explanations for weak MHW regulation include an overemphasis on physical safety in regulatory frameworks, employers' limited or non-existent knowledge of legal duties relating to MHW and DfS, and the weak enforcement of existing SHW laws where they exist (Cameron and Betts 2025). The limited skills and knowledge needed for DfS and MHW, identified in this study as a key barrier to improved SHW, are consistent with the findings of Umeokafor et al. (2023) in the Nigerian context. This gap can be explained by limited stakeholder attention to SHW and inadequate legislation (Umeokafor 2017). Like many other developing countries, Egypt faces similar systemic and contextual challenges.

As in other contexts, the challenges associated with DfS and MHW (and by implication SHW) identified in this study have negative implications for productivity and performance across the construction and engineering sectors in Egypt (Umeokafor et al. 2018, Umeokafor 2017). Where legislation does not support client and designer responsibilities for DfS, key elements of the DfS strategy (such as clients providing relevant information to designers, the preparation and maintenance of a health and safety file, and designers designing out hazards) become difficult to realise (Umeokafor et al. 2023). Scholars in this domain [including Umeokafor et al 2021, 2023) argue that these challenges and contextual issues interact, resulting in a complex and often ineffective regulatory regime for SHW and its management.

5.2. Industry skills, knowledge and experience requirements

Soft skills for DfS and MHW are critical for achieving the required competency, especially in the construction sector. Communication, collaboration, and control skills are fundamental to both DfS and MHW. For example, the Construction (Design and Management) Regulations 2015 in the UK emphasise these skills, including information sharing, and risk and hazard identification and control. The characteristics of management (such as communication, allocation of roles and responsibilities, timelines, and worker engagement) demonstrate that technical skills alone are not sufficient for DfS. Similarly, the "priority safety areas" relating to MHW (Table 2) reaffirm the importance of both soft and technical skills. For instance, communication and empathy are essential for tackling stigma and encouraging help-seeking in MHW.

The technical skills required for DfS and MHW differ from conventional SHW skills in that they require engineering, management, design, and legal skills, knowledge, and experience (Che Ibrahim and Umeokafor 2024). This may explain why these skills are less common and often lacking compared with other SHW skills (Umeokafor et al. 2023, Che Ibrahim and Umeokafor 2024). It is notable that industry stakeholders want graduates to possess practical SHW skills upon graduation. While higher education institutions often face challenges in providing such experience, construction and engineering organisations are willing to create opportunities for students to gain practical experience (Table 3). Such experience deepens students' understanding of relevant topics and aspects of construction and engineering, better equipping them to meet industry needs.

The technical and soft skill requirements identified by industry in this study align with the findings of Che Ibrahim and Umeokafor (2024) in Malaysia. Their competency assessment tool for DfS (which includes knowledge of legislation, design skills, and hazard and risk identification) is reflected in Table 2. Skills not captured by the participants in the current study under the "Perceived safety priority" subtheme (indicating that they may not be the priority in the industry) are also documented by Che Ibrahim and Umeokafor (2024). A possible explanation is that Malaysia may have a more advanced DfS-supportive regulatory system, enabling clearer competency requirements and stronger enforcement. Egypt's regulatory environment does not provide a statutory backing to DfS, unlike Malaysia.

For MHW in construction and engineering, the situation in Egypt mirrors that of many developing countries, where MHW is not yet commonplace. The skills, knowledge, and experience requirements identified in this study are consistent with existing literature (Saraji, and Mehany 2025). For example, information and communication skills are essential for technology-driven MHW interventions (ibid). Technical skills such as psychosocial risk identification, along with communication skills, are also highlighted in Saraji and Mehany (2025). Achieving optimal MHW and DfS has important implications for the performance and productivity of the construction and engineering sectors (Gurmu 2019, and Umeokafor 2028).

5.3 The roles of universities and the industry

The lack of skills and knowledge required for DfS may explain its absence in educational curricula (Che Ibrahim et al. 2021) and the shortage of educators who are sufficiently skilled and knowledgeable in DfS (Umeokafor et al. 2021, Che Ibrahim et al. 2021). The same situation applies to MHW (Sanders et al. 2024). Umeokafor et al. (2024) provide a detailed analysis of the barriers affecting the diffusion of DfS education and training. The dominance of theoretical instruction, with limited practical input (resulting in students having minimal hands-on experience), is well documented in the literature (Umeoakfor et al. 2021). Students actively seek practical experience because it aligns with what prospective employers expect and it increases their chances of employability upon graduation. Practical experience is a core component of employability skills and enhances students' depth of understanding of DfS and MHW concepts.

Several strategies exist for integrating MHW and DfS into university curricula. These include embedding the concepts within existing modules, gradually integrating them across programmes, using digital technologies for delivery, and developing new standalone modules (Umeokafor et al. 2024). For MHW, integration may not always relate to content alone; it can also involve institutional measures that support student wellbeing including spacing assessment submission dates to avoid clustering, providing manageable deadlines, and providing clear extenuating circumstances procedures for students.

The enthusiasm and willingness of industry stakeholders to support universities in equipping students with relevant DfS and MHW skills, knowledge, and experience which is found in the research is commendable. Such collaboration can help bridge the gap between theory and practice, produce more employable graduates, and contribute to reducing employment gaps in the country. The role of professional bodies in providing guidance and regulatory oversight (such as making DfS and MHW core requirements for accreditation or licensing) is also recognised in the literature (Umeokafor et al. 2021, Che Ibrahim et al. 2021, Umeokafor et al. 2024). However, the impact of such requirements depends on the extent to which universities perceive them as reasonable and feasible.

5.4. Interaction among challenges, skills gaps, and roles

The challenges, skills, knowledge requirements, and stakeholder roles interact in multiple ways, highlighting the complex and interconnected nature of SHW issues. Weak SHW regulation leads to inadequate attention to DfS and MHW, thereby limiting their adoption and implementation. Misalignment between industry expectations and university contributions persists due to limited collaboration. As SHW issues are systemic, solutions must be collaborative, lifecycle-based, and inclusive, involving universities, industry, regulators, and non-governmental organisations.

6. CONCLUSIONS

This study makes an interpretive, applied, and country-specific contribution by synthesising multi-stakeholder perspectives on DfS and MHW within the Egyptian construction and engineering sectors. It aims to advance the understanding of challenges related to skills, knowledge, and experience in DfS and MHW, with the objective of improving SHW across the industry in Egypt. The study provides interpretive insights into how skills, knowledge gaps, and stakeholder roles interact in the adoption of DfS and MHW, with clear implications for policy, education, and practice. Poor regulation of safety, health, and wellbeing, together with a weak safety culture, contributes to limited skills, knowledge, and experience in DfS and MHW. As a qualitative study, the findings are not intended to be generalisable, but they offer valuable interpretive insights to inform policy, practice, and education in Egypt.

The findings indicate that, unlike in other contexts, the Egyptian industry prioritises certain skills, knowledge areas, and experience requirements for DfS and MHW, reinforcing the importance of country-specific research. Nevertheless, the study confirms the importance of both soft and technical skills. Communication and empathy are critical for addressing stigma and encouraging help-seeking in MHW, while information sharing, risk and hazard identification, and hazard control are essential for DfS. The industry's willingness to collaborate with universities to develop relevant student competencies is notable and can help align graduate capabilities with industry needs, including safety, health, and wellbeing.

This is the first study to examine the challenges, skills requirements, and stakeholder roles related to integrating DfS and MHW in Egyptian construction and engineering. The study is limited by its reliance on focus groups and panel discussions, which may restrict depth. Future research could use semi-structured interviews. Incremental integration of DfS and MHW into academic programmes is recommended.

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