

# Comparative Analysis of Construction Safety Culture in Australia and China: A Systematic Literature Review

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**Abstract:** The construction industry has been recognized as one of the most high-risk industries globally, promoting a shift towards enhancing safety culture to mitigate accident rates. With a notable good safety performance in Australia, this study therefore compares its advanced safety culture with the evolving safety culture in China through a systematic review of literature published over the last two decades. The aim of the research is to explore the influence of differing societal cultural contexts on the development of safety culture. The study covers various aspects of safety culture, including leadership and management commitment, regulatory environments, safety communication, workers' involvement, and organizational safety systems. Findings indicate a strong commitment from industry participants in both countries. However, there are notable differences in safety culture conceptualization and implementation. Australia showcases a mature safety culture, deeply integrated with stringent regulations and fostering individual proactive engagement. Conversely, China's safety culture, marked by rapid evolution, emphasizes regulatory compliance, with challenges in achieving broad worker participation. The analysis highlights that Australian construction workers' inclination towards a proactive approach in managing safety, in contrast to Chinese construction workers who tend to focus more on adhering to safety regulations than actively participating in safety initiatives. These findings emphasize the significant role societal culture plays in shaping construction safety cultures. The study's insights are instrumental for practitioners across the global construction industry, advocating for the adoption of nuanced, culturally sensitive safety management strategies to enhance safety outcomes.

**Key words:** Safety Culture, Societal Influence, Cross-cultural Comparison, Safety Management

## 1. INTRODUCTION

The global construction industry remains one of the most hazardous sectors, with persistently high fatality numbers despite significant efforts and extensive research aimed at enhancing workplace safety [1]. Recent statistics from the U.S. Bureau of Labour Statistics [2] reveal that the sector experienced 1,069 fatalities in 2022 alone. In the same year, Australia and the UK reported 27 and 45 fatalities [3], [4], respectively, while China's figures exceeded 3,000 in recent years [5]. This alarming trend outlines

the critical need for a robust safety culture within the industry to mitigate unsafe worker behaviour, the primary cause of onsite accidents [6], [7]. Safety culture, defined as the shared safety beliefs, practices, and values within an organization, alongside safety climate—employees' shared perceptions of their work environment's safety—has become a focal point in efforts to reduce unsafe behaviour [6]. Research in this field has advanced, leading to the development of various frameworks and models aimed at understanding, assessing, and enhancing organizational safety culture [3], [8]. Relevant measurement tools, including safety climate surveys, play a pivotal role in assessing the current state of an organization's safety culture. However, the complex nature of safety culture, deeply intertwined with societal norms and values, presents challenges in fully capturing and understanding through these tools alone [9].

Despite the recognized influence of societal culture on safety outcomes, there is a notable gap in the literature regarding the explicit relationship between societal influences and the evolution of safety culture. This gap necessitates a thorough investigation that not only compares safety cultures across different contexts but also examines the societal factors influencing these practices. Societal culture, as defined by Hofstede's cultural dimensions, impacts workplace safety through attitudes toward risk, safety, and collective responsibility, as well as through the organizational environment, including regulations, institutions, and workforce characteristics [10]. Existing comparative studies examining safety climates in Australia, China, and Indonesia have highlighted the significant impact of societal cultures on safety climate and, consequently, safety performance [1], [11]. However, the findings have not yet delved deep into how distinct societal contexts, specifically in Australia and China, influence the development of safety culture.

Understanding the societal dimensions affecting safety culture is critical for the construction industry, given its inherent risks and the global nature of its operations. This research aims to conduct initial comparative analysis to reveal the complex interplay between societal culture and safety culture and contribute valuable insights into future development of more effective, culturally sensitive safety management strategies. This paper seeks to provide nuanced insights that could inform more effective safety management strategies in the construction industry, thereby paving the way for culturally informed safety practices.

## **2. Research Methodology**

To accomplish the aim of the study, a systematic literature review (SLR) approach is used, which arguably is the most effective method to build on existing large body of knowledge on safety culture, which have been investigated and modelled in both Australia and China [12]. Both Scopus and Web of Science are used to ensure the full coverage of relevant literature. The inclusion and exclusion criteria were developed to rationalize the selection process, which follows the seven steps of an SLR as demonstrated by Hussein and Zayed [13], to avoid publication and selection bias. The inclusion criteria include (1) Studies that focused on the safety management in the construction industry; (2) Studies that include empirical evidence with reliable data; (3) Studies in any projects type, and publication year; (4) Studies conducted fully or partially in Australia and China. The exclusion criteria are: (1) Studies published not in English and Chinese; (2) Studies do not include empirical evidence; (3) Studies not related to AEC industry; (4) Studies integrated with other advanced construction technology; (5) Studies failed to obtain reliable data; (6) Studies do not include projects in Australia and China. To identify eligible studies for analysis, the systematic flow determined by PRISMA is adopted [13]. Relevant keywords to the topic, such as “safety culture” and “safety climate” were considered. The type of document was set to journal articles and conference papers in English and Chinese only. The initial search resulted in identifying 362 studies. Further analysis of the title and abstracts resulted in removing five duplicated studies and 273 irrelevant studies to the topic. In the next stage, full-text analysis of the remaining studies resulted in removing another 54 studies. As a result, a total of 30 studies were identified as the study's dataset.

### 3. Findings and Discussion

#### 3.1 Safety Culture in Australia

This dataset encompasses 16 studies pivotal to understanding safety culture and climate within the Australian construction industry, with a notable division: six studies look into safety culture, while ten investigate safety climate. This distribution suggests a prevailing research focus on safety climate, valued for its ability to serve as a reflection of the underlying safety culture at various moments [6].

##### 3.1.1 Current Level of Safety Culture in the Australian Construction Industry

In the Australian construction sector, safety culture is conceptualized as a multifaceted construct encompassing individual and collective beliefs, norms, attitudes, and practices aimed at minimizing risk and exposure to unsafe conditions [14]. This definition underscores a systemic approach to safety, focusing on preventive strategies and active participation across all organizational levels in safety-related practices. This broader understanding of safety culture in Australia advocates for a proactive stance on safety, urging behaviours that extend beyond mere adherence to legal requirements [15]. Despite the overarching consensus on the importance of safety culture, interpretations among industry participants vary, including three main perceptions: (1) an integral part of organizational culture; (2) an implicit aspect of the workplace ethos; and (3) an action-oriented framework [16].

##### 3.1.2 Key Constructs of Positive Australian Safety Culture

The literature emphasizes five main constructs as essential to fostering a positive safety culture in Australia:

- 1) *Leadership and management commitment*: The foundation of the positive safety culture in Australia lies in the commitment of its leaders. Bigg's research [16] outlines the imperative for safety leaders to not only commit to safety practices but also to be visibly engaged with their teams. In the Australian construction context, the safety leadership is carried by a diverse group of individuals, from Senior Managers and Safety Professionals to Engineers, Project Managers, and Construction Site Managers [17]. Newaz [18] emphasizes the particular importance of supervisors, whose role as safety leaders is critical in nurturing a safety-centric perception among project teams. It's the active promotion of safety as a core organizational value by these leaders that markedly influences the overall safety culture.
- 2) *Regulatory Environment*: The foundation of Australia's supportive safety culture is significantly bolstered by its regulatory frameworks. OHS institutions in Australia are characterized by meticulously crafted policies, strategies, regulations, laws, contracts, and operational guidelines. These regulations are actively enforced and communicated through formal channels, ensuring that safety standards are not only established but also adhered to across the construction industry [11]. For example, the key regulatory body, WorkSafe, has made safety consultation a mandated requirement within the supportive safety culture. This mandate ensures that safety practices are not unilaterally imposed but are developed in consultation with the workforce, fostering a collaborative approach to safety management across the nation [19], [20].
- 3) *Safety Communication*: Another key construct of a robust safety culture in Australia lies in the implementation of effective communication strategies. These strategies aim to reduce conflict and actively involve workers in safety processes, thereby significantly enhancing safety awareness across the organization [15]. Pioneering research by Mohamed [21] has spotlighted the crucial roles that management communication plays within Australian construction projects. For communication to be effective, it must be clear, unambiguous, and direct, ensuring that safety messages are properly conveyed and understood by the workforce. Safety leaders within

Australian companies also acknowledge the importance of listening—a practice that fosters a deeper understanding of the workforce's actual safety needs and concerns [15].

- 4) *Worker's involvement*: A pivotal element in cultivating a robust safety culture within the Australian construction industry is the emphasis on worker involvement through a bottom-up approach. Recognizing the collective responsibility of all individuals involved in the construction process, safety leaders accord significant importance to fostering an inclusive environment where every worker's input is valued [18]. This engagement not only bolsters their commitment to adhering to safety practices but also ensures that safety strategies are reflective of the workforce's actual needs and experiences [16].
- 5) *Organizational Safety System*: Recent discussions in the Australian construction sector have shifted focus from the detailed parts of organizational safety systems. Yet their significance in enhancing the maturity of safety culture remains acknowledged [18]. As these systems reach higher levels of maturity, industry stakeholders have increasingly emphasized the need for simplicity over complexity. The rationale behind this shift is to streamline safety protocols, making them more accessible and understandable to all levels of the workforce [1]. The current industry goal is to streamline and simplify the lengthy documentation and reporting processes associated with safety systems.

### 3.2 Safety Culture in China

In the review of the Chinese construction industry's approach to safety culture and climate, 14 studies pertinent to this context are identified. Of these, 9 studies primarily focus on safety climate, while only 3 delve into the broader concept of safety culture. This distribution suggests that, unlike Australia's mature safety culture, the development and implementation of a comprehensive safety culture in China are still in their early stages. Such a finding underscores a significant contrast between the two countries, with China's focus remaining largely on safety climate to assess the current state of safety culture within the industry.

#### 3.2.1 Current Level of Safety Culture in the Chinese Construction Industry

In the Chinese construction industry, the development of safety culture is in its early stages, marked by a dynamic interplay between complex project environments, socialization, and governmental influences [22], [23]. Recognized as a fundamental means to enhance safety performance within organizations, the conceptualization of safety culture in China incorporates a diverse range of influences and perspectives [24]. Zhang and Gao [22] have proposed a multifaceted framework for understanding safety culture in China, categorizing it into four distinct levels: physical culture, behaviour culture, management and norm culture, and ideological culture. This framework underscores the comprehensive approach required to address safety culture effectively, spanning from the tangible aspects of the physical work environment to the intangible elements of organizational beliefs and norms. Echoing this layered understanding, Huang et al. [23] introduced a system dividing safety culture into three dimensions: human, objects, and the interaction between them. This division highlights the critical roles both the physical environment and human factors play in shaping safety practices within the industry. Despite these scholarly efforts, a universally accepted definition of safety culture remains elusive in the Chinese context, with current interpretations heavily influenced by Western models [22].

#### 3.2.2 Key Constructs of Positive Chinese Safety Culture

The literature emphasizes five main constructs as essential to fostering a positive safety culture in China:

- 1) *Regulatory Environment*: In China, the regulatory landscape plays a pivotal role in defining and promoting safety culture within the construction sector. Recent years have witnessed a significant

expansion in safety regulations and standards aimed at elevating workplace safety. Notable initiatives include the implementation of the Green Card Program organized by the Labour Department, which mandates the qualification of workers on projects, ensuring that only trained personnel are engaged in construction activities. Additionally, the Pay for Safety Scheme represents a progressive move towards prioritizing safety over cost in the competitive bidding process, explicitly separating safety items from the overall project pricing to ensure adequate investment in safety measures [25]. Despite these advances, the practical impact of such regulations on enhancing safety culture faces challenges [22]. Inconsistencies in enforcement and a discernible disconnect between established policies and their actual implementation on construction sites undermine the effectiveness of these regulatory efforts.

- 2) *Site Environment*: The physical site environment holds a significant influence on the safety culture within China's construction industry. Recognizing the direct impact of site conditions on worker safety, recent initiatives have aimed at enhancing the physical aspects of construction sites to mitigate risks. Measures such as the standardization of safety signage, implementation of barrier systems, and the mandatory use of personal protective equipment (PPE) are examples of efforts to elevate the safety standards of the physical working environment [23]. However, the challenge lies in ensuring consistent application and maintenance of these physical safety measures across diverse projects. Variability in site conditions, coupled with the transient nature of the construction workforce, often complicates the uniform implementation of safety standards.
- 3) *Worker Involvement*: Worker involvement, which is understood as a socialization process, is also critical in integrating safety culture within China's construction sector, aiming to effectively shape safety behaviour. The interaction between supervisors and workers, coupled with managerial behaviour, is often cited as a method to enhance behavioural norms and management practices related to safety in Chinese projects, indicating a top-down management approach [22]. Despite signs of increasing worker engagement in safety production, entrenched hierarchical norms within traditional workplace relationships pose significant barriers to active participation [26]. Addressing these barriers is essential for the evolution of a comprehensive safety culture in China, underscoring the importance of modifying structural and cultural norms to encourage more substantial worker involvement in safety protocols.
- 4) *Safety Communication*: The importance of safety communication in shaping safety culture within China's construction industry is widely acknowledged, yet its effectiveness is hindered by the workforce's diversity and mobility, language barriers, and a lack of standardized protocols for safety training and information dissemination [27]. Ongoing initiatives aimed at improving safety communication seek to establish a more inclusive and well-informed environment. These efforts are essential to ensure that safety messages are effectively communicated to all workers, thereby reinforcing the foundation of a strong safety culture.
- 5) *Organizational Safety System*: The focus on organizational safety systems in China's construction industry is increasing, driven by the recognition of the need for comprehensive safety management practices. The development of safety management system is often a key element in assessing organizational safety culture as emphasized by multiple construction practitioners [6], [23]. Organizations has paid most attention to safety procedures and policies, acknowledging its effectiveness on accidents reduction [28]. However, the complexity and bureaucratic nature of implementing these systems still often limit their effectiveness.

### 3.3 The Influence of Differing Societal Contexts on Safety Culture

The development of safety culture within the construction industry is significantly influenced by societal factors. These factors include national culture, regulatory frameworks, and societal values, which play a crucial role in shaping organizational safety practices. The following analysis reveals how societal factors shape organizational safety culture, reflecting the unique challenges and approaches undertaken by each country.

In Australia, the construction industry's safety culture is profoundly shaped by societal values that emphasize collective responsibility, health, safety, and well-being [10]. These values foster an environment where safety is viewed as a shared responsibility, leading to the active engagement of all parties in safety practices. The Australian approach is underpinned by a mature regulatory environment characterized by stringent safety standards and proactive enforcement, supporting a human-centric culture of safety across the construction industry. This framework is reflective of broader societal expectations for high safety standards, promoting a culture where safety extends beyond compliance to become a core organizational value [17]. However, challenges such as subcontracting, competing business priorities, and the complexity of safety management systems remain and highlight the ongoing journey towards an inclusive and effective safety culture, necessitating continuous alignment with societal values and expectations [29].

Conversely, China's safety culture within the construction industry is at an earlier stage of conceptual development, influenced by Confucian values that prioritize hierarchical relationships and collective harmony [10]. The state plays a significant role through top-down regulatory measures and a focus on compliance, yet gaps between formal safety policies and their practical implementation on construction sites are evident. The emphasis on collective action and the role of state directives creates a context where adherence to and respect for rules are paramount, sometimes at the expense of open communication and worker involvement [27]. At the same time, current conceptualization of safety culture in China largely borrows Western studies, which inevitably caused a mixture of values from both contexts [22]. The evolving nature of safety culture in China calls for a holistic approach that considers both internal organizational dynamics and external influences, including regulatory and societal norms.

#### **4. Conclusion**

This study contrasts the safety cultures within the Australian and Chinese construction industries, underscoring how societal contexts distinctly shape their evolution and implementation. Australia's mature safety culture, characterized by strong regulatory frameworks, organizational commitment, and worker involvement, reflects an integrated approach to safety, supported by societal values of collective responsibility and proactive safety management. In contrast, China's safety culture, still evolving, shows promise but faces challenges in consistency, worker engagement, and the integration of safety into traditional societal norms. The comparison reveals the essential role of societal values and norms in influencing safety practices and attitudes, highlighting the need for culturally sensitive safety management approaches. This study serves as the initial analysis of a future in-depth investigation on the underlying societal cultural factors influencing safety culture. Therefore, several limitations exist. The use of systematic literature review may not capture the full spectrum of safety practices or the most current trends in safety culture and tend to be subject to publication bias. The analysis on the societal factors in this study is subject to the existing evidence provided, which has the potential to oversimplify the diverse safety cultures within each country. Overall, the findings emphasize the importance of understanding societal influences on safety culture for practitioners and policymakers. Future research is encouraged to explore more deeply the societal and cultural mechanisms that affect safety culture in the construction industry, aiming to improve global safety outcomes through culturally tailored interventions. This study's insights advocate for a nuanced appreciation of the interplay between societal context and safety culture, pivotal for developing more effective and inclusive safety practices in the construction industry worldwide.

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