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Artificial Intelligence Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

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Abstract

PURPOSE

This study aims to investigate the relationship between collective anxiety relating to the introduction of Artificial Intelligence (AI) technologies in construction companies and team innovative behaviours, purposing a potential mediation role of employees' coping strategies.

DESIGN/METHODOLOGY/APPROACH

The deductive nature of the research dedicated a quantitative research methodology. Structural equation modelling was conducted on a data set of 540 randomly chosen responses to an online questionnaire from European-based construction employees.

FINDINGS

The results showed a significant positive relationship between collective AI anxiety and team innovative behaviour. The mediation relationships were also statistically significant. While emotion-focused and relationship-focused coping had positive relationships with team innovative behaviour, problem-focused coping had a negative relationship. An explanation from cognitive psychology is offered for this finding.

ORIGINALITY

This study contributes to understanding the psychological and social impacts of AI in the construction industry, offering practical insights for fostering innovation amidst AI-induced anxieties. Additionally, it presents an empirical study examining relation-focused coping as a new strategy for collective team coping. Building the conceptual framework at the team level addresses the scarcity of research on managing anxiety and fostering innovation within teams.

PRACTICAL IMPLICATIONS

There is potential for construction organisations to increase team innovative behaviours through supporting emotion-focused and relationship-focused coping strategies for collective AI anxiety. Approaches include open discussions on AI-related concerns to allow team members to voice their anxieties and fostering interpersonal connections to facilitate relationship-focused coping.

Keywords: Collective AI anxiety, Team innovative behaviour, Problem-focused coping strategy, emotion-focused coping strategy, relation-focused coping strategy.

1. Introduction

The recent exponential growth in interest in Artificial Intelligence (AI) is illustrated by Collins Dictionaries' choice of 'AI' as its 'Word of the Year 2023' (Collins, 2024). Organisations are introducing AI in the expectation of realising the many benefits that can accrue. These include higher rates of efficiency, fewer errors, faster processing and more (Makarius et al., 2020). In the construction industry, this interest in AI is particularly pertinent due to the sector's historical challenges, including low productivity and limited digitisation, which have underscored the need for transformative technologies (Regona et al., 2022ab; 2023). These technologies, including AI, hold promise for enhancing cost efficiency, accelerating project timelines, and elevating project quality and safety standards (Demirkesen and Tezel, 2022). AI, broadly defined as "theories and techniques used to create machines capable of simulating intelligence," encompasses various subfields such as machine learning, robotics, and natural language processing (Abioye et al., 2021). Recent advancements have demonstrated AI's potential in addressing sector-specific issues, with applications spanning health and safety management, project planning optimisation, and sustainability initiatives (Abioye et al., 2021).

However, the integration of AI in construction also brings forth a host of challenges and societal implications. Concerns such as job displacement, privacy infringement, algorithmic biases, and ethical dilemmas have garnered attention (Arslan et al., 2022; Lazaroiu and Rogalska, 2023; Golda et al., 2024; Makarius et al., 2020; Ntoutsi et al., 2020; Sartori and Theodorou, 2022; Kim et al., 2023). These challenges contribute to the emergence of AI anxiety, characterised by excessive fear stemming from the transformative effects of AI technologies on personal and social spheres (Kaya et al., 2024).

AI anxiety, akin to historical notions of computer anxiety, encompasses various dimensions, including job replacement anxiety and concerns about human-AI interaction (Wang and Wang, 2022). In construction, this anxiety is heightened due to the industry's heavy reliance on human labour, which makes concerns about automation particularly pronounced (Taher, 2021). This anxiety is not confined to individuals but can manifest as a collective experience within teams, permeating through the social fabric and impacting team dynamics (Yang et al., 2021; Lazaroiu and Rogalska, 2023). While research has highlighted the detrimental effects of AI anxiety on safety performance and organisational readiness for change, there remains a dearth of studies investigating its implications at the team level, particularly within construction teams (Song et al., 2024; Suseno et al., 2020).

Simultaneously, within organisational settings, the pursuit of innovation is paramount for staying competitive and adapting to technological advancements (Nasaj, 2020; Nasaj, 2021). Team innovation, defined as the collective generation and implementation of novel ideas within a group, is crucial for organisational success (Lin et al., 2022). The construction industry's embrace of Construction 4.0, which focuses on integrating digital technologies, makes understanding team innovation even more critical (Oesterreich & Teuteberg, 2016). However, despite the acknowledged importance of innovation at both individual and organisational levels, research at the team level, especially within the construction industry, remains limited (Le Blanc et al., 2021; Statsenko et al., 2023). This gap in understanding is particularly concerning given the industry's transition towards Construction 4.0, emphasising technological integration and innovation (Osunsanmi et al., 2020).

Therefore, this study aims to explore the nexus between collective AI anxiety and team innovative behaviour within construction teams. Despite extensive research on AI and individual anxiety (e.g. Kim et al., 2016; Li and Huang, 2020, Wang and Wang, 2022), limited studies have explored the collective impact of AI anxiety on team dynamics and innovation. Given the construction sector's growing reliance on multidisciplinary teams and collaborative environments (Fong, 2003; Singh et al., 2011), understanding the interplay between AI anxiety and team innovation is important. By examining how AI anxiety influences team dynamics and innovative outcomes, this research seeks to offer insights into fostering resilience and promoting a culture of innovation amidst technological disruptions. Moreover, this study posits that the relationship between collective AI anxiety and team innovative behaviour is mediated through collective coping mechanisms, an aspect that has cultivated increasing attention in recent research (e.g. Badi, 2024). Drawing upon the rich literature on collective coping strategies, encompassing problem-focused, emotion-focused, and relation-focused approaches, this study seeks to shed light on how construction teams collectively confront and manage the stressors associated with AI anxiety. The main research question that underpins our study is:

> *RQ: How does collective AI anxiety influence team innovative behaviour, and do coping strategies play the role of mediators?*

The study adopts a theoretical framework drawing from social cognitive theory and organisational behaviour literature to conceptualise the relationships among the variables and empirically examine the relationships between collective AI anxiety, coping strategies, and team innovative behaviour.

2. Conceptual Underpinnings

2.1 Artificial Intelligence (AI) in Construction

Artificial Intelligence (AI) in the context of the construction industry can be defined as the simulation of human intelligence processes by machines, particularly computer systems, to enhance various aspects of construction projects (Regona, 2023). This includes the ability to learn from data (machine learning), understand natural language, recognise patterns, and make decisions that improve efficiency, safety, and productivity throughout the construction lifecycle (Zabala-Vargas, 2023; Abioye et al., 2021; Kanan et al, 2018). AI technologies are integral to the Fourth Industrial Revolution, characterised by the integration of digital technologies into traditional industries, including construction (Regona et al., 2022a; Regona, 2023).

The integration of AI in the construction industry has led to transformative changes across project management, automation, safety, and workforce dynamics. Based on the nature of the construction industry, advanced planning is a crucial step in construction project management (Schmelzer, 2024). As highlighted by Zabala-Vargas (2023), AI enhances project management by improving planning, scheduling, and resource allocation through data analytics and machine learning algorithms. The integration of AI with Building Information Modeling (BIM) further optimises construction management and workflow efficiency (Sacks et al., 2020). AI also drives automation, significantly improving productivity and efficiency (Abioye et al., 2021). Datta et al. (2024) and Regona et al. (2024) discuss how AI technologies like neural networks and machine learning optimise construction tasks, reduce labour costs, and minimise material waste, fostering sustainability in construction. The AI in global construction market value has been predicted at more than 15.1 billion dollars by 2023 (Artificial Intelligence in Construction Market, 2022).

Furthermore, previous literature highlighted numerous factors that contribute to successful AI adoption in construction. Gledson et al. (2023) emphasized the significance of digital leadership, highlighting that successful digital transformation requires strategic alignment, robust leadership capabilities, and a clear vision. Murguia et al. (2024) similarly highlighted the necessity of strategic scenario planning, capability building, and innovative business models as foundational elements for sustained Construction 4.0 innovation. Extending these insights, this research addresses the psychological dimension of digital transformation, specifically exploring how psychological barriers such as collective AI anxiety can be effectively managed and leveraged to foster innovation. This combined perspective enriches the current understanding by demonstrating that successful digital transformations in the construction sector depend not only on strategic and technological initiatives but also on managing psychological factors to encourage innovative behaviours within teams.

Additionally, AI plays a crucial role in enhancing safety on construction sites, improving risk management through action recognition for workers and equipment, and reducing accidents by enabling real-time safety monitoring with IoT integration (Kanan et al, 2018; Rabbi & Jeelani, 2024). However, the workforce transformation resulting from AI adoption raises concerns across sectors about labour displacement, but it also creates new roles, requiring training and upskilling initiatives for workers (Morandini et al., 2023; Pradhan & Saxena, 2023; Van Hie, 2024). Hence, while AI drives efficiency, sustainability, and safety, it introduces challenges related to workforce adaptation, as will be discussed in the next section.

2.2 Collective AI Anxiety in Construction Teams

AI technology offers significant benefits to the construction industry but also presents challenges, impacting society through job displacement, privacy concerns, algorithmic bias, widening socio-economic gaps, and unethical behaviour (Lazaroiu & Rogalska, 2023; Golda et al., 2024; Ntoutsi et al., 2020; Sartori & Theodorou, 2022; Kim et al., 2023). Traditionally, the construction industry has been considered as a labour-intensive sector (Wang, et al., 2020). Along with the development of AI technology in the recent decade, in the construction sector specifically, workers and managers face unique challenges with AI adoption, such as concerns about job security due to the automation of tasks, the need for reskilling to operate AI-driven systems, and the perceived loss of traditional roles and expertise (Regona et al. 2022b; Khan et al., 2024; Na et al., 2023). These challenges can lead to disruptions that result in feelings of anxiety. AI anxiety has been defined as "excessive fear arising from problems originating from changes formed by AI technologies in personal or social life" (Kaya et al., 2024, p. 499). In the context of construction, AI anxiety may emerge due to fears of job replacement by automated machinery, apprehensions about adapting to new skill requirements, and the uncertainty of relying on AI systems for critical decision-making processes (Regona et al., 2022b; Souza & Debs, 2023). Before the emergence of AI anxiety, computer anxiety has been discussed since the 1980s as "the tendency of individuals to be uneasy, apprehensive, or fearful about the current or future use of computers" (Li and Huang, 2020, p. 2). Beyond the anxiety from learning, AI anxiety can also be from its automatic decision-making processes and anthropomorphised forms (Kim et al., 2016). Wang and Wang (2022) have categorised AI anxiety into several dimensions: "job replacement anxiety," which involves fear of the adverse effects of AI on employment; "sociotechnical blindness," referring to anxiety stemming from a lack of complete understanding of the interdependence between AI and human beings; "AI configuration anxiety," which entails apprehension regarding humanoid AI; and "AI learning anxiety," which relates to concerns about AI technologies acquiring knowledge. In construction, these dimensions manifest through specific scenarios, such as the fear that advanced AI tools might entirely replace traditional craftsmanship or concerns about human-machine collaboration in safety-critical tasks (Colley et al., 2022; Regona et al., 2022b). The well-developed conceptual framework of AI anxiety explains AI-driven anxiety (Spielberger, 1966), which is "a transitory state that changes over time" (Wang & Wang, 2022, p. 621). It elucidates how this phenomenon permeates various aspects of professional life, from concerns about job security to uncertainties about human-AI collaboration.

While anxiety is often perceived as an individual-level construct, it can also manifest as a collective experience in groups (Yang et al., 2021). In terms of AI anxiety, the multifaceted challenges posed by AI technology, ranging from job displacement to ethical dilemmas (Lazaroiu and Rogalska, 2023; Kim et al., 2023), may permeate through the social fabric of teams, fostering a shared sense of unease and apprehension. As Kaya et al. (2024) delineate, AI anxiety stems from the disruptive changes brought about by AI technologies, impacting both personal and social spheres (Hagerty, and Rubinov, 2019). In construction teams, such disruptions may include uncertainties about human-machine collaboration in critical tasks, fears of skills becoming obsolete, or tensions arising from the unequal distribution of AI-related benefits (Colley et al., 2022; Fisher et al., 2023; Regona et al., 2022b). This collective unease about AI (Bao et al., 2022) mirrors the historical discourse surrounding computer anxiety, indicating a longstanding pattern of technological apprehension (Li and Huang, 2020). Research by Song et al. (2024) and Suseno et al. (2020) underscores the detrimental impact of AI anxiety on safety performance and change readiness within the workplace, highlighting its relevance as a team-level phenomenon. In construction, this anxiety may lead to reduced team cohesion, hesitation in adopting AI-enabled tools, and lowered confidence in the reliability of automated systems. By acknowledging AI anxiety as a collective experience, organisations can implement strategies to foster resilience, enhance understanding, and promote a culture of adaptability in the face of technological disruption. However, there is little research on the sequelae of collective AI anxiety in organisations and no research to our knowledge on the effects of collective AI anxiety in construction teams. Our study addresses this critical gap by exploring the unique manifestations and consequences of collective AI anxiety in construction teams.

2.3 Team innovative behaviour

The term innovation sometimes is interchangeably discussed with the term creativity (Nasaj, 2021; Nasaj & Badi 2021). Innovation refers to the generation or adoption and implementation of creative ideas in an organisation (Nasaj et al., 2022). Unlike creativity which may have individual behaviours involved, innovation is "a multistage and iterative process that encompasses both production and implementation of creative ideas by team members in a group" (Lin et al., 2022, p. 1). To foster work efficiency, organisations establish work teams. A team is a part of the organisational structure based on networked development in the organisation (Fay et al., 2015). Compared with individuals, the work unit of a team has more knowledge diversity and greater processing capacities of the information (Müller et al., 2009). In the construction industry, many work tasks are collectively project-based and involve expertise and knowledge sharing within the team (Haq et al., 2023). Team innovative behaviour is defined as "team members' collective behaviours on the production and execution of novel service ideas, methods, and procedures in a team" (Lin et al., 2022). This concept involves social interactions for innovation development and the collective work unit in the organisation (Widmann et al., 2016). Despite the plethora of studies on individual and organisational innovation, there is a paucity of research at the team level (Le Blanc et al., 2021). The lack of research is especially pronounced in the construction industry (Statsenko et al, 2023), which is concerning given the importance of understanding and cultivating innovative behaviour among teams for construction organisations seeking to adapt and thrive in the evolving Construction 4.0 technological change (Osunsanmi et al., 2020).

3. Conceptual Framework and Hypotheses Development

3.1 Collective AI anxiety and team innovative behaviours

In the age of accelerated AI development, research has identified multiple forms of AI anxiety within workplaces. This anxiety may be the result of the challenges associated with mastering AI technologies (Cetindamar et al., 2022); adjusting to working in collaboration with AI systems (Arslan et al., 2022), and navigating the job market (Vochozka et al., 2018). Collective AI anxiety can encompass fears related to learning about AI, concerns about job replacement due to AI adoption, anxieties regarding the societal and ethical implications of AI, and apprehensions specifically related to humanoid AI technologies. These anxieties may manifest within teams as an unfavourable group affective tone (George and King, 2007). However, emerging research, in contrast to conventional wisdom, indicates that some types of anxiety might potentially stimulate innovation as opposed to impede it. Research by Mao et al. (2021) has found that an intermediate level of team job-related anxiety was associated with higher individual creativity in teams. An earlier study by Akgün et al. (2007) has also found that team anxiety positively impacts speed-to-market in new product development teams. In this study, we are postulating that collective AI anxiety is associated with higher innovation behaviour in construction teams. This nuanced relationship suggests that AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasising the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). This also aligns with research that has found that AI technologies effectively augment employee creativity (Ding, 2022; Jia et al., 2024). Based on these observations, we put forth our first hypothesis:

> *Hypothesis 1. Collective AI anxiety is positively associated with team innovative behaviours.*

3.2 The mediating role of team collective coping strategies

A large number of studies have examined individual coping (e.g. Freire et al., 2019; Lazarus and Folkamn, 1984). However, in most employment and competitive and achievement-focused situations (such as sports and projects), people work together to attain objectives. Thus, 'collective' (communal) coping is attracting investigation. Collective coping emphasises the 'relational' feature of coping and is known for its social and interactive nature. A group owns, assesses, and handles a stressor as "our problem and our responsibility" under this view (Afifi et al. 2006, p. 378). This community ownership of a stressor contrasts with individual accountability (Afifi et al., 2006). Lyons et al. (1998) define collective coping as the community pooling resources and efforts to overcome adversity. As they accept responsibility and take proactive steps to manage the stressor, the group's synergy and collaboration are highlighted (Afifi et al., 2006). Collective coping was observed in studies of communities facing natural disasters (Afifi et al., 2012), couples with health issues (Rentscher, 2019), sports teams (Leprince, et al 2019) as well as project teams in construction (Badi, 2024). Collective coping was found to reduce stress and improve mental health (e.g. Afifi et al., 2012; Rentscher, 2019) as well as reduce the organisational stress climate (Rodríguez et al., 2019).

Aligning with this goal, three collective coping strategies have been discussed in the literature: problem-focused, emotion-focused, and relation-focused strategies (Badi, 2024; Länsisalmi et al., 2000). First, problem-focused collective effort is a coping approach that involves analysing the difficulties associated with the stressor, exchanging knowledge, and engaging in problem-solving activities (Pearsall et al., 2009). Problem-focused coping techniques in teams include a diverse array of tactics, such as issue definition, producing various solutions, and evaluating these solutions based on criteria including costs, benefits, decision-making, and action (Lazarus and Folkman, 1984). The research conducted by Länsisalmi et al. (2000) found that problem-focused coping was associated with a shared feeling of responsibility for all tasks, good communication, information sharing, and knowledge management. Problem-focused collective effort coping techniques include the team's inclination to see stressful events as within their control and capable of being altered (Badi, 2024). Teams often use proactive and strategic coping mechanisms in response to challenging circumstances, promptly taking appropriate measures to resolve the problem (Länsisalmi et al., 2000). Hence, by adopting collective problem-focused coping, the team members may identify problems triggered by AI anxiety, and employ coping strategies such as generating solutions to address AI Anxiety, including thinking of ways to manage the situation devising work plans collaboratively, and implementing effective strategies to alleviate AI anxiety. The increased apprehension regarding AI among team members (Makarius, et al., 2020) may lead to heightened levels of information sharing and communication channels within a team. The heightened discourse is motivated by the collective necessity to address the difficulties presented by AI, which ultimately results in improved collaborative problem-solving abilities. In addition, the shared concern regarding the potential consequences of AI on employment positions may instil a feeling of immediacy, which may encourage team members to invest greater effort in collaborative deliberations and idea generation. Hence, we forward the following hypothesis:

> *Hypothesis 2: Problem-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.*

The second collective coping strategy is emotion-focused coping. Emotions play a crucial role in shaping individual, team, and organisational behaviours, processes, and outcomes (Barsade and Gibson, 2007; Heaphy, 2017). Emotionally intelligent teams are those capable of attending to their emotional state and need (Goleman et al., 2002), while psychological safety, or the ability to admit mistakes and express feelings without fear of punishment, is a significant predictor of team effectiveness (Frazier et al., 2017). Collective positive emotions, such as gratitude, can strengthen a team's ability to introduce novel ideas, feelings, and relationships, enabling them to build enduring resources such as social support and resilience (Meneghel et al., 2016). Expressing negative emotions constructively, such as fear, anxiety, and distress, was also found to enhance teams' knowledge-creation capabilities and performance (Stephens and Carmeli, 2016). Collective emotion-focused coping strategies within the team foster emotional openness by encouraging honest expression of feelings and support without blame, while also promoting a positive outlook by maintaining hope, building on strengths, and focusing on possibilities despite AI anxiety challenges. Emotional support among team members can be encouraging each other to look positive and/or alleviating the negative feelings of low self-efficacy and low self-confidence

(Chambers et al., 2001). Therefore, when team members work together to generate and implement innovative ideas, the individuals in the team may seek emotional support from other team members to reduce their AI anxiety. Hypothesis 3 is proposed:

> *Hypothesis 3: Emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.*

The third and final collective coping strategy is the relation-focused coping strategies which rely on interactions within the team (Afifi et al., 2006). Relation-focused coping strategies involve seeking and utilising support, guidance, and resources from leaders, colleagues, and organisational members to navigate challenges and adapt to the needs of team members facing difficulties, such as AI Anxiety. During the team innovation development process (Scott and Bruce, 1994), team creative behaviours and team implementation behaviours are involved (Widmann et al., 2016). Team members discover opportunities, identify the needs of a specific innovation, and come out with new ideas through a variety of creative activities. After that, the team moves to promote and implement the explored ideas by assigning tasks to team members, seeking resource support, and testing and refining the process (Widmann et al., 2016). Therefore, building social support, compensating for the individual weaknesses of other team members, and pooling the team members' resources can strengthen the collective competency of the team to confront collective AI anxiety as well as contribute to team innovation (Badi, 2024; Leprince et al., 2019). Hypothesis 4 is proposed as:

> *Hypothesis 4: Relation-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours*

The overall proposed conceptual framework of the study is illustrated in Figure1.

Figure1: Conceptual Framework

***** INSERT FIGURE 1 ABOUT HERE *****

4. Methodology

The research aims to study the relationship between collective AI anxiety and team innovative behaviour as well as the mediating role of coping strategies. Thus, a quantitative methodology is considered suitable for deducing the nature of these relationships among the research's variables (Saunders et al., 2016).

4.1 Sampling and data collection

In the technological race led predominantly by the United States and China (Brattberg et al. 2020), Europe stands out with its unique industrial strengths and prominence in AI applications. Despite this, Europe has yet to fully exploit its technological potential due to challenges such as digital market fragmentation, recruitment issues, and lack of competitiveness. Moreover, the anxiety surrounding the adoption and impact of artificial intelligence (AI) in Europe stemming from concerns over job security, ethical implications, and potential misuse underscores the need for targeted research in this area (Brattberg et al. 2020). Therefore, the study involved European construction organisations where AI integration is prominent, focusing on teams as the unit of analysis.

Data collection involved a quasi-random sampling technique via an online survey questionnaire distributed to construction companies' employees working in several countries in Europe: Denmark, Germany, Netherlands, Norway, Portugal, Spain, Sweden, and the UK. A professional data collection company (cint.com) were utilised to facilitate data collection. A single key informant sampling method was utilised in this research, as initially proposed by Van de Ven and Ferry (1980). This approach is consistent with recent research methodologies within the construction industry, including the works of Talat and Riaz (2020) and Badi (2024). The rationale for selecting a single key informant from each organisation, rather than surveying the entire team, is based on two main considerations. To effectively capture a wide array of evaluations regarding the AI anxiety phenomenon within the construction sector, it proved more efficient to gather insights from key informants across a variety of organisations. This method helps to avoid the homogeneity in responses that could emerge from consulting multiple members of the same organisation, thereby providing a more comprehensive view of the diverse ways in which AI anxiety phenomena affect team innovation behaviours through shared coping mechanisms. Furthermore, the literature validates the efficacy of engaging a single key informant for gaining insights into team-oriented phenomena, particularly for studies addressing complex initiatives like AI anxiety phenomena (Badi 2024; Talat and Riaz, 2020). This method offers a perspective that reflects both team dynamics and the broader organisational context in handling AI anxiety, crucial for dissecting the intricacies of innovation and coping mechanisms within the construction sector.

The survey was disseminated in February 2024 in multiple waves, with a total of 2,720 surveys sent out. Of these, 954 responses were received, representing a response rate of approximately 35.07%. Upon examining the responses, 540 were found to be complete and usable for analysis. Table I demonstrates the profile of the research participants.

Table I Participants' Profile Summary

***** INSERT TABLE I ABOUT HERE *****

4.2 Questionnaire design and measurement items

The study evaluated its constructs through a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), following the agreement rating system suggested by Saunders et al. (2016). The scale items are detailed in Appendix A.

The questionnaire was designed by adapting and integrating previously validated scales from published research, ensuring consistency with established measurement frameworks while tailoring them to the construction industry. This approach allows for a multidimensional assessment of AI-related attitudes and behaviours, aligning with seminal work that advocates the combination of constructs from different fields to capture complex workplace phenomena and enhance theoretical robustness (Edwards, 2001; MacKenzie et al., 2011).

Collective AI anxiety was measured by updating the recently developed scale by Wang and Wang (2022) to the team level. The scale consists of four dimensions: Learning (8 items), Job Replacement (6 items), Sociotechnical Blindness (4 items), and AI Configuration (3 items).

For collective coping strategy, the research examined three well-established coping strategies: problem-focused, emotion-focused, and relation-focused coping strategies.

- Problem-focused coping strategies were measured using the Leprince et al. (2019) scale, which has been previously validated and recently applied in the construction context (Badi, 2024) with robust reliability and validity results. It comprises two dimensions: analysis and information sharing (3 items) and problem-solving (3 items).
- Emotion-focused coping strategies were measured using Ramadhana's (2020) scale, .specifically developed to capture how groups navigate emotional challenges and maintain morale. It includes two dimensions: emotional openness (4 items) and positive outlook (4 items).
- Relation-focused coping strategies were measured using a recently developed and validated scale by Badi (2024), which has demonstrated strong reliability. It consists of two dimensions: social support (3 items) and compensation (3 items).

The construct of team innovative behaviours was measured using the Litchfield et al. (2018) scale, which is specifically designed to assess innovation in technology-driven environments. Given the nature of this research, this scale was particularly suitable for evaluating the extent and frequency of innovative behaviours within teams. The scale consists of 5 items, providing a comprehensive measure of team-level innovation.

In addition, the questionnaire featured a demographic section capturing organizational size, age, gender, work experience, job position, and educational background. These characteristics have been shown to influence employees' perceptions of their workplace, potentially shaping their attitudes toward their jobs, work processes, and performance (Kirkman et al., 2004). The demographic categories are detailed in Table I.

To ensure the validity of the questionnaire design, convergent and discriminant validity, as well as factor analysis results are presented in Table 2 and Appendix B. The findings reinforce the appropriateness of the grouped items and contribute further empirical support for the usefulness of the adopted scales in the construction sector.

4.3 Data analysis

Data analysis was performed via SPSS v23.0 and Amos v23.0 programs.

4.3.1 Common Method Bias

Assessing for common method bias is crucial, particularly in self-administered surveys (Fuller et al., 2016). To this end, the study utilised the commonly applied Harman's single-factor test (Podsakoff and Organ, 1986) for its analysis. The results revealed that only 35.214 % of the data variance was attributed to a single factor, remaining under the 50% benchmark. Hence, it is inferred that common method bias does not pose a significant issue in this research.

4.3.2 Reliability and Validity

The research evaluated the reliability of its constructs through multiple tests. Initially, Cronbach's alpha was employed, with all constructs displaying values above 0.7, indicating their reliability according to George and Mallery (2003). Furthermore, the Kaiser-Meyer-Olkin (KMO) test was carried out to assess sample adequacy, yielding a result of .970. This demonstrates good scale adequacy, as a KMO value close to 1.0 signals higher reliability and values below 0.50 indicate unreliability (Morgan et al., 2004). Additionally, the Bartlett Test of Sphericity was used to examine correlations to confirm each scale's reliability in the study (Hair et al., 2010), resulting in a Bartlett Test of Sphericity value of .000. Therefore, the reliability assessments conducted substantiate the scales' dependability within the research. The research variables' correlation matrix and descriptive statistics are detailed in Table 2.

Table 2: Reliability, Validity and Correlation Analysis

***** INSERT TABLE 2 ABOUT HERE *****

Factor analysis was employed to verify the variables' validity within the study. An Exploratory Factor Analysis (EFA) was conducted, employing principal component analysis for the extraction process and varimax rotation. The outcomes of the EFA indicated that the items in the questionnaire were well-matched with their intended constructs, achieving acceptable values above 0.45, in line with Field's (2013) guidelines. The detailed results of the Exploratory Factor Analysis (EFA) are reported in Appendix B

The Confirmatory Factor Analysis (CFA) results demonstrate a strong model fit, with all indices falling within the recommended thresholds: chi-square/degrees of freedom (χ^2/df) = 1.778, indicating a good fit according to Schreiber et al. (2006); Root Mean Square Residual (RMR) = 0.034, suggesting minimal residuals as per Browne and Cudeck (1993); Comparative Fit Index (CFI) = 0.964 and Incremental Fit Index (IFI) = 0.964, both reflecting a high degree of model fit as noted by Byrne (2010) and Bentler (2007); Tucker-Lewis Index (TLI) = 0.961, indicating a good fit based on Marsh et al. (2004); and Root Mean Square Error of Approximation (RMSEA) = 0.038, denoting a close fit in line with Steiger (2007). The specifics of the CFA results are presented in Figure 2.

Figure 2: Confirmatory factor analysis

***** INSERT FIGURE 2 ABOUT HERE *****

Furthermore, evaluations of both convergent and discriminant validity for the measurement scales were performed. The criteria for satisfactory outcomes were established at a minimum cut-off value exceeding 0.5, as specified by Hair et al. (2006). The process for assessing discriminant validity included contrasting the square root of the average variance extracted (AVE) with the correlations existing between constructs. To affirm discriminant validity, it is necessary for the square root of AVE to surpass the inter-construct correlations (Hair et al., 2006). Based on the information provided in Table 2, the study effectively confirmed both convergent and discriminant validity.

4.3.3 Hypothesis testing

The research inspects the relations between collective AI anxiety and team innovative behaviour highlighting the mediation role of coping strategies. Structural equation modelling with robust maximum likelihood estimation was conducted to examine the research hypotheses. The structural equation model is represented in Figure 3.

Figure 3: The structural model

***** INSERT FIGURE 3 ABOUT HERE *****

The structural equation model fit indices demonstrated a good model fit: $\chi 2/df = 2.058$, RMR = .079, CFI =. 950, IFI = .950, TLI =. 947, RMSEA = .044.

The results of direct relations amongst the constructs are illustrated in Table 3.

Table 3 SEM Direct Relations Results

***** INSERT TABLE 3 ABOUT HERE *****

The results illustrate that there is a significant relation between collective AI anxiety and team innovative behaviour at 99% confidence level, and therefore H1 is supported.

In terms of H2, H3 and H4, we can see that there are significant relations at 99% confidence level among all the variables however the relation between collective AI Anxiety and problem-focused coping strategy is significant at 95% confidence level. Hence, a potential mediating role for coping strategies is demonstrated.

The bootstrapping technique (Preacher and Hayes, 2004) was employed to further investigate the indirect effect among the variables in order to validate the mediating role of coping strategies. This approach is advised for the analysis of mediating variables (MacKinnon et al., 2012; Hayes, 2017). Utilising 2000 resamples, the bootstrapping method generated at 95% confidence intervals for the indirect impacts of collective AI anxiety on team innovative behaviour. The outcomes of these indirect relationships are shown in Table 4.

Table 4 Indirect Relations Results

***** INSERT TABLE 4 ABOUT HERE *****

The results of the indirect relation between collective AI anxiety and team innovative behaviour demonstrate that coping strategies have a mediating role over the relation between collective AI anxiety and team innovative behaviour with all two-tailed significance tests significant relations at 95% confidence level.

5. Discussion of results

The rapid advancement of AI technologies has led to anxieties among employees about their roles, job security, and the need to acquire new skills (Li and Huang, 2020). Within the construction industry, these concerns are particularly acute due to the sector's reliance on manual labour, traditional workflows, and the perceived threat of automation to job stability. For instance, construction workers often experience anxiety about whether AI-driven tools will replace their jobs, alter skill requirements, or increase the complexity of their tasks (Regona et al. 2022b; Khan et al., 2024; Na et al., 2023). However, this anxiety can have positive outcomes for the organisation. First, Hypothesis H1 suggests that collective AI anxiety in the workplace positively influences team innovative behaviours. Our empirical analysis supports this hypothesis, indicating a significant positive association between collective AI anxiety and team innovative behaviours (β: 0.37, $p < 0.001$). Previous research suggests that negative affective states within teams can hinder performance (McCarthy et al., 2016). However, our findings suggest a nuanced relationship wherein AI anxiety, although initially negative, can catalyse increased innovation efforts within teams. The work of Gong et al. (2013) has noted that anxiety stemming from job demands can drive increased creativity among team members. Our study aligns with this by revealing how collective AI anxiety can paradoxically foster heightened levels of innovation among team members and challenge conventional notions of how negative affective states influence team behaviour. Our three remaining three hypotheses explore some of the mediatory mechanisms through which collective AI anxiety enhances team innovation, potentially uncovering collective coping strategies to leverage this phenomenon for organisational benefit.

The supported Hypothesis H2 identified that collective problem-focused coping strategies serve as a mediator between collective AI anxiety and team innovative behaviours. This finding builds upon established literature concerning coping mechanisms and their impact on team dynamics. Pearsall et al. (2009) and Länsisalmi et al. (2000) have outlined the significance of collective problem-focused coping techniques, emphasising their association with enhanced communication, shared responsibility, and proactive problem-solving within teams. Badi (2024) underlined the significance of problem-focused collective efforts in construction teams. A collective problem-focused coping strategy entails actively generating solutions, considering strategies to manage Collective AI anxiety, exploring coping methods, developing collaborative action plans, implementing effective strategies, and executing agreed-upon plans to address and alleviate collective AI anxiety. Against our expectations, we found that problem-focused team coping strategies had a negative relationship with team innovative behaviour. This negative relationship indicates that as the adoption of problem-focused coping strategies increases within the team, there is a decrease in team innovative behaviour. This could imply that when teams primarily focus on addressing problems associated with AI anxiety through problem-solving techniques, they may allocate less energy or attention towards generating innovative ideas or solutions. This may relate to the cognitive processes underlying innovation. Creativity has long been understood to result from a balance between two different thinking styles: divergent thinking (idea generation) and convergent thinking (idea evaluation) (Guildford 1967). Divergent thinking can be the more 'creative' style in the sense of developing multiple, imaginative ideas, while convergent thinking can be more implementation-focused in the sense of identifying the single, optimal answer (Runco, 2010). Problem-focused coping strategies may depend more on convergent thinking styles, leading to lower levels of innovation. Hence, excessive emphasis on problem-solving may lead to a lack of exploration or creativity, thereby hindering the team's ability to innovate.

In addition, the supported Hypothesis H3 offers empirical evidence that collective emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours, drawing from a robust literature highlighting emotions' influence on team dynamics and outcomes (Barsade and Gibson, 2007; Heaphy, 2017; Frazier et al., 2017). Collective emotion-focused coping, characterised by emotional openness, involves acknowledging and expressing emotions truthfully, sharing both negative and positive feelings, demonstrating understanding without blame, maintaining hope and confidence, encouraging each other, seizing opportunities and persisting in efforts, and focusing on possibilities while accepting limitations to cope with collective AI anxiety-related difficulties. By fostering emotional openness, support, and resilience, these coping strategies appear to help teams manage AI-related anxiety effectively (Meneghel et al., 2016; Stephens and Carmeli, 2016). Through constructive expression of emotions and encouragement of positive outlooks, such strategies can mitigate the potentially negative impact of collective AI anxiety on innovation (Chambers et al., 2001). The findings of H3 contribute to understanding coping mechanisms amid technological challenges, emphasising the importance of emotional support and resilience-building in fostering creativity (Meneghel et al., 2016).

Finally, the supported Hypothesis H4 underlined collective relational-focused coping strategies as a mediator in the relationship between collective AI anxiety and team innovative behaviours, offering a nuanced understanding of how interpersonal interactions within teams influence adaptive responses to technological disruptions. This finding aligns with the literature emphasising the significance of relation-focused coping strategies, as highlighted by Afifi et al. (2006). We extend the work of Badi (2024) in the construction industry by underscoring the pivotal role of social support in bolstering team innovation efforts amidst technological challenges. Collective relation-focused coping entails seeking support from leadership and colleagues, accessing organisational resources, and implementing compensatory measures such as supporting, adjusting work plans, and accommodating weaknesses of team members to manage challenges related to collective AI anxiety. By fostering social support networks, compensating for individual weaknesses, and leveraging collective resources, teams can enhance their overall competency to confront collective AI anxiety and drive innovation forward.

6. Conclusion

Our study contributes to the literature by elucidating the impact of collective AI anxiety on team dynamics and behaviours within construction industry organisations. Firstly, our findings indicate that collective AI anxiety can positively influence team innovative behaviours, contrary to the conventional understanding that negative affective states hinder performance. This nuanced relationship suggests that collective AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasising the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). Secondly, the findings highlight the mediating role of collective problem-focused, emotion-focused and relation-focused coping strategies in addressing AI-related anxiety. This draws upon established literature emphasising the significance of such collective coping mechanisms in enhancing team proactive problem-solving and the role of emotional and social support in bolstering team efforts to confront AI-induced anxiety and drive innovation forward amidst technological change.

The results from this study contribute to the body of knowledge in several ways. First, despite its increasing popularity, empirical inquiry into the social and psychological implications of AI in construction is still in its infancy. Even though there are research studies dealing with AI implementation in the construction industry (e.g. An et al., 2021; Dumrak et al., 2023; Pan and Zhang, 2021) there is a paucity of studies exploring the social and psychological implications of

AI. Therefore, the study addresses this gap in the literature by empirically examining AI from a psychological perspective, focusing on AI anxiety in construction teams. Second, the study examines the concepts of AI anxiety and coping as team-level collective phenomena and answers the call for further studies exploring team-level dynamics in construction. To our knowledge, our study is the first to update the Wang and Wang (2022) AI anxiety scale to explore the team-level collective phenomenon and we confirmed the validity and reliability of the modified scale in this context. Thus, our study contributes to the advancement of research in the stress and coping domain by addressing the gap in understanding team-level dynamics in the context of anxiety and coping strategies, particularly within the construction industry. Third, this study develops and validates a research model of collective teams coping with AI anxiety and innovation outcomes. To our knowledge, our study is one of the first to apply collective coping strategies to understand how teams cope with collective AI anxiety with team innovative behaviour as the outcome.

The findings of our study have several implications for construction organisations seeking to harness the creative potential of their teams amidst the growing prevalence of AI technologies. First, recognising the potential positive impact of collective AI anxiety on team innovative behaviours, organisations should encourage open discussions about AI-related concerns and provide platforms for team members to voice their anxieties. This can help harness the heightened cognitive arousal associated with collective AI anxiety, fuelling creativity and innovation within teams. Second, the study's findings emphasize the critical role of the "people dimension" in successful digital transformation, reinforcing recent literature highlighting the importance of technical capabilities, talent management, and organizational digital culture (Aghimien et al., 2024). Construction organizations should prioritize not only technological adoption but also workforce preparedness through systematic re-skilling and continuous learning initiatives. Therefore, organisations should prioritise emotion-focused and relation-focused coping strategies to address AI-related anxiety. Organisations should implement organisation-wide initiatives such as providing promoting a supportive work environment and fostering strong interpersonal relationships. By nurturing these coping mechanisms, organisations can empower their teams to navigate AI-induced anxiety, capitalise on collective strengths, and drive innovation in the construction industry. This can include conducting workshops focused on emotional intelligence and resilience, enabling team members to manage and express emotions constructively. Regular structured discussions, such as "AI Anxiety Forums," can provide a safe space for team members to voice concerns and collaborate on solutions. Additionally, incorporating team-building activities, such as innovation hackathons or trust-building exercises, can enhance interpersonal connections and relation-focused coping. These strategies not only alleviate AI-related anxieties but also establish a foundation for enhanced collaboration and innovation within teams. This supportive environment helps attract and retain the right digital talent by fostering an organizational culture that encourages innovation and values employee involvement, thus promoting sustainable innovation within construction organizations (Aghimien et al., 2024).

Thirdly, the positive influence of collective AI anxiety on team innovative behaviours, as found in our study, aligns with emerging literature on digital leadership and innovation management. For instance, Gledson et al. (2023) emphasized that effective digital leadership is critical for successful digital transformations, particularly in managing strategic alignments and fostering innovation. Our results deepen this understanding by highlighting how leaders could strategically manage collective psychological responses, such as AI anxiety, through targeted coping strategies to enhance innovation. Similarly, Murguia et al. (2024) provided insights into strategic planning, capability building, and business models necessary for long-term innovation in Construction 4.0. Our findings extend these discussions by empirically demonstrating that psychological factors, particularly collective AI anxiety, play a significant role in determining team innovation outcomes. These insights underline the practical implications for managers and policymakers in the construction sector, indicating the need to integrate psychological coping mechanisms into digital transformation strategies to achieve sustainable and effective AI implementation.

While our study provides valuable insights into the relationship between collective AI anxiety and team innovative behaviours in the construction sector, several limitations should be considered and that should guide future research. To begin, there is the inherent risk of subjectivity when using self-reported data. To ensure that future studies are more reliable, multi-source data-gathering techniques could be used such as objective performance measurements or observational data. Second, further research is needed to explore our tentative explanation of problem-focused coping as tending towards convergent thinking. Third the mediating function of coping

mechanisms in reducing collective AI anxiety and increasing team innovation was the primary emphasis of our research. Nevertheless, these dynamics might be impacted by other individual, team and contextual factors, such as personality, team composition, organisational culture, and project characteristics. We can learn more about the intricate relationship between collective AI anxiety and team innovation if we investigate these other aspects. Additionally, the results may not apply to other sectors or organisational contexts since our research was carried out within the framework of companies in the construction industry. To further enrich this line of inquiry, future research could explore whether collective AI anxiety manifests differently across industries by comparing the construction sector with other fields, such as healthcare, finance, or manufacturing. Investigating sector-specific factors—such as regulatory environments, technological maturity, and workforce skill requirements—could provide valuable insights into the broader applicability of our findings and reveal industry-specific strategies for mitigating AI-related anxiety and fostering innovation. To test how well our results, hold up in other settings and how applicable they are to various types of organisations, future studies may replicate our study. Furthermore, longitudinal research may shed light on how collective AI anxiety impacts team performance and creativity in the long run. The subjective experiences and opinions of team members regarding collective AI anxiety and coping techniques might be additionally understood with the use of qualitative research methodologies, such as focus groups or interviews. To better understand these occurrences and to guide the creation of tailored solutions to assist teams in handling AI-related anxiety, it would be beneficial to combine quantitative and qualitative assessments.

To sum it up, this study sheds light on the relationship between collective AI anxiety and team innovative behaviour in the construction industry, highlighting the mediating role of collective coping strategies. The findings reveal that collective AI anxiety, often viewed as a negative force, can positively influence team innovation by fostering cognitive arousal. The study identifies emotion-focused and relation-focused coping strategies as effective mediators, promoting resilience and collaboration, while problem-focused strategies may limit divergent thinking and hinder innovation.

The implications suggest that organisations should address AI-induced anxieties through open communication, supportive work environments, and fostering strong interpersonal relationships to leverage their teams' innovative potential. By nurturing appropriate coping mechanisms, construction organisations can navigate the challenges of technological transformation while enhancing team performance and creativity. These insights contribute to the understanding of team-level dynamics, providing a foundation for future research into collective psychological phenomena and innovation in other sectors.

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APPENDIX A: Measurement items

Constructs	Items	Source
Collective AI Anxiety	*Learning:* AIA1: Learning to understand all of the special functions associated with an AI technique/product makes us anxious. AIA2: Learning to use AI techniques/products makes us anxious. AIA3: Learning to use specific functions of an AI technique/product makes us anxious. AIA4: Learning how an AI technique/product works makes us anxious. AIA5: Learning to interact with an AI technique/product makes us anxious. AIA6: Taking a class about the development of AI techniques/products makes us anxious. AIA7: Reading an AI technique/product manual makes us anxious. AIA8: Being unable to keep up with the advances associated with AI techniques/ products makes us anxious. *Job Replacement:* AIA9: We are afraid that an AI technique/product may make us dependent on AI applications. AIA10: We are afraid that an AI technique/product may make us lazier. AIA11: We are afraid that an AI technique/product may replace humans. AIA12: We are afraid that widespread use of humanoid robots will take jobs away from people. AIA13: We are afraid that if I begin to use AI techniques/products we will become dependent upon them and lose some of our reasoning skills. AIA14: We are afraid that AI techniques/products will replace someone's job. *Sociotechnical Blindness:* AIA15: We are afraid that an AI technique/product may be misused. AIA16: We are afraid of various problems potentially associated with an AI technique/ product. AIA17: We are afraid that an AI technique/product may get out of control and malfunction. AIA18: We are afraid that an AI technique/product may lead to robot autonomy. *AI Configuration:* AIA19: We find humanoid AI techniques/products (e.g. humanoid robots) scary. AIA20: We find humanoid AI techniques/products (e.g. humanoid robots) intimidating. AIA21: We don't know why, but humanoid AI techniques/products (e.g. humanoid robots) scare us.	Wang & Wang (2022)
Problem-Focused Coping	*Analysis and Information Sharing:* PRO1: We think of solutions to solve the problems generated by AI Anxiety. PRO2: We think of possible solutions to manage the AI Anxiety situation. PRO3: We try to find possible ways of dealing with the AI Anxiety situation. *Problem-solving:* PRO4: We deal with the AI Anxiety situation by adopting a work plan that we have discussed together. PRO5: We put simple and effective work strategies in place. PRO6: We implement the work plan we have collectively decided on to get out of the AI Anxiety situation.	Leprince et al. (2019)

Emotion-Focused Coping	*Emotional openness:* EMO1: We express our feelings and are truthful with each other. EMO2: We can share negative feelings such as sadness, anger, and fear. EMO3: We show each other understanding and avoid blame. EMO4: We can share positive feelings such as gratitude, appreciation, humor, and fun. *Positive outlook:* EMO5: We keep hopeful and confident that we will overcome difficulties caused by AI Anxiety. EMO6: We encourage each other and build on our strengths. EMO7: We seize opportunities, take-action, and persist in our efforts. EMO8: We focus on possibilities and try to accept what we cannot change.	Ramadhana (2020)
Relation-Focused Coping	*Social Support:* RFC1: We can rely on strong leadership by the team leader to provide support and guidance. RFC2: We can rely on the support of colleagues and other organisational members. RFC3: We can access organisational resources to help our team through difficult times. *Compensation:* RFC4: We try to help a team member facing difficulty with AI Anxiety by compensating for some of his/ her actions. RFC5: We re-adjust our work plan by taking on the tasks of a team member facing difficulty with AI Anxiety. RFC6: We adapt our work plan to deal with a team member's weaknesses with AI Anxiety.	Badi, (2024)
Team innovative behaviour	TIB1: My team members often implement new ideas to improve the quality of our products and services. TIB2: My team members give a lot of consideration to new and alternative methods and procedures for doing their work. TIB3: My team members often produce new services, methods, or procedures. TIB4: This is an innovative team. TIB5: My team creates new ideas for difficult issues.	Litchfield et al., 2018

Items were measured on a 5-point Likert scale.

APPENDIX B: Exploratory Factor Analysis

Rotated Component Matrix[a]

	Component 1	2	3	4	5
CHA1	.635				
CHA2	.691				
CHA3	.651				
CHA4	.718				
HIA1		.787			
HIA2		.844			
HIA3		.838			
HIA4		.751			
PFCS1			.761		
PFCS2			.701		
PFCS3			.645		
PFCS4			.697		
PFCS5			.525		
PFCS6			.517		
EFCS1				.759	
EFCS2				.689	
EFCS3				.737	

EFCS4				.793	
EFCS5				.731	
EFCS6				.781	
EFCS7				.730	
EFCS8				.691	
TIB1					.789
TIB2					.780
TIB3					.797
TIB4					.803
TIB5					.819

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Response to reviewers' comments

Manuscript ID CI-08-2024-0222.R1

Title: Artificial Intelligence Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

Construction Innovation: Information, Process, Management

Dear Professor Srinath Perera and Professor Peng Wu,

We sincerely appreciate the opportunity to submit a revised version of our manuscript for the Journal of Construction Innovation.

We have carefully considered the feedback and made the necessary adjustments, as detailed in the attached 'Detailed Responses to Reviewers.' Your constructive insights have significantly contributed to improving the quality of our paper, and we believe these revisions bring the manuscript closer to meeting the high standards of the Journal of Construction Innovation.

Once again, thank you for your continued support and patience throughout this process. We look forward to the possibility of future collaborations.

Best regards,

Authors

Detailed Responses to Reviewers' Comments

Response to Associate Editor's Comments

- **Comment #1: "All reviewers' comments have been adequately addressed. The integration of the outcome of the study with previous literature from Construction Innovation on this area needs to be improved. For example, Gledson et al. (2023) discussed digital leadership for digital transformation and innovation in construction. Murguia et al. (2024) discussed how construction 4.0 lead to long term innovation in construction. How this piece of work add to these existing studies so that AI can be further promoted in the construction industry should be extensively elaborated.**

Response #1: we have improved the integration of our study's outcomes with prior literature from Construction Innovation, explicitly addressing recent research by Gledson et al. (2023) and Murguia et al. (2024). The following text has been added to section: 2.1 Artificial Intelligence (AI) in Construction, page number 5. References are updated as well accordingly.

Furthermore, previous literature highlighted numerous factors that contribute to successful AI adoption in construction. Gledson et al. (2023) emphasized the significance of digital leadership, highlighting that successful digital transformation requires strategic alignment, robust leadership capabilities, and a clear vision. Murguia et al. (2024) similarly highlighted the necessity of strategic scenario planning, capability building, and innovative business models as foundational elements for sustained Construction 4.0 innovation. Extending these insights, this research addresses the psychological dimension of digital transformation, specifically exploring how psychological barriers such as collective AI anxiety can be effectively managed and leveraged to foster innovation. This combined perspective enriches the current understanding by demonstrating that successful digital transformations in the construction sector depend not only on strategic and technological initiatives but also on managing psychological factors to encourage innovative behaviours within teams.

- **Comment #2: There needs to be more in depth discussion of the implication of the study with the support of existing work in Construction Innovation and other relevant journals.**

Response #2: Thank you for this constructive suggestion. In this revised version, we have provided a more comprehensive and in-depth discussion of the implications of our study. We have integrated recent literature from Construction Innovation and other relevant journals (Gledson et al., 2023; Murguia et al., 2024; Aghimien et al., 2024), clearly highlighting how our findings extend current understandings of digital leadership, organizational culture, and innovation management. Specifically, we've emphasized how recognizing collective AI anxiety and applying targeted coping strategies can strategically enhance team innovation, support digital talent retention, and sustain organizational innovation capabilities. These insights offer practical guidance to construction industry managers and policymakers on creating supportive organizational cultures, fostering emotional resilience, and strategically managing psychological responses to AI adoption. Below is the update paragraph of our implications section (Page: 23-24):

The findings of our study have several implications for construction organisations seeking to harness the creative potential of their teams amidst the growing prevalence of AI technologies. First, recognising the potential positive impact of collective AI anxiety on team innovative behaviours, organisations should encourage open discussions about AI-related concerns and provide platforms for team members to voice their anxieties. This can help harness the heightened cognitive arousal associated with collective AI anxiety, fuelling creativity and innovation within teams. Second, the study's findings emphasize the critical role of the "people dimension" in successful digital transformation, reinforcing recent literature highlighting the importance of technical capabilities, talent management, and organizational digital culture (Aghimien et al., 2024). Construction organizations should prioritize not only technological adoption but also workforce preparedness through systematic re-skilling and continuous learning initiatives. Therefore, organisations should prioritise emotion-focused and relation-focused coping strategies to address AI-related anxiety. Organisations should implement organisation-wide initiatives such as providing promoting a supportive work environment and fostering strong interpersonal relationships. By nurturing these coping mechanisms, organisations can empower their teams to navigate AI-induced anxiety, capitalise on collective strengths, and drive innovation in the construction industry. This can include conducting workshops focused on emotional intelligence and resilience, enabling team members to manage and express emotions constructively. Regular structured discussions, such as "AI Anxiety Forums," can provide a safe space for team members to voice concerns and collaborate on solutions. Additionally, incorporating team-building activities, such as innovation hackathons or trust-building exercises, can enhance interpersonal connections and relation-focused coping. These strategies not only alleviate AI-related anxieties but also establish a foundation for enhanced collaboration and innovation within teams. This supportive environment helps attract and retain the right digital talent by fostering an organizational culture that encourages innovation and values employee involvement, thus promoting sustainable innovation within construction organizations (Aghimien et al., 2024).

Thirdly, the positive influence of collective AI anxiety on team innovative behaviours, as found in our study, aligns with emerging literature on digital leadership and innovation management. For instance, Gledson et al. (2023) emphasized that effective digital leadership is critical for successful digital transformations, particularly in managing strategic alignments and fostering innovation. Our results deepen this understanding by highlighting how leaders could strategically manage collective psychological responses, such as AI anxiety, through targeted coping strategies to enhance innovation. Similarly, Murguia et al. (2024) provided insights into strategic planning, capability building, and business models necessary for long-term innovation in Construction 4.0. Our findings extend these discussions by empirically demonstrating that psychological factors, particularly collective AI anxiety, play a significant role in determining team innovation outcomes. These insights underline the practical implications for managers and policymakers in the construction sector, indicating the need to integrate psychological coping mechanisms into digital transformation strategies to achieve sustainable and effective AI implementation.

Table I Participants' Profile Summary

Variable	Item	Frequency	Percentage
Gender	Male	366	67.8
	Female	174	32.2
Age	Less than 24	30	5.6
	25 – 30	88	16.3
	31 – 40	193	35.7
	41 – 50	138	25.6
	51 or above	91	16.9
Experience	0 – 2 years	24	4.4
	3 – 5 years	111	20.6
	6 – 10 years	188	34.8
	11- 19 years	104	19.3
	20 years or above	113	20.9
Education	High school graduate or Less	119	22.0
	College degree	172	31.9
	Higher Diploma/Bachelor degree	152	28.1
	Masters	83	15.4
	Doctorate	14	2.6
Country	Germany	81	15.0
	Netherlands	57	10.6
	Norway	51	9.4
	Portugal	63	11.7
	Spain	74	13.7
	Sweden	71	13.1
	UK	143	26.5
Job Level	Senior Management	92	17.0
	Middle management	178	33.0
	line Management	103	19.1
	Senior Staff	56	10.4
	Staff	111	20.6
Organizational Size	1 – 49	190	35.2
	50 – 250	203	37.6
	251 – 4,999	119	22.0
	5,000 or more	28	5.2

Table II: Reliability, Validity and Correlation Analysis

	# Items	Mean	Std. Deviation	Cronbach's alpha	1	2	3	4	5
Collective AI Anxiety	21	3.31	.913	.977	***(.819)***	-	-	-	
Problem-focused Coping	6	3.54	.627	843	.081	**(.691)**	-	-	
Emotion-focused Coping	8	3.63	.753	.914	.357**	.472**	***(.758)***	-	
Relation-focused Coping	6	3.50	.862	.920	.490**	.440**	.253**	***(.811)***	
Team innovative behaviours	5	3.30	1.163	.956	.505**	-.013	.300**	.370**	***(.902)***

Note: N= 406. *p<.05, **p<.01. ***p < 0.001
Notes: AVE is shown in diagonal and between brackets

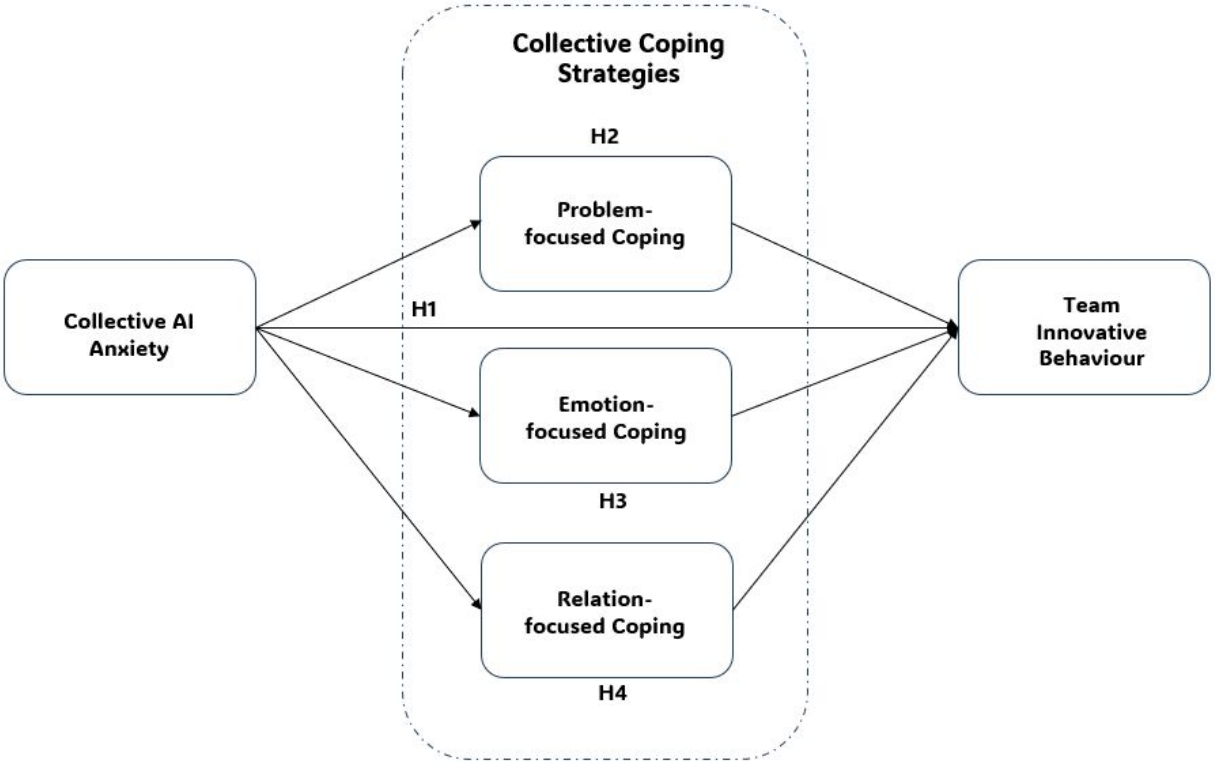
Table III SEM Direct & Indirect Relations Results

Direct Paths			Estimate	S.E.	C.R.	P
Collective AI Anxiety	--->	Team Innovative Behavior	.373	.061	6.145	***
Collective AI Anxiety	--->	Problem-focused Coping Strategy	.064	.030	2.110	.035**
Collective AI Anxiety	--->	Emotion-focused Coping Strategy	.302	.038	8.045	***
Collective AI Anxiety	--->	Relation-focused Coping Strategy	.486	.043	11.271	***
Problem-focused Coping Strategy	--->	Team Innovative Behavior	-.613	.084	-7.335	***
Emotion-focused Coping Strategy	--->	Team Innovative Behavior	.426	.067	6.325	***
Relation-focused Coping Strategy	--->	Team Innovative Behavior	.417	.062	6.742	***

Indirect Paths					Lower Bounds	Upper Bounds	Two-tailed Significance
Collective AI Anxiety	--->	Problem-focused	--->	Team Innovative Behavior	-.079	-.004	.030**
Collective AI Anxiety	--->	Emotion-focused	--->	Team Innovative Behavior	.073	.200	***
Collective AI Anxiety	--->	Relation-focused	--->	Team Innovative Behavior	.127	.300	***

Note: ***p < 0.001, **p < 0.05

Figure1: Conceptual Framework



Collective AI Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

Abstract

PURPOSE

This study aims to investigate the relationship between collective anxiety relating to the introduction of Artificial Intelligence (AI) technologies in construction companies and team innovative behaviours, purposing a potential mediation role of employees' coping strategies.

DESIGN/METHODOLOGY/APPROACH

The deductive nature of the research dedicated a quantitative research methodology. Structural equation modelling was conducted on a data set of 540 randomly chosen responses to an online questionnaire from European-based construction employees.

FINDINGS

The results showed a significant positive relationship between collective AI anxiety and team innovative behaviour. The mediation relationships were also statistically significant. While emotion-focused and relationship-focused coping had positive relationships with team innovative behaviour, problem-focused coping had a negative relationship. An explanation from cognitive psychology is offered for this finding.

ORIGINALITY

This study contributes to understanding the psychological and social impacts of AI in the construction industry, offering practical insights for fostering innovation amidst AI-induced anxieties. Additionally, it presents an empirical study examining relation-focused coping as a new strategy for collective team coping. Building the conceptual framework at the team level addresses the scarcity of research on managing anxiety and fostering innovation within teams.

PRACTICAL IMPLICATIONS

There is potential for construction organisations to increase team innovative behaviours through supporting emotion-focused and relationship-focused coping strategies for collective AI anxiety. Approaches include open discussions on AI-related concerns to allow team members to voice their anxieties and fostering interpersonal connections to facilitate relationship-focused coping.

Keywords: Collective AI anxiety, Team innovative behaviour, Problem-focused coping strategy, emotion-focused coping strategy, relation-focused coping strategy.

1. Introduction

The recent exponential growth in interest in Artificial Intelligence (AI) is illustrated by Collins Dictionaries' choice of 'AI' as its 'Word of the Year 2023' (Collins, 2024). Organisations are introducing AI in the expectation of realising the many benefits that can accrue. These include higher rates of efficiency, fewer errors, faster processing and more (Makarius et al., 2020). In the construction industry, this interest in AI is particularly pertinent due to the sector's historical challenges, including low productivity and limited digitisation, which have underscored the need for transformative technologies (Regona et al., 2022ab; 2023). These technologies, including AI, hold promise for enhancing cost efficiency, accelerating project timelines, and elevating project quality and safety standards (Demirkesen and Tezel, 2022). AI, broadly defined as "theories and techniques used to create machines capable of simulating intelligence," encompasses various subfields such as machine learning, robotics, and natural language processing (Abioye et al., 2021). Recent advancements have demonstrated AI's potential in addressing sector-specific issues, with applications spanning health and safety management, project planning optimisation, and sustainability initiatives (Abioye et al., 2021).

However, the integration of AI in construction also brings forth a host of challenges and societal implications. Concerns such as job displacement, privacy infringement, algorithmic biases, and ethical dilemmas have garnered attention (Arslan et al., 2022; Lazaroiu and Rogalska, 2023; Golda et al., 2024; Makarius et al., 2020; Ntoutsi et al., 2020; Sartori and Theodorou, 2022; Kim et al., 2023). These challenges contribute to the emergence of AI anxiety, characterised by excessive fear stemming from the transformative effects of AI technologies on personal and social spheres (Kaya et al., 2024).

AI anxiety, akin to historical notions of computer anxiety, encompasses various dimensions, including job replacement anxiety and concerns about human-AI interaction (Wang and Wang, 2022). In construction, this anxiety is heightened due to the industry's heavy reliance on human labour, which makes concerns about automation particularly pronounced (Taher, 2021). This anxiety is not confined to individuals but can manifest as a collective experience within teams, permeating through the social fabric and impacting team dynamics (Yang et al., 2021; Lazaroiu and Rogalska, 2023). While research has highlighted the detrimental effects of AI anxiety on safety performance and organisational readiness for change, there remains a dearth of studies investigating its implications at the team level, particularly within construction teams (Song et al., 2024; Suseno et al., 2020).

Simultaneously, within organisational settings, the pursuit of innovation is paramount for staying competitive and adapting to technological advancements (Nasaj, 2020; Nasaj, 2021). Team innovation, defined as the collective generation and implementation of novel ideas within a group, is crucial for organisational success (Lin et al., 2022). The construction industry's embrace of Construction 4.0, which focuses on integrating digital technologies, makes understanding team innovation even more critical (Oesterreich & Teuteberg, 2016). However, despite the acknowledged importance of innovation at both individual and organisational levels, research at the team level, especially within the construction industry, remains limited (Le Blanc et al., 2021; Statsenko et al., 2023). This gap in understanding is particularly concerning given the industry's transition towards Construction 4.0, emphasising technological integration and innovation (Osunsanmi et al., 2020).

Therefore, this study aims to explore the nexus between collective AI anxiety and team innovative behaviour within construction teams. Despite extensive research on AI and individual anxiety (e.g. Kim et al., 2016; Li and Huang, 2020, Wang and Wang, 2022), limited studies have explored the collective impact of AI anxiety on team dynamics and innovation. Given the construction sector's growing reliance on multidisciplinary teams and collaborative environments (Fong, 2003; Singh et al., 2011), understanding the interplay between AI anxiety and team innovation is important. By examining how AI anxiety influences team dynamics and innovative outcomes, this research seeks to offer insights into fostering resilience and promoting a culture of innovation amidst technological disruptions. Moreover, this study posits that the relationship between collective AI anxiety and team innovative behaviour is mediated through collective coping mechanisms, an aspect that has cultivated increasing attention in recent research (e.g. Badi, 2024). Drawing upon the rich literature on collective coping strategies, encompassing problem-focused, emotion-focused, and relation-focused approaches, this study seeks to shed light on how construction teams collectively confront and manage the stressors associated with AI anxiety. The main research question that underpins our study is:

> *RQ: How does collective AI anxiety influence team innovative behaviour, and do coping strategies play the role of mediators?*

The study adopts a theoretical framework drawing from social cognitive theory and organisational behaviour literature to conceptualise the relationships among the variables and empirically examine the relationships between collective AI anxiety, coping strategies, and team innovative behaviour.

2. Conceptual Underpinnings

2.1 Artificial Intelligence (AI) in Construction

Artificial Intelligence (AI) in the context of the construction industry can be defined as the simulation of human intelligence processes by machines, particularly computer systems, to enhance various aspects of construction projects (Regona, 2023). This includes the ability to learn from data (machine learning), understand natural language, recognise patterns, and make decisions that improve efficiency, safety, and productivity throughout the construction lifecycle (Zabala-Vargas, 2023; Abioye et al., 2021; Kanan et al, 2018). AI technologies are integral to the Fourth Industrial Revolution, characterised by the integration of digital technologies into traditional industries, including construction (Regona et al., 2022a; Regona, 2023).

The integration of AI in the construction industry has led to transformative changes across project management, automation, safety, and workforce dynamics. Based on the nature of the construction industry, advanced planning is a crucial step in construction project management (Schmelzer, 2024). As highlighted by Zabala-Vargas (2023), AI enhances project management by improving planning, scheduling, and resource allocation through data analytics and machine learning algorithms. The integration of AI with Building Information Modeling (BIM) further optimises construction management and workflow efficiency (Sacks et al., 2020). AI also drives automation, significantly improving productivity and efficiency (Abioye et al., 2021). Datta et al. (2024) and Regona et al. (2024) discuss how AI technologies like neural networks and machine learning optimise construction tasks, reduce labour costs, and minimise material waste, fostering sustainability in construction. The AI in global construction market value has been predicted at more than 15.1 billion dollars by 2023 (Artificial Intelligence in Construction Market, 2022).

Additionally, AI plays a crucial role in enhancing safety on construction sites, improving risk management through action recognition for workers and equipment, and reducing accidents by enabling real-time safety monitoring with IoT integration (Kanan et al, 2018; Rabbi & Jeelani, 2024). However, the workforce transformation resulting from AI adoption raises concerns across sectors about labour displacement, but it also creates new roles, requiring training and upskilling initiatives for workers (Morandini et al., 2023; Pradhan & Saxena, 2023; Van Hie, 2024). Hence, while AI drives efficiency, sustainability, and safety, it introduces challenges related to workforce adaptation, as will be discussed in the next section.

2.2 *Collective AI Anxiety in Construction Teams*

AI technology offers significant benefits to the construction industry but also presents challenges, impacting society through job displacement, privacy concerns, algorithmic bias, widening socio-economic gaps, and unethical behaviour (Lazaroiu & Rogalska, 2023; Golda et al., 2024; Ntoutsi et al., 2020; Sartori & Theodorou, 2022; Kim et al., 2023). Traditionally, the construction industry has been considered as a labour-intensive sector (Wang, et al., 2020). Along with the development of AI technology in the recent decade, in the construction sector specifically, workers and managers face unique challenges with AI adoption, such as concerns about job security due to the automation of tasks, the need for reskilling to operate AI-driven systems, and the perceived loss of traditional roles and expertise (Regona et al. 2022b; Khan et al., 2024; Na et al., 2023). These challenges can lead to disruptions that result in feelings of anxiety. AI anxiety has been defined as "excessive fear arising from problems originating from changes formed by AI technologies in personal or social life" (Kaya et al., 2024, p. 499). In the context of construction, AI anxiety may emerge due to fears of job replacement by automated machinery, apprehensions about adapting to new skill requirements, and the uncertainty of relying on AI systems for critical decision-making processes (Regona et al., 2022b; Souza & Debs, 2023). Before the emergence of AI anxiety, computer anxiety has been discussed since the 1980s as "the tendency of individuals to be uneasy, apprehensive, or fearful about the current or future use of computers" (Li and Huang, 2020, p. 2). Beyond the anxiety from learning, AI anxiety can also be from its automatic decision-making processes and anthropomorphised forms (Kim et al., 2016). Wang and Wang (2022) have categorised AI anxiety into several dimensions: "job replacement anxiety," which involves fear of the adverse effects of AI on employment; "sociotechnical blindness," referring to anxiety stemming from a lack of complete understanding of the interdependence between AI and human beings; "AI configuration anxiety," which entails apprehension regarding humanoid AI; and "AI learning anxiety," which relates to concerns about AI technologies acquiring knowledge. In construction, these dimensions manifest through specific scenarios, such as the fear that advanced AI tools might entirely replace traditional craftsmanship or concerns about human-machine collaboration in safety-critical tasks (Colley et al., 2022; Regona et al., 2022b). The well-developed conceptual framework of AI anxiety explains AI-driven anxiety (Spielberger, 1966), which is “a transitory state that changes over time” (Wang & Wang, 2022, p. 621). It elucidates how this phenomenon permeates various aspects of professional life, from concerns about job security to uncertainties about human-AI collaboration.

While anxiety is often perceived as an individual-level construct, it can also manifest as a collective experience in groups (Yang et al., 2021). In terms of AI anxiety, the multifaceted challenges posed by AI technology, ranging from job displacement to ethical dilemmas (Lazaroiu and Rogalska, 2023; Kim et al., 2023), may permeate through the social fabric of teams, fostering a shared sense of unease and apprehension. As Kaya et al. (2024) delineate, AI anxiety stems from the disruptive changes brought about by AI technologies, impacting both personal and social spheres (Hagerty, and Rubinov, 2019). In construction teams, such disruptions may include uncertainties about human-machine collaboration in critical tasks, fears of skills becoming obsolete, or tensions arising from the unequal distribution of AI-related benefits (Colley et al., 2022; Fisher et al., 2023; Regona et al., 2022b). This collective unease about AI (Bao et al., 2022) mirrors the historical discourse surrounding computer anxiety, indicating a longstanding pattern of technological apprehension (Li and Huang, 2020). Research by Song et al. (2024) and Suseno et al. (2020) underscores the detrimental impact of AI anxiety on safety performance and change readiness within the workplace, highlighting its relevance as a team-level phenomenon. In construction, this anxiety may lead to reduced team cohesion, hesitation in adopting AI-enabled tools, and lowered confidence in the reliability of automated systems. By acknowledging AI anxiety as a collective experience, organisations can implement strategies to foster resilience, enhance understanding, and promote a culture of adaptability in the face of technological disruption. However, there is little research on the sequelae of collective AI anxiety in organisations and no research to our knowledge on the effects of collective AI anxiety in construction teams. Our study addresses this critical gap by exploring the unique manifestations and consequences of collective AI anxiety in construction teams.

2.3 Team innovative behaviour

The term innovation sometimes is interchangeably discussed with the term creativity (Nasaj, 2021; Nasaj & Badi 2021). Innovation refers to the generation or adoption and implementation of creative ideas in an organisation (Nasaj et al., 2022). Unlike creativity which may have individual behaviors involved, innovation is "a multistage and iterative process that encompasses both production and implementation of creative ideas by team members in a group" (Lin et al., 2022, p. 1). To foster work efficiency, organisations establish work teams. A team is a part of the organisational structure based on networked development in the organisation (Fay et al., 2015). Compared with individuals, the work unit of a team has more knowledge diversity and greater processing capacities of the information (Müller et al., 2009). In the construction industry, many work tasks are collectively project-based and involve expertise and knowledge sharing within the team (Haq et al., 2023). Team innovative behavior is defined as "team members' collective behaviors on the production and execution of novel service ideas, methods, and procedures in a team" (Lin et al., 2022). This concept involves social interactions for innovation development and the collective work unit in the organisation (Widmann et al., 2016). Despite the plethora of studies on individual and organisational innovation, there is a paucity of research at the team level (Le Blanc et al., 2021). The lack of research is especially pronounced in the construction industry (Statsenko et al, 2023), which is concerning given the importance of understanding and cultivating innovative behaviour among teams for construction organisations seeking to adapt and thrive in the evolving Construction 4.0 technological change (Osunsanmi et al., 2020).

3. Conceptual Framework and Hypotheses Development

3.1 Collective AI anxiety and team innovative behaviours

In the age of accelerated AI development, research has identified multiple forms of AI anxiety within workplaces. This anxiety may be the result of the challenges associated with mastering AI technologies (Cetindamar et al., 2022); adjusting to working in collaboration with AI systems (Arslan et al., 2022), and navigating the job market (Vochozka et al., 2018). Collective AI anxiety can encompass fears related to learning about AI, concerns about job replacement due to AI adoption, anxieties regarding the societal and ethical implications of AI, and apprehensions specifically related to humanoid AI technologies. These anxieties may manifest within teams as an unfavourable group affective tone (George and King, 2007). However, emerging research, in contrast to conventional wisdom, indicates that some types of anxiety might potentially stimulate innovation as opposed to impede it. Research by Mao et al. (2021) has found that an intermediate level of team job-related anxiety was associated with higher individual creativity in teams. An earlier study by Akgün et al. (2007) has also found that team anxiety positively impacts speed-to-market in new product development teams. In this study, we are postulating that collective AI anxiety is associated with higher innovation behaviour in construction teams. This nuanced relationship suggests that AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasising the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). This also aligns with research that has found that AI technologies effectively augment employee creativity (Ding, 2022; Jia et al., 2024). Based on these observations, we put forth our first hypothesis:

> *Hypothesis 1. Collective AI anxiety is positively associated with team innovative behaviours.*

3.2 The mediating role of team collective coping strategies

A large number of studies have examined individual coping (e.g. Freire et al., 2019; Lazarus and Folkamn, 1984). However, in most employment and competitive and achievement-focused situations (such as sports and projects), people work together to attain objectives. Thus, 'collective' (communal) coping is attracting investigation. Collective coping emphasises the 'relational' feature of coping and is known for its social and interactive nature. A group owns, assesses, and handles a stressor as "our problem and our responsibility" under this view (Afifi et al. 2006, p. 378). This community ownership of a stressor contrasts with individual accountability (Afifi et al., 2006). Lyons et al. (1998) define collective coping as the community pooling resources and efforts to overcome adversity. As they accept responsibility and take proactive steps to manage the stressor, the group's synergy and collaboration are highlighted (Afifi et al., 2006). Collective coping was observed in studies of communities facing natural disasters (Afifi et al., 2012), couples with health issues (Rentscher, 2019), sports teams (Leprince, et al 2019) as well as project teams in construction (Badi, 2024). Collective coping was found to reduce stress and improve mental health (e.g. Afifi et al., 2012; Rentscher, 2019) as well as reduce the organisational stress climate (Rodríguez et al., 2019).

Aligning with this goal, three collective coping strategies have been discussed in the literature: problem-focused, emotion-focused, and relation-focused strategies (Badi, 2024; Länsisalmi et al., 2000). First, problem-focused collective effort is a coping approach that involves analysing the difficulties associated with the stressor, exchanging knowledge, and engaging in problem-solving activities (Pearsall et al., 2009). Problem-focused coping techniques in teams include a diverse array of tactics, such as issue definition, producing various solutions, and evaluating these solutions based on criteria including costs, benefits, decision-making, and action (Lazarus and Folkman, 1984). The research conducted by Länsisalmi et al. (2000) found that problem-focused coping was associated with a shared feeling of responsibility for all tasks, good communication, information sharing, and knowledge management. Problem-focused collective effort coping techniques include the team's inclination to see stressful events as within their control and capable of being altered (Badi, 2024). Teams often use proactive and strategic coping mechanisms in response to challenging circumstances, promptly taking appropriate measures to resolve the problem (Länsisalmi et al., 2000). Hence, by adopting collective problem-focused coping, the team members may identify problems triggered by AI anxiety, and employ coping strategies such as generating solutions to address AI Anxiety, including thinking of ways to manage the situation devising work plans collaboratively, and implementing effective strategies to alleviate AI anxiety. The increased apprehension regarding AI among team members (Makarius, et al., 2020) may lead to heightened levels of information sharing and communication channels within a team. The heightened discourse is motivated by the collective necessity to address the difficulties presented by AI, which ultimately results in improved collaborative problem-solving abilities. In addition, the shared concern regarding the potential consequences of AI on employment positions may instil a feeling of immediacy, which may encourage team members to invest greater effort in collaborative deliberations and idea generation. Hence, we forward the following hypothesis:

> *Hypothesis 2: Problem-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.*

The second collective coping strategy is emotion-focused coping. Emotions play a crucial role in shaping individual, team, and organisational behaviours, processes, and outcomes (Barsade and Gibson, 2007; Heaphy, 2017). Emotionally intelligent teams are those capable of attending to their emotional state and need (Goleman et al., 2002), while psychological safety, or the ability to admit mistakes and express feelings without fear of punishment, is a significant predictor of team effectiveness (Frazier et al., 2017). Collective positive emotions, such as gratitude, can strengthen a team's ability to introduce novel ideas, feelings, and relationships, enabling them to build enduring resources such as social support and resilience (Meneghel et al., 2016). Expressing negative emotions constructively, such as fear, anxiety, and distress, was also found to enhance teams' knowledge-creation capabilities and performance (Stephens and Carmeli, 2016). Collective emotion-focused coping strategies within the team foster emotional openness by encouraging honest expression of feelings and support without blame, while also promoting a positive outlook by maintaining hope, building on strengths, and focusing on possibilities despite AI anxiety challenges. Emotional support among team members can be encouraging each other to look positive and/or alleviating the negative feelings of low self-efficacy and low self-confidence (Chambers et al., 2001). Therefore, when team members work together to generate and implement innovative ideas, the individuals in the team may seek emotional support from other team members to reduce their AI anxiety. Hypothesis 3 is proposed:

> *Hypothesis 3: Emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.*

The third and final collective coping strategy is the relation-focused coping strategies which rely on interactions within the team (Afifi et al., 2006). Relation-focused coping strategies involve seeking and utilising support, guidance, and resources from leaders, colleagues, and organisational members to navigate challenges and adapt to the needs of team members facing difficulties, such as AI Anxiety. During the team innovation development process (Scott and Bruce, 1994), team creative behaviours and team implementation behaviours are involved (Widmann et al., 2016). Team members discover opportunities, identify the needs of a specific innovation, and come out with new ideas through a variety of creative activities. After that, the team moves to promote and implement the explored ideas by assigning tasks to team members, seeking resource support, and testing and refining the process (Widmann et al., 2016). Therefore, building social support, compensating for the individual weaknesses of other team members, and pooling the team members' resources can strengthen the collective competency of the team to confront collective AI anxiety as well as contribute to team innovation (Badi, 2024; Leprince et al., 2019). Hypothesis 4 is proposed as:

Hypothesis 4: Relation-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours

The overall proposed conceptual framework of the study is illustrated in Figure1.

Figure1: Conceptual Framework

***** INSERT FIGURE 1 ABOUT HERE *****

4. Methodology

The research aims to study the relationship between collective AI anxiety and team innovative behaviour as well as the mediating role of coping strategies. Thus, a quantitative methodology is considered suitable for deducing the nature of these relationships among the research's variables (Saunders et al., 2016).

4.1 Sampling and data collection

In the technological race led predominantly by the United States and China (Brattberg et al. 2020), Europe stands out with its unique industrial strengths and prominence in AI applications. Despite this, Europe has yet to fully exploit its technological potential due to challenges such as digital market fragmentation, recruitment issues, and lack of competitiveness. Moreover, the anxiety surrounding the adoption and impact of artificial intelligence (AI) in Europe stemming from concerns over job security, ethical implications, and potential misuse underscores the need for targeted research in this area (Brattberg et al. 2020). Therefore, the study involved European construction organisations where AI integration is prominent, focusing on teams as the unit of analysis.

Data collection involved a quasi-random sampling technique via an online survey questionnaire distributed to construction companies' employees working in several countries in Europe: Denmark, Germany, Netherlands, Norway, Portugal, Spain, Sweden, and the UK. A professional data collection company (cint.com) were utilised to facilitate data collection. A single key informant sampling method was utilised in this research, as initially proposed by Van de Ven and Ferry (1980). This approach is consistent with recent research methodologies within the construction industry, including the works of Talat and Riaz (2020) and Badi (2024). The rationale for selecting a single key informant from each organisation, rather than surveying the entire team, is based on two main considerations. To effectively capture a wide array of evaluations regarding the AI anxiety phenomenon within the construction sector, it proved more efficient to gather insights from key informants across a variety of organisations. This method helps to avoid the homogeneity in responses that could emerge from consulting multiple members of the same organisation, thereby providing a more comprehensive view of the diverse ways in which AI anxiety phenomena affect team innovation behaviours through shared coping mechanisms. Furthermore, the literature validates the efficacy of engaging a single key informant for gaining insights into team-oriented phenomena, particularly for studies addressing complex initiatives like AI anxiety phenomena (Badi 2024; Talat and Riaz, 2020). This method offers a perspective that reflects both team dynamics and the broader organisational context in handling AI anxiety, crucial for dissecting the intricacies of innovation and coping mechanisms within the construction sector.

The survey was disseminated in February 2024 in multiple waves, with a total of 2,720 surveys sent out. Of these, 954 responses were received, representing a response rate of approximately 35.07%. Upon examining the responses, 540 were found to be complete and usable for analysis. Table I demonstrates the profile of the research participants.

Table I Participants' Profile Summary

***** INSERT TABLE I ABOUT HERE *****

4.2 Questionnaire design and measurement items

The study evaluated its constructs through a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), following the agreement rating system suggested by Saunders et al. (2016). The scale items are detailed in Appendix A.

The questionnaire was designed by adapting and integrating previously validated scales from published research, ensuring consistency with established measurement frameworks while tailoring them to the construction industry. This approach allows for a multidimensional assessment of AI-related attitudes and behaviours, aligning with seminal work that advocates the combination of constructs from different fields to capture complex workplace phenomena and enhance theoretical robustness (Edwards, 2001; MacKenzie et al., 2011).

Collective AI anxiety was measured by updating the recently developed scale by Wang and Wang (2022) to the team level. The scale consists of four dimensions: Learning (8 items), Job Replacement (6 items), Sociotechnical Blindness (4 items), and AI Configuration (3 items).

For collective coping strategy, the research examined three well-established coping strategies: problem-focused, emotion-focused, and relation-focused coping strategies.

- Problem-focused coping strategies were measured using the Leprince et al. (2019) scale, which has been previously validated and recently applied in the construction context (Badi, 2024) with robust reliability and validity results. It comprises two dimensions: analysis and information sharing (3 items) and problem-solving (3 items).
- Emotion-focused coping strategies were measured using Ramadhana's (2020) scale, .specifically developed to capture how groups navigate emotional challenges and maintain morale. It includes two dimensions: emotional openness (4 items) and positive outlook (4 items).
- Relation-focused coping strategies were measured using a recently developed and validated scale by Badi (2024), which has demonstrated strong reliability. It consists of two dimensions: social support (3 items) and compensation (3 items).

The construct of team innovative behaviours was measured using the Litchfield et al. (2018) scale, which is specifically designed to assess innovation in technology-driven environments. Given the nature of this research, this scale was particularly suitable for evaluating the extent and frequency of innovative behaviours within teams. The scale consists of 5 items, providing a comprehensive measure of team-level innovation.

In addition, the questionnaire featured a demographic section capturing organizational size, age, gender, work experience, job position, and educational background. These characteristics have been shown to influence employees' perceptions of their workplace, potentially shaping their attitudes toward their jobs, work processes, and performance (Kirkman et al., 2004). The demographic categories are detailed in Table I.

To ensure the validity of the questionnaire design, convergent and discriminant validity, as well as factor analysis results are presented in Table 2 and Appendix B. The findings reinforce the appropriateness of the grouped items and contribute further empirical support for the usefulness of the adopted scales in the construction sector.

4.3 Data analysis

Data analysis was performed via SPSS v23.0 and Amos v23.0 programs.

4.3.1 Common Method Bias

Assessing for common method bias is crucial, particularly in self-administered surveys (Fuller et al., 2016). To this end, the study utilised the commonly applied Harman's single-factor test (Podsakoff and Organ, 1986) for its analysis. The results revealed that only 35.214 % of the data variance was attributed to a single factor, remaining under the 50% benchmark. Hence, it is inferred that common method bias does not pose a significant issue in this research.

4.3.2 Reliability and Validity

The research evaluated the reliability of its constructs through multiple tests. Initially, Cronbach's alpha was employed, with all constructs displaying values above 0.7, indicating their reliability according to George and Mallery (2003). Furthermore, the Kaiser-Meyer-Olkin (KMO) test was carried out to assess sample adequacy, yielding a result of .970. This demonstrates good scale adequacy, as a KMO value close to 1.0 signals higher reliability and values below 0.50 indicate unreliability (Morgan et al., 2004). Additionally, the Bartlett Test of Sphericity was used to examine correlations to confirm each scale's reliability in the study (Hair et al., 2010), resulting in a Bartlett Test of Sphericity value of .000. Therefore, the reliability assessments conducted substantiate the scales' dependability within the research. The research variables' correlation matrix and descriptive statistics are detailed in Table 2.

Table 2: Reliability, Validity and Correlation Analysis

***** INSERT TABLE 2 ABOUT HERE *****

Factor analysis was employed to verify the variables' validity within the study. An Exploratory Factor Analysis (EFA) was conducted, employing principal component analysis for the extraction process and varimax rotation. The outcomes of the EFA indicated that the items in the questionnaire were well-matched with their intended constructs, achieving acceptable values above 0.45, in line with Field's (2013) guidelines. The detailed results of the Exploratory Factor Analysis (EFA) are reported in Appendix B

The Confirmatory Factor Analysis (CFA) results demonstrate a strong model fit, with all indices falling within the recommended thresholds: chi-square/degrees of freedom (χ^2/df) = 1.778, indicating a good fit according to Schreiber et al. (2006); Root Mean Square Residual (RMR) = 0.034, suggesting minimal residuals as per Browne and Cudeck (1993); Comparative Fit Index (CFI) = 0.964 and Incremental Fit Index (IFI) = 0.964, both reflecting a high degree of model fit as noted by Byrne (2010) and Bentler (2007); Tucker-Lewis Index (TLI) = 0.961, indicating a good fit based on Marsh et al. (2004); and Root Mean Square Error of Approximation (RMSEA) = 0.038, denoting a close fit in line with Steiger (2007). The specifics of the CFA results are presented in Figure 2.

Figure 2: Confirmatory factor analysis

***** INSERT FIGURE 2 ABOUT HERE *****

Furthermore, evaluations of both convergent and discriminant validity for the measurement scales were performed. The criteria for satisfactory outcomes were established at a minimum cut-off value exceeding 0.5, as specified by Hair et al. (2006). The process for assessing discriminant validity included contrasting the square root of the average variance extracted (AVE) with the correlations existing between constructs. To affirm discriminant validity, it is necessary for the square root of AVE to surpass the inter-construct correlations (Hair et al., 2006). Based on the information provided in Table 2, the study effectively confirmed both convergent and discriminant validity.

4.3.3 Hypothesis testing

The research inspects the relations between collective AI anxiety and team innovative behaviour highlighting the mediation role of coping strategies. Structural equation modelling with robust maximum likelihood estimation was conducted to examine the research hypotheses. The structural equation model is represented in Figure 3.

Figure 3: The structural model

***** INSERT FIGURE 3 ABOUT HERE *****

The structural equation model fit indices demonstrated a good model fit: $\chi2/df$ = 2.058, RMR = .079, CFI =. 950, IFI = .950, TLI =. 947, RMSEA = .044.

The results of direct relations amongst the constructs are illustrated in Table 3.

Table 3 SEM Direct Relations Results

***** INSERT TABLE 3 ABOUT HERE *****

The results illustrate that there is a significant relation between collective AI anxiety and team innovative behaviour at 99% confidence level, and therefore H1 is supported.

In terms of H2, H3 and H4, we can see that there are significant relations at 99% confidence level among all the variables however the relation between collective AI Anxiety and problem-focused coping strategy is significant at 95% confidence level. Hence, a potential mediating role for coping strategies is demonstrated.

The bootstrapping technique (Preacher and Hayes, 2004) was employed to further investigate the indirect effect among the variables in order to validate the mediating role of coping strategies. This approach is advised for the analysis of mediating variables (MacKinnon et al., 2012; Hayes, 2017). Utilising 2000 resamples, the bootstrapping method generated at 95% confidence intervals for the indirect impacts of collective AI anxiety on team innovative behaviour. The outcomes of these indirect relationships are shown in Table 4.

Table 4 Indirect Relations Results

***** INSERT TABLE 4 ABOUT HERE *****

The results of the indirect relation between collective AI anxiety and team innovative behaviour demonstrate that coping strategies have a mediating role over the relation between collective AI anxiety and team innovative behaviour with all two-tailed significance tests significant relations at 95% confidence level.

5. Discussion of results

The rapid advancement of AI technologies has led to anxieties among employees about their roles, job security, and the need to acquire new skills (Li and Huang, 2020). Within the construction industry, these concerns are particularly acute due to the sector's reliance on manual labour, traditional workflows, and the perceived threat of automation to job stability. For instance, construction workers often experience anxiety about whether AI-driven tools will replace their jobs, alter skill requirements, or increase the complexity of their tasks (Regona et al. 2022b; Khan et al., 2024; Na et al., 2023). However, this anxiety can have positive outcomes for the organisation. First, Hypothesis H1 suggests that collective AI anxiety in the workplace positively influences team innovative behaviours. Our empirical analysis supports this hypothesis, indicating a significant positive association between collective AI anxiety and team innovative behaviours (β: 0.37, $p < 0.001$). Previous research suggests that negative affective states within teams can hinder performance (McCarthy et al., 2016). However, our findings suggest a nuanced relationship wherein AI anxiety, although initially negative, can catalyse increased innovation efforts within teams. The work of Gong et al. (2013) has noted that anxiety stemming from job demands can drive increased creativity among team members. Our study aligns with this by revealing how collective AI anxiety can paradoxically foster heightened levels of innovation among team members and challenge conventional notions of how negative affective states influence team behaviour. Our three remaining three hypotheses explore some of the mediatory mechanisms through which collective AI anxiety enhances team innovation, potentially uncovering collective coping strategies to leverage this phenomenon for organisational benefit.

The supported Hypothesis H2 identified that collective problem-focused coping strategies serve as a mediator between collective AI anxiety and team innovative behaviours. This finding builds upon established literature concerning coping mechanisms and their impact on team dynamics. Pearsall et al. (2009) and Länsisalmi et al. (2000) have outlined the significance of collective problem-focused coping techniques, emphasising their association with enhanced communication, shared responsibility, and proactive problem-solving within teams. Badi (2024) underlined the significance of problem-focused collective efforts in construction teams. A collective problem-focused coping strategy entails actively generating solutions, considering strategies to manage Collective AI anxiety, exploring coping methods, developing collaborative action plans, implementing effective strategies, and executing agreed-upon plans to address and alleviate collective AI anxiety. Against our expectations, we found that problem-focused team coping strategies had a negative relationship with team innovative behaviour. This negative relationship indicates that as the adoption of problem-focused coping strategies increases within the team, there is a decrease in team innovative behaviour. This could imply that when teams primarily focus on addressing problems associated with AI anxiety through problem-solving techniques, they may allocate less energy or attention towards generating innovative ideas or solutions. This may relate to the cognitive processes underlying innovation. Creativity has long been understood to result from a balance between two different thinking styles: divergent thinking (idea generation) and convergent thinking (idea evaluation) (Guildford 1967). Divergent thinking can be the more 'creative' style in the sense of developing multiple, imaginative ideas, while convergent thinking can be more implementation-focused in the sense of identifying the single, optimal answer (Runco, 2010). Problem-focused coping strategies may depend more on convergent thinking styles, leading to lower levels of innovation. Hence, excessive emphasis on problem-solving may lead to a lack of exploration or creativity, thereby hindering the team's ability to innovate.

In addition, the supported Hypothesis H3 offers empirical evidence that collective emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours, drawing from a robust literature highlighting emotions' influence on team dynamics and outcomes (Barsade and Gibson, 2007; Heaphy, 2017; Frazier et al., 2017). Collective emotion-focused coping, characterised by emotional openness, involves acknowledging and expressing emotions truthfully, sharing both negative and positive feelings, demonstrating understanding without blame, maintaining hope and confidence, encouraging each other, seizing opportunities and persisting in efforts, and focusing on possibilities while accepting limitations to cope with collective AI anxiety-related difficulties. By fostering emotional openness, support, and resilience, these coping strategies appear to help teams manage AI-related anxiety effectively (Meneghel et al., 2016; Stephens and Carmeli, 2016). Through constructive expression of emotions and encouragement of positive outlooks, such strategies can mitigate the potentially negative impact of collective AI anxiety on innovation (Chambers et al., 2001). The findings of H3 contribute to understanding coping mechanisms amid technological challenges, emphasising the importance of emotional support and resilience-building in fostering creativity (Meneghel et al., 2016).

Finally, the supported Hypothesis H4 underlined collective relational-focused coping strategies as a mediator in the relationship between collective AI anxiety and team innovative behaviours, offering a nuanced understanding of how interpersonal interactions within teams influence adaptive responses to technological disruptions. This finding aligns with the literature emphasising the significance of relation-focused coping strategies, as highlighted by Afifi et al. (2006). We extend the work of Badi (2024) in the construction industry by underscoring the pivotal role of social support in bolstering team innovation efforts amidst technological challenges. Collective relation-focused coping entails seeking support from leadership and colleagues, accessing organisational resources, and implementing compensatory measures such as supporting, adjusting work plans, and accommodating weaknesses of team members to manage challenges related to collective AI anxiety. By fostering social support networks, compensating for individual weaknesses, and leveraging collective resources, teams can enhance their overall competency to confront collective AI anxiety and drive innovation forward.

6. Conclusion

Our study contributes to the literature by elucidating the impact of collective AI anxiety on team dynamics and behaviours within construction industry organisations. Firstly, our findings indicate that collective AI anxiety can positively influence team innovative behaviours, contrary to the conventional understanding that negative affective states hinder performance. This nuanced relationship suggests that collective AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasising the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). Secondly, the findings highlight the mediating role of collective problem-focused, emotion-focused and relation-focused coping strategies in addressing AI-related anxiety. This draws upon established literature emphasising the significance of such collective coping mechanisms in enhancing team proactive problem-solving and the role of emotional and social support in bolstering team efforts to confront AI-induced anxiety and drive innovation forward amidst technological change.

The results from this study contribute to the body of knowledge in several ways. First, despite its increasing popularity, empirical inquiry into the social and psychological implications of AI in construction is still in its infancy. Even though there are research studies dealing with AI implementation in the construction industry (e.g. An et al., 2021; Dumrak et al., 2023; Pan and Zhang, 2021) there is a paucity of studies exploring the social and psychological implications of AI. Therefore, the study addresses this gap in the literature by empirically examining AI from a psychological perspective, focusing on AI anxiety in construction teams. Second, the study examines the concepts of AI anxiety and coping as team-level collective phenomena and answers the call for further studies exploring team-level dynamics in construction. To our knowledge, our study is the first to update the Wang and Wang (2022) AI anxiety scale to explore the team-level collective phenomenon and we confirmed the validity and reliability of the modified scale in this context. Thus, our study contributes to the advancement of research in the stress and coping domain by addressing the gap in understanding team-level dynamics in the context of anxiety and coping strategies, particularly within the construction industry. Third, this study develops and validates a research model of collective teams coping with AI anxiety and innovation outcomes. To our knowledge, our study is one of the first to apply collective coping strategies to understand how teams cope with collective AI anxiety with team innovative behaviour as the outcome.

The findings of our study have several implications for construction organisations seeking to harness the creative potential of their teams amidst the growing prevalence of AI technologies. First, recognising the potential positive impact of collective AI anxiety on team innovative behaviours, organisations should encourage open discussions about AI-related concerns and provide platforms for team members to voice their anxieties. This can help harness the heightened cognitive arousal associated with collective AI anxiety, fueling creativity and innovation within teams. Second, organisations should prioritise emotion-focused and relation-focused coping strategies to address AI-related anxiety. Organisations should implement organisation-wide initiatives such as providing promoting a supportive work environment, and fostering strong interpersonal relationships. By nurturing these coping mechanisms, organisations can empower their teams to navigate AI-induced anxiety, capitalise on collective strengths, and drive innovation in the construction industry. This can include conducting workshops focused on emotional intelligence and resilience, enabling team members to manage and express emotions constructively. Regular structured discussions, such as "AI Anxiety Forums," can provide a safe space for team members to voice concerns and collaborate on solutions. Additionally, incorporating team-building activities, such as innovation hackathons or trust-building exercises, can enhance interpersonal connections and relation-focused coping. These strategies not only alleviate AI-related anxieties but also create a foundation for increased collaboration and innovation within teams.

While our study provides valuable insights into the relationship between collective AI anxiety and team innovative behaviours in the construction sector, several limitations should be considered and that should guide future research. To begin, there is the inherent risk of subjectivity when using self-reported data. To ensure that future studies are more reliable, multi-source data-gathering techniques could be used such as objective performance measurements or observational data. Second, further research is needed to explore our tentative explanation of problem-focused coping as tending towards convergent thinking. Third the mediating function of coping

mechanisms in reducing collective AI anxiety and increasing team innovation was the primary emphasis of our research. Nevertheless, these dynamics might be impacted by other individual, team and contextual factors, such as personality, team composition, organisational culture, and project characteristics. We can learn more about the intricate relationship between collective AI anxiety and team innovation if we investigate these other aspects. Additionally, the results may not apply to other sectors or organisational contexts since our research was carried out within the framework of companies in the construction industry. To further enrich this line of inquiry, future research could explore whether collective AI anxiety manifests differently across industries by comparing the construction sector with other fields, such as healthcare, finance, or manufacturing. Investigating sector-specific factors—such as regulatory environments, technological maturity, and workforce skill requirements—could provide valuable insights into the broader applicability of our findings and reveal industry-specific strategies for mitigating AI-related anxiety and fostering innovation. To test how well our results, hold up in other settings and how applicable they are to various types of organisations, future studies may replicate our study. Furthermore, longitudinal research may shed light on how collective AI anxiety impacts team performance and creativity in the long run. The subjective experiences and opinions of team members regarding collective AI anxiety and coping techniques might be additionally understood with the use of qualitative research methodologies, such as focus groups or interviews. To better understand these occurrences and to guide the creation of tailored solutions to assist teams in handling AI-related anxiety, it would be beneficial to combine quantitative and qualitative assessments.

To sum it up, this study sheds light on the relationship between collective AI anxiety and team innovative behaviour in the construction industry, highlighting the mediating role of collective coping strategies. The findings reveal that collective AI anxiety, often viewed as a negative force, can positively influence team innovation by fostering cognitive arousal. The study identifies emotion-focused and relation-focused coping strategies as effective mediators, promoting resilience and collaboration, while problem-focused strategies may limit divergent thinking and hinder innovation.

The implications suggest that organisations should address AI-induced anxieties through open communication, supportive work environments, and fostering strong interpersonal relationships to leverage their teams' innovative potential. By nurturing appropriate coping mechanisms, construction organisations can navigate the challenges of technological transformation while enhancing team performance and creativity. These insights contribute to the understanding of team-level dynamics, providing a foundation for future research into collective psychological phenomena and innovation in other sectors.

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APPENDIX A: Measurement items

Constructs	Items	Source
Collective AI Anxiety	*Learning:* AIA1: Learning to understand all of the special functions associated with an AI technique/product makes us anxious. AIA2: Learning to use AI techniques/products makes us anxious. AIA3: Learning to use specific functions of an AI technique/product makes us anxious. AIA4: Learning how an AI technique/product works makes us anxious. AIA5: Learning to interact with an AI technique/product makes us anxious. AIA6: Taking a class about the development of AI techniques/products makes us anxious. AIA7: Reading an AI technique/product manual makes us anxious. AIA8: Being unable to keep up with the advances associated with AI techniques/ products makes us anxious. *Job Replacement:* AIA9: We are afraid that an AI technique/product may make us dependent on AI applications. AIA10: We are afraid that an AI technique/product may make us lazier. AIA11: We are afraid that an AI technique/product may replace humans. AIA12: We are afraid that widespread use of humanoid robots will take jobs away from people. AIA13: We are afraid that if I begin to use AI techniques/products we will become dependent upon them and lose some of our reasoning skills. AIA14: We are afraid that AI techniques/products will replace someone's job. *Sociotechnical Blindness:* AIA15: We are afraid that an AI technique/product may be misused. AIA16: We are afraid of various problems potentially associated with an AI technique/ product. AIA17: We are afraid that an AI technique/product may get out of control and malfunction. AIA18: We are afraid that an AI technique/product may lead to robot autonomy. *AI Configuration:* AIA19: We find humanoid AI techniques/products (e.g. humanoid robots) scary. AIA20: We find humanoid AI techniques/products (e.g. humanoid robots) intimidating. AIA21: We don't know why, but humanoid AI techniques/products (e.g. humanoid robots) scare us.	Wang & Wang (2022)
Problem-Focused Coping	*Analysis and Information Sharing:* PRO1: We think of solutions to solve the problems generated by AI Anxiety. PRO2: We think of possible solutions to manage the AI Anxiety situation. PRO3: We try to find possible ways of dealing with the AI Anxiety situation. *Problem-solving:* PRO4: We deal with the AI Anxiety situation by adopting a work plan that we have discussed together. PRO5: We put simple and effective work strategies in place. PRO6: We implement the work plan we have collectively decided on to get out of the AI Anxiety situation.	Leprince et al. (2019)

Emotion-Focused Coping	*Emotional openness:* EMO1: We express our feelings and are truthful with each other. EMO2: We can share negative feelings such as sadness, anger, and fear. EMO3: We show each other understanding and avoid blame. EMO4: We can share positive feelings such as gratitude, appreciation, humor, and fun. *Positive outlook:* EMO5: We keep hopeful and confident that we will overcome difficulties caused by AI Anxiety. EMO6: We encourage each other and build on our strengths. EMO7: We seize opportunities, take-action, and persist in our efforts. EMO8: We focus on possibilities and try to accept what we cannot change.	Ramadhana (2020)
Relation-Focused Coping	*Social Support:* RFC1: We can rely on strong leadership by the team leader to provide support and guidance. RFC2: We can rely on the support of colleagues and other organisational members. RFC3: We can access organisational resources to help our team through difficult times. *Compensation:* RFC4: We try to help a team member facing difficulty with AI Anxiety by compensating for some of his/ her actions. RFC5: We re-adjust our work plan by taking on the tasks of a team member facing difficulty with AI Anxiety. RFC6: We adapt our work plan to deal with a team member's weaknesses with AI Anxiety.	Badi, (2024)
Team innovative behaviour	TIB1: My team members often implement new ideas to improve the quality of our products and services. TIB2: My team members give a lot of consideration to new and alternative methods and procedures for doing their work. TIB3: My team members often produce new services, methods, or procedures. TIB4: This is an innovative team. TIB5: My team creates new ideas for difficult issues.	Litchfield et al., 2018

Items were measured on a 5-point Likert scale.

APPENDIX B: Exploratory Factor Analysis

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
CHA1	.635				
CHA2	.691				
CHA3	.651				
CHA4	.718				
HIA1		.787			
HIA2		.844			
HIA3		.838			
HIA4		.751			
PFCS1			.761		
PFCS2			.701		
PFCS3			.645		
PFCS4			.697		
PFCS5			.525		
PFCS6			.517		
EFCS1				.759	
EFCS2				.689	
EFCS3				.737	

EFCS4				.793	
EFCS5				.731	
EFCS6				.781	
EFCS7				.730	
EFCS8				.691	
TIB1					.789
TIB2					.780
TIB3					.797
TIB4					.803
TIB5					.819

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Response to reviewers' comments

Manuscript ID CI-08-2024-0222.R1

Title: Artificial Intelligence Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

Construction Innovation: Information, Process, Management

Dear Professor Srinath Perera and Professor Peng Wu,

We sincerely appreciate the opportunity to submit a revised version of our manuscript for the Journal of Construction Innovation.

We have carefully considered the feedback and made the necessary adjustments, as detailed in the attached 'Detailed Responses to Reviewers.' Your constructive insights have significantly contributed to improving the quality of our paper, and we believe these revisions bring the manuscript closer to meeting the high standards of the Journal of Construction Innovation.

Once again, thank you for your continued support and patience throughout this process. We look forward to the possibility of future collaborations.

Best regards,

Authors

Detailed Responses to Reviewers' Comments

Response to Associate Editor's Comments

- **Comment #1: "The reviewer has raised an important concern which is the relevance of this study to the construction industry. Authors are encouraged to address the reviewers' comments and submit a revised submission."**

Response #1: Thank you for your feedback. We have carefully reviewed the concerns raised regarding the relevance of our study to the construction industry. In the revised manuscript, we have strengthened the link between our research and the construction sector by emphasising how AI is transforming practices in construction management, project delivery, and workforce dynamics. We also added specific studies from the construction industry to demonstrate the practical implications of our study and to justify the relevance of the topic to this field. These revisions can be found in **Section 1 (Introduction),** with new sentences highlighted in yellow. In addition, the following new section has been added to **Section 2 (Conceptual Underpinnings).**

> 2.1 Artificial Intelligence (AI) in Construction
>
> Artificial Intelligence (AI) in the context of the construction industry can be defined as the simulation of human intelligence processes by machines, particularly computer systems, to enhance various aspects of construction projects (Regona, 2023). This includes the ability to learn from data (machine learning), understand natural language, recognise patterns, and make decisions that improve efficiency, safety, and productivity throughout the construction lifecycle (Zabala-Vargas, 2023; Abioye et al., 2021; Kanan et al., 2018). AI technologies are integral to the Fourth Industrial Revolution, characterised by the integration of digital technologies into traditional industries, including construction (Regona et al., 2022; Regona, 2023).
>
> The integration of AI in the construction industry has led to transformative changes across project management, automation, safety, and workforce dynamics. As highlighted by Zabala-Vargas (2023), AI enhances project management by improving planning, scheduling, and resource allocation through data analytics and machine learning algorithms. The integration of AI with Building Information Modeling (BIM) further optimises construction management and workflow efficiency (Sacks et al., 2020). AI also drives automation, significantly improving productivity and efficiency (Abioye et al., 2021). Datta et al. (2024) and Regona et al. (2024) discuss how AI technologies like neural networks and machine learning optimise construction tasks, reduce labour costs, and minimise material waste, fostering sustainability in construction.

Additionally, AI plays a crucial role in enhancing safety on construction sites, improving risk management through action recognition for workers and equipment, and reducing accidents by enabling real-time safety monitoring with IoT integration (Kanan et al., 2018; Rabbi & Jeelani, 2024). However, the workforce transformation resulting from AI adoption raises concerns across sectors about labour displacement, but it also creates new roles, requiring training and upskilling initiatives for workers (Morandini et al., 2023; Pradhan & Saxena, 2023; Van Hie, 2024). Hence, while AI drives efficiency, sustainability, and safety, it introduces challenges related to workforce adaptation, as will be discussed in the next section..

Response to Reviewer #1's Comments

- **Comment #1: "Good work in addressing the comments."**

Response #1: Thank you for your positive feedback. We appreciate your acknowledgement of the revisions made. We remain committed to ensuring the clarity and depth of the paper, and we are glad that our revisions met your expectations.

Response to Reviewer #2's Comments

- **Comment #1: "The author's research topic aligns with current trends, and it is undeniable that AI has profoundly changed human society. The author has made revisions based on the feedback from the previous round of reviewers, but I still have the following considerations: I believe the most significant issue with this study is its severe detachment from the construction industry. The author should not assume that simply because the survey participants are from the construction industry, the study automatically fits within the scope of this journal."**

Response #1: Thank you for highlighting this issue. We agree that the relevance to the construction industry should be thoroughly established and not assumed. In response to this concern, we have expanded the discussion on the specific ways AI impacts the construction sector, particularly in areas such as project management, automation, safety, and workforce transformation. We revised the introduction and the literature review to better highlight the sector-specific challenges and opportunities related to AI adoption. These revisions can be found in **Section 1 (Introduction),** with new sentences highlighted in yellow. In addition, the following new section has been added to **Section 2 (Conceptual Underpinnings).**

2.1 Artificial Intelligence (AI) in Construction

Artificial Intelligence (AI) in the context of the construction industry can be defined as the simulation of human intelligence processes by machines, particularly computer systems, to enhance various aspects of construction projects (Regona, 2023). This includes the ability to learn from data (machine learning), understand natural language, recognise patterns, and make decisions that improve efficiency, safety, and productivity throughout the construction lifecycle (Zabala-Vargas, 2023; Abioye et al., 2021; Kanan et al., 2018). AI technologies are integral to the Fourth Industrial Revolution, characterised by the integration of digital technologies into traditional industries, including construction (Regona et al., 2022; Regona, 2023).

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- **Comment #2: "Due to the issue mentioned above, the author's explanations of many concepts lack industry-specific characteristics. For example, the interpretation of AI Anxiety is entirely unrelated to the construction field."**

Response #2: Thank you for pointing this out. We have revised the interpretation of key concepts, such as AI Anxiety, to specifically address how they manifest in the context of the construction industry. We incorporated literature on construction workers' perceptions of AI and its impact on job security, skill requirements, and task automation. We also added relevant studies from construction to illustrate the challenges and anxieties faced by workers and managers as they adopt AI technologies. These updates can be found in **Section 2.2 (Collective AI Anxiety in Construction Teams)** as follows:

2.2 Collective AI Anxiety in Construction Teams

AI technology offers significant benefits to the construction industry but also presents challenges, impacting society through job displacement, privacy concerns, algorithmic bias, widening socio-economic gaps, and unethical behaviour (Lazaroiu & Rogalska, 2023; Golda et al., 2024; Ntoutsi et al., 2020; Sartori & Theodorou, 2022; Kim et al., 2023). In the construction sector specifically, workers and managers face unique challenges with AI adoption, such as concerns about job security due to the automation of tasks, the need for reskilling to operate AI-driven systems, and the perceived loss of traditional roles and expertise (Regona et al. 2022b; Khan et al., 2024; Na et al., 2023). These challenges can lead to disruptions that result in feelings of anxiety. AI anxiety has been defined as "excessive fear arising from problems originating from changes formed by AI technologies in personal or social life" (Kaya et al., 2024, p. 499). In the context of construction, AI anxiety may emerge due to fears of job replacement by automated machinery, apprehensions about adapting to new skill requirements, and the uncertainty of relying on AI systems for critical decision-making processes (Regona et al., 2022b; Souza & Debs, 2023). Before the emergence of AI anxiety, computer anxiety has been discussed since the 1980s as "the tendency of individuals to be uneasy, apprehensive, or fearful about the current or future use of computers" (Li and Huang, 2020, p. 2). Beyond the anxiety from learning, AI anxiety can also be from its automatic decision-making processes and anthropomorphised forms (Kim et al., 2016). Wang and Wang (2022) have categorised AI anxiety into several dimensions: "job replacement anxiety," which involves fear of the adverse effects of AI on employment; "sociotechnical blindness," referring to anxiety stemming from a lack of complete understanding of the interdependence between AI and human beings; "AI configuration anxiety," which entails apprehension regarding humanoid AI; and "AI learning anxiety," which relates to concerns about AI technologies acquiring knowledge. In construction, these dimensions manifest through specific scenarios, such as the fear that advanced AI tools might entirely replace traditional craftsmanship or concerns about human-machine collaboration in safety-critical tasks (Colley et al., 2022; Regona et al., 2022b). The well-developed conceptual framework of AI anxiety explains AI-driven anxiety (Spielberger, 1966), which is "a transitory state that changes over time" (Wang & Wang, 2022, p. 621). It elucidates how this phenomenon permeates various aspects of professional life, from concerns about job security to uncertainties about human-AI collaboration.

While anxiety is often perceived as an individual-level construct, it can also manifest as a collective experience in groups (Yang et al., 2021). In terms of AI anxiety, the multifaceted challenges posed by AI technology, ranging from job displacement to ethical dilemmas (Lazaroiu and Rogalska, 2023; Kim et al., 2023), may permeate through the social fabric of teams, fostering a shared sense of unease and apprehension. As Kaya et al. (2024) delineate, AI anxiety stems from the disruptive changes brought about by AI technologies, impacting both personal and social spheres (Hagerty, and Rubinov, 2019). In construction teams, such disruptions may include uncertainties about human-machine collaboration in critical tasks, fears of skills becoming obsolete, or tensions arising from the unequal distribution of AI-related benefits (Colley et al., 2022; Fisher et al., 2023; Regona et al., 2022b). This collective unease about AI (Bao et al., 2022) mirrors the historical discourse surrounding computer anxiety, indicating a longstanding pattern of technological apprehension (Li and Huang, 2020). Research by Song et al. (2024) and Suseno et al. (2020) underscores the detrimental impact of AI anxiety on safety performance and change readiness within the workplace, highlighting its relevance as a team-level phenomenon. In construction, this anxiety may lead to reduced team cohesion, hesitation in adopting AI-enabled tools, and lowered confidence in the reliability of automated systems. By acknowledging AI anxiety as a collective experience, organisations can implement strategies to foster resilience, enhance understanding, and promote a culture of adaptability in the face of technological disruption. However, there is little research on the sequelae of collective AI anxiety in organisations and no research to our knowledge on the effects of collective AI anxiety in construction teams. Our study addresses this critical gap by exploring the unique manifestations and consequences of collective AI anxiety in construction teams.

- **Comment #3: "I agree with the other reviewers' opinions in the previous round that the selection of survey subjects is crucial. The employee teams within the construction sector vary significantly, such as those more inclined toward intellectual labor versus those focused on manual labor. The author needs to provide a more detailed explanation and explore whether there are differences between the construction industry and other sectors."**

Response #3: Thank you for your valuable feedback. We acknowledge the importance of carefully selecting survey subjects, particularly in an industry as diverse as construction, where employees range from those engaged in intellectual labor to those performing manual tasks.

In this study, our focus is on understanding industry-wide patterns rather than isolating specific subgroups. To ensure a comprehensive and representative sample, we collected data across a diverse range of demographic categories, including gender, age, work experience, education level, job role, country, and organisational size (see **Table 1**). Our dataset includes both intellectual and manual labor groups, as reflected in the distribution of education levels (22% high school graduates or less, 31.9% college degree holders, and 46.1% with higher education) and job roles (33% middle management, 19.1% line management, 20.6% staff-level employees, among others). By incorporating this broad demographic representation, we ensure that our findings reflect the collective experiences of the workforce rather than being biased toward a specific subgroup. We believe that this inclusive sampling approach enhances the external validity of our findings while ensuring that insights derived from the study are relevant across different workforce segments within the construction industry.

In addition, while we recognise the merit of cross-industry comparisons, our expertise lies in the construction domain, and the study is not designed as a comparative analysis. Instead, we aim to provide insights that are specifically relevant to construction firms, ensuring practical applicability to this sector. Nonetheless, we have strengthened the discussion in **Section 6 (Conclusion)** to propose a comparative study with other sectors as follows:

> To further enrich this line of inquiry, future research could explore whether collective AI anxiety manifests differently across industries by comparing the construction sector with other fields, such as healthcare, finance, or manufacturing. Investigating sector-specific factors—such as regulatory environments, technological maturity, and workforce skill requirements—could provide valuable insights into the broader applicability of our findings and reveal industry-specific strategies for mitigating AI-related anxiety and fostering innovation.

We appreciate your suggestion and believe these clarifications will enhance the paper's clarity and contribution.

- **Comment #4: "The author designed the questionnaire based on several previously published papers, but the validity of the questionnaire itself lacks sufficient justification. In particular, the rationale for grouping items from different fields together needs to be discussed in more depth."**

Response #4: Thank you for raising this concern. We have now provided a more detailed justification for the design of our questionnaire in **Section 4.2 (Questionnaire design and measurement items**). Specifically, we explain the rationale for grouping items from different fields by citing previous studies that have successfully applied similar methods. Our approach follows established research practices where constructs from different domains are combined to capture a multidimensional phenomenon—in this case, AI-related attitudes and behaviours in the construction industry. The questionnaire is grounded in previously validated scales from published research, which provides an initial indication of its validity. By drawing on established measures, we align our study with existing empirical work and ensure consistency with prior findings. Moreover, our results contribute new evidence on the applicability and robustness of these scales within the construction sector, further reinforcing their usefulness.

> 4.2 Questionnaire design and measurement items
>
> The study evaluated its constructs through a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), following the agreement rating system suggested by Saunders et al. (2016) The scale items are detailed in Appendix A.

The questionnaire was designed by adapting and integrating previously validated scales from published research, ensuring consistency with established measurement frameworks while tailoring them to the construction industry. This approach allows for a multidimensional assessment of AI-related attitudes and behaviours, aligning with seminal work that advocates the combination of constructs from different fields to capture complex workplace phenomena and enhance theoretical robustness (Edwards, 2001; MacKenzie et al., 2011).

Collective AI anxiety was measured by updating the recently developed scale by Wang and Wang (2022) to the team level. The scale consists of four dimensions: Learning (8 items), Job Replacement (6 items), Sociotechnical Blindness (4 items), and AI Configuration (3 items).

For collective coping strategy, the research examined three well-established coping strategies: problem-focused, emotion-focused, and relation-focused coping strategies.

- Problem-focused coping strategies were measured using the Leprince et al. (2019) scale, which has been previously validated and recently applied in the construction context (Badi, 2024) with robust reliability and validity results. It comprises two dimensions: analysis and information sharing (3 items) and problem-solving (3 items).

- Emotion-focused coping strategies were measured using Ramadhana's (2020) scale, .specifically developed to capture how groups navigate emotional challenges and maintain morale. It includes two dimensions: emotional openness (4 items) and positive outlook (4 items).

- Relation-focused coping strategies were measured using a recently developed and validated scale by Badi (2024), which has demonstrated strong reliability. It consists of two dimensions: social support (3 items) and compensation (3 items).

The construct of team innovative behaviours was measured using the Litchfield et al. (2018) scale, which is specifically designed to assess innovation in technology-driven environments. Given the nature of this research, this scale was particularly suitable for evaluating the extent and frequency of innovative behaviours within teams. The scale consists of 5 items, providing a comprehensive measure of team-level innovation.

In addition, the questionnaire featured a demographic section capturing organizational size, age, gender, work experience, job position, and educational background. These characteristics have been shown to influence employees' perceptions of their workplace, potentially shaping their attitudes toward their jobs, work processes, and performance (Kirkman et al., 2004). The demographic categories are detailed in Table I.

To ensure the validity of the questionnaire design, convergent and discriminant validity, as well as factor analysis results are presented in Table 2 and Appendix B. The findings reinforce the appropriateness of the grouped items and contribute further empirical support for the usefulness of the adopted scales in the construction sector.

Furthermore, we conducted a validity check by reviewing the convergent and discriminant validity as well as factor analysis results, which we present in **Table 2** and **Appendix B**. These analyses confirm that the grouped items align well with the theoretical constructs they are intended to measure, supporting the appropriateness of our questionnaire design. These changes aim to clarify the reasoning behind the questionnaire structure and enhance the credibility of the findings.

We thank you for the opportunity to revise our work and are confident that the changes made have strengthened the manuscript.

Thank you once again for your valuable input and support throughout the review process.

Best regards,

Authors

Collective AI Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

Abstract

PURPOSE

This study aims to investigate the relationship between collective anxiety relating to the introduction of Artificial Intelligence (AI) technologies in construction companies and team innovative behaviours, purposing a potential mediation role of employees' coping strategies.

DESIGN/METHODOLOGY/APPROACH

The deductive nature of the research dedicated a quantitative research methodology. Structural equation modelling was conducted on a data set of 540 randomly chosen responses to an online questionnaire from European-based construction employees.

FINDINGS

The results showed a significant positive relationship between collective AI anxiety and team innovative behaviour. The mediation relationships were also statistically significant. While emotion-focused and relationship-focused coping had positive relationships with team innovative behaviour, problem-focused coping had a negative relationship. An explanation from cognitive psychology is offered for this finding.

ORIGINALITY

This study contributes to understanding the psychological and social impacts of AI in the construction industry, offering practical insights for fostering innovation amidst AI-induced anxieties. Additionally, it presents an empirical study examining relation-focused coping as a new strategy for collective team coping. Building the conceptual framework at the team level addresses the scarcity of research on managing anxiety and fostering innovation within teams.

PRACTICAL IMPLICATIONS

There is potential for construction organizations to increase team innovative behaviours through supporting emotion-focused and relationship-focused coping strategies for collective AI anxiety. Approaches include open discussions on AI-related concerns to allow team members to voice their anxieties and fostering interpersonal connections to facilitate relationship-focused coping.

Keywords: Collective AI anxiety, Team innovative behaviour, Problem-focused coping strategy, emotion-focused coping strategy, relation-focused coping strategy.

1. Introduction

The recent exponential growth in interest in Artificial Intelligence (AI) is illustrated by Collins Dictionaries' choice of 'AI' as its 'Word of the Year 2023' (Collins, 2024). Organizations are introducing AI in the expectation of realizing the many benefits that can accrue. These include higher rates of efficiency, fewer errors, faster processing and more (Makarius et al., 2020). In the rapidly evolving landscape of the construction industry, characterized by low productivity and limited digitization, the adoption of artificial intelligence (AI) and other cutting-edge technologies has become important (Demirkesen and Tezel, 2022). These technologies, including AI, hold promise for enhancing cost efficiency, accelerating project timelines, and elevating project quality and safety standards (Demirkesen and Tezel, 2022). AI, broadly defined as "theories and techniques used to create machines capable of simulating intelligence," encompasses various subfields such as machine learning, robotics, and natural language processing (Abioye et al., 2021). These advancements have found application across diverse areas within the construction sector, ranging from health and safety to project planning and sustainability (Abioye et al., 2021).

However, the integration of AI in construction also brings forth a host of challenges and societal implications. Concerns such as job displacement, privacy infringement, algorithmic biases, and ethical dilemmas have garnered attention (Arslan et al., 2022; Lazaroiu and Rogalska, 2023; Golda et al., 2024; Makarius et al., 2020; Ntoutsi et al., 2020; Sartori and Theodorou, 2022; Kim et al., 2023). These challenges contribute to the emergence of AI anxiety, characterized by excessive fear stemming from the transformative effects of AI technologies on personal and social spheres (Kaya et al., 2024).

AI anxiety, akin to historical notions of computer anxiety, encompasses various dimensions, including job replacement anxiety and concerns about human-AI interaction (Wang and Wang, 2022). This anxiety is not confined to individuals but can manifest as a collective experience within teams, permeating through the social fabric and impacting team dynamics (Yang et al., 2021; Lazaroiu and Rogalska, 2023). While research has highlighted the detrimental effects of AI anxiety on safety performance and organizational readiness for change, there remains a dearth of studies investigating its implications at the team level, particularly within construction teams (Song et al., 2024; Suseno et al., 2020).

Simultaneously, within organizational settings, the pursuit of innovation is paramount for staying competitive and adapting to technological advancements (Nasaj, 2020; Nasaj, 2021). Team innovation, defined as the collective generation and implementation of novel ideas within a group, is crucial for organizational success (Lin et al., 2022). However, despite the acknowledged importance of innovation at both individual and organizational levels, research at the team level, especially within the construction industry, remains limited (Le Blanc et al., 2021; Statsenko et al., 2023). This gap in understanding is particularly concerning given the industry's transition towards Construction 4.0, emphasizing technological integration and innovation (Osunsanmi et al., 2020).

Therefore, this study aims to explore the nexus between collective AI anxiety and team innovative behaviour within construction teams. Despite extensive research on AI and individual anxiety (e.g. Kim et al., 2016; Li and Huang, 2020, Wang and Wang, 2022), limited studies have explored the collective impact of AI anxiety on team dynamics and innovation. By examining how AI anxiety influences team dynamics and innovative outcomes, this research seeks to offer insights into fostering resilience and promoting a culture of innovation amidst technological disruptions. Moreover, this study posits that the relationship between collective AI anxiety and team innovative behaviour is mediated through collective coping mechanisms, an aspect that has cultivated increasing attention in recent research (e.g. Badi, 2024). Drawing upon the rich literature on collective coping strategies, encompassing problem-focused, emotion-focused, and relation-focused approaches, this study seeks to shed light on how construction teams collectively confront and manage the stressors associated with AI anxiety. The main research question that underpins our study is:

> *RQ: How does collective AI anxiety influence team innovative behaviour, and do coping strategies play the role of mediators?*

The study adopts a theoretical framework drawing from social cognitive theory and organizational behaviour literature to conceptualize the relationships among the variables and empirically examine the relationships between collective AI anxiety, coping strategies, and team innovative behaviour.

2. Conceptual Underpinnings

2.1 Collective AI Anxiety and construction teams

The advent of AI technology not only brings various challenges to the construction industry, but influences society in ways including but not limited to job displacement (Lazaroiu and Rogalska, 2023), concerns surrounding privacy and transparency (Golda et al., 2024), biases embedded within algorithms (Ntoutsi et al., 2020), widening socio-economic disparities (Sartori and Theodorou, 2022), and instances of unethical behaviour (Kim et al., 2023). These challenges can lead to disruptions that result in feelings of anxiety. AI anxiety has been defined as “excessive fear arising from problems originating from changes formed by AI technologies in personal or social life" (Kaya et al., 2024, p. 499). Before the emergence of AI anxiety, computer anxiety has been discussed since the 1980s as "the tendency of individuals to be uneasy, apprehensive, or fearful about the current or future use of computers" (Li and Huang, 2020, p. 2). Beyond the anxiety from learning, AI anxiety also can be from its automatic decision-making processes and anthropomorphized forms (Kim et al., 2016). Wang and Wang (2022) have categorized AI anxiety into several dimensions: "job replacement anxiety," which involves fear of the adverse effects of AI on employment; "sociotechnical blindness," referring to anxiety stemming from a lack of complete understanding of the interdependence between AI and human beings; "AI configuration anxiety," which entails apprehension regarding humanoid AI; and "AI learning anxiety," which relates to concerns about AI technologies acquiring knowledge. This well-developed conceptual framework of the AI anxiety explains the AI-driven anxiety (Spielberger, 1966), which is "a transitory state that changes over time" (Wang and Wang, 2022, p. 621), and elucidates how this phenomenon permeates various aspects of professional life, from concerns about job security to uncertainties about human-AI collaboration.

While anxiety is often perceived as an individual-level construct, it can also manifest as a collective experience in groups (Yang et al., 2021). In terms of AI anxiety, the multifaceted challenges posed by AI technology, ranging from job displacement to ethical dilemmas (Lazaroiu and Rogalska, 2023; Kim et al., 2023), may permeate through the social fabric of teams, fostering a shared sense of unease and apprehension. As Kaya et al. (2024) delineate, AI anxiety stems from the disruptive changes brought about by AI technologies, impacting both personal and social spheres (Hagerty, and Rubinov, 2019). This collective unease about AI (Bao et al., 2022) mirrors the historical discourse surrounding computer anxiety, indicating a longstanding pattern of technological apprehension (Li and Huang, 2020). Research by Song et al. (2024) and Suseno et al. (2020) underscores the detrimental impact of AI anxiety on safety performance and change readiness within the workplace, highlighting its relevance as a team-level phenomenon. By acknowledging AI anxiety as a collective experience, organizations can implement strategies to foster resilience, enhance understanding, and promote a culture of adaptability in the face of technological disruption. However, there is little research on the sequelae of collective AI anxiety in organisations and no research to our knowledge on the effects of collective AI anxiety in construction teams.

2.2 Team innovative behaviour

The term innovation sometimes is interchangeably discussed with the term creativity (Nasaj, 2021; Nasaj & Badi 2021). Innovation refers to the generation or adoption and implementation of creative ideas in an organization (Nasaj et al., 2022). Unlike creativity which may have individual behaviors involved, innovation is "a multistage and iterative process that encompasses both production and implementation of creative ideas by team members in a group" (Lin et al., 2022, p. 1). To foster work efficiency, organizations establish work teams. A team is a part of the organizational structure based on networked development in the organization (Fay et al., 2015). Compared with individuals, the work unit of a team has more knowledge diversity and greater processing capacities of the information (Müller et al., 2009). Team innovative behavior is defined as "team members' collective behaviors on the production and execution of novel service ideas, methods, and procedures in a team" (Lin et al., 2022). This concept involves social interactions for innovation development and the collective work unit in the organization (Widmann et al., 2016). Despite the plethora of studies on individual and organizational innovation, there is a paucity of research at the team level (Le Blanc et al., 2021). The lack of research is especially pronounced in the construction industry (Statsenko et al, 2023), which is concerning given the importance of understanding and cultivating innovative behaviour among teams for construction organizations seeking to adapt and thrive in the evolving Construction 4.0 technological change (Osunsanmi et al., 2020).

3. Conceptual Framework and Hypotheses Development

3.1 Collective AI anxiety and team innovative behaviours

In the age of accelerated AI development, research has identified multiple forms of AI anxiety within workplaces. This anxiety may be the result of the challenges associated with mastering AI technologies (Cetindamar et al., 2022); adjusting to working in collaboration with AI systems (Arslan et al., 2022), and navigating the job market (Vochozka et al., 2018). Collective AI anxiety can encompass fears related to learning about AI, concerns about job replacement due to AI adoption, anxieties regarding the societal and ethical implications of AI, and apprehensions specifically related to humanoid AI technologies. These anxieties may manifest within teams as an unfavourable group affective tone (George and King, 2007). However, emerging research, in contrast to conventional wisdom, indicates that some types of anxiety might potentially stimulate innovation as opposed to impede it. Research by Mao et al. (2021) has found that an intermediate level of team job-related anxiety was associated with higher individual creativity in teams. An earlier study by Akgün et al. (2007) has also found that team anxiety positively impacts speed-to-market in new product development teams. In this study, we are postulating that collective AI anxiety is associated with higher innovation behaviour in construction teams. This nuanced relationship suggests that AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasizing the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). This also aligns with research that has found that AI technologies effectively augment employee creativity (Ding, 2022; Jia et al., 2024). Based on these observations, we put forth our first hypothesis:

> *Hypothesis 1. Collective AI anxiety is positively associated with team innovative behaviours.*

3.2 The mediating role of team collective coping strategies

A large number of studies have examined individual coping (e.g. Freire et al., 2019; Lazarus and Folkamn, 1984). However, in most employment and competitive and achievement-focused situations (such as sports and projects), people work together to attain objectives. Thus, 'collective' (communal) coping is attracting investigation. Collective coping emphasizes the 'relational' feature of coping and is known for its social and interactive nature. A group owns, assesses, and handles a stressor as "our problem and our responsibility" under this view (Afifi et al. 2006, p. 378). This community ownership of a stressor contrasts with individual accountability (Afifi et al., 2006). Lyons et al. (1998) define collective coping as the community pooling resources and efforts to overcome adversity. As they accept responsibility and take proactive steps to manage the stressor, the group's synergy and collaboration are highlighted (Afifi et al., 2006). Collective coping was observed in studies of communities facing natural disasters (Afifi et al., 2012), couples with health issues (Rentscher, 2019), sports teams (Leprince, et al 2019) as well as project teams in construction (Badi, 2024). Collective coping was found to reduce stress and improve mental health (e.g. Afifi et al., 2012; Rentscher, 2019) as well as reduce the organizational stress climate (Rodríguez et al., 2019).

Aligning with this goal, three collective coping strategies have been discussed in the literature: problem-focused, emotion-focused, and relation-focused strategies (Badi, 2024; Länsisalmi et al., 2000). First, problem-focused collective effort is a coping approach that involves analyzing the difficulties associated with the stressor, exchanging knowledge, and engaging in problem-solving activities (Pearsall et al., 2009). Problem-focused coping techniques in teams include a diverse array of tactics, such as issue definition, producing various solutions, and evaluating these solutions based on criteria including costs, benefits, decision-making, and action (Lazarus and Folkman, 1984). The research conducted by Länsisalmi et al. (2000) found that problem-focused coping was associated with a shared feeling of responsibility for all tasks, good communication, information sharing, and knowledge management. Problem-focused collective effort coping techniques include the team's inclination to see stressful events as within their control and capable of being altered (Badi, 2024). Teams often use proactive and strategic coping mechanisms in response to challenging circumstances, promptly taking appropriate measures to resolve the problem (Länsisalmi et al., 2000). Hence, by adopting collective problem-focused coping, the team members may identify problems triggered by AI anxiety, and employ coping strategies such as generating solutions to address AI Anxiety, including thinking of ways to manage the situation devising work plans collaboratively, and implementing effective strategies to alleviate AI anxiety. The increased apprehension regarding AI among team members (Makarius, et al., 2020) may lead to heightened levels of information sharing and communication channels within a team. The heightened discourse is motivated by the collective necessity to address the difficulties presented by AI, which ultimately results in improved collaborative problem-solving abilities. In addition, the shared concern regarding the potential consequences of AI on employment positions may instil a feeling of immediacy, which may encourage team members to invest greater effort in collaborative deliberations and idea generation. Hence, we forward the following hypothesis:

Hypothesis 2: Problem-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.

The second collective coping strategy is emotion-focused coping. Emotions play a crucial role in shaping individual, team, and organizational behaviours, processes, and outcomes (Barsade and Gibson, 2007; Heaphy, 2017). Emotionally intelligent teams are those capable of attending to their emotional state and need (Goleman et al., 2002), while psychological safety, or the ability to admit mistakes and express feelings without fear of punishment, is a significant predictor of team effectiveness (Frazier et al., 2017). Collective positive emotions, such as gratitude, can strengthen a team's ability to introduce novel ideas, feelings, and relationships, enabling them to build enduring resources such as social support and resilience (Meneghel et al., 2016). Expressing negative emotions constructively, such as fear, anxiety, and distress, was also found to enhance teams' knowledge-creation capabilities and performance (Stephens and Carmeli, 2016). Collective emotion-focused coping strategies within the team foster emotional openness by encouraging honest expression of feelings and support without blame, while also promoting a positive outlook by maintaining hope, building on strengths, and focusing on possibilities despite AI anxiety challenges. Emotional support among team members can be encouraging each other to look positive and/or alleviating the negative feelings of low self-efficacy and low self-confidence

(Chambers et al., 2001). Therefore, when team members work together to generate and implement innovative ideas, the individuals in the team may seek emotional support from other team members to reduce their AI anxiety. Hypothesis 3 is proposed:

Hypothesis 3: Emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours.

The third and final collective coping strategy is the relation-focused coping strategies which rely on interactions within the team (Afifi et al., 2006). Relation-focused coping strategies involve seeking and utilizing support, guidance, and resources from leaders, colleagues, and organizational members to navigate challenges and adapt to the needs of team members facing difficulties, such as AI Anxiety. During the team innovation development process (Scott and Bruce, 1994), team creative behaviours and team implementation behaviours are involved (Widmann et al., 2016). Team members discover opportunities, identify the needs of a specific innovation, and come out with new ideas through a variety of creative activities. After that, the team moves to promote and implement the explored ideas by assigning tasks to team members, seeking resource support, and testing and refining the process (Widmann et al., 2016). Therefore, building social support, compensating for the individual weaknesses of other team members, and pooling the team members' resources can strengthen the collective competency of the team to confront collective AI anxiety as well as contribute to team innovation (Badi, 2024; Leprince et al., 2019). Hypothesis 4 is proposed as:

Hypothesis 4: Relation-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours

The overall proposed conceptual framework of the study is illustrated in Figure1.

Figure1: Conceptual Framework

***** INSERT FIGURE 1 ABOUT HERE *****

4. Methodology

The research aims to study the relationship between collective AI anxiety and team innovative behaviour as well as the mediating role of coping strategies. Thus, a quantitative methodology is considered suitable for deducing the nature of these relationships among the research's variables (Saunders et al., 2016).

4.1 Sampling and data collection

In the technological race led predominantly by the United States and China (Brattberg et al. 2020), Europe stands out with its unique industrial strengths and prominence in AI applications. Despite this, Europe has yet to fully exploit its technological potential due to challenges such as digital market fragmentation, recruitment issues, and lack of competitiveness. Moreover, the anxiety surrounding the adoption and impact of artificial intelligence (AI) in Europe stemming from concerns over job security, ethical implications, and potential misuse underscores the need for targeted research in this area (Brattberg et al. 2020). Therefore, the study involved European construction organisations where AI integration is prominent, focusing on teams as the unit of analysis.

Data collection involved a quasi-random sampling technique via an online survey questionnaire distributed to construction companies' employees working in several countries in Europe: Denmark, Germany, Netherlands, Norway, Portugal, Spain, Sweden, and the UK. A professional data collection company (cint.com) were utilized to facilitate data collection. A single key informant sampling method was utilized in this research, as initially proposed by Van de Ven and Ferry (1980). This approach is consistent with recent research methodologies within the construction industry, including the works of Talat and Riaz (2020) and Badi (2024). The rationale for selecting a single key informant from each organization, rather than surveying the entire team, is based on two main considerations. To effectively capture a wide array of evaluations regarding the AI anxiety phenomenon within the construction sector, it proved more efficient to gather insights from key informants across a variety of organizations. This method helps to avoid the homogeneity in responses that could emerge from consulting multiple members of the same organization, thereby providing a more comprehensive view of the diverse ways in which AI anxiety phenomena affect team innovation behaviours through shared coping mechanisms. Furthermore, the literature validates the efficacy of engaging a single key informant for gaining insights into team-oriented phenomena, particularly for studies addressing complex initiatives like AI anxiety phenomena (Badi 2024; Talat and Riaz, 2020). This method offers a perspective that reflects both team dynamics and the broader organizational context in handling AI anxiety, crucial for dissecting the intricacies of innovation and coping mechanisms within the construction sector.

The survey was disseminated in February 2024 in multiple waves, with a total of 2,720 surveys sent out. Of these, 954 responses were received, representing a response rate of approximately 35.07%. Upon examining the responses, 540 were found to be complete and usable for analysis. Table I demonstrates the profile of the research participants.

Table I Participants' Profile Summary

***** INSERT TABLE I ABOUT HERE *****

4.2 Questionnaire design and measurement items

The study evaluated its constructs through a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), following the agreement rating system suggested by Saunders et al. (2016) The scale items are detailed in the appendices.

Collective AI anxiety was measured by updating the recently developed robust scale by Wang and Wang (2022) to the team-level. The scale consists of four dimensions: Learning (8 items), Job Replacement (6 items), Sociotechnical Blindness (4 items) and AI Configuration (3 items).

In terms of collective coping strategy, the research examined three established coping strategies: problem-focused, emotion-focused and relation- focused coping strategies.

The construct of problem-focused coping strategies was measured via the scale developed by Leprince et al. (2019). This scale has been recently used in construction context (Badi 2024) and showed robust reliability and validity results. It comprises two dimensions: analysis and information sharing (3 items) and problem-solving (3 items). For the measurement of emotion-focused coping strategies, a scale developed by Ramadhana (2020) was adopted since it is designed to capture how teams steer emotional challenges and uphold morale amidst adversity. The scale has two dimensions: emotional openness (4 items) and positive outlook (4 items). For relation-focused coping strategy, a recently developed scale developed by Badi (2024) was adopted, which had demonstrated robust reliability and validity. The scale consists of two dimensions: social support (3 items) and compensation (3 items).

The construct of team innovative behaviours was measured utilizing Litchfield and colleagues' (2018) scale. The scale is designed to assess team innovation within the context of technology-driven environments which is suitable to the nature of this research. The scale has 5 items that offer a detailed measure of the frequency and extent of innovative behaviours in teams.

In addition, the questionnaire featured a section dedicated to gathering participants' demographic information, including organizational size, age, gender, work experience, job position, and educational background. Such characteristics could influence employees' perceptions of their workplace, potentially affecting their attitudes towards their job, work processes, and performance (Kirkman et al., 2004). Table I demonstrates the categories for the demographics.

4.3 Data analysis

Data analysis was performed via SPSS v23.0 and Amos v23.0 programs.

4.3.1 Common Method Bias

Assessing for common method bias is crucial, particularly in self-administered surveys (Fuller et al., 2016). To this end, the study utilized the commonly applied Harman's single-factor test (Podsakoff and Organ, 1986) for its analysis. The results revealed that only 35.214 % of the data variance was attributed to a single factor, remaining under the 50% benchmark. Hence, it is inferred that common method bias does not pose a significant issue in this research.

4.3.2 Reliability and Validity

The research evaluated the reliability of its constructs through multiple tests. Initially, Cronbach's alpha was employed, with all constructs displaying values above 0.7, indicating their reliability according to George and Mallery (2003). Furthermore, the Kaiser-Meyer-Olkin (KMO) test was carried out to assess sample adequacy, yielding a result of .970. This demonstrates good scale adequacy, as a KMO value close to 1.0 signals higher reliability and values below 0.50 indicate unreliability (Morgan et al., 2004). Additionally, the Bartlett Test of Sphericity was used to examine correlations to confirm each scale's reliability in the study (Hair et al., 2010), resulting in a Bartlett Test of Sphericity value of .000. Therefore, the reliability assessments conducted substantiate the scales' dependability within the research. The research variables' correlation matrix and descriptive statistics are detailed in Table II.

Table II: Reliability, Validity and Correlation Analysis

***** INSERT TABLE II ABOUT HERE *****

Factor analysis was employed to verify the variables' validity within the study. An Exploratory Factor Analysis (EFA) was conducted, employing principal component analysis for the extraction process and varimax rotation. The outcomes of the EFA indicated that the items in the questionnaire were well-matched with their intended constructs, achieving acceptable values above 0.45, in line with Field's (2013) guidelines. **The detailed results of the Exploratory Factor Analysis (EFA) are indeed reported in Appendix B**

The Confirmatory Factor Analysis (CFA) results demonstrate a strong model fit, with all indices falling within the recommended thresholds: chi-square/degrees of freedom (χ^2/df) = 1.778, indicating a good fit according to Schreiber et al. (2006); Root Mean Square Residual (RMR) = 0.034, suggesting minimal residuals as per Browne and Cudeck (1993); Comparative Fit Index (CFI) = 0.964 and Incremental Fit Index (IFI) = 0.964, both reflecting a high degree of model fit as noted by Byrne (2010) and Bentler (2007); Tucker-Lewis Index (TLI) = 0.961, indicating a good fit based on Marsh et al. (2004); and Root Mean Square Error of Approximation (RMSEA) = 0.038, denoting a close fit in line with Steiger (2007). The specifics of the CFA results are presented in Figure 2.

Figure 2: Confirmatory factor analysis

***** INSERT FIGURE 2 ABOUT HERE *****

Furthermore, evaluations of both convergent and discriminant validity for the measurement scales were performed. The criteria for satisfactory outcomes were established at a minimum cut-off value exceeding 0.5, as specified by Hair et al. (2006). The process for assessing discriminant validity included contrasting the square root of the average variance extracted (AVE) with the correlations existing between constructs. To affirm discriminant validity, it is necessary for the square root of AVE to surpass the inter-construct correlations (Hair et al., 2006). Based on the information provided in Table II, the study effectively confirmed both convergent and discriminant validity.

4.3.3 Hypothesis testing

The research inspects the relations between collective AI anxiety and team innovative behaviour highlighting the mediation role of coping strategies. Structural equation modelling with robust maximum likelihood estimation was conducted to examine the research hypotheses. The structural equation model is represented in Figure 3.

Figure 3: The structural model

***** INSERT FIGURE 3 ABOUT HERE *****

The structural equation model fit indices demonstrated a good model fit: $\chi 2/df$ = 2.058, RMR = .079, CFI =. 950, IFI = .950, TLI =. 947, RMSEA = .044.

The results of direct relations amongst the constructs are illustrated in Table III.

Table III SEM Direct Relations Results

***** INSERT TABLE III ABOUT HERE *****

The results illustrate that there is a significant relation between collective AI anxiety and team innovative behaviour at 99% confidence level, and therefore H1 is supported.

In terms of H2, H3 and H4, we can see that there are significant relations at 99% confidence level among all the variables however the relation between collective AI Anxiety and problem-focused coping strategy is significant at 95% confidence level. Hence, a potential mediating role for coping strategies is demonstrated.

The bootstrapping technique (Preacher and Hayes, 2004) was employed to further investigate the indirect effect among the variables in order to validate the mediating role of coping strategies. This approach is advised for the analysis of mediating variables (MacKinnon et al., 2012; Hayes, 2017). Utilizing 2000 resamples, the bootstrapping method generated at 95% confidence intervals for the indirect impacts of collective AI anxiety on team innovative behaviour. The outcomes of these indirect relationships are shown in Table IV.

Table IV Indirect Relations Results

***** INSERT TABLE IV ABOUT HERE *****

The results of the indirect relation between collective AI anxiety and team innovative behaviour demonstrate that coping strategies have a mediating role over the relation between collective AI anxiety and team innovative behaviour with all two-tailed significance tests significant relations at 95% confidence level.

5. Discussion of results

The rapid advancement of AI technologies has led to anxieties among employees about their roles, job security, and the need to acquire new skills (Li and Huang, 2020). However, this anxiety can have positive outcomes for the organisation. First, Hypothesis H1 suggests that collective AI anxiety in the workplace positively influences team innovative behaviours. Our empirical analysis supports this hypothesis, indicating a significant positive association between collective AI anxiety and team innovative behaviours (β: 0.37, $p < 0.001$). Previous research suggests that negative affective states within teams can hinder performance (McCarthy et al., 2016). However, our findings suggest a nuanced relationship wherein AI anxiety, although initially negative, can catalyse increased innovation efforts within teams. The work of Gong et al. (2013) has noted that anxiety stemming from job demands can drive increased creativity among team members. Our study aligns with this by revealing how collective AI anxiety can paradoxically foster heightened levels of innovation among team members and challenge conventional notions of how negative affective states influence team behaviour. Our three remaining three hypotheses explore some of the mediatory mechanisms through which collective AI anxiety enhances team innovation, potentially uncovering collective coping strategies to leverage this phenomenon for organizational benefit.

The supported Hypothesis H2 identified that collective problem-focused coping strategies serve as a mediator between collective AI anxiety and team innovative behaviours. This finding builds upon established literature concerning coping mechanisms and their impact on team dynamics. Pearsall et al. (2009) and Länsisalmi et al. (2000) have outlined the significance of collective problem-focused coping techniques, emphasizing their association with enhanced communication, shared responsibility, and proactive problem-solving within teams. Badi (2024) underlined the significance of problem-focused collective efforts in construction teams. A collective problem-focused coping strategy entails actively generating solutions, considering strategies to manage Collective AI anxiety, exploring coping methods, developing collaborative action plans, implementing effective strategies, and executing agreed-upon plans to address and alleviate collective AI anxiety. Against our expectations, we found that problem-focused team coping strategies had a negative relationship with team innovative behaviour. This negative relationship indicates that as the adoption of problem-focused coping strategies increases within the team, there is a decrease in team innovative behaviour. This could imply that when teams primarily focus on addressing problems associated with AI anxiety through problem-solving techniques, they may allocate less energy or attention towards generating innovative ideas or solutions. This may relate to the cognitive processes underlying innovation. Creativity has long been understood to result from a balance between two different thinking styles: divergent thinking (idea generation) and convergent thinking (idea evaluation) (Guildford 1967). Divergent thinking can be the more 'creative' style in the sense of developing multiple, imaginative ideas, while convergent thinking can be more implementation-focused in the sense of identifying the single, optimal answer (Runco, 2010). Problem-focused coping strategies may depend more on convergent thinking styles, leading to lower levels of innovation. Hence, excessive emphasis on problem-solving may lead to a lack of exploration or creativity, thereby hindering the team's ability to innovate.

In addition, the supported Hypothesis H3 offers empirical evidence that collective emotion-focused coping strategies mediate the relationship between collective AI anxiety and team innovative behaviours, drawing from a robust literature highlighting emotions' influence on team dynamics and outcomes (Barsade and Gibson, 2007; Heaphy, 2017; Frazier et al., 2017). Collective emotion-focused coping, characterized by emotional openness, involves acknowledging and expressing emotions truthfully, sharing both negative and positive feelings, demonstrating understanding without blame, maintaining hope and confidence, encouraging each other, seizing opportunities and persisting in efforts, and focusing on possibilities while accepting limitations to cope with collective AI anxiety-related difficulties. By fostering emotional openness, support, and resilience, these coping strategies appear to help teams manage AI-related anxiety effectively (Meneghel et al., 2016; Stephens and Carmeli, 2016). Through constructive expression of emotions and encouragement of positive outlooks, such strategies can mitigate the potentially negative impact of collective AI anxiety on innovation (Chambers et al., 2001). The findings of H3 contribute to understanding coping mechanisms amid technological challenges, emphasizing the importance of emotional support and resilience-building in fostering creativity (Meneghel et al., 2016).

Finally, the supported Hypothesis H4 underlined collective relational-focused coping strategies as a mediator in the relationship between collective AI anxiety and team innovative behaviours, offering a nuanced understanding of how interpersonal interactions within teams influence adaptive responses to technological disruptions. This finding aligns with the literature emphasizing the significance of relation-focused coping strategies, as highlighted by Afifi et al. (2006). We extend the work of Badi (2024) in the construction industry by underscoring the pivotal role of social support in bolstering team innovation efforts amidst technological challenges. Collective relation-focused coping entails seeking support from leadership and colleagues, accessing organizational resources, and implementing compensatory measures such as supporting, adjusting work plans, and accommodating weaknesses of team members to manage challenges related to collective AI anxiety. By fostering social support networks, compensating for individual weaknesses, and leveraging collective resources, teams can enhance their overall competency to confront collective AI anxiety and drive innovation forward.

6. Conclusion

Our study contributes to the literature by elucidating the impact of collective AI anxiety on team dynamics and behaviours within construction industry organisations. Firstly, our findings indicate that collective AI anxiety can positively influence team innovative behaviours, contrary to the conventional understanding that negative affective states hinder performance. This nuanced relationship suggests that collective AI anxiety prompts increased cognitive arousal among team members, aligning with previous research emphasizing the role of heightened cognitive states in fostering team innovation (e.g. Akgün et al. 2007; Mao et al. 2021). Secondly, the findings highlight the mediating role of collective problem-focused, emotion-focused and relation-focused coping strategies in addressing AI-related anxiety. This draws upon established literature emphasizing the significance of such collective coping mechanisms in enhancing team proactive problem-solving and the role of emotional and social support in bolstering team efforts to confront AI-induced anxiety and drive innovation forward amidst technological change.

The results from this study contribute to the body of knowledge in several ways. First, despite its increasing popularity, empirical inquiry into the social and psychological implications of AI in construction is still in its infancy. Even though there are research studies dealing with AI implementation in the construction industry (e.g. An et al., 2021; Dumrak et al., 2023; Pan and Zhang, 2021) there is a paucity of studies exploring the social and psychological implications of AI. Therefore, the study addresses this gap in the literature by empirically examining AI from a psychological perspective, focusing on AI anxiety in construction teams. Second, the study examines the concepts of AI anxiety and coping as team-level collective phenomena and answers the call for further studies exploring team-level dynamics in construction. To our knowledge, our study is the first to update the Wang and Wang (2022) AI anxiety scale to explore the team-level collective phenomenon and we confirmed the validity and reliability of the modified scale in this context. Thus, our study contributes to the advancement of research in the stress and coping domain by addressing the gap in understanding team-level dynamics in the context of anxiety and coping strategies, particularly within the construction industry. Third, this study develops and validates a research model of collective teams coping with AI anxiety and innovation outcomes. To our knowledge, our study is one of the first to apply collective coping strategies to understand how teams cope with collective AI anxiety with team innovative behaviour as the outcome.

The findings of our study have several implications for construction organizations seeking to harness the creative potential of their teams amidst the growing prevalence of AI technologies. First, recognizing the potential positive impact of collective AI anxiety on team innovative behaviours, organizations should encourage open discussions about AI-related concerns and provide platforms for team members to voice their anxieties. This can help harness the heightened cognitive arousal associated with collective AI anxiety, fueling creativity and innovation within teams. Second, organisations should prioritize emotion-focused and relation-focused coping strategies to address AI-related anxiety. Organizations should implement organization-wide initiatives such as providing promoting a supportive work environment, and fostering strong interpersonal relationships. By nurturing these coping mechanisms, organizations can empower their teams to navigate AI-induced anxiety, capitalize on collective strengths, and drive innovation in the construction industry. **This can include conducting workshops focused on emotional intelligence and resilience, enabling team members to manage and express emotions constructively. Regular structured discussions, such as "AI Anxiety Forums," can provide a safe space for team members to voice concerns and collaborate on solutions. Additionally, incorporating team-building activities, such as innovation hackathons or trust-building exercises, can enhance interpersonal connections and relation-focused coping. These strategies not only alleviate AI-related anxieties but also create a foundation for increased collaboration and innovation within teams.**

While our study provides valuable insights into the relationship between collective AI anxiety and team innovative behaviours in the construction sector, several limitations should be considered and that should guide future research. To begin, there is the inherent risk of subjectivity when using self-reported data. To ensure that future studies are more reliable, multi-source data-gathering techniques could be used such as objective performance measurements or observational data. Second, further research is needed to explore our tentative explanation of problem-focused coping as tending towards convergent thinking. Third the mediating function of coping

mechanisms in reducing collective AI anxiety and increasing team innovation was the primary emphasis of our research. Nevertheless, these dynamics might be impacted by other individual, team and contextual factors, such as personality, team composition, organizational culture, and project characteristics. We can learn more about the intricate relationship between collective AI anxiety and team innovation if we investigate these other aspects. Additionally, the results may not apply to other sectors or organizational contexts since our research was carried out within the framework of companies in the construction industry. To test how well our results, hold up in other settings and how applicable they are to various types of organizations, future studies may replicate our study. Furthermore, longitudinal research may shed light on how collective AI anxiety impacts team performance and creativity in the long run. The subjective experiences and opinions of team members regarding collective AI anxiety and coping techniques might be additionally understood with the use of qualitative research methodologies, such as focus groups or interviews. To better understand these occurrences and to guide the creation of tailored solutions to assist teams in handling AI-related anxiety, it would be beneficial to combine quantitative and qualitative assessments.

To sum it up, this study sheds light on the relationship between collective AI anxiety and team innovative behavior in the construction industry, highlighting the mediating role of collective coping strategies. The findings reveal that collective AI anxiety, often viewed as a negative force, can positively influence team innovation by fostering cognitive arousal. The study identifies emotion-focused and relation-focused coping strategies as effective mediators, promoting resilience and collaboration, while problem-focused strategies may limit divergent thinking and hinder innovation.

The implications suggest that organizations should address AI-induced anxieties through open communication, supportive work environments, and fostering strong interpersonal relationships to leverage the innovative potential of their teams. By nurturing appropriate coping mechanisms, construction organizations can navigate the challenges of technological transformation while enhancing team performance and creativity. These insights contribute

to the understanding of team-level dynamics, providing a foundation for future research into collective psychological phenomena and innovation in other sectors.

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APPENDIX A: Measurement items

Constructs	Items	Source
Collective AI Anxiety	*Learning:* AIA1: Learning to understand all of the special functions associated with an AI technique/product makes us anxious. AIA2: Learning to use AI techniques/products makes us anxious. AIA3: Learning to use specific functions of an AI technique/product makes us anxious. AIA4: Learning how an AI technique/product works makes us anxious. AIA5: Learning to interact with an AI technique/product makes us anxious. AIA6: Taking a class about the development of AI techniques/products makes us anxious. AIA7: Reading an AI technique/product manual makes us anxious. AIA8: Being unable to keep up with the advances associated with AI techniques/ products makes us anxious. *Job Replacement:* AIA9: We are afraid that an AI technique/product may make us dependent on AI applications. AIA10: We are afraid that an AI technique/product may make us lazier. AIA11: We are afraid that an AI technique/product may replace humans. AIA12: We are afraid that widespread use of humanoid robots will take jobs away from people. AIA13: We are afraid that if I begin to use AI techniques/products we will become dependent upon them and lose some of our reasoning skills. AIA14: We are afraid that AI techniques/products will replace someone's job. *Sociotechnical Blindness:* AIA15: We are afraid that an AI technique/product may be misused. AIA16: We are afraid of various problems potentially associated with an AI technique/ product. AIA17: We are afraid that an AI technique/product may get out of control and malfunction. AIA18: We are afraid that an AI technique/product may lead to robot autonomy. *AI Configuration:* AIA19: We find humanoid AI techniques/products (e.g. humanoid robots) scary. AIA20: We find humanoid AI techniques/products (e.g. humanoid robots) intimidating. AIA21: We don't know why, but humanoid AI techniques/products (e.g. humanoid robots) scare us.	Wang & Wang (2022)
Problem-Focused Coping	*Analysis and Information Sharing:* PRO1: We think of solutions to solve the problems generated by AI Anxiety. PRO2: We think of possible solutions to manage the AI Anxiety situation. PRO3: We try to find possible ways of dealing with the AI Anxiety situation. *Problem-solving:* PRO4: We deal with the AI Anxiety situation by adopting a work plan that we have discussed together. PRO5: We put simple and effective work strategies in place. PRO6: We implement the work plan we have collectively decided on to get out of the AI Anxiety situation.	Leprince et al. (2019)

Emotion-Focused Coping	*Emotional openness:* EMO1: We express our feelings and are truthful with each other. EMO2: We can share negative feelings such as sadness, anger, and fear. EMO3: We show each other understanding and avoid blame. EMO4: We can share positive feelings such as gratitude, appreciation, humor, and fun. *Positive outlook:* EMO5: We keep hopeful and confident that we will overcome difficulties caused by AI Anxiety. EMO6: We encourage each other and build on our strengths. EMO7: We seize opportunities, take-action, and persist in our efforts. EMO8: We focus on possibilities and try to accept what we cannot change.	Ramadhana (2020)
Relation-Focused Coping	*Social Support:* RFC1: We can rely on strong leadership by the team leader to provide support and guidance. RFC2: We can rely on the support of colleagues and other organizational members. RFC3: We can access organizational resources to help our team through difficult times. *Compensation:* RFC4: We try to help a team member facing difficulty with AI Anxiety by compensating for some of his/ her actions. RFC5: We re-adjust our work plan by taking on the tasks of a team member facing difficulty with AI Anxiety. RFC6: We adapt our work plan to deal with a team member's weaknesses with AI Anxiety.	Badi, (2024)
Team innovative behaviour	TIB1: My team members often implement new ideas to improve the quality of our products and services. TIB2: My team members give a lot of consideration to new and alternative methods and procedures for doing their work. TIB3: My team members often produce new services, methods, or procedures. TIB4: This is an innovative team. TIB5: My team creates new ideas for difficult issues.	Litchfield et al., 2018

Items were measured on a 5-point Likert scale.

APPENDIX B: Exploratory Factor Analysis

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
CHA1	.635				
CHA2	.691				
CHA3	.651				
CHA4	.718				
HIA1		.787			
HIA2		.844			
HIA3		.838			
HIA4		.751			
PFCS1			.761		
PFCS2			.701		
PFCS3			.645		
PFCS4			.697		
PFCS5			.525		
PFCS6			.517		
EFCS1				.759	
EFCS2				.689	
EFCS3				.737	

EFCS4				.793	
EFCS5				.731	
EFCS6				.781	
EFCS7				.730	
EFCS8				.691	
TIB1					.789
TIB2					.780
TIB3					.797
TIB4					.803
TIB5					.819

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Artificial Intelligence Anxiety and Team Innovative Behaviour: The Role of Coping Strategies

Reviewer's Comments and Responses

We would like to sincerely thank the reviewers for their valuable feedback and constructive comments, which have greatly enhanced the clarity, depth, and overall quality of our work. Your insights have been instrumental in refining our analysis and strengthening the contribution of this study. We deeply appreciate the time and effort you dedicated to reviewing our manuscript.

Reviewer 1 Comments to Author	Authors Response to Reviewers Comments
What is the basis of selecting suitable companies for data collection?	The companies for data collection were selected based on their alignment with the study's focus on collective AI anxiety and team innovative behaviour in the construction industry. Organizations with prominent AI integration were prioritized, reflecting the relevance of technological adoption in the evolving Construction 4.0 paradigm (Osunsanmi et al., 2020). European companies were chosen due to the region's industrial strengths and specific challenges, such as digital fragmentation, job security concerns, and ethical implications, which heighten AI anxiety (Brattberg et al., 2020). Data was gathered using a

	quasi-random sampling approach through an online questionnaire distributed by a professional data collection company: Cint.com, targeting several countries, including Denmark, Germany, and the UK, to ensure a diverse representation of construction teams.
Is there any specific considerations for selection?	Specific criteria were provided to the data collection company, Cint, to guide the selection of companies from their database. These included prioritizing organizations where AI technologies were actively implemented, ensuring relevance to the study's focus on AI-induced anxiety and innovation. The criteria also emphasized targeting European construction companies due to their unique industrial strengths and challenges, such as digital fragmentation and concerns over AI's impact on job security and ethics, which heighten collective AI anxiety. Additionally, responses were sought from multiple countries, including Denmark, Germany, and the UK, to ensure robust regional representation and varied insights into the evolving Construction 4.0 paradigm.
Also, is their sufficient evidence from the literature to support the adequacy of selecting single respondent from each organisation and have you considered any criteria to select those respondents to obtain overall view of that company?	Key informants were selected to capture team-level dynamics and organizational contexts, avoiding response homogeneity while ensuring high-quality insights as recommended by Badi (2024) and Talat and Riaz, (2020). This provided a robust

	foundation for examining coping strategies and innovation.
It is better to add a proper conclusion in addition to the implications, with a summary of the findings.	A proper summary was added see page no 21
Reviewer 2 Comments to Author	**Authors Response to Reviewers Comments**
1- The authors used a single key informant sampling method, relying on only one person from each organization for insights. This approach risks missing various team perspectives and may introduce bias if that individual's views do not represent the entire team's experiences. Were any measures taken to minimize this bias or to limit the impact of the informant's personal opinions?	To address the concern regarding the single key informant approach, we minimized bias by employing a random sampling technique through a professional data company, which selected employees based on specific criteria matching our target audience. This ensured a diverse and representative sample of informants. Additionally, after data collection, we conducted a common method bias test to confirm that the data was free from systematic biases. This approach aligns with established research practices, as adopted in previous studies, such as Badi (2024) and Talaat and Riaz (2020), which demonstrated the reliability of single-informant methodologies in similar contexts.
2. The authors used a single key informant method for data collection, which is common. However, it would be helpful to explain why they did not consider using a multi-informant design. Research such as Link shows that having multiple	We chose the single key informant method due to its practicality in collecting data from a large sample across multiple organizations, which aligns with established practices in organizational research, including studies by Badi (2024) and Talaat and Riaz (2020). This approach ensured efficiency while targeting individuals with sufficient knowledge of team

informants can reduce bias and provide a more complete view of team dynamics and perspectives. Could the authors clarify their reasons for choosing this method and discuss how it might affect the study's findings?	dynamics and AI integration. While a multi-informant design could provide richer perspectives, it was deemed impractical given the scope and geographic spread of the sample. We acknowledge that relying on single informants may limit the depth of insights and recommend future studies consider multi-informant or mixed-method approaches to validate and expand upon our findings. See page 21: "While our study provides valuable insights into the relationship between collective AI anxiety and team innovative behaviours in the construction sector, several limitations should be considered and that should guide future research. To begin, there is the inherent risk of subjectivity when using self-reported data. To ensure that future studies are more reliable, multi-source data-gathering techniques could be used such as objective performance measurements or observational data."
3- The abbreviations of RMR, CFI, IFI, TLI, and RMSEA are missing.	This is fixed see page 15
4. The research discusses three distinct kinds of coping methods; What are the reasons why problem-focused coping methods may inhibit innovation in comparison to emotion-focused and relationship-focused solutions?	Problem-focused coping methods may inhibit innovation because they often emphasize convergent thinking, which focuses on solving specific problems and finding optimal solutions. This can limit the exploration of alternative, creative ideas necessary for innovation. In contrast, emotion-focused coping fosters psychological safety, emotional openness, and resilience, creating an environment conducive to creativity. Similarly, relationship-focused coping enhances social support and collaboration,

	leveraging collective strengths and compensating for weaknesses, which are critical for generating and implementing innovative ideas. Excessive focus on problem-solving may inadvertently narrow the team's cognitive and emotional bandwidth, leaving less room for divergent thinking, which is essential for innovation. Please see Discussion of Results section. Specifically, the manuscript addresses this on page 17, where it states: "This negative relationship indicates that as the adoption of problem-focused coping strategies increases within the team, there is a decrease in team innovative behaviour. This could imply that when teams primarily focus on addressing problems associated with AI anxiety through problem-solving techniques, they may allocate less energy or attention towards generating innovative ideas or solutions. This may relate to the cognitive processes underlying innovation. Creativity has long been understood to result from a balance between two different thinking styles: divergent thinking (idea generation) and convergent thinking (idea evaluation) (Guildford 1967)."
5. An Exploratory Factor Analysis (EFA) was performed using principal component analysis for extraction and varimax rotation. This output ought to be presented in this publication.	The detailed results of the Exploratory Factor Analysis (EFA) are reported in Appendix B, and referred to in the text at page 14

6. The authors note that the study was conducted within construction industry organizations. Could they further discuss the extent to which these findings might be transferable to other industries facing AI-induced anxiety?	Yes, the comment regarding the transferability of findings to other industries and the inclusion of this as a future research avenue has been addressed. The manuscript discusses the limitations of the study, specifically noting that the results may not apply to other sectors or organizational contexts since the research was conducted within the construction industry. It suggests that future studies replicate this research in different industries to test the generalizability and applicability of the findings to diverse organizational settings. please see bottom of page 21
7. Are there unique stressors in construction teams' experience with AI that could influence AI anxiety differently than in other industries?	Yes, construction teams face unique stressors related to AI that may influence AI anxiety differently than in other industries. These include concerns over job displacement due to the automation of labour-intensive roles, challenges in adapting to rapidly evolving technologies in a traditionally low-digitalization industry, and apprehensions about the reliability and safety of AI in high-risk environments. Additionally, the fragmented nature of construction projects, involving multiple stakeholders and transient teams, can amplify uncertainty and anxiety about AI implementation. Future research could explore these stressors in greater detail and investigate other industry-specific stressors to understand how they uniquely shape

	AI anxiety and coping mechanisms across different sectors. Please see pgae21.
8. The practical implications are helpful, but adding more specific examples or recommendations would make them stronger. For instance, are there specific workshops, discussion formats, or team-building activities that could effectively support emotion- and relation-focused coping strategies	This comment has been added on page21, by adding the following text: "This can include conducting workshops focused on emotional intelligence and resilience, enabling team members to manage and express emotions constructively. Regular structured discussions, such as "AI Anxiety Forums," can provide a safe space for team members to voice concerns and collaborate on solutions. Additionally, incorporating team-building activities, such as innovation hackathons or trust-building exercises, can enhance interpersonal connections and relation-focused coping. These strategies not only alleviate AI-related anxieties but also create a foundation for increased collaboration and innovation within teams."