# Cultivating Innovative Work Behavior Through Error Management Climate: A Journey of Resilience and Growth of Pakistani Construction Industry

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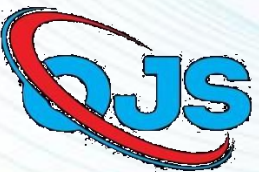
Abstract

The study aims to explore the relationship between Error Management Climate (EMC), Employee Resilience (ER), and Innovative Work Behavior (IWB) in the Pakistani construction industry. It seeks to understand how a supportive error management climate fosters resilience among employees and, in turn, promotes innovative behavior. The research addresses gaps in existing literature by emphasizing the mediating role of resilience and providing actionable insights for creating adaptive and growth-oriented organizational environments. This quantitative study used a time-lagged survey design to examine the relationships between EMC, ER, and IWB. This approach helped mitigate common method bias. Data were collected from employees and their managers in the Pakistani construction industry. Both managerial and non-managerial staff were targeted to capture diverse perspectives. Purposive sampling technique was used to select 402 participants. The data were then analyzed using structural equation modeling (SEM). The findings confirm significant relationships between the constructs. EMC strongly influences ER and IWB. ER also significantly impacts IWB, mediating the relationship between EMC and IWB. The study provides actionable insights for the construction industry and similar error-prone sectors. It underscores the importance of cultivating an EMC that encourages open communication, learning from mistakes, and collaborative problem-solving, thereby reducing the fear of failure. These the findings emphasize the need for an integrated approach to organizational development, combining environmental (EMC) and individual (ER) factors to drive sustainable innovation and adaptability in complex, resource-constrained settings like the Pakistani construction industry.

Keywords: Error management climate; employee resilience; innovative work behavior; construction industry.

Introduction

Today's business environment demands adopting an open approach towards management and learning. Organizations must constantly seek ways to innovate and adapt to the evolving landscape. Unfortunately, Pakistani construction industry is facing challenges (Hasan, 2022). Despite operating in a growing economy, it has shown a negative outlook. In 2023 market size was 15.6 billion USD. Yet, this growth did not guarantee a positive future. Instead, the industry is expected to shrinks by 3.5% in real terms within 2024

(Research and Markets, 2024). State Bank of Pakistan (SBP) identifies these reasons for contraction as political uncertainty, inconsistent policies, stagnant exports, limited savings, and low investment in physical and human capital (Aazim, 2024; Iqbal, 2024). On the bright side, the industry is poised to grow under the umbrella of China Pakistan Economic Corridor (CPEC) and through integration with Shanghai Cooperation Organization (SCO) countries (Alvi, 2024). CPEC has also entered its second phase, known as CPEC 2.0. This phase promises significant growth investment in infrastructure and other initiatives (Ali, 2023).

Journey of Pakistan's construction industry has not been smooth due to various challenges; nevertheless, industry has shown remarkable resilience. The challenges include political instability, economic fluctuations, and natural disasters (Azeem *et al.*, 2020). This resilient nature is largely attributed to industry's ability to adapt innovative construction practices (Farea *et al.*, 2023). The industry has designed itself to use locally sourced material to enhance its cost effectiveness and productivity. Furthermore, government support and integrating traditional construction methods with innovative technology has been critical to recover from adverse situations. Hence construction industry has maintained itself as vital component of the nation's economic development (Asghar *et al.*, 2024).

However, to ensure sustainable growth industry must adopt a flexible approach towards errors. To effectively tread aggressive waters, construction industry is required to recognize the importance of developing right organizational environment, a culture that not only tolerates but also actively learn from errors. Gold et al. (2014) distinguishes between a "blame-oriented" climate versus "open" climate. A blame culture is where errors are not tolerated and those committing errors are punished, and an "open" climate, where errors are seen as opportunities for learning without sanctions on the originator (Gold *et al.*, 2014; Klamar *et al.*, 2022). This research in line with recent research recognizes this approach as error management climate (Chen *et al.*, 2021).

Dekker, (2017) raises concerns that senior management within the organization (much like construction industry of Pakistan) when faced with situations demanding to deal with errors/failures resort to blaming the personnel responsible for task. The blame is also extended to personnel or individuals within proximity (they are blamed for being

closest to the error situation and not managing it even if it's beyond their control). Dekker, (2016) also recognizes that complex systems tend to drift towards failure despite best efforts hence, require understanding effective interplay of human factor in managing errors within a system. In this regard, error management climate plays a crucial role in shaping employee behaviors and attitudes (Carroll *et al.*, 2021; Chen *et al.*, 2021). One of the key outcomes of a positive EMC is the enhancement of employee resilience and innovative work behavior (Bundtzen and Hinrichs, 2021; Elsayed *et al.*, 2023). Error management climate changes how administration interacts with the employees when faced with an error, they do not blame an employee rather collaborate to search remedies within the system (Stasiak, 2021). This increases employee resilience, and they can effectively take calculated risks cultivating innovative work behavior (Akgün *et al.*, 2023).

Riaz *et al.*, (2015) highlights employee development as a neglected area within Pakistani construction industry. Memon *et al.*, (2023) adds the neglect arises from lack of a supportive climate within the industry that can allow construction workers to grow and improve their working environment. This emphasizes the gap that construction industry requires to focus on bringing about a cultural shift focusing on providing effective supportive system to deal with errors, harness employee resilience and translate it into innovative work behavior.

An analysis of the challenges faced by construction industry reveals that challenges arise from absence of an effective organizational climate. This structural gap inhibits employees from developing innovative work behavior. To solve these key challenges some researchers have proposed structural transformation within Pakistani construction industry (Hasan, 2022; Sharma, 2019) but, structural changes are not on sustainable path unless innovative behavior is cultivated (Llorca-Ponce *et al.*, 2021). The traditional Pakistani mindset prevailing within the industry views errors as failures to be avoided at all costs, creating a culture of fear and blame (Simpson *et al.*, 2020; Vanderheiden and Mayer, 2020). This very mindset discourages employees from taking risks or confidently engaging in problem solving consequently, hindering innovation. Furthermore, the traditional mindset is unable to harness employee resilience causing burnouts (Irfan *et al.*, 2023). Currently, the construction industry does not fully

comprehend impact of error management climate on employee resilience to develop innovative work behavior. The research aims to fill this gap in knowledge to facilitate in development of effective strategies to foster a culture of innovation and continuous improvement.

Since, construction industry is very demanding it requires employees to recover from work related challenges and setbacks (Meisels *et al.*, 2024; Mischke *et al.*, 2024). It is believed error management climate can harness employee resilience without causing burnouts (Ashraf *et al.*, 2022). The construction industry with positive error management climate is postulated to harness resilient employees who are more likely to engage in problem solving and deliver innovative solutions incubating innovative work behavior (AlEssa and Durugbo, 2022; Li and Zhang, 2022).

Error management climate (EMC) is a unique concept in organizational context that reflects on the perception of employee, management's attitudes and behaviors towards handling errors within an organization. Marx, (2019) associates no blame process within a just culture to ensure timely actions. This proactiveness allows members to collaborate and find a solution to the problem rather than letting the problem persist and cause more havoc than it should. Murray *et al.*, (2023) error management climate is about establishing just culture but with transparency and responsibility.

The climate established within the industry facilitates innovative work behavior. Where it refers to the actions and attitudes that employees exhibit when introducing and implementing new ideas (AlEssa and Durugbo, 2022). The proactiveness in problem solving is harnessed with a behavior characterized by creativity, agility, and a willingness to take risks (Afsar *et al.*, 2021). Innovative work behavior motivates employees to seek out new opportunities, challenge the status quo, and collaborate with others to bring their ideas to fruition (Afsar and Umrani, 2020). This does not only make the employees problem solvers rather visionaries to carve the future.

The research explores the key relationship between error management climate, employee resilience, and innovative work behavior, highlighting the mechanisms through which these elements interact to promote organizational innovation and adaptability. The research studies error management climate and innovative work behavior in depth, evaluating their key dimensions to establish completeness of error management climate

in instigating innovative work behavior in its operational totality.

Literature Review

The earlier work of Frese (1991) provide insights on defining organizational errors and their handling process. Frese's findings provide evidence that an effective organizational climate enhances error handling leading to desired organizational outcomes. Later the findings are substantiated by Keith and Frese (2008) showing companies having a better error management climate are tend to adapt to environmental changes in a proactive manner (Azhar, 2024). Since 2000 to 2010 research on error management climate has evolved to include organizational learning as an outcome variable (Edmondson *et al.*, 2004; Zhao and Olivera, 2006). During this period, research also began to link EMC with other positive organizational outcomes, such as communication effectiveness, safety, job satisfaction and employee engagement (Cigularov *et al.*, 2010b; Sexton *et al.*, 2000). Guchait *et al.*, (2016) researched working in high-EMC environments reported higher levels of job satisfaction and were more likely to engage in proactive problem-solving behavior.

After 2010s, the concept of EMC became increasingly linked to innovation (Keith and Frese, 2008). Studies by Frese and Keith (2015) demonstrated EMC fosters a culture of experimentation, where employees feel empowered to try new things without the fear of punishment for failure. The culture involving experimentation, spurs creativity and innovation. Similarly, a study by van Woerkom, (2012) reinforced that EMC creates a feedback-rich environment conducive for continuous innovation. Moreover, research Carmeli and Dothan, (2017) explored moments where team learns from failures contributes more to innovation by reducing the fear of failure and encouraging calculated risk-taking. Considering the research it can be established that organizations that actively promote EMC create an environment where employees are more willing to propose and test novel ideas, leading to greater innovation output (Fischer, 2021).

When considering this process intuitively, it can be considered that error prevention is the best possible way forward for an organization as it ensures no errors would occur. However, it is evident from the available research that focusing only on avoiding errors from happening can have negative impact on the organizational outcomes (Horvath *et al.*, 2023; Javed *et al.*, 2020; Klamar *et al.*, 2022). To understand errors are

mostly concealed and evaluated within the consequences of the task hence, this reduces the learning opportunities when trying to learn from the errors. Error management climate teaches to disconnects errors from the consequences (Azhar, 2024). Management and employees communicate errors as they happen, share their learning experience, seek help, help others, and find ways to ensure quick detection and handling of error situations (Van Dyck *et al.*, 2005, p. 1229). Error management climate establishes the groundwork for enabling employees to communicate effectively so that their information is well received (van Mourik *et al.*, 2023; Rami and Gould, 2016). The organization considers it as trustworthy and immediately collaborates to facilitate effective outcomes (Kruse and Wegge, 2024). Hudecek *et al.*, (2024) has concluded that it is perfectly fine for employees to fail but it is not acceptable for them to quit given the right environment to flourish. The employees are motivated to remain resilient in wake of challenging circumstances. This shows error management climate has an influence in cultivating innovative work behavior.

H₁: Error management climate has a significant influence on innovative work behavior.

There are two key approaches adopted by the organization, the first is error prevention and other one is error management (Carmeli *et al.*, 2012). Errors are inherent part of the process, and often occur when talented individuals strive to deliver value for the organization however, unforeseen circumstances can lead to errors/mistakes during this process (van Steenbergen *et al.*, 2020). The management can adopt the process of error prevention, which considers errors as an unwanted outcome, or they can adopt an approach of error management which teaches employees to deal with errors as opportunities to grow and improve outcomes for organization. An error prevention approach fosters culture of blame and reduces collaboration within the organization (Koolwijk *et al.*, 2020; Small *et al.*, 2023). Error prevention impacts employee resilience as they need more personal resources to battle the pressures created by blame (Wang *et al.*, 2020). Relying solely on preventive has central limitations, mistakes are inevitable aspect of the work environment, but, if blame dominates employees will avoid risks solely to prevent errors. This hinders employees in making effort to think out of the box and coming up with better solutions (Putz *et al.*, 2013). The second concept of error

management is gaining more acceptance as companies understand that making errors is part and parcel of every day operational environment. Recognizing this, more companies are exploring the possibilities of constructively engaging with error (Lermer and Hudecek, 2022).

EMC influences various organizational outcomes but its profound impact stems from its ability to develop an environment that can shape up internal processes to harnesses employees' personal resources and channel them into innovative outcomes (Fischer, 2021). Lu *et al.*, (2023) suggests that supportive environment within the organization develops employee resilience. Developing a sustainable behavior requires organization to connect with employees personal resources and integrate them into the system (Roczniewska *et al.*, 2022). The integration of organizational resources and employee expectations aligns effectively with error management climate. Galanakis and Tsitouri, (2022) claims there is a strong interplay between organizational demands and available resources within the organization, with a supportive environment organization can facilitate employees to maneuver through the organizational challenges. Sarrionandia *et al.*, (2018) studies employee resilience as mediator to channelize organizational resources to facilitate in managing through the organizational demands. Employee resilience responds better when supportive environment is provided, particularly through the adoption of error management climate (Li and Zhang, 2022). Kossek and Perrigino, (2016) establishes new premises for exploring employee resilience, regarding it as a dynamic variable that evolves over time, hence necessitating a dynamic system to address new phase requirements and continuously channel employees' personal resources. Zheng *et al.*, (2024) highlight that personal resources drive employee's effort while preventing them from drifting into burnout (Imran & Akhtar, 2023).

The employees like to understand organizational processes and seamlessly integrate into the system. The employees are willing to harness their personal resources in pursuit of effectively deliver organizational goals (Peretz, 2024). However, personal resources are scarce and need to be channeled via a system to maintain sustainability (Ispiryan *et al.*, 2024). Resilient employees are better equipped to manage the professional setbacks, showing the ability to effectively bounce back. The process involves trial and errors, employees can act on their own to find ways to proactively cope

with challenging circumstances (Scheibe *et al.*, 2022). An Error management climate within the organization harnesses the employee's resilience and empowers them to learn from their mistakes without fear (Saba, Fatima, Farooq, & Zafar, 2021; Saba, Tabish, & Khan, 2017). The climate is strongly associated with the culture and integrates within the system to enrich the culture (Zheng *et al.*, 2024). The alignment with culture adds a layer of sustainability and facilitates continuous improvement and development (Almaiman and McLaughlin, 2018). Now the emphasis shifts from punitive processes towards a learning environment without judgement, hindsight blame, and evaluating humans as the problem (Ni *et al.*, 2023). Error management climate helps explore the problem within the system rather than viewing human as the problem (Maqsoom *et al.*, 2023). This points to error management climate being critical in harnessing employee resources.

H₂: Error management climate has a significant influence on employee resilience.

Employee resilience is at the core of promoting innovative work behavior and serving as a driving force behind the creativity and adaptability of employees in organizations (Kossek and Perrigino, 2016). Resilience is this ability to bounce back from adversity; it's the mental strength to respond and survive the pitfalls of the workplace (Abukhait *et al.*, 2020). Being psychologically resilient isn't just about bouncing back-it's about bouncing forward and using setbacks as opportunities to get better and innovate (Lu *et al.*, 2023). The innovation process is itself full of ambiguity and uncertainty, and resilient employees tolerate higher levels of both. They can stay calm and focused in a stressful situation so that when approaching a problem, they can use a creative thinking approach and experiment with extraordinary solutions without the paralyzing fear of failure (Nassani *et al.*, 2024). An important aspect of work that involves innovation and requires a risk taking and an experimenting about new ideas, is this mindset.

In addition, resilience promotes a culture of continuous learning and improvement. Those who have resilience as employees are more likely to use reflective practices such as learning from what they have been through and making use of what they have learned in future challenges. The learning and adaptation to this evolutionary process are key to sustaining innovation within any organization (Cho and Lee, 2014; Mohammad *et al.*, 2024). Moreover, resilient employees create a supportive and a collaborative work environment. By being cognitively positive and adopting proactive coping strategies, they

tend to motivate and inspire their colleagues; jointly their resilience creates a collective resilience boosting the whole group's innovative capacity. Organizations that promote resilience are cultivating a workforce that can both withstand adversity, and drive innovation (Malik, 2023).

H3: Employee Resilience significantly influences innovative work behavior.

The new challenges that have arisen during uncertain situations have taught the organization to deal with errors in a collaborative and constructive manner as otherwise they can add more confusion, fear, and increase uncertainty for the employees (Lermer and Hudecek, 2022). Adopting an error management approach is appropriate because errors are a natural part of learning and innovation process (Edmondson, 2023; Edmondson *et al.*, 2004; Harvey *et al.*, 2019). Moreover, the modern organizations need to continuously innovate which is recognized as essential; hence, an appropriate climate must exist (van Breda-Verduijn and Heijboer, 2016). Dimitrova, (2017, p. 658) explains that the concept is about accepting errors as natural outcome and in some cases it's not even considered as undesirable; instead, they are embraced as a necessary part of the process to achieve excellence. However, it cannot be ignored or just left unmanaged this is where the concepts of error management climate comes in, regulating errors so they can be analyzed and improved (Dimitrova and Van Hooft, 2021). Guchait, (2023) findings reaffirm that error orientation greatly impacts the employee's ability to recover from odd (resilience) which he terms as service recovery performance. This shows that error management creates a healthy climate, focusing employee's resources on mitigating the relationship within the environment to enhance organizational outcomes like innovative work behavior.

Error management climate a key aspect of the organization it has been effectively explore however it connection with sustainable innovative outcomes is not explored (Saxena *et al.*, 2024). Connecting error management climate via employee resilience covers this aspect of the research and provides effective footing for analyzing the sustainable outcomes. As the world is transitioning towards AI and machine learning there is more need for organization to implement error management climate to ensure better management and maintain a positive integration of technology (Omol, 2024). Error management climate is not only effective in channelizing the personal resources of

employees to facilitate resilience and prevent burnouts. Additionally, it fosters behavioral development that drive innovative outcomes (Akgün *et al.*, 2023; Maqsoom *et al.*, 2023; Marquardt *et al.*, 2024). One of the key aspects of implementing error management climate is to create a fertile environment for innovation. An effective error management climate reduces fear of failure when employees approach daily problems (Shaukat, Rehman, & ul Haq, 2021; Shaukat, U., Qureshi, S. A., & ul Haq, 2020). This reduced fear encourages employees to adapt novel methods of solving recurring problems, thereby creating value in process (Kucharska, 2021; Rhaiem and Amara, 2021). Additionally, an error management climate reduces the fear of reprimand when employees fail to produce value while solving errors. In an error management climate, management is focused on learning from the process. It encourages employees to take risks, learn from outcomes, adjust and try again until desired results. This approach encourages employees to report errors rather than hide them, preventing potential crisis (Bundtzen and Hinrichs, 2021). Through an error management climate, management recognizes importance of prompt error reporting to enable immediate correction measure (Tuba, & Rana, 2015). In an error management environment employee are more likely to share information and collaborate to achieve effective outcome. While solving problems, employees gain some valuable insights that can benefit other experiencing similar problems or working on related projects (van Mourik *et al.*, 2023; van Steenbergen *et al.*, 2020; Zheng *et al.*, 2024). As a result, employees share accumulated knowledge, insights gained from failures, and outcomes obtained from implemented solutions. Error management climate promotes transparency, ensuring accurate reporting rather than manipulation to serve personal ambition. This environment effectively fosters innovative behavior within the organization. Error management philosophy is evolutionary; it adapts and grow over time. It seamlessly integrates with current business environment, particularly within industry 4.0. Innovation has allowed organization to achieve robust growth. This establishes employee resilience plays a crucial mediating role in linking error management climate to innovative work behavior.

H₄: Error management climate influences on innovative work behavior are significantly mediated by employee resilience.
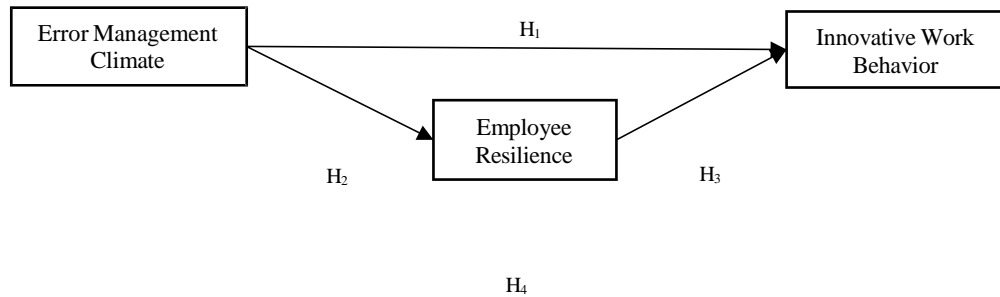

Methodology

The research follows the paradigm of positivism and seeks to explore research questions using quantitative methodology. The research evaluates the research questions using time lagged survey design model (Podsakoff *et al.*, 2024). This approach is effective to evaluate variable relationships and effects while minmizing the bias. According to Podsakoff et al., (2024) time lagged appraoch in data collection is an effective choice as it empowers the researcher to utilize cross-sectional design and avoiding common method bias adding more confidence in data collected.

To gain an effective sample from construction indusrtry in Pakistan, proposive sampling technique was employed. The technique provides some flexibility to gain a qualified sample from a very disjointed industry. A sample size of around 402 employees/managers is collected to allow for meaningful statistical analysis. Employees providing data on error management climate (EMC) and employee resilience and managers respond to employees innovative work behavior (IWB). Data related to EMC) and IWB is collected at one point in time (T1) and employee resilience with a delay of 15 days at time T2.

To analyze the questions the research adopts two-stage approach to structural equation modeling (SEM). The analysis approach provides confidence in data first before approaching the analysis results. In first stage the confirmatory factor analysis (CFA) validates the measurement models ensuring that the indicators accurately represented the underlying latent variables. The process confirmed the measurement model's validity and reliability to proceed with the analysis. The second stage involved in path analysis, which involves evaluating the structural relationships between EMC, Employee Resilience, and

IWB. The second stage involved bootstrapping techniques which creates multiple sub-samples of the original, this technique is nonparametric in approach hence researchers doesn't have to rely on testing assumptions for establishing normality. The stage proceeded with evaluating statistical significance of variables and to establish mediating role of employee resilience. This enhanced the robustness of the mediation analysis adding confidence to the results.

Results
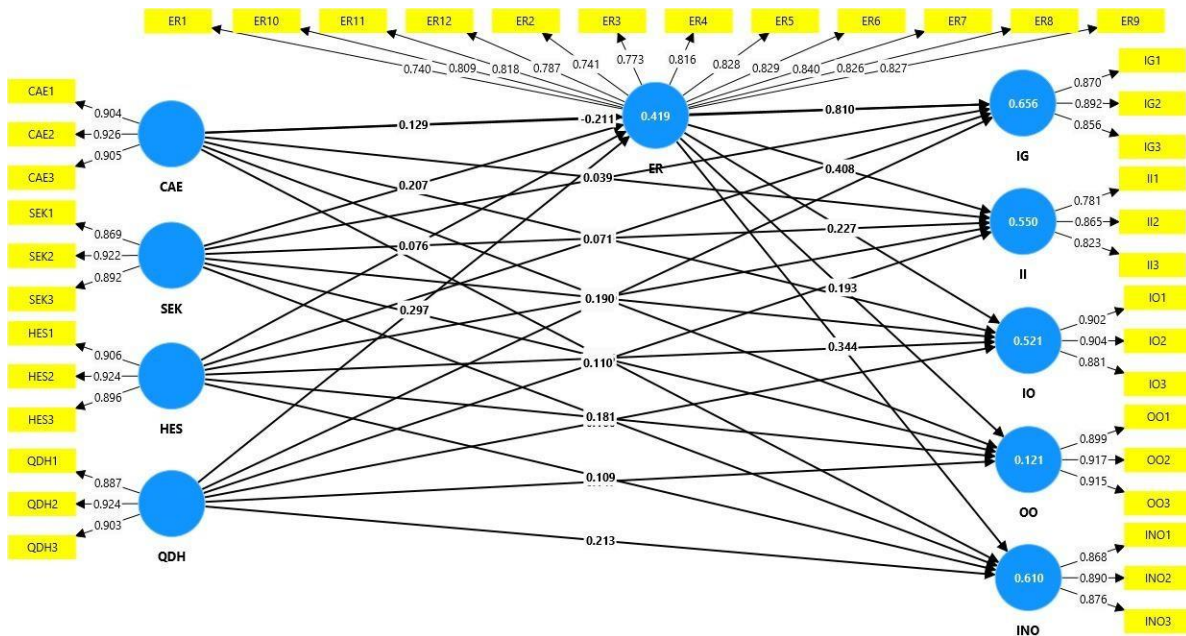
The first stage of the analysis involves confirmatory factor analysis (CFA) to determine if observed variables accurately reflects the underlying latent constructs. CFA facilitated in establishing the validity of measurement model aligning with established theoretical expectations. This establishes the baseline confidence to assess the relationships between the observed variables and their respective latent constructs. The latent constructs for measuring error management climate in this model are communication about errors (CAE), sharing error knowledge (SEK), helping in error situation (HES), and quick detection and handling (QDH). These dimensions are measured by observed indicators as provided by (Van Dyck *et al.*, 2005) represented as CAE1, CAE2 etc. the model fitness is established via Chi-square (χ^2), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The measurement model shows effective results, all the values are acceptable and show effective reliability. This confirms that the measurement model accurately represents the

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data before moving on to the second stage of the analysis.

Fit Summary

	Saturated model	Estimated model
SRMR	0.056	0.061
d_ULS	2.473	2.881
d_G	1.267	1.336
Chi-square	2865.574	2977.898
NFI	0.897	0.889

The above table explains model fit statistics comparing values of estimated model against the saturated. The SRMR given values are close to each other which confirms a good fit. On the other hand, Chi-square, d_ULS and d_G are higher in estimated model showing relatively weak fitness statistics. Additionally, NFI values demonstrate a slight decline. It can be concluded that overall, estimated model is reasonably close showing reasonable fitness to proceed.

The validation of measurement model also involves in determining the construct validity and reliability. the stage for further analysis of the structural relationships in the model.

Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CAE	0.898	0.899	0.937	0.831
ER	0.950	0.950	0.956	0.646
HES	0.895	0.895	0.934	0.826
IG	0.843	0.844	0.906	0.762
II	0.763	0.761	0.863	0.679
INO	0.852	0.852	0.910	0.771
IO	0.877	0.878	0.924	0.803
OO	0.897	0.898	0.936	0.829
QDH	0.889	0.889	0.931	0.818
SEK	0.875	0.877	0.923	0.801

The construct reliability and validity are fundamental aspects of the research. The research employed several key indicators like Cronbach's alpha, composite reliability ("rho_a" and "rho_c"), and Average Variance Extracted (AVE). Cronbach's alpha is the most known and widely used parameter for establishing reliability and its range is considered good when values are above 0.7. The above tables show values range from 0.763 to 0.950, indicating strong internal consistency across all constructs. Composite reliability ("rho_a" and "rho_c") is another parameter to establish validity and internal consistency of the research. The current values for all constructs are above acceptable range. The table shows the range from 0.761 to 0.956, further solidifying the reliability of the constructs. This suggests based on Cronbach alpha and Composite reliability the model consistently measure the underlying latent constructs.

The value established by composite reliability can be further authenticated by Average Variance Extracted (AVE). The recommended threshold of AVE is 0.5 where the above table indicates the range from 0.646 to 0.831. The values express that each construct can explain more than half of the variance occurring in respective indicators. This ability to adequately explain the variance supports good convergent validity. Reviewing the values for AVE constructs like "Communicating About Errors" (CAE) and "Quick Detection and Handling" (QDH) are among the constructs showing strong values (0.831 and 0.818, respectively). This is a strong indication that these variables are that these indicators are good representative of their constructs. Employee Resilience (ER) variable is among exhibiting the highest reliability measures, with a Cronbach's alpha of 0.950 and composite reliability values close to 1, signifying it is well-measured and highly consistent. The values of this model can be clearly state reliable, valid and consistent to produce reliable results.

Heterotrait-Monotrait Ratio (HTMT)

ER <-> CAE	0.599	OO <-> HES	0.325
HES <-> CAE	0.747	OO <-> IG	0.339
HES <-> ER	0.620	OO <-> II	0.450
IG <-> CAE	0.428	OO <-> INO	0.370
IG <-> ER	0.891	OO <-> IO	0.336
IG <-> HES	0.544	QDH <-> CAE	0.788

II <-> CAE	0.666	QDH <-> ER	0.663
II <-> ER	0.773	QDH <-> HES	0.921
II <-> HES	0.768	QDH <-> IG	0.560
II <-> IG	0.781	QDH <-> II	0.763
INO <-> CAE	0.699	QDH <-> INO	0.793
INO <-> ER	0.751	QDH <-> IO	0.725
INO <-> HES	0.760	QDH <-> OO	0.341
INO <-> IG	0.674	SEK <-> CAE	0.891
INO <-> II	0.770	SEK <-> ER	0.655
IO <-> CAE	0.695	SEK <-> HES	0.904
IO <-> ER	0.640	SEK <-> IG	0.568
IO <-> HES	0.698	SEK <-> II	0.751
IO <-> IG	0.566	SEK <-> INO	0.790
IO <-> II	0.878	SEK <-> IO	0.748
IO <-> INO	0.729	SEK <-> OO	0.299
OO <-> CAE	0.243	SEK <-> QDH	0.870
OO <-> ER	0.331		

The Heterotrait-Monotrait (HTMT) is a measure of discriminant validity, this provides insights into the fact that constructs that are theoretically distinct are also distinct in practice. This establishes that the constructs are unique and do not overlap hence the results will produce results that would define the reality. HTMT values are generally ranging below the established threshold of 0.85 establishing most constructs are distinct from each other, though a few exceed this threshold slightly. For example, the HTMT value between "Sharing Error Knowledge" (SEK) and "Communicating About Errors" (CAE) is 0.891, and between "Quick Detection and Handling" (QDH) and "Helping in Error Situations" (HES) is 0.921, indicating strong associations that could suggest potential overlap in these constructs.

However, other key relationships, such as "Idea Generation" (IG) with "Communicating About Errors" (CAE) at 0.428, and "Overcoming Obstacles" (OO) with various constructs (e.g., CAE at 0.243, ER at 0.331), show lower HTMT values, suggesting clear differentiation. The connections between constructs that are more

distantly related conceptually tend to show lower HTMT values, supporting the discriminant validity of these constructs within the model. Overall, the HTMT analysis supports the model's structural integrity, with most constructs demonstrating acceptable levels of distinctiveness, although the slight overlap in some areas (e.g., between SEK and CAE, QDH and HES) may warrant further examination to confirm they are adequately differentiated. This analysis reinforces confidence in the construct validity while highlighting areas for potential refinement.

	R-Square	R-square Adjusted
ER	0.419	0.413
IG	0.656	0.652
II	0.550	0.545
INO	0.610	0.605
IO	0.521	0.515
OO	0.121	0.110

R-squared represents the variance emerging within dependent variable caused by independent variable. Value shows the explanatory power independent variables to explain changes within innovative work behavior. In this case, the construct employee resilience (ER) has a desirable R-squared value of 0.419 (adjusted to 0.413), indicating that the independent variables explained a substantial portion of the variance in this factor. Similarly, Idea Generation (IG) and Innovative output (INO) had high R-squared values of 0.656 and 0.610, respectively, suggesting a fair amount of explained variance. In contrast, constructs like idea implementation (II) and Involving Others (IO) had medium R-squared values of 0.550 and 0.521, respectively, indicating that less variance in these constructs was explained by the predictors. Lastly, overcoming obstacles (OO) had a low R-square value of 0.121. Overall, the R-squared values provide important insights into the relative influence of different predictors on each outcome, setting.

Structure Equation Model (SEM)
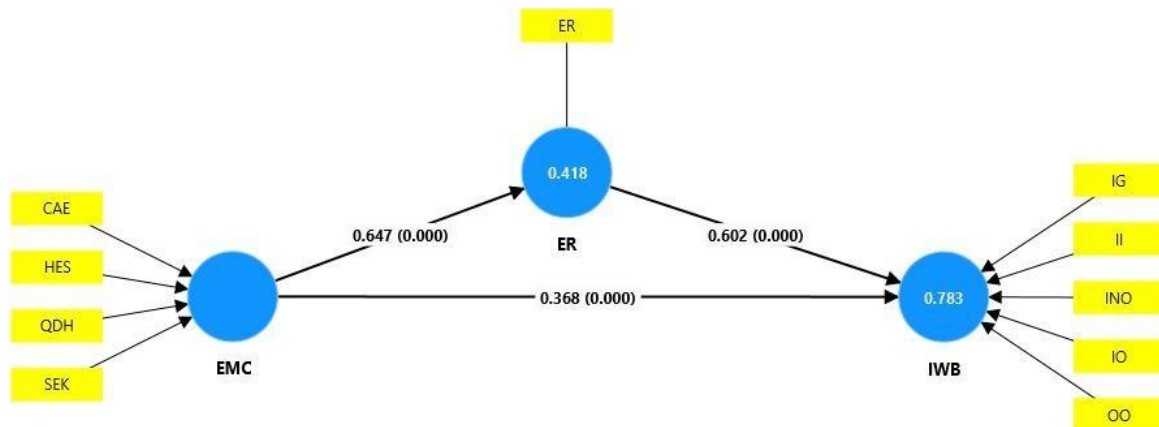
	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Error Management Climate -> Employee Resilience	0.647	0.648	0.057	11.400	0.000
Error Management Climate -> Innovative Work Behavior	0.368	0.372	0.052	7.035	0.000
Employee Resilience -> Innovative Work Behavior	0.602	0.599	0.047	12.709	0.000

The path coefficients provide insights into the strength and significance of the relationships between constructs in the model. Each path represents a hypothesized relationship, and the values indicate how much one construct influences another.

Error Management Climate → Employee Resilience: This path has a coefficient of 0.647, meaning that Error Management Climate has a strong positive effect on Employee Resilience. The high T statistic (11.400) and a P value of 0.000 indicate that this relationship is highly significant, suggesting that a supportive environment for managing errors substantially boosts employees' resilience.

Error Management Climate → Innovative Work Behavior: This path coefficient is 0.368, indicating a moderate positive relationship between Error Management Climate and Innovative Work Behavior. The T statistic of 7.035 and a P value of 0.000 confirm the significance of this relationship, suggesting that when an organization fosters error

management, it also encourages employees to engage in innovative behaviors, though to a lesser extent than it impacts resilience.

Employee Resilience → Innovative Work Behavior: With a path coefficient of 0.602, Employee Resilience has a strong positive impact on Innovative Work Behavior. The high T statistic (12.709) and a P value of 0.000 indicate that this relationship is highly significant. This result implies that resilient employees are more likely to engage in innovative work behaviors, possibly because resilience equips them to better handle the challenges associated with innovation.

Overall, these path coefficients, combined with their T statistics and P values, highlight a clear pathway from Error Management Climate to Innovative Work Behavior, both directly and indirectly through Employee Resilience. This suggests that fostering an error management climate not only directly encourages innovation but also does so indirectly by enhancing resilience, which in turn promotes innovative behavior. The significance of all these paths reinforces the robustness of these relationships in the model.

Specific Indirect Effect

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EMC -> ER -> IWB	0.389	0.388	0.044	8.831	0.000

The path coefficient for the indirect relationship Error Management Climate (EMC) → Employee Resilience (ER) → Innovative Work Behavior (IWB) is 0.389. This value represents the strength of the indirect effect of Error Management Climate on Innovative Work Behavior through the mediator, Employee Resilience. A coefficient of 0.389 indicates a moderately strong indirect impact of Error Management Climate on Innovative Work Behavior, suggesting that an environment supportive of error management significantly enhances resilience, which in turn positively influences employees' engagement in innovative behaviors. The T statistic of 8.831 and a P value of 0.000 confirm that this indirect path is highly significant, reinforcing the importance of Employee Resilience as a mediating factor. In summary, this indirect effect highlights that fostering an Error Management Climate not only has a direct impact on Innovation

but also strengthens it through building resilience in employees, emphasizing the role of resilience as a bridge between error management practices and innovation in the workplace.

Discussion on Hypotheses

The research aimed to establish evidence for error management climate to incultate innovative work behavior within the construction industry via employee resilience. The hypothesis have been tested positive providing effective insights on interplay of EMC on harnessing innovative work behavior.

The research evaluated the direct impact of error management climate on innovative work behavior which was determined as statistically significant. These results enables to imagine a construction workplace in Pakistan where employees are encouraged to report errors and collaborate to finding solutions to the prevailing problems within the construction industry (Koolwijk *et al.*, 2020; Maqsoom *et al.*, 2023). The recent decisions taken within the construction company establish the prevailing climate. Allowing open communication about errors accompanied with detailed analysis acts as a stepping stone for bring innovations. The research results guides that when errors are managed constructively it provides organization with the ability to create opportunities from the imminent problems. This reduces the fear of errors and employees become more confident in approaching errors. The management remains supportive of the process enabling team work translating into meaningful and practical outcomes. The hypothesis results are consistent with (Kruse and Wegge, 2024) as in an environment where employees feel safe to report and learn from errors, are able to view problems from a different prespectives share their thoughts with others to collaborate which results in innovative outcomes (Saxena *et al.*, 2024).

The second hypothesis explored the impact of employee resilience on the innovative work behavior. The result also came significant, showing an organizations where employee resilience is in focus the effective effects ripple far beyond the mere ability of employees' to recover from setbacks. Resilient employees are uniquely positioned to drive innovation (Marquardt *et al.*, 2024). Resilience improves employees readiness to challenge the status quo and adopt changes that are necessary to cope with rapidly transfoming external environment. The findings emphasize the fact in a clear

manner. The research findings substaintiate that employees possessing high resilience are more likely to develop an innovative work behavior.

These behavioral characteristics allow employees not to be significantly deterred by obstacles rather approach it as a challenging opportunity with a solutions-oriented mindset (Mohammad *et al.*, 2024). Now with these behavioral traits the employees are able to play with new ideas. They tend to engage in experiments, collaborate across teams, and be more willing to try novel approaches to reach their desired goals. In practical terms, organizations that invest in building resilience among employees unlock a dual benefit: a workforce that not only withstands change but also actively contributes to innovation. For instance, resilience training programs, coaching, and supportive leadership practices can create a foundation where innovation flourishes. Leaders who encourage autonomy and provide constructive feedback further enhance employees' willingness to take calculated risks and think outside the box (Zheng *et al.*, 2024). By fostering resilience, companies cultivate a culture where innovation becomes a natural outcome of everyday work. Resilient individuals act as catalysts, transforming the organization's approach to challenges into opportunities for growth, learning, and groundbreaking advancements. This relationship highlights a strategic pathway for organizations aiming to maintain a competitive edge in dynamic and uncertain environments (Afsar *et al.*, 2021).

The third hypothesis that error management climate directly influences employee resilience. The environment in which employees work makes their journey of resilience and innovation all the more compelling. Sakaki (2010) shows that adaptive strengths (e.g. resilience) in employees are fostered as a result of the effect of these employees' adaptive strengths on the innovation in organizations and the innovation fosters in the case of positive error management climate. Wherever there aren't errors seen as chances for growth, there is no support for employees to become anything more. The encouragement boosts their confidence and resilience, giving them the ability to tackle difficulties in constructive ways. With time, resilience acts as a path to innovative work behavior. Safe to fail and learn, employees take calculated risks, explore new ideas, experiment with new solutions (Elsayed *et al.*, 2023). And the connection doesn't end there. Resilience is directly impacted by a constructive error management climate, making a workplace

psychologically safe, and promoting emotional and cognitive agility. By inducing resilience, at the same time it exerts an indirect influence on innovation. An error tolerant environment allows employees that are resilient to better utilize the freedom and support afforded to them to engage in creative problem solving and collaborative ideation (Nassani *et al.*, 2024). These pathways form an interconnected pathway, and represent a powerful method for organizational development. Organisations can help build these individual traits such as resilience by fostering an environment that categorises errors as normal, and mistakes as opportunities for growth. This, in turn, sets off a domino effect: And resilient employees tend to be more valuable to organizational innovation and progress (Akgün *et al.*, 2023).

The fourth hypothesis puts all the pieces of the puzzle into one assuming that all the constructs are connected. While a positive error management climate is connected to innovative work behavior through the mediating role of employee resilience. The interplay presented how a carefully designed organizational climate sets off a long series of positive outcomes for both individual and collective performance (Zheng *et al.*, 2024). In such a workspace, employees are allowed to tackle errors openly in a collaborative manner since the error management climate was supportive. It creates a culture of resilience, building psychological safety and resilience to bounce back from setbacks. In turn, resilience becomes a critical enabler of innovative work behavior. Employees who are resilient are far more likely to suggest and experiment with new ideas, and are even better prepared to deal with the uncertainties and risks associated with innovation. These factors are connected dynamically. Like a constructive error management climate directly encourages innovation by facilitating risktaking and creativity, its greatest effect comes from the cultivation of resilience (Elsayed *et al.*, 2023). Organizations interested in adopting such a culture have employees that internalize their resilience to experiment, creatively solve problems, and adapt to quickly changing challenges, all of which lead to sustained innovation within the organization.

Implications for Practice

This study finds several practical implications for businesses aiming to boost their innovative capacity. Secondly, the environment must maintain a supportive error management climate. Good organizations create safe environments for people to learn

from mistakes and encourage open communication about those errors; they also provide constructive feedback. This will greatly increase employee resilience, one of the main engines of innovative work behavior.

Second, investment must be made in resilience building programs for employees. Employees learn coping strategies, stress management adaptive skills through training programs aimed at building employees' resilience. Leadership practices that cultivate resilience in the workplace include providing emotional support and recognizing employees' efforts, which can also help create a supportive work environment.

Lastly, error management climate and employee resilience are found to be so interwoven in nature that one should adopt a holistic approach when fostering innovation. This means that by exploring the organizational environment and individual capabilities simultaneously, organizations can produce a synergistic effect on their capacity for innovation.

Based on these findings, research suggest that organizations practice both integrated organizational climate and individual capacities development strategies. Again, to create growth oriented culture research first begin by improving the error management climate. Second, embedded in these interventions are resilience training programs and leadership development initiatives that outfit employees with the means to get 'off the mat' after falling and to thrive. But, finally, creating an innovation culture via cross functional collaboration and support for calculated risk taking, transforms your resilience into meaningful innovation.

Conclusion

The hypotheses tested in this study confirm the criticality of error management climate and employee resilience to promote innovative work behavior. The findings of this study establishes a strong connection among these constructs, ascertaining the need to foster a supportive organizational environment to increase personnel resilience and inculcate innovative work behavior. The findings also make contributions for construction industry professionals stressing on removing errors within the system rather than blaming individuals. The findings authenticate success in construction projects via cultivating innovative work behavior and simultaneously ensuring sustainable oganizational growth.

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