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Original scientific paper

The Influence of Risk Management Culture and Process on Competitive Advantage: Mediation Role of Employee Engagement in Construction Companies in Senegal

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Abstract: This comprehensive study delves into the intricate examination of the intricate interplay between risk management culture, process, and competitive advantage in Senegal's construction industry. By utilizing data from a diverse pool of 280 construction companies, the study employed quantitative research methods, specifically utilizing Structural Equation Modeling (SEM) with Smart PLS as the analytical tool. The results shed light on the significant contributions of risk management culture and process to competitive advantage, while also emphasizing the crucial role of employee engagement as a mediator in this dynamic relationship. These findings highlight the importance of fostering a risk-aware culture, implementing robust risk management processes, and nurturing employee engagement to strengthen competitive advantage in Senegal's construction sector. Moreover, this study enhances the existing literature on risk management, employee engagement, and competitive advantage, offering valuable implications for industry managers and policymakers navigating the complexities of the construction sector in Senegal and similar contexts.

Keywords: Risk management culture, Risk management process, Employee engagement, Competitive advantage

1. Introduction

In the current landscape of intense business competition, the significance of effective risk management cannot be overstated, especially within the high-risk construction industry. Implementing robust risk management practices is essential for attaining and maintaining a sustainable competitive advantage (Regona et al., 2022). Construction projects play a significant role in driving economic development, generating employment opportunities, and contributing to overall growth. However, these projects are also susceptible to various risks that can have a significant impact on project outcomes and financial performance (Assaad et al., 2020). In order to address these risks effectively, construction companies need to implement strong risk management strategies that combine organizational culture with clearly defined procedures. Additionally, acknowledging the significance of employee engagement is crucial for achieving organizational success and gaining a competitive edge (Nana and Otoo, 2023).

The construction industry in Senegal, a thriving center of activity in West Africa, provides an exceptional setting to examine how risk management culture, processes, employee engagement, and competitive advantage interact. With Senegal experiencing rapid economic growth and infrastructure development, construction companies face the challenge of capitalizing on opportunities while effectively managing complex project risks.

Recent studies have increasingly highlighted the importance of the relationship between risk management and competitive advantage, emphasizing the mediating role of employee engagement. For instance, the research by Yang, S., Ishtiaq, M., and Anwar, M. (2018) has shown the significant mediating effects of employee engagement on the relationship between human resource development practices and organizational commitment, impacting organizational performance and sustainability. Additionally, studies by Olajide and Shafau (2018) have explored enterprise risk management practices' impact on firm performance, emphasizing competitive advantage's mediating role and financial literacy's moderating role.

However, there is a significant gap in existing literature that specifically addresses the role of employee engagement as a mediator in Senegal's construction industry. This gap presents an important area for further research, considering the distinctive challenges and dynamics of the construction sector in emerging markets. To fill this gap, it is crucial to investigate how the culture and processes of risk management impact the competitive advantage of construction companies in Senegal, with a particular focus on the mediating influence of employee engagement. By examining these connections, this study aims to advance theoretical knowledge and offer practical insights for construction companies in Senegal and similar contexts worldwide.

To accomplish this objective, the study will undertake an extensive review of existing literature, incorporating relevant theories and empirical studies from the fields of risk management, organizational culture, employee engagement, and competitive advantage. A quantitative approach will be employed to gather data from a representative sample of construction companies in Senegal. Advanced statistical techniques and thematic analysis will be utilized to analyze the data and uncover the connections between risk management culture, processes, employee engagement, and competitive advantage.

The forthcoming results will underscore the importance of cultivating a strong culture of risk management and establishing efficient risk management procedures within construction firms. Through an examination of the intermediary effect of employee engagement, the research will shed light on how employee engagement affects the relationship between risk management and gaining a competitive edge.. These results will inform various stakeholders in the construction industry, including executives, managers, and policymakers, about the crucial factors that drive competitive advantage in Senegal's construction sector. Additionally, the study will offer practical recommendations for enhancing risk management practices and promoting employee engagement.
The structure of the study is as follows: Section 2 provides a literature review and develops the hypotheses, Section 3 outlines the research methodology, Section 4 presents the results and data analysis, Section 5 discusses the findings and their implications, and Section 6 concludes the study.

2. Literature Review and Hypotheses Development

2.1. Definition and Components of Risk Management Culture

Risk management culture encompasses the collective mindset, attitudes, beliefs, and behaviors prevalent within an organization, influencing its approach to the identification, evaluation, and mitigation of risks (S. Kumar and Anbanandam, 2019). It encompasses the values, norms, and practices that influence how risks are perceived, communicated, and addressed at all levels of the organization. Extensive theoretical and empirical research has acknowledged the importance of risk management culture (Bromiley et al., 2014). A strong risk management culture is essential for organizations to effectively navigate uncertainties, make informed decisions, and achieve their goals while minimizing potential adverse outcomes (Sinha and Arena, 2020). It provides the groundwork for a proactive and integrated risk management approach, integrating risk considerations into the organization's operational fabric. Leadership plays a pivotal role in shaping and promoting a risk-aware culture. Effective leaders set the tone at the top by demonstrating a commitment to risk management, fostering open communication, and advocating for a culture of accountability and continuous improvement (Power, 2009). Their actions and behaviors influence how risks are perceived and managed throughout the organization. Likewise, organizational values and norms also play a vital role in shaping risk management culture. Organizations with a strong risk management culture prioritize ethical behavior, transparency, and accountability (Medina-salgado and Settembre-blundo, 2021). They establish an environment where employees are encouraged to speak up about risks, mistakes, and near misses, fostering a learning-oriented culture that promotes continuous improvement and innovation.

Effective communication is vital in establishing and maintaining a culture of risk management. Organizations need to clearly communicate their risk management policies, procedures, and expectations to all employees. They should offer training programs to increase risk awareness, equip employees with the necessary skills and knowledge to recognize and handle risks, and promote a mindset that values risk awareness throughout the organization. It is crucial to incorporate risk considerations into decision-making processes to foster a robust risk management culture. This involves conducting risk assessments during strategic planning, project management, and day-to-day operations. By doing so, organizations can identify, evaluate, and address risks appropriately, leading to well-informed decisions and efficient resource allocation (Olawale et al., 2024).

Creating mechanisms for risk reporting and feedback is crucial in cultivating an effective risk management culture. Organizations should actively encourage employees to report near misses, incidents, and potential risks. Feedback loops play a vital role in leveraging past experiences, enhancing risk management practices, and ensuring ongoing monitoring and evaluation of risks. A robust risk management culture embraces organizational learning and adaptability. It promotes a proactive and flexible approach to risk, placing emphasis on learning from both failures and successes (Stemn et al., 2018). Valuable insights from risk events and incidents are captured, shared, and utilized to enhance risk management practices. This fosters a culture of continuous learning and improvement (Mikes, 2009). The regulatory and industry context also shapes an organization's risk management culture. Compliance with legal and regulatory requirements, industry standards, and best practices influences risk management practices and expectations (Moshood et al., 2020). Organizations operating in highly regulated industries may have more formalized risk management cultures, while others may have more flexibility in shaping their risk management approaches. Hence, a robust risk management culture is a fundamental component of effective risk management. It requires leadership commitment, clear communication, integration with decision-making processes, and a learning-oriented approach. By fostering a risk-aware culture, organizations can enhance their resilience, maintain stakeholder trust, and achieve long-term success in an increasingly complex and uncertain business environment.

2.2. Importance of Risk Management Culture in Construction Companies

Previous studies have emphasized the significance of a positive risk management culture in construction companies (Saeidi et al., 2018). A strong risk management culture fosters a proactive approach towards risk identification, assessment, and mitigation. It promotes effective communication and collaboration among employees, enhances risk-aware decision-making, and creates a supportive environment for risk management practices. A positive risk management culture has been associated with improved project performance, reduced costs, increased stakeholder satisfaction, and ultimately, competitive advantage (Saglam and Çankaya, 2020).

Prior research has placed considerable emphasis on recognizing the significance of cultivating a favorable risk management culture within construction companies. Such a culture encourages a proactive mindset in identifying, evaluating, and mitigating risks (Disasters, 2023). By fostering an environment that prioritizes effective communication and collaboration among employees, it facilitates risk-conscious decision-making and bolsters the implementation of resilient risk management practices. (Willumsen et al., 2019). Moreover, a positive risk management culture in construction companies has been found to have several benefits and advantages. Firstly, it is associated with improved project performance. When a construction company has a strong risk management culture, it enables proactive identification and assessment of risks, allowing for timely and appropriate risk (Asim et al., 2022). This proactive approach helps in minimizing the occurrence of incidents, delays, and disruptions, thereby enhancing overall project outcomes.

Secondly, a positive risk management culture in construction companies contributes to cost reduction. By integrating risk management practices into everyday operations, construction companies can identify potential risks that may lead to cost overruns, rework, or schedule delays (Tepeli et al., 2019). Early identification and effective risk mitigation strategies can significantly reduce these risks, resulting in cost savings and improved financial performance.

Thirdly, a strong risk management culture enhances stakeholder satisfaction. Construction projects involve various stakeholders, including clients, contractors, subcontractors, and suppliers. When a construction company demonstrates a robust risk management culture, it instills confidence and trust in its stakeholders. Effective risk communication, transparency, and accountability create a positive perception of the company's ability to manage risks, leading to increased stakeholder satisfaction and long-term relationships.

Moreover, a positive risk management culture within construction companies contributes to their competitive advantage. In an industry characterized by complexities, uncertainties, and inherent risks, companies that prioritize risk management and embed it into their organizational culture stand out from their competitors. Clients and partners are more likely to choose companies that demonstrate a strong commitment to risk management, as it provides assurance of reliable project delivery and successful outcomes.

2.3. Risk Management Process

2.3.1. Risk Identification and Assessment

Risk identification and assessment are pivotal components of construction risk management since they encompass the recognition and evaluation of potential risks, taking into account their probability and consequences on project goals. This procedure empowers construction companies to actively identify and comprehend the risks they might face during various stages of a project. Through evaluating the likelihood of these risks materializing and gauging their potential impact on project objectives, organizations can devise efficient strategies to appropriately mitigate or handle these risks. By adopting this approach, construction projects are better prepared to navigate potential obstacles and successfully accomplish their desired objectives. This systematic process allows companies to proactively address risks, develop mitigation strategies, and allocate resources effectively. The first step is gathering information from various sources like project documentation, historical data, industry standards, and expert knowledge to uncover risks that may occur during the project lifecycle. Techniques such as brainstorming sessions, stakeholder interviews, and reviewing past projects aid in identifying these risks.

After identification, risks should be categorized based on their characteristics for a focused assessment and response planning. Categories commonly used include technical, financial, operational, legal and regulatory, environmental, and reputational risks (X. Li et al., 2019). Risk assessment involves evaluating the likelihood and impact of identified risks using qualitative methods (subjective judgments, risk rating scales, risk matrices, expert opinions) and quantitative methods (Hock-Doepgen et al., 2021). Once assessed, risks are prioritized based on their significance. High-priority risks, with greater likelihood and impact, receive more resources and tailored mitigation strategies. Tools like risk matrices or risk registers visually represent these risks, highlighting those requiring immediate attention.

Mitigation strategies are created to reduce the likelihood or impact of risks. These strategies encompass preventive actions, contingency plans, risk transfer (insurance, contracts), or alternative project designs (Algarni, 2023). Involving stakeholders like project managers, engineers, contractors, and subcontractors is crucial. Regular monitoring and evaluation ensure the effectiveness of mitigation measures. Construction companies must develop comprehensive strategies and responses to mitigate identified risks. This involves choosing suitable options like risk avoidance, reduction, transfer, or acceptance. Effective mitigation measures minimize project disruptions, enhance safety, and maintain schedules and budgets.

2.3.2. Risk Monitoring and Control

Monitoring and controlling risks are essential for the success of construction projects. This involves continuous tracking, evaluation, and implementation of control measures to mitigate risks. It allows construction companies to maintain control over potential threats and gain a competitive advantage. Regular risk review meetings facilitate discussions and assessments of identified risks, ensuring that management strategies remain effective and relevant while identifying new risks. Key performance indicators (KPIs) measure the progress of risk management activities, including the number of identified risks, percentage of mitigated risks, and effectiveness of response strategies, highlighting areas for improvement. Feedback mechanisms gather insights from project team members and stakeholders, enabling prompt identification of new risks or updates on existing ones, and implementing corrective actions. Timely risk monitoring and control help identify early warning signs, enabling proactive control measures and prompt risk addressing. This enhances responsiveness to changing project conditions. Effective risk monitoring and control demonstrate a company's commitment to successful project delivery, instilling confidence in clients and stakeholders, improving reputation, and potentially leading to cost savings, better project performance, and increased profitability.

2.4. Employee Engagement

Employee engagement pertains to the extent of emotional attachment, active participation, and loyalty that employees exhibit towards their work and the organization they belong to (Info et al., 2021). It encompasses various aspects that contribute to fostering a favorable and productive workplace environment. Job satisfaction represents the level of contentment and fulfillment experienced by employees in their respective roles. Organizational commitment, on the other hand, refers to the extent to which employees identify with and are dedicated to the goals and values of their organization. Committed employees frequently surpass their job expectations and willingly contribute beyond what is required of them.

By incorporating job satisfaction, organizational commitment, motivation, discretionary effort, and participation, employee engagement captures the emotional connection and dedication employees have towards their work and organization. Cultivating employee engagement is instrumental in establishing a work environment that is positive, productive, and rewarding, ultimately leading to enhanced performance and business achievements (Kremer et al., 2018). Engaged employees actively embrace risk management practices by actively participating in risk identification, assessment, and mitigation. They display heightened levels of risk awareness, proactivity, and accountability, thereby fostering a positive risk management culture. Additionally, engaged employees facilitate effective communication, knowledge sharing, and collaboration, all of which contribute to successful risk management. Their involvement is crucial in achieving a competitive advantage in the business landscape (Kusnanto and Azhari, 2023).

2.5. Competitive Advantage

Competitive advantage refers to the unique and sustainable factors that allow organizations to outperform competitors. Key dimensions include cost leadership, differentiation, innovation, customer satisfaction, and market share (V. Kumar et al., 2016). Cost leadership involves providing products or services at lower costs than competitors by optimizing efficiencies, streamlining processes, and leveraging economies of scale. This attracts cost-conscious customers, leading to higher profitability and market share as long as the cost advantage is maintained.

Differentiation focuses on offering unique products or services through quality, features, design, or brand image. By creating a distinctive value proposition, companies can attract customers willing to pay a premium, leading to customer loyalty, increased market share, and higher profit margins (Liu and Atuahene-gima, 2018). Customer satisfaction emphasizes delivering exceptional customer experiences. By prioritizing customer needs and providing superior service, organizations build strong customer loyalty and advocacy. Satisfied customers are more likely to repurchase, refer others, and contribute to a positive reputation, leading to increased market share and sustainable growth.

Market share reflects an organization's position relative to competitors. A higher market share indicates a larger customer base and greater control over resources, distribution channels, and pricing. Companies with significant market share benefit from economies of scale, increased bargaining power, and better brand recognition, creating barriers to entry for new competitors and providing a platform for growth and expansion. In summary, competitive advantage through cost leadership, differentiation, innovation, customer satisfaction, and market share drives an organization's success and market dominance (Bahamid et al., 2022).

2.6. Relationship Between Risk Management and Competitive Advantage

Previous research consistently shows that effective risk management practices yield competitive advantages in diverse industries (R. Ahmed et al., 2021). This holds true for construction companies that prioritize and integrate risk management into their strategic decision-making and project execution (Pandeya et al., 2021). Proactive risk management enables these companies to minimize disruptions, allocate resources efficiently, and make informed decisions.

By identifying and assessing risks early on, they avoid costly incidents and delays, leading to improved project performance and client satisfaction (Johnson, 2021). Moreover, effective risk management enhances a construction company's reputation and trustworthiness. Clients trust companies with robust risk management frameworks, resulting in repeat business and long-term relationships, giving them a competitive advantage (Gordon et al., 2009). Furthermore, construction companies excelling in risk management enjoy a stronger market position by differentiating themselves from competitors and attracting clients who value successful risk management (El-Sayegh et al., 2021). Additionally, effective risk management empowers construction companies to seize opportunities and drive innovation. By systematically evaluating and responding to risks, they identify areas for improvement, explore new technologies, and adapt to market changes. This fosters a culture of innovation, enabling companies to stay ahead of competitors and maintain their competitive advantage.

2.7. Theoretical Framework and Hypotheses Development

2.7.1. Risk Management Culture and Competitive Advantage

Organizations with a robust risk management culture tend to make more informed and effective decisions. By systematically identifying, assessing, and managing risks, they can anticipate potential challenges, evaluate alternatives, and choose strategies that align with their risk appetite (Asim et al., 2022). This approach allows them to capitalize on opportunities while minimizing potential threats, ultimately leading to a competitive advantage. A proactive risk management culture fosters a forward-looking approach to risk mitigation. Instead of reacting to risks as they arise, these organizations anticipate risks and implement proactive measures to mitigate them. This reduces the likelihood and impact of adverse events, helping avoid costly disruptions and maintain operational continuity, thus providing a competitive edge (Advantage, 2015).

A profound risk management culture not only fosters stakeholder confidence and trust, but also engenders a deep sense of assurance among customers, investors, and partners when an organization exhibits an all-encompassing comprehension of potential risks and implements highly effective risk management practices (Stone et al., 2017). Both empirical evidence and theoretical viewpoints converge to affirm that a fortified risk management culture plays a pivotal role in attaining a competitive edge (Jegan et al., 2024). Extensive research has consistently demonstrated that organizations endowed with resilient risk management cultures surpass their competitors in terms of financial performance, market share, innovation, and overall effectiveness.

The resource-based view (RBV) and dynamic capabilities theory offer insights into how risk management culture leads to competitive advantage. According to the RBV, a firm's unique resources and capabilities, including its internal processes and culture, can provide a sustainable competitive advantage (Shad et al., 2018). A robust risk management culture is a valuable asset that improves an organization's capacity to efficiently recognize, evaluate, and address risks. According to dynamic capabilities theory, an organization's adaptability to changing environments is crucial. By fostering a risk management culture focused on proactive risk identification and mitigation, organizations can anticipate and respond to emerging risks and opportunities. This adaptability and agility are key to sustaining a competitive advantage in dynamic and uncertain markets.

Hypothesis 1: Risk management culture positively influences competitive advantage.

2.7.2. Risk Management Process and Competitive Advantage

The risk management process includes risk identification, assessment, mitigation, and monitoring. Effective risk management practices, in turn, positively impact competitive advantage, leading to improved project performance, reduced costs, enhanced stakeholder satisfaction, and increased market share (Ormiston, 2022).

Organizations with a robust risk management process are likely to gain a competitive advantage. By systematically identifying, assessing, and managing risks, these organizations can anticipate potential challenges, evaluate alternatives, and choose strategies that align with their risk appetite (Jegan et al., 2024). This approach enables them to capitalize on opportunities while minimizing potential threats, leading to superior performance and sustainability.

A proactive risk management process fosters a forward-looking approach to risk mitigation (D. Ahmed, 2022). Rather than reacting to risks as they arise, these organizations anticipate risks and implement proactive measures to mitigate them. This reduces the likelihood and impact of adverse events, helps avoid costly disruptions, and maintains operational continuity, thus providing a competitive edge. Moreover, an effective risk management process cultivates stakeholder confidence and trust. When an organization demonstrates a comprehensive understanding of potential risks and implements effective risk management practices, it instills confidence in stakeholders, including customers, investors, and partners.

Empirical evidence and theoretical perspectives suggest that a strong risk management process contributes to gaining a competitive advantage (Handoyo et al., 2023). Studies indicate that organizations with effective risk management processes outperform their competitors in financial performance, market share, innovation, and overall effectiveness (Hinterhuber and Hinterhuber, 2013). According to the RBV, a firm's unique resources and capabilities, including its internal processes, can provide a sustainable competitive advantage. An effective risk management process is one such unique resource that enhances an organization's ability to identify, assess, and respond to risks effectively (H. Fan et al., 2016). A risk management process that promotes proactive identification and mitigation of risks enables organizations to anticipate and respond to emerging threats and opportunities. This adaptability and agility contribute to maintaining a competitive advantage in dynamic and uncertain markets. Based on the empirical and theoretical perspectives, the following hypotheses can be constructed:
Hypothesis 2: Risk management process positively influences competitive advantage

2.8. Mediating Role of Employee Engagement

2.8.1. Risk Management Culture, Employee Engagement and Competitive Advantage

In the current fast-paced business landscape, organizations seek to gain a competitive edge through effective risk management. A strong risk management culture, firmly ingrained within an organization, is instrumental in this pursuit. This culture encompasses shared values, beliefs, and practices that emphasize risk awareness, communication, responsiveness, and accountability (Braunscheidel and Suresh, 2009). Successful implementation of a risk management culture not only helps mitigate potential threats but also creates an environment that promotes employee engagement, leading to a competitive advantage. A risk management culture serves as the foundation for an organization to anticipate, identify, and manage risks effectively. It ensures that employees at all levels are knowledgeable about potential risks, comprehend communication protocols, and possess the agility to respond swiftly and effectively (Soufi et al., 2021). Furthermore, assigning clear roles and responsibilities for risk management creates a structured approach to risk mitigation. This preparedness translates into business stability and resilience, which are crucial in maintaining a competitive position in the market (Areas, 2013).

Employee Engagement acts as the critical intermediary in this relationship. Engaged employees exhibit higher levels of motivation, loyalty, alignment with organizational goals, and performance (Y. Li et al., 2018). A robust risk management culture amplifies employee engagement by establishing a sense of security and clarity within the organization. When employees are well-informed and actively involved in risk management processes, they feel valued and essential to the organization's achievements. Open communication channels regarding risks cultivate trust and loyalty, while clear accountability enhances their comprehension of their role within the broader organizational framework. The combined impact of a strong risk management culture and high employee engagement generates a synergistic effect that drives competitive advantage (Komolafe et al., 2024).

Practically, organizations can leverage this connection by promoting risk awareness through training and communication, encouraging open discussions about risks, defining clear roles, and fostering a supportive environment that rewards proactive risk management. By doing so, organizations not only protect themselves from potential risks but also cultivate an engaged workforce that drives efficiency and market leadership.

Therefore, the impact of risk management culture on competitive advantage, through employee engagement, highlights the importance of integrating organizational culture and employee management. By instilling a strong risk management culture, organizations can boost employee engagement, resulting in superior performance, innovation, customer satisfaction, and ultimately, a significant competitive advantage in the market.
Hypotheses 3: Employee engagement has a significant positive mediation impact on the relationship between risk management culture and competitive advantage

2.8.2. Risk Management Process, Employee Engagement and Competitive Advantage

In the dynamic and fiercely competitive realm of contemporary business, the adeptness to proficiently navigate risks assumes paramount importance, as it is instrumental in safeguarding and elevating an organization's competitive advantage (Sonnentag et al., 2021). Central to organizational resilience, the risk management process, encompassing the identification, assessment, mitigation, and monitoring of risks, serves as the fundamental pillar. Nevertheless, the true potential of this process is fully harnessed when it is bolstered by elevated levels of employee engagement. Employee engagement emerges as a significant positive mediator, fortifying the connection between effective risk management and the attainment of a competitive advantage (Y. Fan et al., 2018).

The risk management process involves a methodical approach to identifying potential risks, assessing their impact, devising strategies to mitigate them, and consistently monitoring the risk environment (Qiu et al., 2020). This process ensures that an organization is well-prepared to handle uncertainties and maintain operational stability. Effective risk management reduces disruptions, safeguards assets, and ensures compliance with regulations, thereby protecting the organization's reputation and financial well-being. Employee engagement refers to the emotional dedication and active participation of employees in their work and the organization. Engaged employees are motivated, loyal, and aligned with the company's objectives and values. They demonstrate increased productivity, superior performance, and a willingness to go beyond their job requirements. When employees are engaged, they are more inclined to actively participate in and contribute to the risk management process. The positive impact of employee engagement on the relationship between the risk management process and competitive advantage can be explained as follows: Engaged employees are more observant and proactive in identifying potential risks. Their heightened sense of responsibility and commitment drives them to be more observant and report issues promptly, allowing the organization to address risks before they escalate.

When employees feel valued and heard, they are more likely to share information and collaborate on risk mitigation strategies. This collective effort leads to more comprehensive and effective risk management solutions (Sattam et al., 2020). Engaged employees are more innovative and adaptable, essential traits for effective risk management. They are more likely to come up with creative solutions to mitigate risks and adapt quickly to changing circumstances, ensuring the organization remains resilient and competitive. High levels of engagement lead to a stronger commitment to organizational goals, including risk management objectives. Engaged employees understand the importance of risk management in achieving long-term success and are dedicated to supporting these efforts.

Engaged employees perform at higher levels, contributing to overall organizational efficiency. Their active participation in risk management processes ensures that risk-related tasks are completed more efficiently and effectively, reducing the likelihood of disruptions and enhancing the organization's competitive position (Hughes and Rog, 2008). Effective risk management processes, supported by engaged employees, lead to competitive advantage. Engaged employees drive innovation, efficiency, and customer satisfaction, enhancing the organization's reputation and market position. Employee engagement mediates the relationship between risk management and competitive advantage, making it crucial for sustainable success in a dynamic business environment. Therefore based on the above arguments
Hypothesis 4: Employee engagement plays a pivotal role in mediating the relationship between the risk management process and competitive advantage.

2.8.3. Employee Engagement and Competitive Advantage

Employee engagement significantly influences an organization's competitive advantage in today's business landscape. Engaged employees, motivated and committed to their work, drive higher productivity and performance, enabling the organization to deliver superior products or services compared to competitors (Gebauer et al., 2017). Engaged employees provide excellent customer service, fostering loyalty and satisfaction. They contribute to innovation and create a creative environment. Their problem-solving skills and adaptability enable the organization to navigate changes and seize opportunities efficiently.

Employee engagement also contributes to talent retention, as engaged employees are more likely to stay with the organization long-term, preserving institutional knowledge and expertise. Furthermore, a positive work environment characterized by high engagement levels enhances (Gebauer et al., 2017) the organization's reputation, attracting both top talent and customers and solidifying its competitive position. Engaged employees enhance operational efficiency, reduce costs, and boost profitability. They contribute to productivity, innovation, customer satisfaction, talent retention, and operational efficiency, all vital for competitive advantage. Organizations prioritizing employee engagement outperform competitors, adapt to market changes, and achieve long-term success. The proposed theoretical framework for studying risk management culture's impact on competitive advantage through employee engagement mediation in Senegalese construction companies is shown in Figure 1.

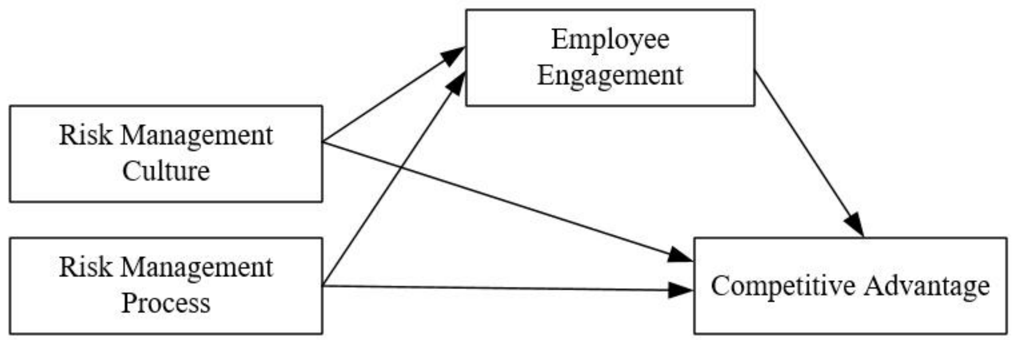

Figure 1: The Proposed Conceptual Model of This Study by the Authors

3. Research Methodology

3.1. Research Design

This study employed a quantitative approach, focusing on engineering construction companies in Senegal. A sample size of 280 companies was selected using purposive sampling (Hajjar, 2018). The Likert scale was used to collect reliable and valid data, ensuring credibility and consistency of findings. The research design demonstrates meticulousness and rigor in addressing the objectives and obtaining high-quality data for analysis.

3.2. Sampling Techniques and Data Collection

The study involved 1,200 construction company managers, supervisors, and owners to determine the sample size. Purposive sampling selected 315 respondents, while cluster sampling chose 10 companies from a pool of 30. Simple random sampling ensured unbiased representation. The researchers distributed 315 questionnaires, collected and analyzed 280 using Smart PLS statistical tools, ensuring diverse and representative data.

3.1. Measurement Items

This study employed meticulously designed questionnaires, adapted from previous research, to measure various factors using a five-point Likert scale. It included twenty-four assessment items and four construct variables, providing a nuanced understanding. Established methods were used to evaluate competitive advantage, with modifications based on prior findings. Six contextualized items were assessed using a five-point Likert scale. The study identified risk management culture, process, and employee engagement as variables. The rigorous methodology and Smart PLS analysis yielded valuable insights into the complex interplay of these factors. Appendix A provides detailed information on the measurement items.

4. Results and Analysis

4.1. Descriptive Statistics for Demography

The study collected demographic information from the 280 sample respondents, including age, gender, educational background, and years of experience in engineering construction. The findings revealed a male predominance in the sector, potentially influencing risk management practices and competitive advantage. The educational background showed a significant percentage with bachelor's and master's degrees, indicating a value placed on education in the sector. This could impact innovation adaptation and risk management practices. The majority of respondents had more than 15 years of experience, suggesting that many firms in the sector have been established for a significant period, which is associated with higher success rates in credit applications. Table 1 highlights the respondents' ability to comprehend and contribute valuable information to the study. Understanding these demographic variables is essential for interpreting the study's results and their implications in the engineering construction industry in Senegal.

Table 1: Demographic Information

Demographic variables		Frequency	%
Gender	Male	168	60
	Female	112	40
Age	20- 25	28	10
	26- 30	34	12
	31-35	120	43
	36-40	50	18
	Above 40	56	20
Education	Diploma	70	25
	Bachelor	101	36
	Masters	59	21
	Doctor	8	3
	Others	56	20
Engineering Construction Companies Experiences (Year)	6-10	62	22
	11-15	90	32
	Above 15	128	46

4.2. Measurement Model Analysis

In this research, the measurement model was utilized to determine the construct's validity and reliability. The research hypotheses were then examined using partial least squares structural equation modeling (PLS-SEM). PLS-SEM is a powerful tool for assessing the connections between constructs, investigating moderating effects, and evaluating the theoretical coherence of variable relationships. Initially, Smart PLS was employed to estimate the measurement model, and then it was used to test the hypothetical associations in the structural model.

4.3. Reliability and Validity Analysis

The present study employed PLS-SEM with Smart PLS as a statistical technique to assess the reliability and validity of questionnaire items. The measurement model evaluated validity and reliability by examining factor loadings, Cronbach's alpha, composite reliability, convergent validity, and discriminant validity (Suteja et al., 2023). Table 2 presents the results of convergent validity, while internal consistency was evaluated using Cronbach's alpha and composite reliability (Haji-Othman and Yusuff, 2022). The recommended thresholds for these measures are values above 0.70, and both the average variance extracted (AVE) and factor loadings should exceed 0.50 (Henseler et al., 2015). The data from the study, as shown in Table 2 and Figure 2, demonstrate robustness and reliability, with Cronbach's alpha and C.R. values surpassing 0.70, and AVE and factor loadings exceeding 0.50, indicating strong correlations between the items and actual convergent validity.

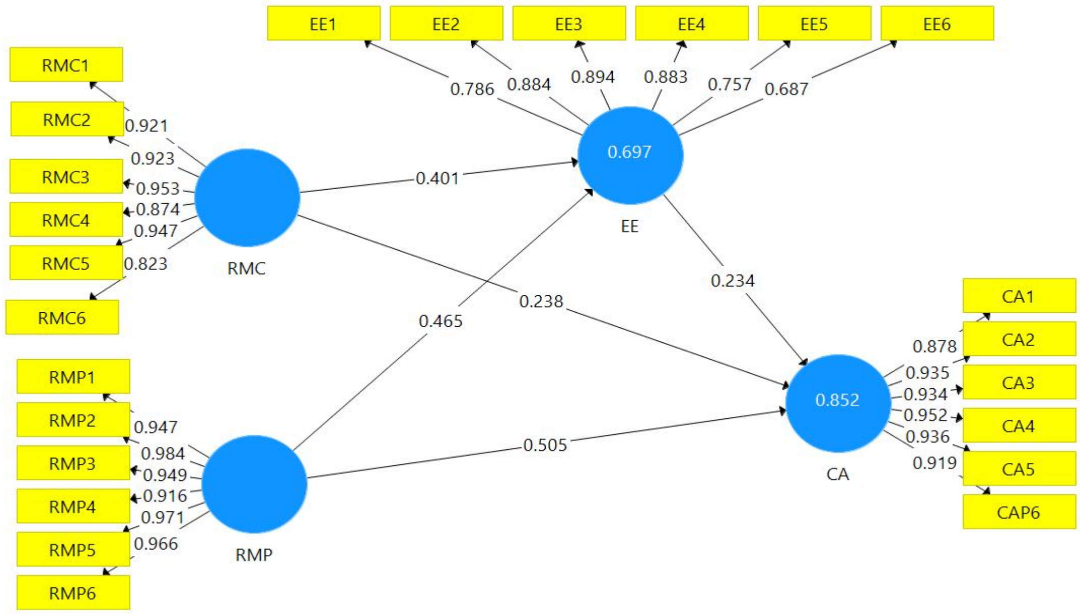

Figure 2: Measurement Model Assessment (output)

Constructs	Items	F. Loading	Cronbach's Alpha	Composite Reliability	(AVE)
	RMC1	0.921			
	RMC2	0.923			
Risk Management Culture	RMC3	0.953	0.957	0.966	0.825
	RMPC4	0.874			
	RMC5	0.947			
	RMC6	0.823			
	RMP1	0.947			
	RMP2	0.984			
Risk Management Process	RMP3	0.949	0.981	0.984	0.913
	RMP4	0.916			
	RMP5	0.971			
	RMP6	0.966			
	EE1	0.786			
	EE2	0.884			
Employee Engagement	EE3	0.894	0.902	0.924	0.671
	EE4	0.883			
	EE5	0.757			
	EE6	0.700			
	CA1	0.878			
	CA2	0.935			
Competitive Advantage	CA3	0.934	0.967	0.973	0.857
	CA4	0.952			
	CA5	0.936			
	CA6	0.919			

Table 2: Measurement model analysis

Note: RMC = Risk Management Culture, RMP = Risk Management Process, EE = Employee Engagement, CA = Competitive Advantage

4.4. Discriminant Validity

The study employed advanced statistical methods to assess the convergence, reliability, and discriminant validity of their findings. Within the framework of Smart-PLS, they utilized three specific techniques: Cross-loadings, Heterotrait Monitrat (HTMT) ratio analysis, and the Fornell-Larcker criterion. The Fornell-Larcker criterion examines the square root of a construct's Average Variance Extracted (AVE) and compares it to its correlation with other constructs. By examining the squared AVE values presented in Table 3, which are highlighted in bold, it becomes evident that there are no significant concerns regarding discriminant validity. These bold values exceed the correlations between constructs, confirming that each construct is distinct and encompasses concepts that are not represented by other constructs in the model.

Table 3: Fornnel Larcker Criterion

	CA	**EE**	**RMC**	**RMP**
CA	0.926			
EE	0.833	0.819		
RMC	0.857	0.799	0.908	
RMP	0.898	0.809	0.856	0.956

Note: RMC = Risk Management Culture, RMP = Risk Management Process, EE = Employee Engagement, CA = Competitive Advantage

The next phase involved employing cross loading (CL) to ensure the discriminant validity. This approach examines whether a particular item demonstrates stronger connections with its parent constructs compared to other constructs under examination (Mohammad and Wasiuzzaman, 2021). By referring to Table 4, it is evident that the item exhibits higher loadings in comparison to the others, indicating a limited association between the variables and comprehensive discriminant validity.

Table 4: Cross Loadings

	CA	EE	RMC	RMP
CA1	0.878	0.711	0.72	0.753
CA2	0.935	0.77	0.802	0.835
CA3	0.934	0.764	0.794	0.839
CA4	0.952	0.793	0.804	0.852
CA5	0.936	0.791	0.812	0.846
CAP6	0.919	0.792	0.826	0.857
EE1	0.537	0.786	0.516	0.492
EE2	0.733	0.884	0.682	0.704
EE3	0.806	0.894	0.779	0.808
EE4	0.827	0.883	0.809	0.823
EE5	0.508	0.757	0.485	0.476
EE6	0.57	0.687	0.548	0.542
RMC1	0.836	0.8	0.921	0.833
RMC2	0.82	0.775	0.923	0.82
RMC3	0.805	0.754	0.953	0.798
RMC4	0.713	0.654	0.874	0.722
RMC5	0.797	0.738	0.947	0.792
RMC6	0.682	0.611	0.823	0.68
RMP1	0.857	0.781	0.825	0.947
RMP2	0.872	0.784	0.838	0.984
RMP3	0.86	0.775	0.815	0.949
RMP4	0.841	0.758	0.808	0.916
RMP5	0.867	0.771	0.818	0.971
RMP6	0.85	0.767	0.8	0.966

Note: RMC = Risk Management Culture, RMP = Risk Management Process, EE = Employee Engagement, CA = Competitive Advantage

4.5. Structure Model Analysis

The authors initially addressed the issue of collinearity in the structural model analysis. Collinearity refers to high correlations among predictor variables that can impact model interpretation. To evaluate collinearity, the authors computed the variance inflation factor (VIF), where VIF values below the threshold of three (3) indicate no collinearity concerns. Results from the collinearity analysis revealed VIF values ranging from 1.509 to 2.676, indicating no collinearity problems among the constructs in the study. Additionally, the authors calculated the R-squared (R^2) value, a measure used in partial least squares (PLS) structural equation modeling to assess model fit. R^2 represents the squared correlation between observed and predicted values of the endogenous latent variable. Higher R^2 values (0-1) indicate better alignment between observed and predicted values. In PLS-SEM, an R^2 value equal to or exceeding 0.60 signifies significant predictive accuracy. The authors reported R^2 results above 0.60 (79% and 63%) for the dependent variables in their study, indicating a substantial level of predictive accuracy as shown in Table 5.

Table 5: (R^2) Results Report

Explained variance for each dependent variable (R^2)	
Competitive Advantage	0.852
Employee Engagement	0.697

Results from the Author's analysis through SEM-PLS

4.5.1. Path Analysis

Path analysis is employed for estimating a set of equations in which all variables are observed. Unlike regression models, path models permit the inclusion of multiple dependent variables. In Smart-PLS, variables within a path model can be expressed as single-item constructs, and the scores for the dependent variable constructs are determined by assigning equal weights to the indicators. Smart-PLS also facilitates significance testing through bootstrapping. It encompasses all the essential modeling and computational functionalities, thereby eliminating the need for additional computations external to the software. The results are promptly generated, and the process model is visually depicted in Figure 3 and Table 6.

Table 6: Direct Path and Mediation Analysis Results

Paths	**Coefficient**	**SDV**		**T-value**	**p-value**
EE -> CA	0.234	0.045		5.21	0
RMC -> CA	0.238	0.042		5.65	0
RMC -> EE	0.401	0.068		5.914	0
RMP -> CA	0.505	0.048		10.593	0
RMP -> EE	0.465	0.071		6.599	0
	Mediation effect				
RMC -> EE -> CA	0.094	0.023		4.125	0
RMP -> EE -> CA	0.109	0.029		3.789	0

Note: RMC = Risk Management Culture, RMP = Risk Management Process, EE = Employee Engagement, CA = Competitive Advantage

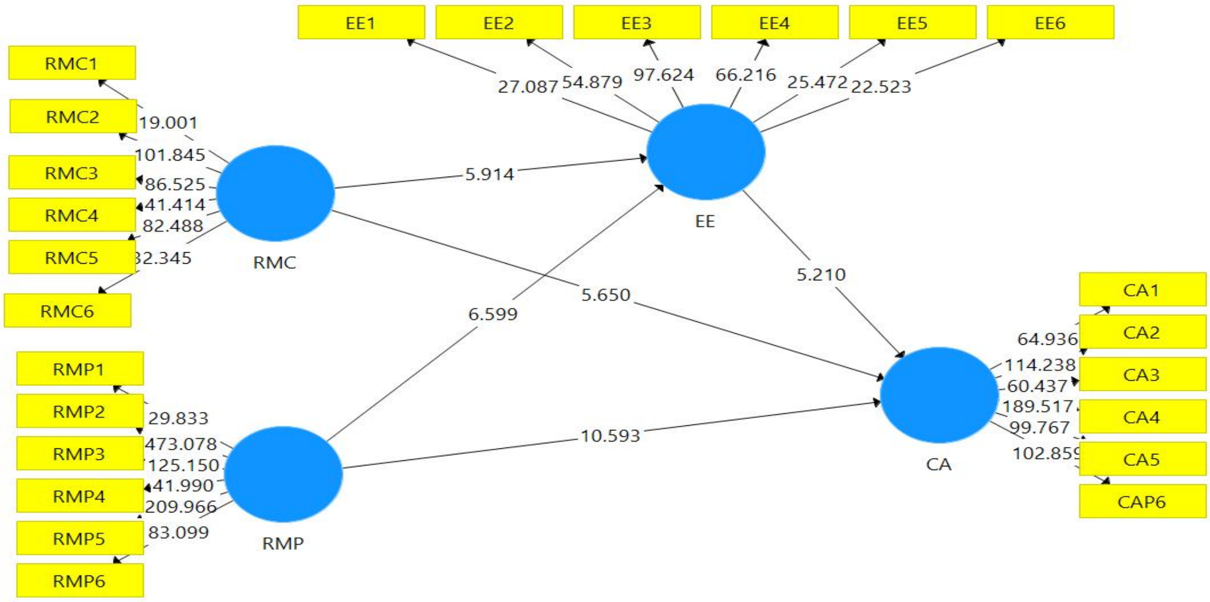

Figure 3: Structural Model Analysis

4.5.2. Hypothesis Testing

After ensuring the validity and reliability of the outer models and addressing any issues related to multicollinearity, the study proceeded to evaluate the hypothesized relationships within the inner models. The findings pertaining to the direct influence of independent factors on the dependent variable are presented in Table 7. The significance of the route coefficient was determined by examining both its magnitude (+1) and the corresponding t-statistic values. Typically, t-values equal to or greater than 1.96 are considered optimal, and the researchers employed the bootstrapping method to ascertain the significance of each structural path. The results of the analysis confirmed the first hypothesis (H1), which suggested that there is a positive relationship between risk management culture and the competitive advantage of construction companies in Senegal ($\beta = 0.238$, $t = 5.65$, $p < 0.05$). Similarly, the second hypothesis (H3) showed that risk management process had a significant positive effect on competitive advantage ($\beta = 0.505$, $t = 10.593$, p-value < 0.05). Moreover, the study analyzed the mediation effect of employee engagement and found a positive and significant impact on the relationship between risk management culture and competitive advantage ($\beta = 0.094$, $t = 4.125$, p-value < 0.05), as well as between risk management process and competitive advantage ($\beta = 0.109$, $t = 3.789$, p-value < 0.05). Additionally, employee engagement itself had a significant effect on competitive advantage ($\beta = 0.234$, $t = 5.21$, p-value < 0.05).

As a result, the study supports hypotheses H1, H2, H3, H4, and H5, indicating that risk management culture, risk management process, and employee engagement positively contribute to competitive advantage. The mediation effects of employee engagement on risk management culture, process, and competitive advantage were also found to be significant. Hence, all the stated hypotheses are supported, as shown in Table 8.

Table 7. Summarized Results Testing the Hypotheses

Hypotheses	Paths	Coefficient	T-value	p-value	Decision
H1(+)	RMC -> CA	0.238	5.65	0.000	Supported
H2 (+)	RMP -> CA	0.505	10.593	0.000	Supported
H3 (+)	RMC -> EE	0.401	5.91	0.000	Supported
H4 (+)	RMP -> EE	0.465	6.599	0.000	Supported
H5 (+)	EE -> CA	0.234	5.21	0.000	Supported

Note: RMC = Risk Management Culture, RMP = Risk Management Process, EE = Employee Engagement, CA = Competitive Advantage

5. Discussion and Implications for Policy Makers

The study's findings regarding the impact of risk management culture and process on competitive advantage, with employee engagement as a mediator, provide valuable insights into the operational dynamics of construction companies in Senegal. These insights are crucial for understanding the factors that drive organizational effectiveness and success within the construction industry. The study reveals that both risk management culture and process independently contribute positively to competitive advantage, indicating a mutually reinforcing relationship between these two aspects of risk management. While risk management culture reflects the organizational values, beliefs, and attitudes towards risk, risk management processes involve the systematic approaches, frameworks, and tools used to identify, assess, and mitigate risks. This highlights the importance of a comprehensive approach to risk management, where organizational culture aligns with structured processes to enhance competitive advantage (Algarni, 2023).

Moreover, the significant and positive effect of risk management culture on competitive advantage emphasizes the pivotal role of organizational culture in promoting risk-awareness, accountability, and resilience (Ormiston, 2022). A robust risk management culture likely permeates various levels of the organization, influencing decision-making, behavior, and resource allocation. Thus, there is a pressing need for construction firms to cultivate a culture that not only recognizes the significance of risk management but also empowers employees to actively engage in risk-related activities.

Similarly, the study underscores the effectiveness of structured risk management processes in driving organizational performance and gaining a competitive edge in the marketplace. Senegalese construction companies that adopt systematic approaches to risk management are better equipped to anticipate and respond to risks and opportunities. This underscores the importance of investing in comprehensive risk management systems, training, and technology to enhance organizational resilience and adaptability amidst evolving market dynamics.

Furthermore, the study highlights the mediating role of employee engagement in the relationship between risk management culture, process, and competitive advantage. Engaged employees play a crucial role in realizing the benefits of a strong risk management culture and effective processes by actively participating in risk management activities, contributing innovative solutions, and demonstrating commitment towards organizational goals (Handoyo et al., 2023). This emphasizes the importance of fostering a workforce that is not only technically proficient but also emotionally invested in the organization's success.

Therefore, the study's findings have significant implications for organizational leadership and management practices within Senegal's construction companies. Leaders must prioritize initiatives aimed at embedding risk management principles into the organizational fabric and enhancing employee engagement. By striking a harmonious balance between risk-aware culture, effective processes, and engaged workforce, construction companies can achieve sustainable competitive advantage in a volatile industry landscape. This underscores the need to align organizational culture with strategic objectives, operational practices, and performance metrics to drive continuous improvement and value creation. In conclusion, the study sheds light on the multifaceted nature of risk management and its implications for organizational effectiveness and competitive advantage within Senegal's construction industry. Recognizing the interconnectedness between risk management culture, process, and employee engagement, construction companies can leverage these insights to foster a culture of resilience, innovation, and strategic agility, thereby enhancing their capacity to thrive amidst complexity and uncertainty.

5.1. Implications for Mangers and Policy Makers

Managers in construction firms should prioritize fostering a risk-aware culture, emphasizing values, attitudes, and behaviors that prioritize risk management throughout the organization. They need to establish structured risk management processes that incorporate systematic approaches, frameworks, and tools to effectively identify, assess, and mitigate risks. Moreover, recognizing the importance of employee engagement is crucial, as it enables the integration of risk management culture and processes into tangible competitive advantages. Managers should encourage active participation, innovation, and commitment among employees in risk management efforts. Policy makers should incentivize and strengthen risk management initiatives in Senegal's construction sector by providing resources, training, and guidance to facilitate the development and implementation of robust risk management practices. They should aim to instill a culture of risk awareness and resilience within construction companies through policy interventions, potentially by creating regulatory frameworks that reward adherence to best practices and promote accountability. Additionally, it is essential to support initiatives that enhance employee engagement within construction firms. This could involve funding programs that encourage employee involvement, skill development, and empowerment in risk management processes.

5.2. Practical Recommendations

A study focused on the impact of risk management culture and processes on gaining a competitive advantage in construction firms in Senegal has provided practical recommendations.

- To enhance competitive advantage, organizations should foster a risk-conscious culture by promoting transparent communication and knowledge sharing about risks, motivating employees to identify and report risks, and providing necessary training and resources.

- Implementing robust risk management procedures is vital, including comprehensive protocols for identifying, assessing, mitigating, and monitoring risks, regularly reviewing and updating processes, and aligning them with industry best practices.

- Recognizing the importance of employee engagement is crucial, involving creating a positive work environment, encouraging participation in decision-making, and offering professional growth opportunities.

- Promoting cross-functional collaboration and knowledge sharing between departments and project teams is advantageous. Regular training programs and workshops on risk management practices should be provided, customized to employees' roles and responsibilities.

- Defining and monitoring key performance indicators related to risk management and employee engagement is essential for data-driven decision-making.

- Leveraging technology through digital tools and software solutions improves risk management processes and employee engagement. Continuously monitoring and evaluating risk management practices and employee engagement initiatives helps identify areas for improvement and refine strategies.

5.3. Innovation Points

Based on the study's findings, here are some innovative strategies for improving risk management practices in Senegal's construction companies:

1)Establish an integrated risk management framework that emphasizes the fusion of risk management culture and processes. This framework should align organizational values, attitudes, and behaviors with structured risk management processes, ultimately enhancing the company's competitive advantage.

2) Implement comprehensive training and development programs aimed at enhancing employees' risk management skills and knowledge across all levels of the organization. These programs should focus on cultivating a culture of risk awareness and resilience, empowering employees to actively participate in risk management activities.

3) Launch initiatives that promote employee engagement and involvement in risk management processes. Encourage employees to contribute innovative ideas, share insights, and take ownership of risk management initiatives. This approach will not only enhance risk management practices but also contribute to the organization's overall competitive advantage

6. Conclusion

In conclusion, this study has provided valuable insights into the intricate dynamics of risk management culture, process, and their impact on competitive advantage in Senegal's construction industry. By employing quantitative research methods and analyzing data from 280 construction companies using Smart PLS and Structural Equation Modeling (SEM), the study has demonstrated the significant and positive effects of risk management culture and process on competitive advantage. Additionally, the study has revealed the crucial mediating role of employee engagement in enhancing the relationship between risk management culture, process, and competitive advantage. These findings emphasize the importance of cultivating a risk-aware culture, implementing robust risk management processes, and promoting employee engagement to strengthen competitive advantage in Senegal's construction sector. The implications of these insights extend to industry practitioners and policymakers, providing valuable guidance in navigating the complexities of the construction sector in Senegal and similar contexts. However, the study does have limitations, including its lack of generalizability to other industries or regions, potential issues with sample size and selection, and the inability to establish causality due to its cross-sectional design. To further advance theory and practice in the construction industry and beyond, future research should focus on conducting comparative and longitudinal studies, qualitative research, and investigating moderating factors. These efforts will contribute to a deeper understanding of the relationships between risk management, employee engagement, and competitive advantage.

Appendix A

Table A1: Measurement Constructs Item

Variables	***Items***	***Source***
	(1) To what extent do employees understand the importance of risk management and their role in identifying and managing risks?	
	(2) How effectively is risk information communicated within the organization? This item assesses the clarity and frequency of risk-related communication.	
Risk Management Culture	(3) To what extent are individuals and teams held accountable for managing risks?	
	(4) How well are risks documented and reported? This item evaluates the quality and timeliness of risk reporting processes.	
	(5) . This item assesses the extent to which risk management is integrated into decision-making processes and organizational activities.	
	(6) To what extent does the organization promote a learning culture around risk management?	
	(1) The organization has a systematic process for identifying and documenting risks across all relevant areas and activities.	
	(2) The risk assessments are based on reliable data, supported by appropriate methodologies and expert judgment.	
Risk Management Process	(3) The implemented risk controls are aligned with industry best practices and adequately reduce the likelihood and impact of the risks.	
	(4) Risk monitoring activities are conducted regularly and provide timely updates on the status of identified risks.	
	(5) The risk reports are clear, concise, and accessible, facilitating informed decision-making at all levels of the organization.	

	(6) Lessons learned from risk incidents and near-misses are captured and used to refine risk management practices and procedures.	
	(1) I am satisfied with my current role and responsibilities.	
	(2) I feel a strong sense of loyalty towards the organization.	
Employee Engagement	(3) I am enthusiastic about taking on new challenges and learning opportunities	
	(4) I have positive and supportive relationships with my colleagues.	
	(5) My contributions and achievements are acknowledged and appreciated.	
	(6) believe in and align with the values and mission of the organization.	
	(1) Customers perceive our brand as unique and offering added value compared to alternatives in the market.	
	(2) We have effective cost management strategies that give us an advantage over competitors.	
Competitive advantage	(3) We consistently attract new customers and retain existing ones, increasing our market presence.	
	(4) We have a well-established culture of innovation and continuously invest in research and development.	
	(5) Our organization has a high level of customer loyalty, with customers actively choosing us over competitors.	
	(6) Our organization consistently delivers high-quality products or services with superior operational efficiency.	

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