

Article

Creativity in Project Implementation: An Empirical Study of Project Managers

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Abstract: The construction industry is a dynamic and ever-evolving sector, continuously adapting to societal needs. Within this context, project managers play a pivotal role in steering projects from inception to completion. This study delves into the vital dimension of creativity among project managers in the United Arab Emirates (UAE) and its substantial contribution to the growth of the construction industry in the region. Research in the broader field of construction and project management has traditionally concentrated on factors such as scheduling, cost control, and risk management. However, a noticeable gap exists in the exploration of the relationship between project manager creativity and project success. Hence, the objective of this study is to comprehensively explore various dimensions of project managers' creativity and evaluate its influence, alongside other criteria, on the outcomes of construction projects. Dimensions and indicators of creativity are derived from a meticulous literature review, and online survey questionnaires were employed to gather insights from individuals engaged in construction projects. The resulting hypothetical model underwent rigorous statistical analysis, employing confirmatory factor analysis and structural equation modeling. Findings indicate a positive impact of tacit knowledge sharing and emotional intelligence on the creativity of construction project managers in the UAE. Moreover, the study establishes that project managers' creativity, combined with other criteria, significantly contributes to the success of construction projects in the region. These insights are instrumental for fostering creativity among project managers and enhancing overall project success within the construction industry. The study's originality lies in its distinct contribution to the discourse on creativity in the construction sector.

Keywords: creativity; project managers; project implementation; construction industry; structural equation modeling (SEM)



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1. Introduction

Creativity and innovation are among the key catalysts of growth and prosperity in the construction industry [1,2]. Arguably, project managers are, or should be, instrumental in nurturing and enabling creativity and innovation in any construction firm. Due to the multifaceted and ever-changing characteristics of creativity and innovation [3], their definition and assessment have posed challenges [4]. One definition of creativity is the capacity or ability to recognize and address a problem and produce ideas or solutions that are both original and beneficial [5–7]. Regardless of the definitional challenge, creativity in any organization is vital to the organization's successful performance and longer-term survival [6]. It is a key predecessor to innovation, which encompasses the effective realization of creative concepts [5,8]. Thus, to be competitive in today's ever-changing work environment, creativity is a treasured resource.

The construction sector ranks among the largest industries globally. It is dynamic, and it continuously responds to society's construction needs. Its employment capacity

is unmatched. Entrants into the sector come from numerous professional and career backgrounds, and possess an extensive array of skills, knowledge, and experience. This research focused on the construction industry in the United Arab Emirates (UAE), a globally renowned ‘laboratory’ of construction creativity and innovation. The construction market in the UAE presents opportunities for growth, which is expected to further drive market competition [9]. Actors in the construction industry, such as project managers, must demonstrate flexibility both in their thought processes and in their responsiveness to society’s continuous demands for construction projects. Project managers bear the responsibility of addressing a multitude of challenges. These challenges encompass engaging multiple stakeholders, ensuring long-term resilience, overcoming labor shortages, and addressing environmental concerns. All of these are crucial for achieving overall success in delivering projects while adhering to the constraints of cost, schedule, and quality requirements.

The International Project Management Association (IPMA) identifies five vital traits that are crucial for effective project managers. These traits are closely related to enhancing their leadership skills, including having positive energy, the ability to motivate and energize others, the capacity to make difficult decisions, the competence to execute their plans, and a strong passion for their pursuits [10]. Creativity serves as a potent instrument that has the potential to amplify the proficiency of project managers in utilizing these competencies, consequently elevating the prospects of triumph in project endeavors. By skillfully employing creative methodologies, a project manager can enhance the implementation of technical processes and lead the project team to successful goal achievement. Moreover, creativity has the potential to improve the application of interpersonal skills, fostering enriched interactions with both the project team and other vested stakeholders.

Considering the various dimensions of the construction industry, project managers are most likely to be successful if they possess and demonstrate creativity on an ongoing basis. Creativity is not left to chance for project managers; instead, it must be actively developed, acquired, nurtured, and applied through education, training, and experience. Recognizing that creativity in project management involves the ability to envision innovative solutions, optimize resource utilization, and adapt to evolving challenges, this research illuminates the pathways through which innovative thinking contributes to the efficiency and positive outcomes of construction projects, particularly in the unique context of the UAE. The sheer size of the construction industry in the world today raises the continuous need for creative project managers. This has implications for education and training institutions, local policymakers, and the construction profession. Understanding the attributes of creativity through scholarly research would assist training institutions, local governments, and professional construction organizations to respond effectively to the need and demand for creative project managers. The demand and need are particularly high in the UAE, given the robust construction industry in the region, the dearth of local or indigenous professional construction expertise or capacity, and the limited number of reputable institutions providing pertinent education and training for project managers. Therefore, the purpose of the study is to probe into the perceptions of project managers in the UAE on how their creativity and innovation contribute to effective project implementation in the construction industry. The existing literature lacks a comprehensive exploration of these attributes, and this research seeks to fill this gap by providing insights that are crucial for enhancing project management practices in the dynamic construction landscape of the UAE. To shed light on the role of creative project managers and their relationship to project success, the subsequent research question will be addressed. What are the attributes of creativity that construction project managers should demonstrate or possess to manage construction projects successfully in the UAE? To address the research question, this study employs a cross-sectional survey design to investigate the creativity attributes of construction project managers in the UAE and their impact on project success. Statistical analyses then aim to uncover interrelationships between creativity and other factors.

The paper is structured as follows: Section 2 offers a comprehensive review of the literature, providing insights into creativity dimensions and project success. Following this,

Section 3 outlines the methodology and analysis used in this research, detailing the research design and the application of the chosen methods. Section 4 delves into a discussion of the results, and finally, Section 5 concludes the paper with summary remarks and outlines directions for further research and applications.

2. Creativity Constructs

The following subsections discuss the theoretical definition of creativity, identify the main extracted constructs for creativity in the construction industry, and design the hypothetical model according to the extracted constructs.

Creativity is a complex construct that has been defined in a variety of ways. The most generally accepted definition of creativity is “the production, conceptualization, or development of novel and useful ideas, processes, or procedures” [11]. As per this definition, both novelty and utility emerge as indispensable prerequisites for deeming ideas creatively noteworthy. The notion that an idea should possess an element of novelty or ingenuity to qualify as creative is widely accepted. Nevertheless, within the realm of workplace creativity, novelty alone does not suffice; ideas must also demonstrate practicality to garner recognition as creative contributions. Hence, within the context of construction projects, fostering creativity entails the ability to view matters through a distinct lens, devise novel approaches to challenges, and amalgamate formerly disparate procedures, items, and substances to yield innovations that are both unprecedented and practical. This results in a multitude of advantages, encompassing efficiencies in time and expenditure, optimized resource utilization, and the potential enhancement of aesthetic and/or functional attributes.

Numerous studies exist on the topic of creativity. An avenue of research focused on creativity involves uncovering its predictive elements. Sternberg, for instance, posited that creativity is linked to factors such as “personality, intelligence, knowledge, thinking style, motivation, and environment” [12]. In their meta-analysis, Da Costa et al. [13] clarified that individual factors, such as creative personality, self-efficacy, divergent thinking, intelligence, openness to experience, and motivation, play a pivotal role in creative performance. Furthermore, Andriopoulos (2001) underscored five key factors that foster employees’ creativity within the workplace: “organizational climate, culture and structure, leadership style, resources, and skills” [14]. Scholars suggest that creativity holds paramount importance for the enduring viability of organizations, empowering them to maintain competitiveness in a volatile and swiftly evolving setting, and to attain competitive advantages [15]. This segment of the paper is dedicated to casting light on the theoretical foundation of the primary creativity constructs employed in the present study. The selection of creativity constructs in this study was guided by their extensive exploration in the existing literature, ensuring a robust foundation for our research. It is crucial to underscore that these constructs are not arranged hierarchically in terms of importance. Rather, each construct embodies a unique facet of creativity, contributing to a holistic understanding of the phenomenon. By incorporating multiple constructs, our study aims to capture the multifaceted nature of creativity and its diverse manifestations within the context of our research. This approach enables us to provide a nuanced and comprehensive analysis, shedding light on various dimensions of creativity and their implications for our study objectives.

2.1. Transformational Leadership

Leadership plays a significant role in influencing creativity within any organizational context [16,17]. Leaders hold a crucial role in fostering and sustaining the growth and cultivation of creativity. As outlined by Bass and Bass (2009), leadership is described as “an interaction between two or more members of a group that often involves a structuring or restructuring of the situation and the perceptions. . . directing the attention of other members to goals and the paths to achieve them” [18]. Two primary leadership styles have been discerned within the literature: (1) transactional and (2) transformational. Managers exhibiting transactional leadership exert their influence over employees through the estab-

ishment of explicit objectives and the provision of meaningful rewards within a reciprocal exchange dynamic. Conversely, managers embodying transformational leadership (TL) are capable of impacting their employees by expanding established goals and fostering enhanced self-assurance in the workplace [18–20], which results in positive behaviors from employees toward job performance [21].

Among all available leadership theories, TL was chosen, as it has been documented in numerous studies to foster and enhance creativity (e.g., [17,22,23]). Subordinates and superiors alike perceive leaders who embrace a transformational style as more effective [24,25]. The most widely used measure of TL, the Multifactor Leadership Questionnaire (MLQ), based on the Bass and Avolio [26] model, was adopted. The MLQ demonstrated validity and reliability as an effective tool for assessing behaviors associated with TL [27]. The leader version of the MLQ, which was utilized in this study, asks for self-reports as to the extent to which the individual completing the report that they engage in TL behaviors. The indicators corresponding to this dimension are (1) idealized influence (charisma), (2) inspirational motivation, (3) intellectual stimulation, and (4) individualized consideration.

The previously mentioned results were mainly derived from organizations that are not project-based. This research seeks to explore the applicability of this leadership style within the context of project-based environments, in this case, construction projects. Because project managers are considered “leading groups of talented people in an environment of collaborative bureaucracy” (as cited in [28]), the focus has transitioned from exerting control and ensuring compliance to fostering identification, loyalty, and dedication. These processes align inherently with the principles of TL. Consequently, TL emerges as a prominent leadership style that appears to align effectively with the demands of the project-based environment.

2.2. Creative Problem-Solving Capacity

Creative behavior is fundamentally centered around creative problem-solving. It entails “dealing with situations in which the individual attempts to find a creative solution to a given problem” [29]. Consistent with this conceptualization, this part of our study focuses on exploring creative problem-solving as the method through which project managers interpret and apply knowledge to creatively resolve issues. Project managers frequently encounter unique and swiftly evolving challenges that necessitate the utilization of creative problem-solving abilities to generate practical solutions [30]. It is during these situations that their role becomes especially critical. In light of the contemporary economy marked by heightened competition and the organizational aspiration for greater flexibility and adaptability, the significance of creative problem-solving becomes even more imperative for the organization’s sustenance [11]. Creative problem-solving processes have been regarded as a crucial precursor to fostering creativity [30,31]. Empirical assessments of diverse creative problem-solving processes have demonstrated their significance and effectiveness as predictors of creative performance [32].

Mumford et al. (1991) [30] highlight that creative problem-solving predominantly takes place within ill-defined domains, where problems are inadequately defined and their existence must often be conceived by the individual. Cognitive processes are recognized as one of the pivotal elements that can enhance and facilitate creative problem-solving [5,33–35]. The progression of cognitive models for multistage creative thinking and problem-solving processes originated with Wallas’s foundational four main stages: (1) preparation, (2) incubation, (3) illumination, and (4) verification, as outlined by Wallas in 1926. [36]. Amabile also identified five stages: (1) presentation, (2) preparation, (3) generation, (4) validation, and (5) assessment [5]. Over the years, various additional models of creative problem-solving have been introduced and deliberated upon (e.g., [12,30,37,38]). The model of creative thinking processes proposed by Reiter-Palmon and Illies stands out as one of the most widely acknowledged and accepted in the field [31], which is the one adopted in this study. The measurement includes four main processes: (1) problem identification and construction, (2) information search and encoding, (3) solution or alternatives generation,

and (4) idea evaluation and selection. Numerous studies have accumulated compelling evidence that lends substantial support to this model, as demonstrated in many studies (e.g., [38,39]).

2.3. Tacit Knowledge Sharing

Knowledge plays a pivotal role in influencing creativity [34,40,41]. The emphasis on knowledge is grounded in the perspective that creativity does not manifest in isolation [35]. In order to cultivate an idea that possesses novelty and practicality, individuals must possess a certain level of knowledge within the domain in which they are engaged [3,42]. Knowledge sharing is characterized as “the exchange of knowledge between and among individuals, and within and among teams, organizational units, and organizations” [43]. Numerous studies have underscored the significance of knowledge sharing and its impact on fostering creativity (e.g., [35,44,45]) since knowledge itself cannot create significant value without utilization.

Michael Polanyi (ref. [46]) was a pioneering scholar who notably recognized and categorized two distinct forms of knowledge: (1) explicit knowledge and (2) tacit knowledge. Explicit knowledge pertains to the practical understanding that can be formally and systematically recorded, expressed, and communicated through specific codified formats, such as digital files [47]. In contrast, tacit knowledge stems more from experience and cannot be conveyed in a structured and standardized manner [48,49]. It encompasses procedural knowledge that is conveyed through practical application, observation, and communal exchange. Tacit knowledge has been defined as “the unarticulated knowledge that is in a person that is often difficult to describe and transfer” [50]. As outlined by Nesan [51], the heightened intricacy within the construction sector, coupled with the adoption of novel management approaches and technologies, prompted an amplified emphasis on transmitting explicit knowledge within the industry. Nonetheless, it is tacit knowledge that ultimately shapes the competitive edge of construction enterprises within a business landscape characterized by volatile market dynamics and ever-growing customer expectations.

Nonaka and Toyama posit that knowledge creation stems from socialization, a process involving “converting new tacit knowledge through shared experiences in day-to-day social interaction” [52]. This type of knowledge acquisition is primarily facilitated through firsthand experiences. Additionally, the essential aspect of sharing tacit knowledge hinges on individuals’ readiness and ability to share their expertise and apply the knowledge they acquire [53]. Several studies (e.g., [54,55]) have provided evidence suggesting a positive correlation between participation in tacit knowledge sharing and leadership performance. Consequently, this stimulates the creative performance of the employees, leading to an enhancement in their ability to formulate fresh ideas and innovative solutions [3]. In this study, the scale adopted by Wang et al. [56] and W. He et al. [57] is selected, as it aligns with the knowledge sharing concept embraced within this study and specifically centers on individuals’ engagement in knowledge sharing.

2.4. Emotional Intelligence

Salovey and Mayer define emotional intelligence (EI) as the “ability to monitor one’s and others’ feelings and emotions, to discriminate among them, and to use this information to guide one’s thinking and actions” [58]. EI has been recognized as a pivotal collection of managerial skills, significantly influencing how managers engage and interact with their employees [59]. Researchers who have investigated the impacts of EI, including Clarke [60], Mazur et al. [61], and Carmeli et al. [38], assert that this concept plays a pivotal role in fostering the proficient performance of team members, particularly within expansive and intricate construction projects. Project managers with a high level of emotional intelligence tend to exhibit positive emotional experiences and expressions [62]. This positivity is likely to amplify the enthusiasm of project managers, empowering them to establish effective communication with their team members and fostering creativity to tackle demanding tasks [35]. Several studies have investigated the correlation between EI and creativity, and

have shown that there is an important and significant correlation between EI and creative individuals (e.g., [63,64]). For example, Zhou and George [65] presented a conceptual model of how leaders' EI influences their employees' creativity through five dimensions: identification, information gathering, idea generation, evaluation, and modification. They concluded that leaders with high EI have a greater ability to be creative and, consequently, encourage employees' creativity. Another study by Rego et al. provided empirical evidence on how leaders' EI inspires the creativity of their employees [66]. Employees feel encouraged to discover and develop creative solutions when they feel their leaders are open to ideas that may be counter to their leaders' solutions.

In terms of project success, researchers have consistently identified EI as a fundamental requirement for achieving project success (e.g., [60,61,67]). Müller and Turner specifically discovered empirical proof indicating that EI enhances the likelihood of project success, particularly within exceedingly intricate project settings [67,68]. Thomas and Mengel observed that project managers with high EI scores possess the ability to swiftly rebound from adverse emotions and stress during challenging circumstances [69]. Supporting these findings, Mazur et al. conducted a study that investigated the correlation between EI and project success, focusing on the viewpoint of project managers [61]. They claim that project managers with strong emotional intelligence are more prone to engaging in efficient communication and collaborative problem-solving with stakeholders. Collectively, these studies furnish compelling evidence showcasing the substantial role EI assumes in shaping factors that lead to project success. To measure EI, the Wong and Law Emotional Intelligence Scale (WLEIS) is adopted [70]. This scale was formulated following the principles set forth by Mayer and Salovey's [58] original conceptualization of EI that has emerged as the dominant view of EI. This model is known as the 'gold standard' [71], and it includes four dimensions: (1) self-emotions appraisal, (2) others-emotions appraisal, (3) use of emotion, and (4) regulation of emotion.

2.5. Proactive Personality

A proactive personality is characterized as "the relatively stable tendency to effect environmental change" [72]. An individual low in proactive personality will conform to the conditions of the situation, refraining from imposing their viewpoint, and will essentially "accept their circumstances" according to [72]. On the contrary, Bateman and Crant [72] observed that proactive individuals demonstrate initiative, proactively shape their surroundings, and actively seek novel information and approaches to enhance their performance. Therefore, a proactive personality has been deemed significant for fostering creativity, which has been demonstrated empirically in prior studies (e.g., [73,74]). Ample evidence indicates a clear and positive correlation between proactive personality and individual creativity [73,75,76]. A proactive personality inspires individuals to proactively shape their surroundings by foreseeing challenges and instigating appropriate actions [75], which promotes creativity and innovativeness [72,76]. Previous empirical and meta-analytical studies have solidified the existence of a positive and direct connection between proactive personality and creative behavior (e.g., [74,77–79]). As an example, the research conducted by Kim et al. [74] demonstrated that proactive employees within diverse Hong Kong-based companies exhibited elevated levels of creativity. Likewise, additional studies have reaffirmed the significant and positive association between proactive personality traits and an individual's creativity [79,80]. For instance, Alikaj et al. [81] investigated the connection between proactive personality and creative behavior. The results were consistent with previous studies in which individuals identified as proactive were more inclined to display behaviors associated with creativity. Similarly, Li et al. contend that the foremost predictor of employee creativity is their proactive personality [79].

Proactive personality holds significance as a pivotal topic of discussion within both project management literature and project-based organizations. Given the inherent novelty of projects, creativity becomes essential to effectively address uncertainty. Crant found that proactive behavior produces great outcomes related to performance [82]. Project

managers with proactive traits wield considerable influence, actively seeking and molding opportunities, effectively driving change, and ultimately augmenting overall efficiency [83]. Zhang, Li, and Gong have unveiled that proactive individuals create an environment that fosters challenge in order to pursue the requisite performance [84]. In this study, proactive personality is assessed using a condensed version validated by Seibert et al. [76,85], which has been adapted from Bateman and Crant [72].

All constructs were assessed using scales consisting of multiple items, selected from previously validated measurements in relevant prior studies. The main creativity dimensions that project managers should possess for the success of construction projects in the UAE are summarized in Table 1. Furthermore, Table 2 provides a concise overview of the studies identified in the literature that relate to the dimensions and indicators used to measure creativity in this study.

Table 1. Dimensions and indicators for the creative project manager.

No.	Dimensions	Indicators	Code
1	Transformational Leadership	Idealized Influence: Instilling pride in others for being associated with me.	TL1
		Inspirational Motivation: Expressing enthusiasm about the tasks that need to be completed.	TL2
		Intellectual Stimulation: Reviewing crucial assumptions to assess their relevance and appropriateness.	TL3
		Individualized Consideration: Treating others as distinct individuals rather than mere group members	TL4
2	Creative Problem-Solving Capacity	Problem Identification and Construction: Defining and articulating problems creatively.	CP1
		Information Search: Generating novel ideas and suggesting innovative solutions to resolve work-related issues.	CP2
		Solution/Alternative Generation: Recognizing which ideas are most effective for addressing work-related challenges.	CP3
		Idea Evaluation and Selection: Efficiently putting novel ideas into action to resolve a particular work-related issue.	CP4
3	Tacit Knowledge Sharing	Experience Sharing through Interaction: Exchanging firsthand experiences and viewpoints through conversations and interactions with colleagues and team members	TK1
		Mentorship: Sharing practical knowledge, craftsmanship, and specialized skills required for daily tasks with others through apprenticeship or mentorship.	TK2
		Values, Beliefs, and Viewpoints: Sharing personal values, beliefs, and perspectives derived from one's unique and unquantifiable background of experiences	TK3
		Metaphors and Storytelling: Employing metaphors and storytelling to convey practical guidelines in a tangible way to fellow colleagues.	TK4
		Lessons Learned: Sharing lessons from past failures when necessary.	TK5
4	Emotional Intelligence	Self-Emotions Appraisal: Possessing a comprehensive grasp of one's own emotions and a keen awareness of the reasons behind the prevalence of certain emotions.	EI1
		Others-Emotions Appraisal: Noticing and being attuned to the emotions of others, while being sensitive to their sentiments.	EI2
		Use of Emotion: Setting goals for myself, being a self-motivating person, tying to achieve these goals.	EI3
		Regulation of Emotion: Controlling one's temper results in handling difficulties rationally as well as the ability to calm down quickly whenever angry.	EI4
5	Proactive Personality	Long-term Thinking: Looking for new ways to enhance one's quality of life.	PP1
		Action Orientation: Experiencing more exhilaration when witnessing ideas materialize into actuality	PP2
		Opportunity Identification: Identifying and spotting opportunities long before others.	PP3
		Self-improvement Opportunities: Searching for improved methods of accomplishing tasks.	PP4
		Alternative Actions: Maintaining the conviction that no obstacle can deter me from achieving my goals.	PP5

Table 2. Dimensions and indicators for the creative project manager.

[illegible]

Table 2. Cont.

Dimensions	Previous Studies																			
	[93]	[94]	[95]	[59]	[61]	[96]	[63]	[77]	[64]	[65]	[66]	[97]	[98]	[73]	[99]	[74]	[75]	[79]	[81]	[100]
Transformational Leadership																				
Idealized Influence																				
Inspirational Motivation																				
Intellectual Stimulation																				
Individualized Consideration																				
Creative Problem-Solving																				
Problem Identification																				
Information Search																				
Solution/ Alternative Generation																				
Idea Evaluation and Selection																				
Tacit Knowledge Sharing																				
Experience Sharing through Interaction	X	X	X																	
Mentorship	X	X	X																	
Values, Beliefs, and Viewpoints	X	X	X																	
Metaphors and Storytelling	X	X	X																	
Lessons Learned	X	X	X																	
Emotional Intelligence																				
Self-Emotions Appraisal				X	X	X	X	X	X	X	X	X	X							
Others-Emotions Appraisal				X	X	X	X	X	X	X	X	X	X							
Use of Emotion				X	X	X	X	X	X	X	X	X	X							
Regulation of Emotion				X	X	X	X	X	X	X	X	X	X							
Proactive Personality																				
Long-term Thinking								X						X	X	X	X	X	X	X
Action Orientation								X						X	X	X	X	X	X	X
Opportunity Identification								X						X	X	X	X	X	X	X
Self-improvement Opportunities								X						X	X	X	X	X	X	X
Alternative Actions								X						X	X	X	X	X	X	X

2.6. Project Success

Project success is a widely studied phenomenon and is evaluated in relation to the overarching goals of the project itself [67]. Success criteria offer the principles or benchmarks for assessing project success, whereas success factors contribute to achieving that success [101]. This study views project success in terms of success criteria. Evaluating the success of a project holds significant importance within the realm of construction project management [102]. However, the definition of what constitutes a successful project remains an ambiguous aspect [103]. Lam et al. pointed out the challenge in determining whether a project's performance should be deemed a success or a failure due to the elusive nature of the success concept among project participants [104].

Pinto and Slevin succinctly capture the sentiment: “There are few topics in the field of project management that are so frequently discussed and yet so rarely agreed upon as that of the notion of project success.” [105]. Numerous studies have been conducted to pinpoint the competencies of accomplished project managers and to establish connections between these competencies and project success (e.g., [67,68,106]). Amongst the several project success criteria that are mentioned in the literature, the ‘Iron Triangle’, which consists of time, cost, and scope, establishes the basis of the success approaches [107]. Some studies follow this traditional approach and consider project success a unidimensional construct (e.g., [67,108,109]). On the other hand, other studies see project success as a multifaceted and intricate notion, encompassing numerous attributes beyond just the ‘Iron Triangle’ (e.g., [107,110,111]). The iron triangle has traditionally been the predominant performance indicator in construction projects [102]. However, the project has transitioned from this narrow focus by including other measures such as stakeholder requirements [112]. Drawing from the examined studies, the criteria utilized for assessing project success in this study are grouped as follows: (1) meeting time, cost, and scope requirements, (2) meeting stakeholders’ satisfaction, and (3) meeting strategic objectives. Table 3 provides a succinct overview of the studies identified in the literature, outlining the success criteria utilized in this study for project evaluation.

Table 3. Success criteria extracted from previous studies.

Ref.	Dimensions				
	Scope	Time	Cost	Stakeholders’ Satisfaction	Strategic Objectives
[97]				X	
[102]	X	X	X	X	X
[108]		X	X	X	
[113]	X	X	X	X	X
[109]	X	X	X		
[110]	X	X	X	X	
[112]	X	X	X		
[114]	X	X	X	X	
[115]	X	X	X	X	X
[116]	X	X	X	X	X
[117]	X	X	X	X	
[118]	X	X	X		
[119]	X	X	X	X	
[120]	X	X	X	X	
[121]	X	X	X	X	
[122]	X	X	X	X	X
[123]	X	X	X	X	
[124]	X	X	X		

Based on the literature review, the following hypotheses were proposed:

H1. *Transformational leadership has a positive impact on the creativity of project managers.*

- H2.** *Creative problem-solving capacity has a positive impact on the creativity of project managers.*
- H3.** *Tacit knowledge sharing has a positive impact on the creativity of project managers.*
- H4.** *Emotional intelligence has a positive impact on the creativity of project managers.*
- H5.** *Proactive personality has a positive impact on the creativity of project managers.*
- H6.** *There is a significant correlation among the examined dimensions in the model.*
- H7.** *Project managers' creativity has a positive impact on the project's success.*
- H8.** *Completing the project on time has a positive impact on the project's success.*
- H9.** *Completing the project within the budgeted cost has a positive impact on the project's success.*
- H10.** *Scope completion has a positive impact on the project's success.*
- H11.** *Stakeholders' satisfaction has a positive impact on the project's success.*
- H12.** *Meeting strategic objectives has a positive impact on the project's success.*

3. Methodology and Analysis

The attributes of creativity identified in this study are intended to contribute to the successful management of construction projects, addressing gaps in the existing literature and aligning with the objectives of our research. To enhance result accuracy, a mixed-methods approach was embraced. The conceptual model was crafted through a combination of research methods, including a literature review, expert interviews, and survey questionnaires. The adopted methodology for his research involves a series of consecutive stages, which are detailed in Figure 1.

3.1. Survey Design and Data Collection

Based on the conducted literature review and the outcomes of the interviews with subject matter experts (SMEs), several studies have measured the project manager's creativity and the project's success by assessing several associated dimensions and indicators (Table 2). In this paper, the creativity of a project manager was measured by examining the following dimensions simultaneously, which had not been carried out before: (i) transformational leadership, (ii) creative problem-solving capacity, (iii) tacit knowledge sharing, (iv) emotional intelligence, and (v) proactive personality.

The project's success is measured in terms of the project manager's creativity as well as the time, scope, cost, stakeholders' satisfaction, and meeting strategic objectives simultaneously. All these dimensions were gauged using specific indicators, with each indicator corresponding to a single question in the survey. The survey employed a five-point Likert scale: 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, and 5: strongly agree. For validation purposes, the survey underwent a pilot phase prior to actual data collection. This pilot phase involved administering the survey to a group of field experts and individuals engaged in construction projects at various levels. This step aimed to verify that the questions encompassed all relevant dimensions effectively.

Ensuring research ethics is fundamental across all stages of the research process, including the selection of respondents, data collection, analysis, and interpretation. In the selection of respondents, ethical considerations involve obtaining informed consent, ensuring confidentiality, and promoting voluntary participation. Participants were provided with clear information about the study's purpose, potential risks and benefits, and their rights to withdraw without consequences. During data collection, ethical practices involve safeguarding participants' anonymity and privacy. Measures such as anonymizing data

and securely storing information are implemented to protect participants' identities and sensitive data. In the analysis phase, ethical guidelines are followed to maintain transparency, rigor, and impartiality. This includes employing appropriate statistical methods, avoiding bias in interpretation, and acknowledging any limitations or uncertainties. Ethical considerations also extend to the interpretation of findings, where researchers strive for accuracy, objectivity, and honesty. Finally, results are presented truthfully, without over-generalization or misrepresentation, respecting the trust participants have placed in the research process.

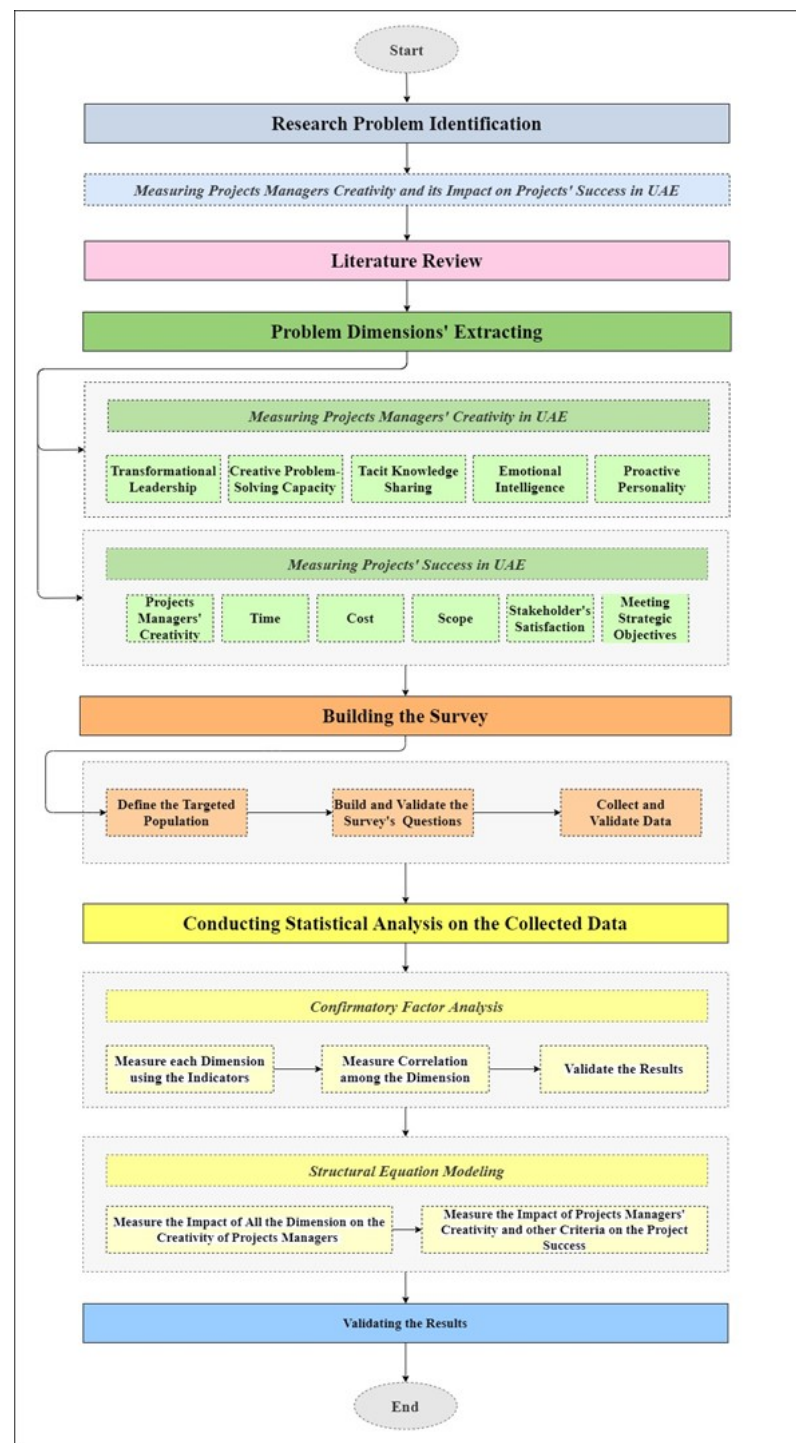


Figure 1. Research methodology.

The sampling strategy employed in this study involved the use of snowball sampling, a method chosen for its suitability for reaching individuals actively engaged in construction projects in the UAE. While snowball sampling facilitated access to a specific and often hard-to-reach population, it is important to acknowledge its inherent limitations. The risk of bias exists, particularly if initial participants predominantly share the survey within networks that share similar characteristics or perspectives. Recognizing this potential bias, efforts were made to diversify the initial contact list for the snowball sampling, and subgroup analyses were conducted to identify any variations in responses. A brief description of the survey's purpose, definitions, and benefits was stated at the beginning of the survey. The survey was distributed online, targeting people who are working on construction projects in the UAE. In total, 234 responses were received. Incomplete responses (7 responses) were omitted from the data during the analysis stage. The decision to collect 234 responses within a limited time frame was based on practical considerations to ensure a robust dataset for analysis, aiming for statistical reliability and representativeness. The survey was distributed widely through professional networks, industry associations, and online platforms, ensuring a broad reach and diverse participation. The demographic information was represented by several questions at the beginning of the survey to obtain some general conclusions about the respondents, which are summarized in Table 4.

Table 4. Respondents' demographic information.

No.	Demographic Characteristic	%	No.	Demographic Characteristic	%
1	Gender		5	Educational Level	
	Male	75		Bachelor	50
	Female	25		Masters	38
				PhD	12
2	Age Group		6	Educational Background	
	25–30	28		Engineering-Technical	19
	31–40	15		Engineering-Management	39
	41–50	18		Architecture	23
	51 or older	39		Technician (GIS, CADD, etc.)	19
3	Years of Experience		7	Qualification Level-Certificate	
	1–5	26		Postgraduate Certificate	56
	6–10	9		Project Management Certificate	16
	11–15	9		Contract Administration Certificate	2
	16–20	10		Two or more of the others	26
	>21	46			
4	Job Position/Level		8	Company's Main Scope of Service	
	Engineer/Sr. Engineer	27		Employer/Developer	19
	Project Manager/Operations Manager	22		Project Management/Consultancy	44
	General Manager/Director	31		Contractor/Sub-Contractor	25
	CXO/Chairman	1		Vendor/Supplier	5
	Business Owner	8		Others	7
	Other Stakeholders	11			

3.2. Data Analysis

In investigating the creativity of project managers within the UAE, structural equation modeling (SEM) served as a robust statistical framework to quantify the intricate relationships among latent constructs and their observable indicators. At the heart of this analysis lies the latent construct of creativity, an intangible trait that is inferred from multiple measurable indicators.

Drawing from an extensive literature review, dimensions crucial to understanding project manager creativity were identified as transformational leadership, creative problem-solving capacity, tacit knowledge sharing, emotional intelligence, and proactive personality. Each of these dimensions, considered latent constructs, consists of multiple indicators, which are observable variables sourced from the literature and believed to encapsulate the essence of the respective dimension.

To establish a comprehensive understanding of creativity, a hypothetical model was constructed, interconnecting each latent construct with its corresponding indicators through specified paths or loadings. These loadings denote the strength and direction of the relationship between the latent variable (creativity) and its observed variables. For instance, an indicator of transformational leadership, such as “inspirational motivation,” is linked to the latent construct of creativity.

The adequacy of the measurement model was then assessed using statistical fit indices. This evaluation gauges how effectively the chosen indicators represent the latent construct. Refinement of the model may be necessary through iterations, involving the inclusion/exclusion of indicators, until an acceptable fit is achieved. This iterative process ensures that the selected indicators faithfully capture the underlying dimensions of creativity.

Once the measurement model was established, it was expanded to incorporate paths between creativity and other latent constructs, representing the aforementioned dimensions. These paths elucidate the hypothesized relationships between creativity and these dimensions. The overall fit of the SEM model, encompassing both the measurement and structural models, was rigorously evaluated. A well-fitting model instills confidence in the validity of hypothesized relationships.

Finally, statistical significance was examined to interpret the practical significance of these relationships, providing valuable insights into the factors influencing the creativity of project managers in the unique context of the UAE. Through this systematic approach, SEM allows for a solid exploration of the multidimensional aspects contributing to project manager creativity, aligning the empirical findings with the extracted dimensions from the literature. The following subsection presents a step-by-step approach for the proposed hypothetical model.

3.2.1. Data Validation

Prior to commencing the analysis, data validation stands as a crucial phase, serving to examine the reliability and validity of the gathered data. The internal consistency of each dimension was evaluated through the utilization of Cronbach’s α and composite reliability (CR). These metrics are reported in Table 5, where it can be noticed that Cronbach’s α and CR values are greater than 0.7. This indicates high reliability. Moreover, the adequacy of the sample size was tested using the Kaiser-Meyer-Olkin (KMO) test, where a KMO value between 0.7 and 1 indicates that the sample size is adequate. For the sample in this paper, the KMO value was 0.94, which implies that the sample was adequate for this analysis.

3.2.2. Confirmatory Factor Analysis (CFA)

During this stage, the covariance matrix of the chosen dimensions and indicators was scrutinized, and the model’s goodness of fit was assessed. The CFA results are shown in Table 6. The results indicate all variables are significant in each dimension, as the standardized loadings or estimates are more than 0.5 and the p -value indicates significance (<0.05). In addition, the goodness of fit tests for the CFA model are the standardized root mean square error (SRMSR) = 0.0546, the goodness of fit index (GFI) = 0.8236, the adjusted goodness of fit index (AGFI) = 0.7757, and the Bentler comparative fit index (BCFI) = 0.8841, where all of them indicate an acceptable fit for the model.

Table 5. Data validation.

Dimensions	Correlation with Total	Cronbach's α	CR
Transformational Leadership		0.821122	0.822583
TL1	0.604113		
TL2	0.720640		
TL3	0.643026		
TL4	0.600118		
Creative Problem-Solving Capacity		0.820615	0.822922
CP1	0.582377		
CP2	0.665562		
CP3	0.680431		
CP4	0.648658		
Tacit Knowledge Sharing		0.858213	0.863935
TK1	0.684188		
TK2	0.719910		
TK3	0.781490		
TK4	0.519385		
TK5	0.667618		
Emotional Intelligence		0.730777	0.72189
EI1	0.598792		
EI2	0.563130		
EI3	0.436360		
EI4	0.514398		
Proactive Personality		0.860405	0.862625
PP1	0.695914		
PP2	0.694202		
PP3	0.694628		
PP4	0.631089		
PP5	0.691229		

Table 6. Confirmatory factor analysis.

Dimensions	CFA Standardized Parameter Estimates	CFA Parameter p -Value
Transformational Leadership		
TL1	0.66412	<0.0001
TL2	0.78376	<0.0001
TL3	0.75294	<0.0001
TL4	0.72713	<0.0001
Creative Problem-Solving Capacity		
CP1	0.70731	<0.0001
CP2	0.73556	<0.0001
CP3	0.76002	<0.0001
CP4	0.72896	<0.0001
Tacit Knowledge Sharing		
TK1	0.79334	<0.0001
TK2	0.77897	<0.0001
TK3	0.83176	<0.0001
TK4	0.58671	<0.0001
TK5	0.73549	<0.0001
Emotional Intelligence		
EI1	0.55760	<0.0001
EI2	0.55844	<0.0001
EI3	0.66651	<0.0001
EI4	0.72055	<0.0001
Proactive Personality		
PP1	0.76600	<0.0001
PP2	0.77510	<0.0001
PP3	0.75098	<0.0001
PP4	0.68044	<0.0001
PP5	0.75602	<0.0001

3.2.3. Structural Equation Modeling (SEM)

Studying the impact of each dimension on the creativity of a project manager, as well as the impact of the project manager's creativity along with other criteria on the success of projects, was conducted using SEM analysis. The SEM model is shown in Figure 2. The goodness of fit indices show acceptable fit where SRMR is 0.0601, GFI is 0.805, AGFI is 0.7413, and BCFI is 0.87. The analysis of the SEM model tested the hypotheses (H_1 – H_{13}). This was performed using PROC CALIS in SAS® software.

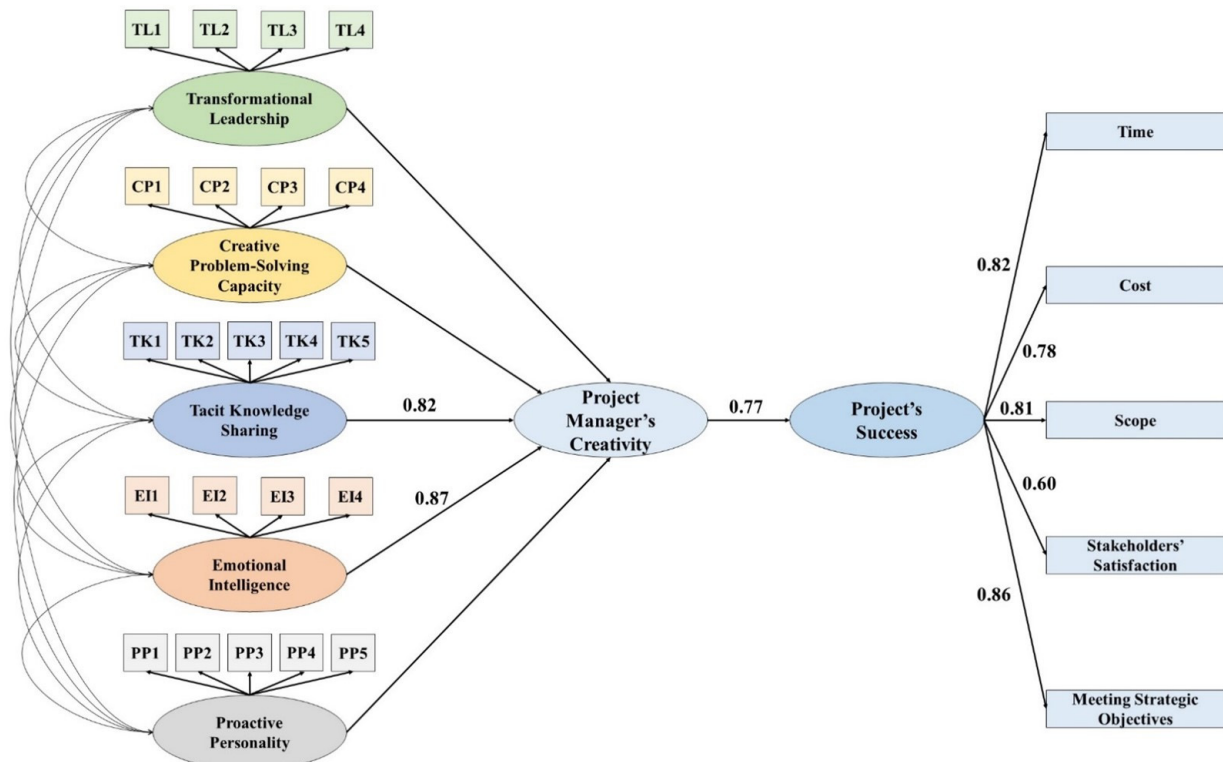


Figure 2. SEM model.

Firstly, Table 7 shows the path list for the model, where the results indicate that the creativity of project managers is positively influenced by tacit knowledge sharing and emotional intelligence (H_3 and H_4 are significant). This suggests that the ability of project managers to share implicit knowledge and understand emotions plays a crucial role in fostering creativity within the construction context in the UAE. However, it is noteworthy that transformational leadership, creative problem-solving capacity, and proactive personality were found to have an insignificant impact on a project manager's creativity (H_1 , H_2 , and H_5 are insignificant). This implies that, contrary to expectations, these factors may not be as influential in driving creativity among project managers in the construction field in the UAE.

Moreover, the analysis revealed a significant correlation among the examined dimensions in the model (H_6 is significant). This underscores the interconnectedness of the factors under investigation, highlighting the complexity of the relationships between transformational leadership, creative problem-solving capacity, tacit knowledge sharing, emotional intelligence, and proactive personality, as shown in Table 8.

In a broader context, this study extends its focus beyond individual creativity and explores the implications of project manager creativity on the success of construction projects in the UAE. The findings suggest that project manager creativity, along with other critical criteria, such as timely completion, adherence to budgeted costs, scope completion, stakeholder satisfaction, and meeting strategic objectives, all significantly contribute to the success of construction projects in the UAE (H_7 – H_{13} are significant). This holistic perspective

emphasizes the multifaceted nature of project success, incorporating not only individual characteristics but also broader project management and stakeholder considerations.

Table 7. SEM path list.

Path		Estimate	p-Value
TL	→	TL1	0.66214
TL	→	TL2	0.78192
TL	→	TL3	0.74791
TL	→	TL4	0.73479
CP	→	CP1	0.71749
CP	→	CP2	0.73020
CP	→	CP3	0.75502
CP	→	CP4	0.72260
TK	→	TK1	0.79187
TK	→	TK2	0.78337
TK	→	TK3	0.83210
TK	→	TK4	0.58707
TK	→	TK5	0.73390
EI	→	EI1	0.58088
EI	→	EI2	0.56162
EI	→	EI3	0.67477
EI	→	EI4	0.72662
PP	→	PP1	0.76298
PP	→	PP2	0.77144
PP	→	PP3	0.75067
PP	→	PP4	0.67915
PP	→	PP5	0.76439
TL	→	Creativity	0.14348
CP	→	Creativity	−0.54120
TK	→	Creativity	0.81750
EI	→	Creativity	0.87460
PP	→	Creativity	−0.17389
Creativity	→	Project Success	0.76932
Project Success	→	Time	0.82314
Project Success	→	Cost	0.78331
Project Success	→	Scope	0.81384
Project Success	→	Stakeholders' Satisfaction	0.59395
Project Success	→	Meeting Strategic Objectives	0.86133

Table 8. SEM—covariance matrix among the dimensions.

	TL	CP	TK	EI	PP
TL		0.91226 <0.0001	0.84208 <0.0001	0.86051 <0.0001	0.85311 <0.0001
CP			0.82181 <0.0001	0.85797 <0.0001	0.86359 <0.0001
TK				0.89558 <0.0001	0.85311 <0.0001
EI					0.88261 <0.0001
PP					

It is crucial to acknowledge the perceived nature of these findings and the subjective perspectives of respondents in interpreting the results. The significance of the relationships was determined through the examination of *p*-values, providing statistical evidence of the observed trends. However, the interpretations are based on the responses and perceptions of the participants, introducing a subjective element that should be considered when generalizing the results. Future research may explore these dynamics further and incorporate

qualitative insights to enhance the understanding of the intricacies involved in project management within the construction industry in the UAE.

4. Discussion

This study examined the creativity attributes that construction project managers in the UAE should demonstrate to successfully manage projects. The authors are unaware of any previous studies in the UAE to measure creativity through the indicated dimensions simultaneously. Moreover, by measuring the impact of creativity on project success, the results show the need and demand for creative project managers. In contrast to previous studies that primarily investigated the direct correlation between a single dimension and individual creativity [38,54,63,99], this research delved into the interrelationship between five dimensions and creativity, specifically within the context of construction. On TL, this study found that it has an insignificant impact on a project manager's creativity. This is consistent with the findings of Jaussi and Dionne [125] and Wang and Rode [126] who explored the impact of transformational leaders on creative performance within experimental contexts and identified no substantial relationship. The finding is inconsistent, however, with the findings of studies elsewhere, such as Spain [23], Turkey [127], China [87], Korea [128], Bangladesh [22], India [88], and Saudi Arabia [17], that TL is an effective style for measuring creativity. To further complicate the empirical landscape, Basu and Green [129] discovered a negative correlation between TL and creativity. They highlighted that transformational leaders might tend to suppress employees' dissenting viewpoints and ideas that deviate from their own, potentially inhibiting employee autonomy and creativity. The findings on creative problem-solving also showed an insignificant impact on project managers' creativity, despite preceding studies viewing creative problem-solving as a significant antecedent for creativity [30–32]. One reason might be the influence of the respondents' backgrounds, since the majority (39%) are 51 years of age or older and have more than 21 (46%) years of experience. Fontenot [130] investigated the effectiveness of training programs in promoting creative problem-solving skills. She observed that inadequate skills seem to carry over from educational environments where the cultivation of creative problem-solving abilities was lacking and students were not consistently encouraged to assimilate, manipulate, and synthesize information to tackle problems. Mumford et al. [131] similarly posited that individuals' endeavors in creative problem-solving are impacted by their organizational contexts. Further investigation is warranted to explore the application of creative problem-solving processes within project-based organizational environments. A deeper comprehension is required regarding creative problem-solving in settings like construction, where individuals are actively involved in addressing intricate real-world challenges. The findings on tacit knowledge sharing corroborate the findings of past research, which found this factor to have a significant positive impact on project manager creativity (e.g., [54–92]). A possible explanation for this might be that most construction knowledge predominantly exists in tacit rather than explicit form, a characteristic stemming from socialization due to the inherent nature of construction projects. Moreover, construction is highly influenced by human factors, such as attitude, experience, skills, communication, personal contact, and interaction [54]. In terms of EI, it also has a significant positive impact on project manager creativity. These results corroborate the findings of various previous works (e.g., [63–132]). They also indicate that, for construction project managers who must constantly solve specific and general problems before, during, and after construction, the ability to control their emotions to achieve productive outcomes is essential. This study found, quite surprisingly, that a proactive personality has an insignificant impact on project managers' creativity. This discovery contrasts with prior research that established a direct positive correlation between proactive personality and individual creativity [73,75,76]. Wang et al. [133] found that organizational support moderated the relationship between individual proactive personality and creativity. They claimed that the positive relationship between proactivity and creativity is stronger for employees who perceive low organizational support. This suggests a need to further investigate the organizational support of the construction companies

for project managers. This study was structured to assess the influence of creativity and other factors—namely time, cost, scope, stakeholders' satisfaction, and alignment with strategic objectives—on the success of construction projects in the UAE. While the definition of project success remains somewhat ambiguous [103], these findings align with prior research that suggests the distinct criteria independently contribute positively to project success (e.g., [113,116]).

The theoretical implications of this study are profound, challenging conventional beliefs about the impact of TL and proactive personality on creativity within the construction context. The findings necessitate a critical reevaluation of existing theoretical frameworks, particularly in the dynamic and project-oriented organizational environments inherent in the construction industry. The nuanced relationships uncovered underscore the need for more context-specific theories that can comprehensively capture the intricacies of creativity dynamics within construction project management. From a practical perspective, the study offers actionable insights for various stakeholders, including training institutions, local governments, and professional construction organizations. The significance of tacit knowledge sharing and emotional intelligence in nurturing creative project managers emerges as a focal point for practical application. Organizations can leverage these insights to tailor training programs and refine leadership approaches, fostering an environment conducive to creativity and innovation in construction projects.

5. Conclusions and Future Work

This study set out to investigate the creativity of project managers in the UAE and how it impacts the success of projects in the construction industry. It was found that tacit knowledge sharing and emotional intelligence are the main attributes that contribute to the creativity of construction project managers in the UAE. This research would be beneficial in understanding the attributes of creativity through scholarly research, which would assist training institutions, local governments, and professional construction organizations to respond effectively to the need and demand for creative project managers.

The limitations of this study warrant careful consideration. While focusing on the UAE aligns with the specified scope, it introduces certain constraints that should be acknowledged. The study's generalizability is inherently limited to the specific context of the UAE's construction industry. The findings may not be universally applicable, and caution should be exercised when extrapolating the results to different cultural and industrial settings. Furthermore, the use of a cross-sectional survey design provides a snapshot of the current state, but it limits our ability to establish causal relationships or capture the dynamics of creativity over time. The reliance on self-reported data introduces the potential for response bias, as participants may provide answers that align with perceived expectations. Additionally, the study's reliance on online surveys may exclude individuals who are not digitally connected, potentially introducing a source of sampling bias. These limitations should be considered when interpreting the findings and underscore the need for further research to validate and extend the study's insights across diverse cultural and industrial contexts.

Potential future research could include extending this study to countries with both similar and dissimilar attributes to the UAE, providing an opportunity to validate or unveil new insights. Exploring additional moderating factors, such as project team size, associated risks, and project complexity, could enrich our understanding of the dynamics involved. It is essential to acknowledge the study's limitation in focusing on the UAE's construction industry, and therefore, there is a need for further research to confirm the findings in diverse cultural and industrial contexts. As globalization continues to influence the construction landscape, adapting creativity theories and management practices to different cultural settings becomes a pertinent area for exploration. Additionally, given the unique workflow patterns in the construction industry, future studies could investigate specific leadership approaches tailored to this sector. These avenues of research promise to

enhance our understanding of creativity in project management across varied cultural and industrial frameworks.

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