



HOW PROJECT MANAGEMENT PRINCIPLES CAN LEAD TO SUCCESSFUL PROJECT COMPLETION IN CONSTRUCTION INDUSTRY

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ABSTRACT

While project success is a prominent topic in project management, the direct influence of project management methodologies on achieving this success remains underexplored. Despite the extensive literature and training available, these methodologies often fail to deliver consistent results. This paper investigates the current state of project management methodologies and their impact on project success. Through a comprehensive literature review, we reveal that the theoretical foundations of project management are still not universally agreed upon. Project success is determined by both the effectiveness of project management and the success of the project's end product, encompassing both micro and macro perspectives. This research analyzes data from project practitioners across ten countries, highlighting that most successful projects utilize but do not fully capitalize on contemporary project management tools and techniques. The success of these tools is heavily influenced by the practitioner's training, timing, and level of implementation, with the human factor playing a crucial role. Ultimately, this research concludes that project management success is one of the two essential components for achieving overall project success...

Index Terms—*Project management, project success, tools and techniques, success factors and criteria.*

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1. INTRODUCTION

Projects have been executed since ancient times [1], suggesting that their management theories have matured into robust practices. However, Koskela and Howell (2002) [2] argued that contemporary project management lacks a solid theoretical foundation and is based on narrow, implicit theories that require further development. Traditional project management often introduces self-inflicted issues that negatively impact project performance, potentially leading to project failure [2]. Recent studies also highlight the absence of clear definitions of project management and project success [3]. Despite extensive project management literature, the question of how project management contributes to project success remains unresolved. While some foundational elements of project success are generally accepted, others are highly contested [4]. There is still considerable debate among scholars, researchers, and practitioners regarding the influence of project management on project success, indicating significant areas for further exploration.

2. WHAT ISA PROJECT?

According to BS ISO 10006:1997, a project is "a unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including constraints of time, cost, and resources" [5]. Projects differ significantly from operational work due to their unique characteristics and rules [6]. Contemporary literature provides various definitions, emphasizing the uniqueness of each project. Projects are temporary organizations established to achieve specific goals, with project teams often being temporary, redundant, or reassigned upon project completion [7]. A key challenge in temporary organizations is the limited timeframe for team contributions. Shenhar (2001) [8] emphasized the misconception that all projects are alike, arguing that using identical tools and techniques for different projects often leads to failure. Projects demand tailored management approaches, making it difficult to implement static methodologies capable of consistently ensuring success due to the unique aims and objectives of each project.

3. MANAGEMENT OF PROJECTS

Project management practices aim to complete projects efficiently by minimizing costs and meeting customer needs [2]. Despite seemingly straightforward goals, projects frequently run late, exceed budgets, or fail to meet objectives [9]. Modern project management emerged during the Manhattan Project in the early 1950s [10], although project management practices existed long before. Henry Gantt's development of the bar chart in 1916 is widely recognized, but Swiss engineer Hermann Schuerch's use of a similar tool in 1912 suggests modern project management concepts began earlier than commonly believed [11]. Project management is a relatively new field, with young literature that lacks comprehensive concepts and theoretical foundations [12]. Nonetheless, project management methodologies date back to as early as 2550 BCE, with the construction of the Pyramids following a structured approach that included project charters and business justifications [1]. Projects are designed to handle uncertainties, requiring proper planning and often presenting greater challenges than routine work [13]. The PMBOK® Guide (2000) acknowledges that its methodology is applicable to most projects most of the time, raising questions about which practices to use and when. Surprisingly, these questions remain largely unanswered [14]. Project management methodologies must be adapted to individual project objectives to achieve consistent success, suggesting that either current methodologies are misapplied or that project management does not directly influence project success.

4. PROJECT SUCCESS

The primary goal of implementing project management practices is to consistently achieve project success. However, the lack of a universally accepted definition of project success complicates this objective. Table I summarizes various success criteria found in the literature on project management. The project manager's experience directly influences project success [16], [17]. Munns and Bjeirmi (1996) [18] emphasized that while project management contributes to project success, numerous other factors beyond its control also play a role. Peters and Horner (1997) [19] argued that project management cannot control time, cost, or quality, which are often subjective measures rather than objective yardsticks. Some projects fail to meet these parameters but are still considered successful. Dvir et al. (2006) [20] highlighted that traditional measures of project success can be misleading, as meeting all three constraints does not necessarily satisfy sponsor requirements [20]. Baccarini (1999) [21] concluded that combining project management success with product success results in overall project success, while Lim and Mohamed (1999) [22] argued that a project is successful if it achieves its objectives. Project success is often seen as a binary measure of success or failure [23]. Lim and Mohamed (1999) [22] introduced the micro and macro perspectives, assessing project success both at completion and in terms of long-term operational benefits and customer satisfaction. This concept aligns with De Wit's (1988) [24] distinction between project success and project management success, emphasizing that project success is measured against overall project objectives post-completion.

TABLE I: LITERATURE SUMMARY OF PROJECT SUCCESS CRITERIA. PARTIALLY (ADAPTED OF WESTHUIZEN, D. AND FITZGERALDE., 2005) [15]

| PROJECT SUCCESS CRITERIA | Booth 1996 | Wateridge 1998 | Baccarini 1999 | Kerzner 2002 | Thomsett 2002 | Marchewka 2003 |
|---------------------------------------|------------|----------------|----------------|--------------|---------------|----------------|
| Quality of Project management process | | | X | X | X | X |
| Within time | X | X | X | X | X | X |
| Within budget | X | X | X | X | X | X |
| Specified quality | X | X | X | X | X | X |
| Specified service quality | | X | X | X | | |
| Projects take holder satisfaction | | X | X | X | X | X |
| User satisfaction | X | X | X | X | X | X |
| Net benefits | | X | X | X | X | X |

Nevertheless, project management success is measured during the project life cycle via the classic performance measures [24]. Milosevic and Srivannaboon (2006) [25] focus on the link between project management and the project's final product as a new dimension for achieving project success, suggesting that project success is not solely achieved by meeting time, cost, and quality constraints, but also by achieving end-user satisfaction [25], [26]. This approach emphasizes delivering individual business outcomes, rather than merely managing project activities [26]. Additionally, other researchers highlight the importance of measuring success from various perspectives, including those of the owner, developer, contractor, end-user, and the general public [22], [27]. As a result, it is broadly accepted that different projects may have unique success factors [28]. Liu (1999) [29] further suggests that each project may even have its unique set of success measures, complicating the derivation of a universally agreed definition of project success. Interestingly, stakeholder satisfaction is commonly recognized as a valuable addition to the iron triangle of time, cost, and quality, implying that a successful project must also satisfy its stakeholders [21]. Kam and Müller (2005) [23] argue that a project that meets time, cost, and quality constraints, yet fails to satisfy customer requirements, is only a partial success. They illustrate this with the phrase, "The operation was a success, but the patient died." Thus, project success comprises two main ingredients: project management success and product success [21]- [23].

5. REVIEW OF CONTEMPORARY PROJECT MANAGEMENT TOOLS AND TECHNIQUES

Defining project and project management success remains an elusive task [3]. Dvir et al.'s observation that there are no universal project success factors applicable to all projects [28] further complicates this pursuit. Contemporary research lacks sufficient hard evidence to justify the positive influence of project management on project success [14]. Nonetheless, successful application of project management tools and techniques against project activities is emphasized to achieve project success. Given the variety of tools and techniques applicable to different project life cycle phases, applying the right tool at the right time is crucial. Zeitoun (1998) [30] suggests that the influence of these tools depends on the practitioner's training and implementation process. Consequently, several success factors relate to human elements—the "soft" aspects of project management [31]. Studies by Nguyen et al. (2004) [32], Scott-Young and Samson (2004) [33], and Kloppenborg and Opfer (2002) [31] support these findings, indicating limited familiarity and effective implementation of project management tools among practitioners. Thamhain (1999) [34] found that only 50% of project managers were familiar with these tools, and a mere 28% implemented them effectively. Al-Hajj and Sayers (2014) [35] reported similar findings in the UAE, where 42% of practitioners did not use the Work Breakdown Structure (WBS) and 48% did not utilize the Organization Breakdown Structure (OBS), yet achieved a 66% success rate (time, cost, quality). This suggests that project management tools are not the sole determinants of project success. Conversely, numerous studies [36]-[39] conclude that properly applied project management tools and techniques can lead to project success. Selecting appropriate tools for specific project phases is crucial to delivering the intended outcomes. Misapplication of these tools, however, can lead to project failure [10], [37], [38]. According to Globerson and Zwikael (2002) [40], project managers are ultimately accountable for project success, responsible for aligning project execution strategies with organizational goals. Turner and Müller (2003) [13] advocate for professional certification of project managers to build trust and confidence among stakeholders. Competence is essential but does not guarantee success [13], [42]. This aligns with Lim and Mohamed's (1999) [22] micro and macro perspectives, where project management success does not necessarily equate to project success. The competence of the project manager is pivotal in selecting the right tools and techniques to achieve project deliverables. Dvir et al. (2004) [43] assert that "Plans are nothing, changing plans is everything," highlighting the need for adaptive project management practices in response to dynamic internal and external factors. Turner and Müller (2003) [13] reinforce that effective project management training is a precursor to achieving high project success rates.

6. LINK BETWEEN PROJECT MANAGEMENT AND PROJECT SUCCESS

Project management practices, combined with other factors, influence project success. Not all tools and techniques are directly associated with success, yet no successful project has been completed without basic project management practices. Researchers [36]-[39] consistently find that well-applied tools and techniques contribute positively to project success. Proper training and the selection of appropriate methodologies are essential for navigating the complexities of project management and ensuring successful project outcomes.

TABLEII: PROJECT SUCCESS FACTORS OF LITERATURE REVIEW

Source:compiledfromAshleyetal.1987[47];Nguyenetal.2004[32];Rohaniyati2009[51];Tooretal.2008[52].

| Rank | Ashleyetal.(1987) | Nguyenetal.(2004) | Rohaniyati(2009) | Tooretal.(2008) |
|------|--|--|--|---|
| 1 | Organisationalplanning effort | Competentprojectmanager | Projectmanager'scapabilitiesand experience | Effectiveprojectplanningand control |
| 2 | Projectmanagergoal commitment | Havingadequatefundingunti l project completion | Clarityofprojectscopeand work definition | Sufficientresources |
| 3 | Teammotivationand goal orientation | Multidisciplinary/competent projectteam | OrganisationalPlanning | Clearanddetailedwritten contract |
| 4 | Scopeandworkdefinition | Thecommitmenttoproject | Theuseofacontrolsyste ms | Clearlydefinedgoals and prioritiesofallstakeholders |
| 5 | Projectmanagercapabilit y and experience | Availabilityofresources | Projectmanager'sgoalcommitme nt | Competentprojectmanager |
| 6 | Control system | Topmanagementsupport | Projectteammotivationandgoal orientation | Adequatecommunication amongrelatedparties |
| 7 | Safety | Awardingbidstothe right designer/contractor | Safetyprecautionandapplied procedures | Competentteammembers |

Contemporary literature describes project management practices as a combination of concepts, processes, tools, and techniques. Besner and Hobbs (2004) [48] illustrate the distinction between the application of tools and techniques versus generic concepts and procedures with the metaphor: “An experienced cook can give details about his recipe, but it is really looking at him in the kitchen, using his tools...” This metaphor underscores the importance of the correct implementation of available tools and techniques, rather than solely relying on generic concepts and procedures, which are also partially applicable in operational management.

Although the traditional "iron triangle" (time, cost, quality) is often considered outdated, it remains a widely accepted measure of project management success. The debate over whether the success of a project's product influences overall project success relates to both macro and micro perspectives. In the long run, a project is unlikely to be deemed successful if its product fails. Therefore, product success is a critical component of project success [21]-[24]. Table II provides a ranking of project success factors as presented in the literature.

RESEARCH METHODOLOGY

This research sought to collect empirical data to support the assertion that effective project management positively influences project success. Recognizing that projects may have individual success criteria and factors, the study recommends initiating global-scale studies to identify a potential universal set of project success parameters.

Quantitative data was collected via a web-based survey, featuring 20 questions sent to 142 selected project managers. Participants were chosen based on their background, geographical location, and employment position. The data quality was high, with over 75% of respondents holding managerial positions. The survey included closed and five-point Likert scale questions combined with matrix ratings, grounded in findings from the literature review.

The research framework was built on the following assumptions:

- Successfully delivered projects employ project management tools and techniques.
- Project failures exhibit patterns related to the improper implementation of project management tools and techniques.
- Competent project managers, well-versed in project management tools and techniques, are crucial for achieving project life cycle deliverables. Therefore, properly trained project managers significantly influence project success.

These assumptions draw on Turner and Müller (2003) [13] conclusions about the necessity of project manager certification for high performance. Furthermore, recent research [46] highlights that different nationalities and cultures perceive project success differently.

ANALYSIS OF RESULTS—PROJECT SUCCESS

Survey results indicate that 86.3% of clients and 89.9% of contractors were satisfied with completed projects. Notably, one-third of project managers failed to keep projects within the iron triangle, suggesting that stakeholder satisfaction is perceived independently of traditional success measures. This finding indicates that project management success influences perceived project success. At the time of the survey, most projects (78.4%) were still in the execution – monitor and control phase, casting doubt on the impact of product success on stakeholder satisfaction. This contradicts previous research [21]-[23], which widely agrees that project success is a blend of project management and product success. Projects failing traditional measures might still satisfy stakeholders.

Interestingly, 42.9% of unsatisfied stakeholders reported their projects being on time, 71.4% within budget, and 28.6% meeting contract terms and conditions. This demonstrates that the iron triangle does not fully encapsulate project success. None of the unsatisfied stakeholders worked for client organizations, while 50% worked for contractors. The overall results align with reviewed literature, suggesting that time, cost, and quality alone are insufficient to assess project success. Additional parameters should be considered. Survey findings reveal that 66.7% of projects were within planned time, 72.5% within budget, and 66.7% met or exceeded quality requirements. About two-thirds of projects achieved both iron triangle and stakeholder satisfaction criteria, representing broadly accepted project management success. However, only 47.8% of respondents predicted successful project completion, with just 19.6% confident in achieving project success. Respondents cited adequate funding as crucial for project success, while market or industry fluctuations could influence outcomes. This finding consolidates the micro and macro perspectives of project success, acknowledging that projects are influenced by global changes and do not operate in a vacuum.

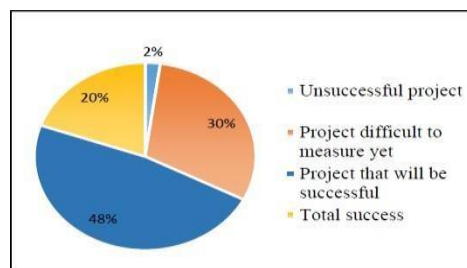


Fig.1 Project success status.

A. *Beyond Stakeholder Satisfaction*

Figure 2 illustrates that 19.6% of respondents rated the quality of their projects as "Excellent – better than required." Notably, 70% of these responses originated from Asia, particularly Singapore. Ashley et al. (1987) [47] emphasize that success is achieved by delivering "results much better than expected." However, this perspective does not align with advanced quality management principles or sound project management practices. Wang (2006) also observed this phenomenon in earlier research, highlighting

that Chinese stakeholders prioritize relationships over the traditional iron triangle (time, cost, quality) when measuring project success. Shenhar et al. (1997) [53] similarly rank stakeholder satisfaction above time, cost, and quality.

This practice, often referred to as "gold plating," is not typically recommended by professional institutions. Project managers should aim to deliver what is necessary to meet project objectives without adding extras. The response to this survey question suggests that Asian stakeholders may be fostering relationships by exceeding contractual obligations. Nevertheless, 47.1% of participants reported delivering projects in accordance with contract terms and conditions (see Fig. 2).

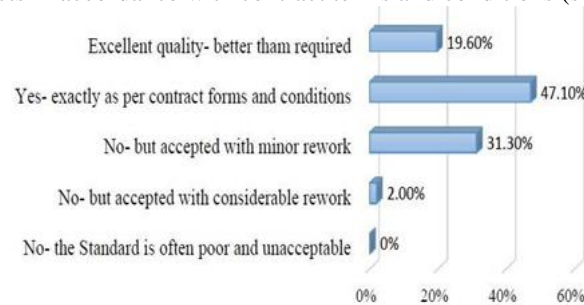


Fig.2 Project quality standards compliance.

B. Project Manager Competence

Figure 3 demonstrates that competence is considered the most crucial trait of a successful project manager. This finding contradicts Turner and Muller's (2005) [49] conclusion that leadership style and the competence of a project manager do not significantly impact project success.



Fig.3 Traits of project managers.

C. Project Management Traits

A competent project manager should possess proper training and hold a professional certification [13]. Surprisingly, 60.9% of respondents indicated they lack formal project management training. Only about 20% are affiliated with a professional project management organization. This suggests that many practitioners believe competence can be achieved without formal training or certification, which contradicts existing literature.

More than three-quarters of the participants hold managerial positions, with 22.2% serving as senior project managers or project directors. The participants' ages range from 25 to 65 years, with a majority (55.6%) holding a bachelor's degree or higher. Only one-third of the practitioners have less than five years of project management experience. Despite this, most respondents are not

Affiliated with recognized project management organizations, implying they lack formal training. Therefore, the data suggests that specific project management training is not necessarily correlated with project success.

Most participating project managers entered the profession through experience rather than certification, contradicting Turner and Müller's (2003) [13] assertion that the title "Project Manager" should be reserved for individuals with professional certificates.

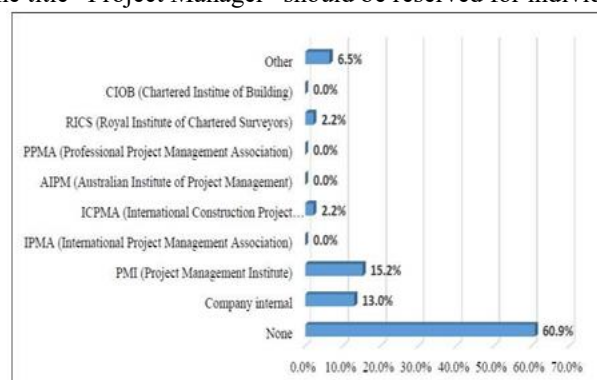


Fig.4 Professional affiliations.

D. Utilization Tools and Techniques

The literature broadly agrees that effective project planning and control are crucial for project success, as reflected in this survey's findings where it achieved a rating of 4.78 out of 5. Respondents also ranked a competent project manager among the top eight success factors, suggesting the possibility of a universal set of factors that lead to project success (see Fig. 5).

This finding contradicts the observations of Dvir et al. (1998) [28] and Liu (1999) [29], who argue that each project may have its own unique success factors [28], [29]. The fact that 78.4% of the surveyed projects are in the execution, monitoring, and control phase may have influenced responses to tools and techniques relevant to this phase. Interestingly, 9.8% of respondents, who deemed effective project planning and control most important, also rated Earned Value Analysis (EVA) as very important, while 19.5% reported rarely using EVA, highlighting a contradiction (see Fig. 6). EVA is a critical tool for performance measurement and project control [50].

Moreover, 16.7% of respondents do not use, and another 16.7% rarely use, a work breakdown structure (WBS). Despite this, 33.4% of participants rated effective project planning and control as the most important factor for project success, which is contradictory since WBS is crucial for these activities. Additionally, respondents ranked clear objectives and scope only sixth among project success factors. This partial alignment with responses about EVA and WBS suggests that contemporary practitioners may perceive project planning and control as independent tools and techniques rather than integrated concepts. This indicates a potential lack of professional training among surveyed practitioners regarding the full appreciation of project management tools and techniques.

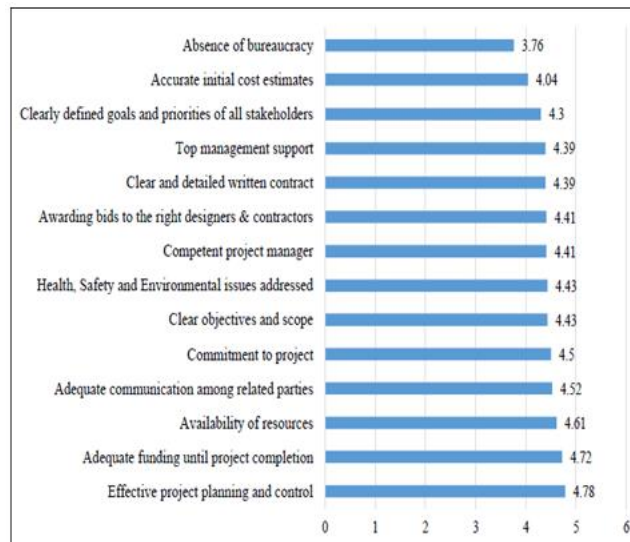


Fig.5 Project success factors from data.

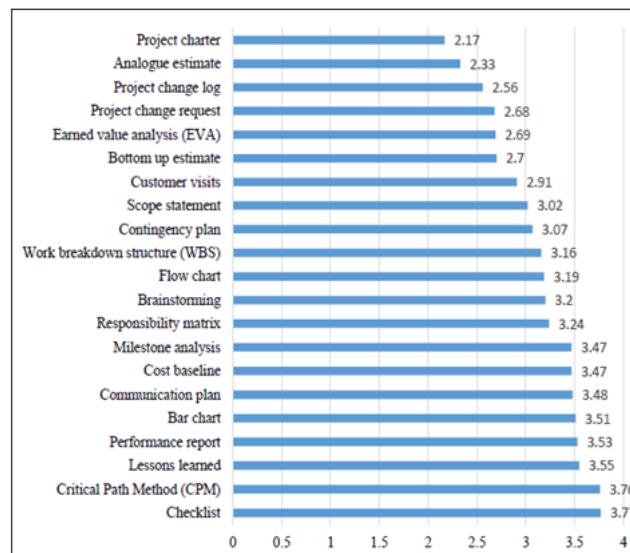


Fig.6 Use of project management tools and techniques.

CONCLUSION

There is a strong correlation between project management success and overall project success. While the traditional criteria of cost, time, and quality remain the preferred metrics for measuring project success, they do not necessarily ensure stakeholder satisfaction.

Project success is ultimately a perceived measure, independent of specific success criteria and factors. None of the surveyed projects reported achieving success without employing project management tools and techniques.

The survey data, collected from projects across ten nations, suggests that there exists a universal set of success measures applicable to all construction industry projects. This finding provides new insights, contrasting with literature that suggests each project has its unique success measures.

Although the data indicates that project practitioners do not always utilize project management tools and techniques perfectly, the majority of project managers do implement project management methodologies. These practices and techniques are widely used in successful projects, highlighting that project management positively influences project success. Consequently, the majority of surveyed projects were deemed successful.

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