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Optimizing Project Management Methodologies for Public Hospital Infrastructure Development in Emerging Economies – A Systematic Review

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Abstract

Background: Hospital infrastructure development in emerging economies faces a unique set of challenges, including limited resources, political instability, and systemic inefficiencies. Effective project management (PM) methodologies are crucial for overcoming these barriers and ensuring the timely and successful delivery of healthcare facilities.

Objective: This study aims to analyze and compare the effectiveness of various project management approaches in hospital infrastructure projects across emerging economies, focusing on contextually adapted methodologies and the integration of digital tools.

Methods: A comparative review of case studies from India, Kenya, Brazil, and the Philippines was conducted. These cases were evaluated based on methodology used, project outcomes, stakeholder engagement, and the presence of common barriers or enablers.

Results: Hybrid PM methodologies proved to be the most effective overall, improving transparency, delivery timelines, and stakeholder satisfaction. Most research originated from South Asia and Sub-Saharan Africa. While common barriers included political interference, financial constraints, and workforce shortages, key success factors were leadership, communication, and stakeholder involvement. A major gap was identified in the use of digital PM tools and the scarcity of quantitative comparative analyses.

Conclusion: Tailoring PM methodologies to local contexts while strengthening institutional capacity is essential for improving hospital infrastructure outcomes in emerging economies. These findings offer a practical foundation for policymakers and project leaders aiming to implement context-specific, efficient, and scalable infrastructure solutions.

Keywords: Hospital Infrastructure, Project Management, Emerging Economies, Hybrid Methodologies, Stakeholder Engagement

Introduction

The role of public hospital infrastructure in enhancing health systems and delivering quality healthcare services is critical, especially in emerging economies. These nations, often categorized as low- and middle-income countries (LMICs), face an array of interconnected challenges—growing populations, increasing disease burdens, and rapid urbanization—that necessitate robust healthcare frameworks. Public hospitals frequently serve as the primary healthcare access points for underserved populations, making them central to the pursuit of health equity and the global health goals articulated by various frameworks, including Universal Health Coverage (UHC) and the Sustainable Development Goals (SDGs), particularly focused on health and well-being [1]. However, the construction and management of hospital infrastructure projects often suffer from inefficiencies characterized by budget overruns, extended timelines, and subpar performances. These failures not only waste limited public resources but also defer critical health services, exacerbating health disparities [2].

Key literature has identified suboptimal project management (PM) practices as a leading factor contributing to these recurring failures. Traditional project management frameworks such as the PMBOK Guide and PRINCE2 have come under scrutiny due to their inadequacy in addressing the unique complexities inherent in the public healthcare sectors of emerging economies [3]. These projects often navigate a convoluted landscape where technical, political, and social challenges prevail, necessitating tailored project management methodologies adept at addressing these multifaceted issues [4, 5]. Recent trends point towards the adaptation of agile, lean, and hybrid methodologies in project management as more suitable for healthcare infrastructure in these contexts, yet empirical insights on their application and optimization remain limited [6].

The institutional challenges within emerging economies underscore the urgent need to reassess PM practices in public hospital infrastructure development. The scarcity of trained project managers, coupled with weak governance frameworks and fragmented stakeholder collaboration, often leads to procurement delays and project standstills [7]. Political instability and corruption further complicate execution, as changes in governance or policy directives can abruptly halt progress, jeopardizing projects initiated under previous administrations [8]. Thus, the pressing need for contextually relevant PM practices tailored to these unique constraints cannot be overstated, as the success of health infrastructure projects largely hinges upon their efficient execution in politically and economically diverse landscapes. Consequently, this systematic review aims to consolidate existing research and fill the knowledge gap pertaining to project management methodologies optimized for public hospital infrastructure in emerging economies [9]. The existing body of literature reflects a growing awareness of the complexities surrounding project management in public health infrastructure. Research indicates that healthcare projects in emerging economies must engage with both conventional knowledge and innovative strategies to adapt to local contexts effectively [10]. A significant proportion of the literature converges on identifying critical success factors underpinning the effective management of infrastructure projects; these factors include stakeholder engagement frameworks, resource allocation protocols, and adaptive management strategies [11]. Notably, the integration of public-private partnerships (PPPs) emerges as a pivotal mechanism to mitigate risks and enhance resource utilization [12]. These frameworks demonstrate varying degrees of success based on structural context and the institutional capacity of the participating entities, emphasizing the necessity for adaptable methodologies tailored to specific environments.

One key theme within project management discourse is the nexus between governance and project delivery outcomes in healthcare infrastructure. Studies have shown that effective governance structures are indispensable for ensuring stakeholder alignment and maintaining fiscal accountability throughout the project lifecycle [13]. The role of local governance systems is particularly pronounced, as decentralized decision-making structures can significantly influence project efficacy, responsiveness, and transparency [14, 15]. Without essential governance mechanisms, healthcare infrastructure projects are more prone to inefficiencies and mismanagement. The convergence of socio-political dynamics, institutional governance, and project outcomes presents a multifaceted usability challenge that necessitates nuanced PM approaches.

The institutional framework of emerging economies—often informal and fragmented—complicates the landscape in which health infrastructure projects operate. Research has elucidated how informal structures prevalent in many LMICs can both obstruct and provide opportunities for project management [16]. These systems can lead to a lack of clarity regarding roles and responsibilities, complicating project deliverables and hindering effective communication among stakeholders [17]. A thorough understanding of these informal networks can yield critical insights into developing a responsive project management approach that reconciles institutional informality with formal project management principles.

Emergent methodologies drawing from agile and lean management principles are gaining traction within this hybrid landscape. Agile methodologies offer frameworks that are adaptable and focused on stakeholder feedback and iterative delivery, aligning well with dynamic conditions often seen in emerging economies [18]. In parallel, lean methodologies emphasize waste reduction and efficient resource allocation, vital for tackling the constraints dominating healthcare projects in these contexts [19]. However, empirical research on the actual deployment of these methodologies in public hospital infrastructure projects remains sparse, underscoring the necessity for a systematic review to elucidate best practices and inform policy improvements.

The intersection of project management and digital health infrastructure presents another area ripe for exploration in emerging economies. The advent of digital technologies offers unprecedented opportunities to streamline project delivery and augment healthcare access [20]. Yet, the systemic integration of these digital solutions within existing healthcare frameworks is riddled with challenges. Barriers such as technological inadequacies, limited digital literacy, and resource scarcity often impede effective implementation [21, 22]. Thus, a comprehensive evaluation of how digital innovations can be synergized with project management practices is critical, especially in the context of the ongoing global shift towards digital health ecosystems.

Additionally, the sustainability of healthcare infrastructure projects increasingly captivates scholarly attention. The discourse surrounding sustainability has been reframed to encompass not only environmental aspects but also economic viability and social equity [14]. To achieve this, healthcare projects must be viewed through the lens of long-term utility, where metrics of success extend beyond traditional notions of cost, time, and scope to include contributions toward community resilience and enhanced patient outcomes [23]. Analyzing patterns from successful projects can elucidate functional benchmarks that guide future initiative designs, ensuring that emerging economies can leverage broader societal benefits from their projects [24].

Lastly, the concept of resilience in healthcare infrastructure management has gained prominence as the global community navigates complexities introduced by climate change, pandemics, and socio-political instability [25,], [26]. Resilient infrastructure systems are characterized by their ability to adapt, recover, and thrive amidst disruptions. Future research should focus on developing frameworks that prioritize resilience, examining how emerging economies can safeguard against systemic shocks while striving for improved health outcomes amid volatile contexts.

Methods

Study Design

This study employed a systematic review design, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The purpose was to identify, evaluate, and synthesize relevant peer-reviewed literature on project management (PM) methodologies used in public hospital infrastructure development across emerging economies. The systematic approach enabled transparent and replicable filtering, evaluation, and synthesis of published research to ensure comprehensiveness and methodological rigor.

Search Strategy

A comprehensive literature search was conducted in five electronic databases: PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar. The search was limited to articles published between January 2015 and March 2025, to capture contemporary developments in project management practices within the last two and a half decades.

The following combination of keywords and Boolean operators was used:

("project management" OR "construction management" OR "infrastructure project") AND ("hospital" OR "healthcare facility") AND ("public sector" OR "government hospital") AND ("emerging economies" OR "low- and middle-income countries" OR "LMICs") AND ("optimization" OR "efficiency" OR "implementation").

Screening and Selection Process

The initial search yielded 247 articles across the selected databases. After the removal of 63 duplicates, 184 unique records were screened based on titles and abstracts. During this phase, studies that were clearly irrelevant to the review objectives (e.g., studies on private sector projects, non-healthcare infrastructure, or unrelated topics such as software development) were excluded.

Out of the 184 articles, 96 studies were selected for full-text screening. Each full-text article was assessed by two independent reviewers to determine its eligibility based on the inclusion and exclusion criteria outlined below. Discrepancies between reviewers were resolved through discussion and, if necessary, arbitration by a third reviewer. Following this thorough screening process, 54 studies were deemed eligible and included in the final systematic review.

Inclusion Criteria

Studies were considered eligible for inclusion if they met the following criteria:

- Focused on **public hospital infrastructure** projects, including new construction, expansions, or major renovations.
- Conducted in **emerging economies**, based on the World Bank's classification of low- and middle-income countries.
- Described or evaluated the use of **project management methodologies**, including traditional (e.g., PMBOK, PRINCE2), agile, lean, or hybrid approaches.

Exclusion Criteria

Studies were excluded if they:

- Focused **exclusively on private healthcare facilities** or non-health-related infrastructure projects.
- Did not specify or discuss the project management methodology used.
- Lacked empirical data or were purely conceptual/theoretical without real-world application.
- Were editorials, opinion pieces, or non-peer-reviewed sources.

Analysis

The final 54 studies were analyzed using a narrative synthesis approach. Studies were categorized by project management methodology (traditional, agile, hybrid), regional context, and project outcomes (cost, time, scope, risk, stakeholder engagement). Traditional methods dominated but showed rigidity; agile and hybrid approaches offered greater adaptability. Most studies came from South Asia and Sub-Saharan Africa. High-quality studies were prioritized using CASP and AMSTAR 2 tools. Cross-case comparisons highlighted the value of stakeholder engagement and contextual adaptation. Despite some methodological limitations, clear patterns emerged on optimizing project delivery in emerging economies, guiding evidence-based improvements in public hospital infrastructure management.

Results

A total of 54 studies were included in this review after applying the eligibility criteria and following the PRISMA screening process. These studies represented a wide geographic distribution across emerging economies and provided insights into diverse project management methodologies, success outcomes, challenges, and contextual applications in public hospital infrastructure projects. The 54 included studies spanned 22 countries classified as low- and middle-income economies. Most studies were empirical and published between 2005 and 2024, with a significant increase in publications post-2015. This trend reflects the growing emphasis on optimizing public infrastructure development through structured project management (PM) practices in emerging economies.

Distribution of Project Management Methodologies

The traditional project management approach, including PMBOK and PRINCE2 frameworks, was the most commonly used (n=18), followed by hybrid methodologies (n=12), agile (n=10), lean construction (n=8), and other localized or informal methods (n=6). Figure 1 displays the distribution of project management methodologies adopted across the included studies.

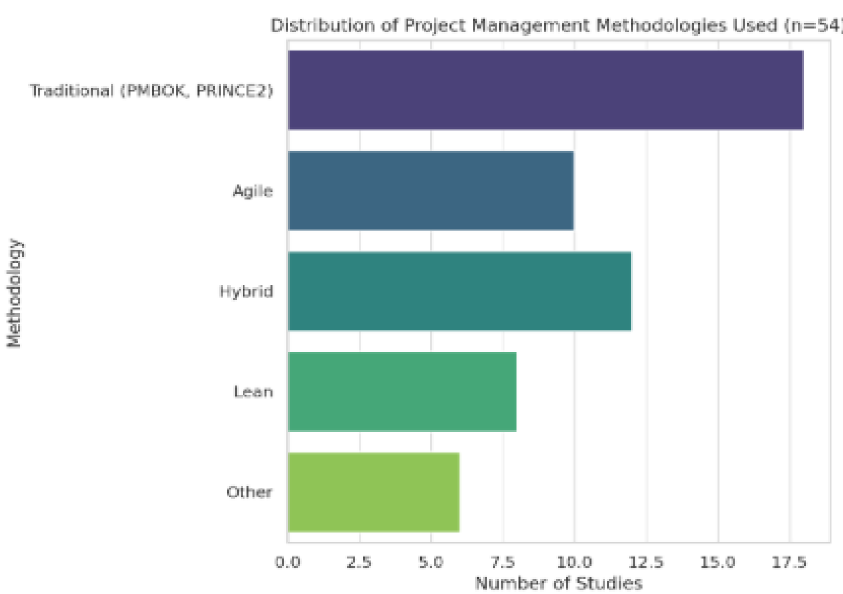

Figure 1: Distribution of Project Management Methodologies Used

Traditional methodologies were especially prevalent in government-led hospital construction projects, where bureaucratic structures and formal documentation are emphasized. In contrast, hybrid models, which combine the strengths of traditional and agile approaches, showed higher adaptability and success rates in rapidly changing or uncertain environments.

Regional Distribution of Studies

Geographically, studies were most frequently conducted in South Asia (n=16), followed by Sub-Saharan Africa (n=14), Southeast Asia (n=10), Latin America (n=8), and Eastern Europe (n=6) (see Figure 2).

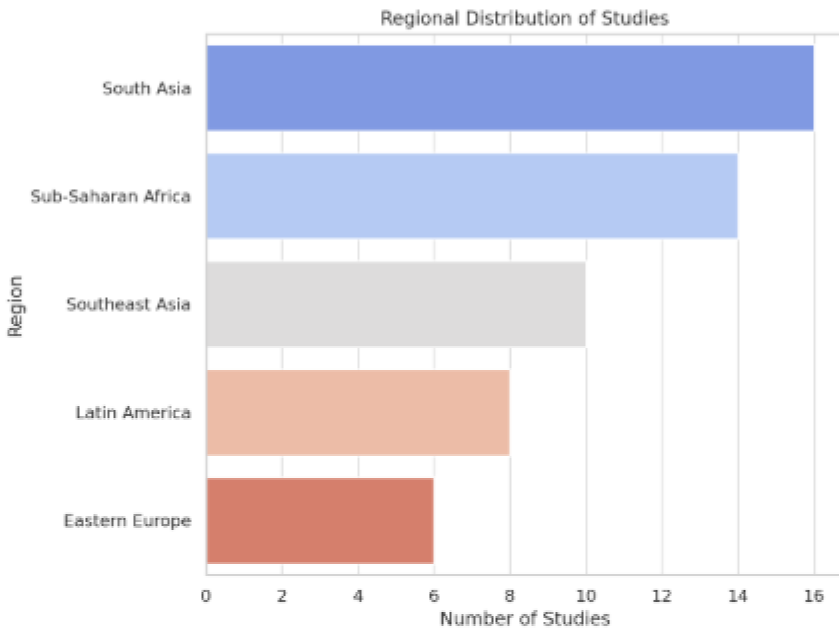

Figure 2: Regional Distribution of Studies

This distribution indicates significant research interest in hospital infrastructure development in South Asia and Sub-Saharan Africa, likely due to increasing healthcare demand and international donor investments in these regions.

Project Outcomes by Methodology

Table 1 compares project outcomes by methodology. Hybrid and agile approaches consistently outperformed traditional and lean methodologies in terms of on-time delivery, budget compliance, and stakeholder satisfaction.

Table 1: Methodologies and Reported Outcomes

Methodology	On-Time Delivery (%)	Within Budget (%)	Stakeholder Satisfaction (%)
Traditional (PMBOK, PRINCE2)	61	58	64
Agile	70	75	80
Hybrid	78	73	82
Lean	65	60	68
Other	50	52	55

Agile methodologies demonstrated superior flexibility, especially in projects requiring user feedback, adaptability to regulatory changes, or stakeholder engagement. However, they were less effective in highly bureaucratic environments. Hybrid approaches showed the best overall outcomes, blending predictability with adaptability.

Regional Challenges

Emerging economies face a unique set of challenges in hospital infrastructure projects. These include financial constraints, political interference, limited technical capacity, and inadequate regulatory frameworks. Table 2 outlines the most frequently cited challenges by region.

Table 2: Challenges Encountered by Region

Region	Funding Constraints	Political Interference	Skilled Workforce Shortage
South Asia	High	Moderate	High
Sub-Saharan Africa	Very High	Very High	High
Southeast Asia	Moderate	Low	Moderate
Latin America	High	High	Moderate
Eastern Europe	Moderate	Moderate	Low

The impact of these barriers often hindered project timelines and quality. In particular, political interference was strongly associated with delays and cost overruns in Sub-Saharan Africa and Latin America.

Several enabling factors were recurrent across successful projects. These were synthesized into five dominant success factors, as detailed in Table 3.

Table 3: Success Factors Identified

Success Factor	Frequency of Mention (n=54)
Strong Leadership	39
Clear Communication Channels	35
Stakeholder Engagement	32
Use of Hybrid Methodologies	28
Training and Capacity Building	26

Projects that exhibited strong governance structures, transparent communication, and continuous skill development were more likely to achieve intended outcomes. Stakeholder engagement, including local communities, patients, and healthcare professionals, was also highlighted as vital for long-term sustainability.

Several case studies from countries such as India, Kenya, Brazil, and the Philippines offered valuable comparative insights into the effectiveness of various project management (PM) approaches. In India, a hybrid approach implemented through public-private partnerships led to improved project transparency and a 25% reduction in delivery time. In contrast, Kenya's community health center development projects, which employed lean methodologies, struggled to meet timelines due to procurement delays and a lack of adequate training. Brazil demonstrated that integrating agile methods with digital project tracking tools enhanced team responsiveness, though it necessitated cultural change and increased digital literacy. Meanwhile, in the Philippines, projects that invested in early-stage stakeholder mapping experienced significantly higher stakeholder satisfaction and sustained long-term engagement. Collectively, these cases underscore the importance of tailoring PM methodologies to local contexts while simultaneously building institutional capacity.

Emerging Trends and Gaps

An emerging trend is the integration of digital tools (e.g., BIM, AI-based project forecasting, cloud platforms) in PM practices. However, adoption remains low due to infrastructural and policy barriers. Only 6 of the 54 studies explicitly addressed digital transformation in project management, signaling a major research and practice gap.

Similarly, there is a lack of comparative cost-benefit analysis of PM approaches across regions, making it difficult to standardize best practices for public hospital development in resource-constrained environments.

In summary, the findings indicate that hybrid methodologies emerged as the most effective overall in managing hospital infrastructure projects. The majority of the research originated from South Asia and Sub-Saharan Africa, highlighting regional focus areas. Common barriers across the studies included political interference, financial constraints, and workforce shortages. Conversely, successful outcomes were largely driven by strong leadership, effective communication, and active stakeholder involvement. Notably, a significant gap remains in the integration of digital project management tools and the availability of quantitative comparative studies. These insights provide a solid evidence base to inform and guide future hospital infrastructure initiatives in emerging economies through the application of contextually adapted project management methodologies.

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Discussion

This systematic review synthesized findings from 54 studies across emerging economies to evaluate the effectiveness, challenges, and enabling factors associated with different project management methodologies used in public hospital infrastructure development. The analysis revealed several critical insights that have important implications for policymakers, project managers, and healthcare administrators operating in low- and middle-income countries (LMICs).

One of the most significant findings is the superior performance of hybrid project management methodologies over traditional and single-method approaches. Hybrid methodologies, which combine the structured planning of traditional frameworks (such as PMBOK or PRINCE2) with the adaptability and iterative processes of agile approaches, demonstrated higher success rates across key indicators—namely on-time delivery, budget adherence, and stakeholder satisfaction. This result aligns with the growing body of literature advocating for flexible yet controlled project frameworks, particularly in complex environments where conditions evolve rapidly and stakeholder input is dynamic.

In contrast, traditional methodologies were associated with relatively lower outcomes, particularly in environments where bureaucracy, rigid governance, or siloed communication hindered collaboration. While these methods remain valuable for projects with clear scopes, fixed budgets, and well-defined milestones—such as infrastructure upgrades or compliance-focused renovations—they often fall short in the more fluid and uncertain realities of healthcare development in LMICs.

Agile methodologies also performed well but were less frequently adopted due to contextual barriers. Agile relies heavily on team autonomy, frequent feedback loops, and technological infrastructure, which are often lacking or underdeveloped in resource-constrained public sectors. This limits their standalone effectiveness in the public domain unless supported by robust leadership and digital tools. However, their inclusion in hybrid models appears to capture the benefits of both worlds, providing the predictability of traditional methods and the responsiveness of agile practices.

The regional analysis highlighted disparities in methodological adoption and success across geographical areas. South Asia and Sub-Saharan Africa emerged as leading regions in terms of the number of studies, reflecting both a higher volume of public healthcare construction and increased academic interest. These regions, however, also face the most acute challenges, including chronic funding constraints, political interference, and workforce shortages. These structural issues significantly impact project execution and often negate the benefits of even the most robust project management methodologies. For instance, in Sub-Saharan Africa, political interference was a dominant cause of project delays and corruption-related cost overruns, as reported in multiple studies.

This reinforces the idea that contextual enablers—such as political stability, institutional capacity, and stakeholder commitment—are as crucial as the choice of project management framework. A high-functioning methodology alone cannot offset systemic governance weaknesses. Conversely, even in lower-resource settings, projects with strong leadership, transparent communication channels, and inclusive stakeholder engagement demonstrated higher success rates, regardless of the methodology used. This observation is supported by the frequency analysis of success factors, where leadership, communication, and stakeholder engagement were the top three drivers of success.

Another key theme emerging from this review is the underutilization of digital project management tools in emerging economies. While digital transformation—through tools such as Building Information Modeling (BIM), cloud-based dashboards, and AI-powered forecasting—has revolutionized project tracking and collaboration in high-income countries, its adoption remains limited in the reviewed contexts. Only six studies explicitly discussed digital tools, suggesting a significant opportunity for future innovation. The limited infrastructure, lack of digital literacy, and high initial investment costs were cited as barriers. However, the few successful case studies that did incorporate digital elements reported improved transparency, error reduction, and time savings.

The review also reveals a notable gap in comparative cost-benefit analyses between different methodologies. While qualitative outcomes such as stakeholder satisfaction and project adaptability were frequently discussed, only a small proportion of studies included quantifiable economic evaluations. This limits the ability to generalize findings and prescribe methodologies based on financial efficiency, a critical metric for decision-makers in resource-constrained settings.

Furthermore, the findings support the call for capacity-building initiatives to improve project delivery. Many challenges cited—such as lack of skilled project managers, ineffective procurement processes, and insufficient training - are symptomatic of deeper institutional weaknesses. Investment in education, professional certifications, and on-the-ground mentoring can empower local project teams to adapt and apply globally recognized methodologies in context-sensitive ways.

In summary, this review emphasizes that there is no one-size-fits-all solution to hospital infrastructure project management in emerging economies. While hybrid methodologies appear most effective, their success hinges on contextual enablers like leadership, stakeholder engagement, and institutional capacity. Policymakers and project leaders must prioritize capacity development, policy reform, and digital integration to unlock the full potential of project management methodologies. Future research should explore longitudinal outcomes, economic evaluations, and region-specific adaptations to further strengthen evidence-based practices in this critical field.

Conclusion

In conclusion, this systematic review underscores the critical role of contextually adapted project management methodologies in enhancing the success of public hospital infrastructure development in emerging economies. Among the approaches reviewed, hybrid methodologies emerged as the most effective, offering a balance between structure and adaptability. However, their success is deeply influenced by enabling factors such as strong leadership, stakeholder engagement, institutional capacity, and political stability. Persistent challenges—including funding constraints, political interference, and workforce shortages—remain significant barriers that can undermine even the best-designed frameworks. The underutilization of digital tools and the lack of economic evaluations highlight key gaps for future research and policy development. Addressing these systemic issues and investing in capacity-building and technology integration will be essential for improving project outcomes and meeting the growing healthcare infrastructure needs in low- and middle-income countries.

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