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Exploration of Contractors' Management Strategies in Delivering Successful Construction Projects in Ghana: A Factor Analysis Approach

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ABSTRACT

This study explores the management strategies used by contractors in Ghana during the construction stage to successfully deliver construction projects. The research employed a descriptive cross-sectional survey to gather data from 375 site managers working in medium and large-sized construction firms in Ghana. Principal Component Analysis (PCA) was used to reduce the 32 strategies identified through the literature review to 25 sub-strategies. The analysis identified four key strategy categories that contribute to successful project delivery: effective project planning, monitoring and control, stakeholder collaboration, and integration of digital technologies. The findings provide valuable insights and recommendations to enhance project management practices within Ghana's construction industry, aiming to improve project delivery and increase stakeholder satisfaction.

Keywords: Construction Industry, Contractors, Management Strategies, Successful Project Delivery.

1.0 INTRODUCTION

The performance of contractors in Ghana's construction industry has become a significant concern for stakeholders. The literature suggests that many contractors, especially Small-Sized Building Contractors (SSBCs), who make up over 70% of the industry, lack the necessary management skills for successful project delivery [1, 2]. As a result, these contractors often fail to meet project performance goals.

Delivering successful projects is crucial for construction firms, as it provides value to stakeholders and promotes business growth. Consistently completing projects on time and within budget enhances a firm's reputation, attracting more clients and investors [2, 3]. In contrast, failed projects lead to financial losses, damage to the company's image, and potential disputes, which can reduce future opportunities [3, 4]. With rising client expectations, constrained resources, and fierce competition within the Ghanaian construction industry, contractors are under increasing pressure to enhance their performance [2].

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2.0 LITERATURE REVIEW

This section focuses on recent and relevant literature relating to the study. It discusses the theories for the study, challenges facing local contractors in Ghana, and contractor's role in construction project delivery. It also summarizes some empirical research conducted in this field of study in recent times. The research gap is also covered

2.1 Resource-Based View (RBV) Theory

This theory emphasizes that an organization's success is dependent on its ability to utilize resources effectively. In the context of Ghana's construction industry, contractors' ability to leverage their tangible (e.g., equipment, materials) and intangible resources (e.g., managerial expertise) directly impacts project success. RBV is relevant for this study as it can guide the analysis of how contractors manage their unique resources to gain a competitive edge and deliver quality projects.

2.2 Contingency Theory

Contingency theory posits that there is no one-size-fits-all approach to management; instead, strategies must align with specific environmental, economic, and organizational contexts. This theory is particularly relevant for Ghana, where construction projects face diverse challenges like fluctuating economic conditions, and regulatory environments. It supports the tailoring of management strategies to fit project-specific demands.

2.3 Challenges Facing Local Contractors in Ghana

The literature suggests that local contractors in Ghana encounter numerous operational barriers that limit their ability to secure large public infrastructure projects. These challenges include insufficient financial, logistical, and technical resources, as well as bureaucratic delays in government payments for completed work [2, 5]. Additionally, the industry faces issues such as outdated technology [6], political interference, inflation, high interest rates, and a shortage of skilled labour and managerial expertise [1, 7]. As global competition intensifies, it is crucial for Ghanaian contractors to adopt robust strategies to enhance their management capabilities and improve project outcomes.

2.4 Contractors Role in Construction Project Delivery

In construction, a contractor is an individual or organization hired by a client to execute a project based on a contract. Contractors play a vital role in managing the construction process, ensuring that projects are finished on time, remain within budget, and comply with the quality standards specified by clients and consultants [8]. Their duties include planning, managing, monitoring, and executing project tasks while ensuring compliance with regulations and safety standards throughout the project's lifecycle [9, 10]. Additionally, contractors are responsible for managing materials efficiently and addressing environmental concerns during construction [11].

2.5 Classifications of Contractors in Ghana

In Ghana, the Ministry of Water Resources, Works, and Housing categorizes construction firms into four level, namely: D1, D2, D3, D4 and K1, K2, K3, K4 based on criteria such as annual turnover, equipment, and workforce. Large-sized contractors are classified as D1K1, medium-sized contractors as D2K2, while small-sized contractors fall under D3K3 and D4K4 [12, 13]. Each classification is associated with specific contract bidding limits. The main contractor organizations in Ghana include the Association of Building and Civil Engineering Contractors of Ghana (ABCECG) and the Association of Road Contractors of Ghana, with ABCECG representing a wide range of construction firms nationwide [14].

2.6 Contractor's Management Strategy

Contractor's management strategy refers to the methods and actions employed by contractor firms to ensure successful project completion while meeting client expectations in a dynamic market environment [3]. This study explores specific strategies implemented by contractors during the construction phase to enhance effective project delivery. Table 1 summarizes key contractor management strategies (CMS) identified in previous research as critical to achieving successful project outcomes.

Table 1: CMSs Extracted from Literature

SN	**Contractors' Management Strategies**	**Authors**
1	Review of past construction projects	[15]
2	Design review for constructability	[16]
3	Collaborative project planning	[15]

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4	Definition of the tasks of team members	[13, 17]
5	Clarity of project mission and goals to the team	[18]
6	Use of alternative construction methodologies	[15]
7	Applying reasonable buffer (safety time)	[15, 19]
8	Top management commitment and support	[20, 21]
9	Use of competent team	[22, 23]
10	Regular update of program of works	[24]
11	Provision of quality assurance functions	[22]
12	Conduct of training workshop and site meetings	[15 24, 25]
13	Enclose construction site from public	[10]
14	Display of Health and safety posters on site	[10]
15	Review of construction activities	[26, 27]
16	Prepare interim valuation and financial statement	[28, 29]
17	Involvement of stakeholders in decision making	[30, 31]
18	Clients' requirements as the basis for quality	[32, 33]
19	Involvement of stakeholders in project M&E	[34, 35]
20	Updates of project communicated to project team	[36, 37]
21	Warm working relationship with stakeholders	[34, 38]
22	Use of computer software for project planning	[19, 39]
23	Use of 3D modelling software for visualization	[15]
24	Use of computer aided software for data processing	[24, 36, 39, 40]
25	Use of ICT/digital tools for communication	[39]
26	Implement environmental protection policy	[11]
27	Provide health and safety manual to workers	[10]
28	Practice reward and incentive system	[3]
29	Establish clear organizational structure and delegate authority	[3, 41]
30	Ensure site workers wear protective clothing	[10]
31	Implement logistic and supply chain management	[22]
32	Implement IT system for site security	[3, 42]

2.7 Identified Research Gap

While several studies in developing economies, including Ghana, have examined critical success factors (CSFs) in project management, most have primarily concentrated on overarching project management approaches or strategies at the organizational level. Limited attention has been given to strategies specifically employed during the construction phase. Furthermore, although research in other countries has explored contractors' management strategies during this phase, there is a noticeable lack of studies addressing this issue in the Ghanaian context. This gap leaves local contractors with insufficient guidance on construction-phase management strategies, increasing their susceptibility to challenges such as delays, cost overruns, and suboptimal project outcomes.

The absence of focused research on construction-phase strategies hinders the development of tailored solutions for Ghana's construction industry. Without specific, evidence-based strategies, contractors may lack the necessary knowledge and tools to manage projects effectively. Addressing this gap is critical to enhancing the performance and competitiveness of contractors in Ghana.

To address this need, the present study aims to explore the strategies employed by medium and large-sized contractors during the construction phase in Ghana. The research findings will provide actionable insights and recommendations to enhance project execution and improve outcomes in the country's construction sector.

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3.0 METHODOLOGY

In this section, the research design, methodologies, participant selection (population) and sample size, data collection procedure are thoroughly examined and justified. Additionally, an explanation is provided regarding the data analyses methods employed.

3.1 Research Design

The study utilized a descriptive cross-sectional survey design to collect quantitative data, aiming to explore the management strategies employed by contractors in Ghana during the construction stage. This approach was selected as it enables researchers to reach a larger number of respondents [43] and was particularly suitable given that all respondents were highly literate [17]. To ensure the validity of the questionnaire, it was reviewed by two construction management experts. Additionally, a pilot test was conducted involving four large-sized and six medium-sized construction firms located in the Central Region of Ghana, comprising fifteen site managers and forty gang leaders. Based on the feedback from this pilot, minor adjustments were made to enhance clarity.

3.2 Study Population and Sample Size

The population for the study comprised contractors registered with the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). The ABCECG includes members from various construction firms across the country and serves as a central organization for contractors from diverse firms [14]. According to the ABCECG secretariat, the total number of D1K1 (large) and D2K2 (medium) construction companies (active members) in their ten administrative regions was 607. Since the total number of construction companies slightly exceeded 600, the entire population was used (census sampling) [44]. However, 43 contractors declined to participate when contacted, resulting in a total sample size of 564 large and medium-size contractors, as shown in Table 2.

Table 2: Selected Contractors

SN	Region	Population	Target Population	Respondents
1	Greater Accra	120	117	95
2	Ashanti	75	73	56
3	Volta	65	63	51
4	Central	55	52	43
5	Eastern	52	54	41
6	Brong Ahafo	50	48	35
7	Northern	38	38	22
8	Upper West	65	35	15
9	Upper East	57	55	10
10	Western	30	29	7
Total		**607**	**564**	**375**

3.3 Data Collection and Analysis Methods

Data were collected using structured questionnaires distributed to all 564 medium and large-sized construction firms registered with the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). Senior site managers were chosen as the primary respondents due to their expertise and in-depth knowledge of their respective firms' operations [45]. Each management strategy was rated on a five-point Likert sized, where 1 indicated "not important" and 5 indicated "very important." The questionnaires were distributed electronically via Google Forms and shared through WhatsApp to ensure ease of access and to enhance participation.

The collected data were analyzed using factor analysis, which is a statistical technique employed to identify underlying relationships between variables and to reduce data into key components for interpretation.

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4.0 RESULTS AND DISCUSSION

4.1 Results

4.1.1 Response rate

A total of 375 valid responses were obtained, representing a response rate of 66.5%. This rate is consistent with the generally accepted response range of 30% to 77% for studies conducted within Ghana's construction industry [2, 46].

4.1.2 Demographic background of respondents

The demographic data of the respondents included their education levels, years of experience in construction, and the years their companies had been in operation. The majority of respondents (75%) held a bachelor's degree, 14% had a Higher National Diploma, and 11% held a master's degree. Additionally, 94% of participants had over five years of experience in the construction industry, and 92% of the firms had been operating for more than ten years. This indicates that the respondents possessed substantial experience and expertise, making them reliable participants for the study.

4.1.3 Factor Analysis

The survey data on 32 strategies were analyzed using Factor Analysis (FA), with the strategies acting as formative indicators contributing to the overall construct. Principal Component Analysis (PCA) was employed to reduce data complexity [47], revealing interrelationships among the strategies and organizing them into a more manageable framework for decision-making. The findings are presented in Table 3. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.835, and Bartlett's test of sphericity was significant at the 0.01 level, while Cronbach's alpha for internal consistency was 0.801, indicating good reliability.

In the initial PCA, five variables, thus sorting and recovering waste before disposal, providing instructions to site workers, specifying supplier requirements, gang leader involvement in planning, and enforcing protective clothing for workers loaded onto two factors, complicating interpretation. These variables were removed, and the analysis was repeated. Two additional variables, quality inspections for materials and employee incentives for productivity, were also removed after loading onto two factors. Following the third iteration, the PCA extracted four factors that accounted for 75.29% of the variance.

The first factor, labeled "planning-related strategy," had an eigenvalue of 6.433 and explained 26.805% of the variance, focusing on planning strategies. The second factor, labeled "monitoring and control strategy," with an eigenvalue of 5.773 and accounting for 24.054% of the variance, encompassed strategies related to monitoring, and control. The third factor, labeled "stakeholder collaboration strategy," had an eigenvalue of 4.338 and explained 18.074% of the variance, reflecting stakeholder collaboration. The fourth factor, associated with digital technology use, had an eigenvalue of 1.525 and accounted for 6.35% of the variance. Each of the 25 items had a factor loading above 0.5, indicating statistical significance [48].

Table 3: Principal Component Analysis of the CMS Strategies

Item	1	2	3	4
Planning related strategy				
Review of past construction projects	0.790			
Design review for constructability	0.782			
Collaborative project planning (involves relevant stakeholders in project planning)	0.773			
Definition of the tasks of team members	0.745			
Clarity of project mission and goals	0.718			
Use of alternative construction activities/methodologies	0.705			

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Applying reasonable buffer (safety time)	0.658			
Monitoring and control related strategy				
Top management commitment and support		0.763		
Use of competent team		0.678		
Update of program of works		0.669		
Presence of quality assurance functions		0.667		
Conduct of training workshop		0.652		
Conduct of site meetings		0.645		
Health and safety posters are displayed on site		0.631		
Regular review of construction activities		0.517		
Preparation of interim valuation and financial statement		0.505		
Stakeholder collaboration related strategy				
Involvement of stakeholders in decision making			0.875	
Use of clients' requirements as the basis for quality			0.870	
Involvement of stakeholders in project monitoring and evaluation			0.823	
Effective stakeholders' communication (constant updates of project progress is communicated to the relevant parties)			0.805	
Maintaining a warm working relationship with stakeholders			0.689	
Digital Technology Integration related strategy				
Use of computer software for project planning				0.786
Use of 3D modelling software for visualization and constructability				0.762
Use of computer aided software for data processing				0.674
Use of ICT for communication (i.e. Email, WhatsApp, Zoom)				0.645
KMO = 0.835, **Bartlett's Test** = 3846.706, **Sig.** 0.000 **Cumulative % Variance**				

4.1.4 Reliability of the Main-Strategy Dimensions

The overall Cronbach's alpha value for the CMS dimensions is 0.801, as displayed in Table 4. Each Cronbach's alpha value for the constructs exceeded the minimum threshold of 0.7 recommended by [49], indicating that all measurements used exhibited acceptable internal consistency.

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Table 4: Reliability test of CMS

Elements	Number of Items	Cronbach alpha Coefficient
Planning related strategy	7	0.824
Monitoring and control strategy	9	0.805
Stakeholder collaboration strategy	5	0.798
Technology related strategy	4	0.774
CMS	25	0.801

4.2 Discussion

The factor analysis reveals that the underlying constructs of contractors' management strategies for successful construction projects in Ghana, particularly for medium and large-sized contractors, are linked to planning-related strategies, monitoring and control strategies, stakeholder collaboration strategies, and digital technology integration.

4.2.1 Construction Project Execution Planning

Construction project execution planning involves creating a detailed roadmap that outlines the necessary resources, timelines, tasks, and deliverables for successful project completion. This phase bridges the gap between project initiation and on-site implementation. Without a well-structured plan, projects are prone to cost overruns, delays, and rework. Effective execution planning helps project managers optimize resource allocation, mitigate risks, and ensure clear communication among all stakeholders.

The survey found that "effective construction project execution planning" is the most important strategy, accounting for 26.8% of the total variance. Under this strategy, there are seven key sub-strategies. First, contractors should review past construction projects before starting new ones. This finding is supported by Ramanayaka [15]. Reviewing past projects helps identify successful strategies and avoid repeating mistakes. It also provides benchmarks for cost, time, and quality [50]. Additionally, past project data helps assess risks for future projects [51].

Another sub-strategy is reviewing designs for constructability before starting construction. Voght and Epstein [16] highlight that this ensures plans are practical, reducing errors, costs, and delays. It also minimizes conflicts and claims, helping projects finish on time. Collaborative planning is also deemed crucial. Ramanayaka [15] and Walker and Lloyd-Walker [52] note that collaboration ensures team members and stakeholders are aligned, improving coordination. Involving various stakeholders brings diverse expertise and leads to better decision-making.

Defining team member tasks is another important sub-strategy. Cleland and Ireland [17] emphasize that clear task definitions enhance accountability and streamline workflow. This reduces overlap, avoids redundancy, and improves efficiency [19]. Proper resource allocation also becomes easier, reducing waste and increasing productivity [53]. Clarity of project mission and goals is another key sub-strategy. According to PMI [27], clear goals ensure all stakeholders understand what the project aims to achieve, aligning efforts toward common objectives.

Using alternative construction methods is another sub-strategy. Ramanayaka [15] suggests that exploring different methodologies provides flexibility and helps manage risks when traditional methods face challenges. Finally, contractors identified the importance of applying reasonable buffer time. Buffers help manage uncertainties and delays, leading to smoother project execution [15, 19]. This also boosts stakeholder confidence, demonstrating that potential risks have been accounted for [27].

4.2.2 Monitoring and Control Strategy

In construction project delivery, monitoring and control involve the continuous processes of overseeing project progress, verifying compliance with schedules, budgets, and quality benchmarks, and detecting any deviations. This enables timely corrective actions to ensure the project remains aligned with its goals and client requirements [19, 27]. This research identifies "monitoring and control" as a key strategy, contributing to 24.05% of the total variance. The sub-strategies

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include top management commitment, utilizing a competent workforce, providing regular schedule updates, ensuring quality assurance, conducting training workshops and site meetings, securing construction sites, displaying health and safety posters, and performing interim valuations and activity reviews. Top management commitment is crucial for project success [6, 22]. It ensures proper allocation of resources (financial, human, and material) helping to overcome challenges and maintain project momentum. Leadership support also boosts morale and fosters a culture of excellence [21]. Having a competent team improves project efficiency, as skilled workers complete tasks faster and increase overall productivity [22, 23], leading to better project outcomes [18]. Regular schedule updates ensure accurate tracking of progress and help identify any deviations early [27], which improves communication and keeps stakeholders informed [24].

Quality assurance ensures compliance with standards and regulations, preventing defects and enhancing client satisfaction [54]. Implementing quality policies, manuals, and audits helps maintain consistency throughout the project [3, 22]. Training workshops enhance the skills of the project team and promote continuous improvement [24, 25]. These workshops also foster knowledge sharing and collaboration [55]. Additionally, regular site meetings with stakeholders promote cooperation and ensure clear communication regarding project progress and issues [15, 27].

Securing construction sites protects both workers and the public from hazards, while health and safety posters raise awareness of potential risks and reinforce safety practices. Together, these measures create a safer work environment, improving both productivity and work quality [11, 19]. Regular reviews of construction activities related to schedule, budget, and quality help detect issues early, allowing corrective actions to keep the project on track [26, 27]. Frequent preparation of interim valuations and financial statements provides up-to-date financial information, aiding better decision-making [19, 29].

4.2.3 Stakeholder Collaboration This survey highlights that effective stakeholder collaboration is vital for project success, contributing 18.07% to the total variance. In construction, stakeholders typically include clients, consultants, investors, end-users, and regulatory bodies. Managing their expectations is key to achieving successful project outcomes [15, 30].

The stakeholder collaboration strategy consists of five sub-strategies. Site managers emphasize the importance of involving stakeholders in decision-making, as well as in monitoring and evaluation. Engaging stakeholders in project implementation fosters broader ownership and enhances budgeting, financing, and resource allocation [35, 37]. This aligns with findings from Magassouba et al. [34], which show that stakeholder participation in planning and monitoring significantly improves project success.

Another critical sub-strategy focuses on meeting client requirements to ensure quality. This is essential for achieving client satisfaction, ensuring compliance, and minimizing rework or cost overruns. Fulfilling client expectations enhances efficiency and can lead to repeat business or referrals (33, 56). Imbeah [32] further highlights the importance of understanding client needs for delivering quality construction projects. Clear communication with stakeholders is another key sub-strategy. Regular updates on project progress promote collaboration and transparency [36, 57]. Timely sharing of changes or critical information reduces misunderstandings, helping to maintain harmony in the project [27].

The survey also underscores the importance of building strong relationships with stakeholders. Trust and clear rules of engagement are essential for project success [38]. Good working relationships improve project performance and lead to higher stakeholder satisfaction, resulting in repeat business and referrals [34]. Strong relationships also boost morale, commitment, and productivity, increasing overall efficiency. Effective collaboration further helps resolve conflicts and enhances project outcomes [31].

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4.2.4 Integrating Digital Technologies in Construction Project Delivery

The results indicate that integrating digital technologies is a key strategy, contributing 6.35% of the total variance. This includes four sub-strategies: the use of project planning software, 3D modeling for visualization, computer-aided data processing, and digital communication tools.

Digital technology streamlines construction by reducing manual labour and boosting productivity. Automated tasks such as data entry, scheduling, and reporting save time and minimize errors [58]. Tools like Building Information Modeling (BIM) improve design accuracy and help avoid costly mistakes [59]. Project planning software allows for the creation and updating of detailed schedules, ensuring realistic timelines and efficient resource allocation of labour, materials, and equipment [19, 39]. It also supports accurate budgeting, helping to prevent cost overruns [7]. 3D modeling software provides clear visualizations of the final product, helping stakeholders understand designs and identify issues early [15]. This reduces constructability problems during construction and leads to higher client satisfaction.

Computer-aided tools improve data management by organizing large volumes of information for easy access [19, 36, 40]. Digital communication tools facilitate quick information exchange among stakeholders, keeping projects on track. These tools also enhance collaboration through shared documents and video conferencing, simplify document management, and reduce paperwork, thereby improving overall efficiency [39].

5.0 CONCLUSION

This study explored the management strategies employed by contractors in Ghana to successfully deliver construction projects during the construction phase. The findings from a survey of 375 site managers in medium and large-sized construction firms highlight that effective project planning, monitoring and control, stakeholder collaboration, and integration of digital technology are crucial for successful project delivery. The study's insights are expected to help construction industry practitioners better understand key management strategies that can improve project performance in developing economies, particularly in Ghana. These strategies include reviewing past projects, conducting constructability reviews, and involving stakeholders in collaborative planning efforts.

Additionally, firms should prioritize continuous workforce training and maintain a competent team, supported by top management. Contractors should involve stakeholders in decision-making and project monitoring, emphasizing clear communication to enhance transparency and reduce potential conflicts. The use of digital tools, such as project management software and 3D modelling, should be promoted in the construction industry to improve project visualization, data management, and overall efficiency. Stakeholders, including the government, should aim to reduce bureaucratic barriers and provide financial and technical support to contractors, especially in adopting modern technology.

The study primarily focused on medium and large-size construction firms. However, data from small-size construction firms would be valuable to broaden the scope and applicability of the findings. Future research could also examine the impact of these identified strategies on construction project outcomes to further enhance the findings.

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