

A Review of Critical Project Management Techniques to Enhance Construction SMEs Project Performance

Chijioke Emere^{1,*}, Innocent Musonda¹, Chioma Okoro¹

¹ Department of Construction Management & Quantity Surveying, University of Johannesburg, Johannesburg, 2000, South Africa.

Abstract. Performance is linked with implementation of project management techniques. Literature suggests that problems such as inefficiency, poor budgetary issues, improper planning, scheduling and control in projects execution are associated with inadequate implementation of the essential techniques for meeting project deliverables. These shortcomings are prevalent among Small and Medium Enterprises (SMEs) in the developing countries including South Africa. Hence, the primary objective of this paper is to review the critical project management techniques for the improvement of construction project performance especially among SMEs in South Africa. The study is based on previous literature on construction SMEs project performance as well as project management techniques implementation. The literature review centered on both international and South African context. The study revealed that critical path method, work breakdown structure, and earned value management analysis were the most occurring project management techniques from the sampled literature. Findings from this study are envisaged to be beneficial to construction stakeholders in developing relevant project management techniques to improve the performance of SMEs.

Keywords: Construction SMEs · Project performance · Project management techniques

1 Introduction

Adequate implementation of project management techniques is a concern in the construction industry especially in this 21st century. Conventional operational procedures are no longer sufficient for settling the issues surrounding quite a large and complex environment such as construction [1]. Hence, construction projects now require a highly specialized approach such as the discipline of project management and the implementation of its techniques in achieving the desired deliverables [1]. Projects are termed successful particularly when they are finished within the planned time, budget, and quality of which are the popular constraints of project management in executing a project [2]. As organizations continue to move toward project-based management to get more done with fewer resources, the need for project management and its techniques became more and more important [3, 4].

However, literature indicates that construction SMEs are fraught with many project management related problems such as inefficiency, poor budgetary issues, improper planning, scheduling and control in their projects execution, partly because of inadequate implementation of project management techniques [5, 6, 7]. It appears that many construction SMEs are negligent or not maximising the usage of formal, recognised

This work is supported by the University of Johannesburg through its National Research Fund Scholarship.

techniques and very little attention is being paid to improving the status quo. Hence, schedule delays, cost overrun, poor quality, client dissatisfaction, loss of contract and unsustainable business growth [5, 8-10]. Improving project performance therefore requires implementation of effective project management techniques to improve performance. Therefore, continuous research on this topic is relevant.

Project management techniques are systematic procedures or practices that project managers use to achieve project deliverables [11]. They are important to the performance of construction SMEs, which account for about 78% of companies in the South African construction industry (CI) which contributes about 10% to the GDP [12, 13]. Moreover, SMEs in the construction industry are major platforms for job creation to solve the prolonged unemployment rate of about 27.7% among South Africans and to foster economic growth [14,10]. Therefore, the performance of SMEs is of paramount concern. However, SMEs are characterized by high failure rate and are below par in their project performance efficiency and effectiveness especially among the lower grades of the CIDB [5]. Consequently, most construction SMEs have a short life span of approximately 6 months due to liquidation arising from inefficiency and poor cash flow management [15]. Projects among emerging contractors in South Africa suffer project management deficiency and quality is compromised due to negligence and shortcuts in project execution [16]. Statistics South Africa [17] and Monks [18] declared that the rate of project failure among SMEs in South Africa is about 75%. CIDB [5] found that 5 in 10 buildings deteriorate few months after erection, which is related to poor quality - a project management problem. Therefore, research on critical project management techniques for the success of SMEs is important.

However, previous related literature seemed to use the terms, “tools” and “techniques” synonymously [1, 19]. Other studies, Flemming and Koppelman [20], as well as Burke [21] discussed the use of Earn Value Management in aiding the project management plan, and control the project in comparable units, so that it can be accurately tracked and controlled. Other studies, like Milosevic [11], Simons and Lucarelli [22], and Kliem and Ludin [23], identified Work Breakdown Structure (WBS) as a key technique in managing scope. PESTEL (Political, Environment, Social, Technological, and Legal factors) Analysis, deliverable breakdown structure, PERT, Make or Buy analysis etc. are among the vital techniques discussed by the Project management method guide [24]. Appropriate evaluation and implementation of project management techniques towards the attainment of project objectives is invaluable.

The objective of this study is to identify the techniques that are relevant for construction project performance improvement. The succeeding sections of the paper present an overview of the method used in conducting the study. Subsequently, the findings from the desktop study are presented and conclusions drawn from the findings are presented.

2 Research Method

The study sought to establish the critical techniques for the improvement of project performance. The paper is part of a wider study being conducted on a Master's degree project. Consequently, the findings from a review of literature on the techniques are presented. Various sources were consulted including journals, conference proceedings, dissertations and theses, to meet the objective of the study. Databases including Science

Direct, Ebscohost, Google and Google Scholar were consulted. The materials were selected based on their possession of relevant keywords including project management, performance, SMEs, success, construction industry and techniques. The identified techniques were ranked according to the frequency of occurrence among the sampled studies. The findings from the review are presented hereunder.

3 Findings on Project Management Techniques for SMEs Performance Improvement

Some project management techniques have been identified by many authors as reliable for improving various aspects of project performance, irrespective of the chosen methodology [11, 25-28]. For instance, for cost management, Earn Value Management is vital [11, 23, 29, 30]. For time management, techniques such as CPM, PERT, milestone analysis, are essential [21, 30-32]. For project risk management, SWOT analysis and Delphi are the notable project management techniques [11, 30]. For project human resource management and communication, conflict management, stakeholder analysis/management and responsibility matrix are some of the essential techniques to be used [11, 19] and 'bidder's conference' and 'Make or Buy' analysis are useful for procurement [1, 11].

Findings from this study portrayed important techniques, which influence project performance in both efficiency and effectiveness. Table 1 presents a summary of the identified techniques from the sampled literature. As shown in the table, the most cited techniques were Critical Path Method, Work Breakdown Structure, Earn Value Management, and Milestone Analysis. Some of these techniques are discussed hereunder.

3.1 Critical Path Method (CPM)

This technique helps the PM determine the start and finish dates for all the activities and identifies the sequence of activities that form the critical path [21]. Burke [21] affirms that the challenge of the PM is *to develop a network diagram and perform the CPM calculation to produce a logical project timeline that will serve as the project plan framework*. According to PMBOK [2], the CPM is necessary even after the use of other techniques such as the Work Breakdown Structure (WBS), to represent work activities for effective time management.

3.2 Work Breakdown Structure (WBS)

According to PMBOK [2], WBS is the process of subdividing project deliverables and project work into smaller, more manageable components. This technique "enables the project manager define the scope of work" [21]. Hence, the purpose behind the WBS is to subdivide the scope of work into a sensible lump that are less demanding to gauge, plan, and relegate to a dependable individual or department for consummation. Similar work should be grouped together in the breakdown to enhance efficiency of production [21].

3.3 Earned Value Management Analysis

Earn Value Management is regarded as a vital technique for project cost management [11, 23, 29, 30]. According to Burke [21], this is one of the special techniques within the project integration knowledge area that aids the PM plan and controls the project in comparable units, so that it can be accurately tracked and controlled". It can also be used for project cost management and as well as the assessment of project risk [11,29,30].

3.4 Quality Benchmarking

Benchmarking is a notable technique for project quality management [1, 19]. Quality benchmarking, also referred to as "best-practice benchmarking", or "process benchmarking", is used in strategic management, to evaluate various aspects of organizations' work-tasks and processes in relation to best-practice. This is usually within a peer-group, which is defined for the purposes of comparison [33]. Organizations are enabled to develop plans on how to make improvements or adapt specific best practices, with the aim of increasing some aspect of performance.

3.5 SWOT Analysis

This is a risk management technique that can be used to examine the strength, weakness, opportunity and threat of project criteria and deliverables for effective contingency planning [24]. This can also be essential for generating courses of action should problems occur.

3.6 Make or Buy Analysis

A Make or Buy Analysis helps the organization to take an informed decision about what to outsource and what not to outsource [24]. "Portfolio managers and project sponsors are often faced with the dilemma to make or buy, considering the availability and skills of resources at hand. The various factors to be considered for a Make or Buy Analysis include cost comparison, technology and business processes, supplier related information, and support systems" [24].

3.7 Stakeholder Analysis (Interest/Influence Matrix (SIIM))

Here, interest and influence of each stakeholder in the project are analyzed, facilitated and documented [24]. It is of utmost importance to know the stakeholders and their relevance for the project to identify project champions and possible detractors.

3.8 Lessons Learned

Capturing Lessons Learned is a way of identifying development / improvement areas within a project for the aim of helping similar projects avoid certain pitfalls in the future [24]. Information that can be captured includes lessons learned from management of risks, quality issues, and outsourcing or contractor issues, change requests and so on.

In summary, the above-discussed techniques are not exhaustive. However, it is notable that the techniques are usable to improve various aspects of project performance and are therefore essential for SMEs in the construction industry, especially CPM, WBS and Earned Value Management Analysis.

Table 1: Project management techniques

Technique	Source													Total		
	Abbassi & Al-Mharmah (2000)	Burke (2013)	Cetindama, et al. (2012)	Chou & Yang (2012)	Fleming & Koppelman (2002)	Golini et al. (2012)	Kerzner & Kerzner (2017)	Micheal et al. (2014)	Milosovic (2003)	Newell (2002)	Patanakul et al. (2010)	Stojcetovic et al. (2013)	PM ² Guide (2016)		PMBOK (2012)	White & Fortune (2002)
Critical Path Method	x	x		x		x	x	x	x		x		x	x	x	11
Work Breakdown Structure (WBS)	x	x		x		x	x	x	x		x			x	x	10
Earn value Management		x		x	x	x			x		x		x	x		9
Milestone Analysis						x		x		x	x		x	x	x	8
Program Evaluation and Review Technique (PERT)	x						x				x		x		x	6
Stakeholder Management (Interest/Influence Matrix)				x		x					x		x	x		5
SWOT Analysis			x								x			x	x	4
Lesson Learned											x		x	x	x	4
Make or Buy Analysis				x							x		x	x		4
Analogous Estimating				x							x			x		3
Parametric Estimating				x							x			x		3
Quality review technique				x							x			x		3
Quality Benchmarking				x							x			x		3
Bidders conference				x							x			x		3
Conflict Management				x										x		2
Delphi Technique											x			x		2
Brainstorming							x					x				2
Change control											x			x		2
Meetings													x			1
PESTEL Analysis													x			1
Deliverable Breakdown Structure (DBS)													x			1

4 Conclusion

The paper set out to establish project management techniques mostly identified in existing literature. The study found that the critical path method, work breakdown structure and earned value management analysis were the most frequently occurring project management techniques among the sampled literature. These techniques, if judiciously applied by Construction SMEs, will go a long way in ensuring that targeted objectives in a project are achieved. Project objectives when achieved increase the overall productivity of the organization, which in turn affects the economic abundance and business sustainability of the company, as well as the gross domestic product of any economy. Good project management practices such as the implementation of techniques in project execution should be given priority among construction SMEs for achieving efficiency, effectiveness, and meeting of the project objective of time, cost and quality.

Being a literature review presentation, the findings of the study are not exhaustive and therefore further research is necessary, even with the use of primary data, to determine critical techniques used among construction SMEs to improve project performance.

References

1. Chou, J.S. and Yang, J.G.(2012). Project management knowledge and effects on construction project outcomes: *An empirical study*. *Project Management Journal*, 43(5):47-67.
2. PMBoK, A. (2013). A guide to the project management body of knowledge (PMBOK guide). Project Management Institute, Inc.
3. Horine, G.M (2013). *Project Management: absolute beginners guide*. 3rd Edition. Que publishing. United States of America: Indianapolis, Indiana.
4. Patah, L. A. (2010). Avaliação da relação do uso de métodos e treinamentos em gerenciamento de projetos no sucesso dos projetos através de uma perspectiva contingencial: uma análise quantitativa. [Evaluation of the relationship between the use of methods and training in project management and the success of projects through a contingency perspective: a quantitative analysis]. PhD in Production Engineering (Dissertation) – Universidade de São Paulo, São Paulo.
5. CIDB. (2011). SMEs Development. Available from: www.info.gov.za/View/DownloadFile-Action?id=68205 [Accessed, April 27, 2018].
6. Ihesiene, U.C. (2014). A Survey-Based Study of Project Management Problems in Small and Medium Scale Enterprises (SME) in Nigeria. *European Scientific Journal*, 10(25):1857-1881.
7. Moilwa, S. (2013). Factors constraining the development of professional project managers in small and medium size construction enterprises in South Africa. (Unpublished Master's thesis). University of Witwatersrand, Johannesburg.
8. CIDB. (2011). Construction quality in South Africa: a client's perspective. Pretoria, South Africa: CIDB.
9. PwC (2014). Trends, challenges and future outlook. Capital projects and infrastructure in East Africa, Southern Africa, and West Africa. SA construction. Available from: www.pwc.co.za/infrastructure (Accessed, June 26, 2018).
10. Statistic South Africa (2017). Gross Domestic Product: Fourth Quarter 2017. www.statssa.gov.za.
11. Milosevic, D. Z. (2003). *Project Management toolbox*. New York, NY: John Wiley and Sons.
12. Stats, S.A. (2011). Statistics South Africa. Formal census.

13. Statistics South Africa. (2014). Gross domestic product: Second quarter. Statistical Release PO441. Pretoria: Statistics South Africa.
14. Shakantu, W.M. (2012). Contractor Development, In: G. Ofori (ed.), *New Perspectives on Construction in Developing Countries*, 1st Edition, New York: Spon Press.
15. Gillam, S., (2004). SA Builder/Bouer, Awards for Excellence, *Journal of the Building Industries Federation South Africa*, 961(May):28-29.
16. Mavetera, N., Sekhabisa, K., Mavetera, C., and Choga, I. (2015). Factors Influencing Success Of Construction Projects By Emerging Contractors In South Africa: A Case of Mahikeng area. *Journal of Corporate Ownership and Control*, 13(1): 1- 9.
17. Statistics South Africa (2010). Quarterly labour force survey. Statistics South Africa.
18. Monks, P. (2010). Sustainable Growth of SMEs. Unpublished Master's research report, Nelson Mandela Metropolitan University.
19. Patanakul, P., Lewwongcharoen, B. and Milosevic, D. (2010). An empirical study on the use of project management tools and techniques across project life-cycle and their impact on project success. *Journal of General Management*, 35(3):41-66.
20. Fleming, Q.W. and Koppelman, J.M. (2002). Earned value management. *Cost engineering*, 44: 32-36.
21. Burke, R. (2013). *Project management: planning and control techniques*. New Jersey, USA.
22. Simons, G. R. and Lucarelli, C. M. (1998), 'Work Breakdown Structures', In: Pinto, J. K., *The Project Management Handbook*, San Francisco, CA, Jossey-Bass Inc.
23. Kliem, R. L. and Ludin, I. S. (1999). Tools and tips for today's project manager, Newtown Square, PA: Project Management Institute
24. PMM (2016). Project Management Methodology Guide. European Union. Available from: <http://europa.eu/pm2>. [Accessed, November 21, 2018]
25. Ghanim, A., Munassar, F. and Dahlan, A.R.A. (2013). Project and change management success factors from Malaysian government departments and agencies perspective. *IOSR Journal of Business and Management*, 11(2), pp.36-45.
26. PMP, G.M.C. (2009). Communications skills for project managers. AMACOM Div American Mgmt Assn.
27. SE Project (2004). *Software Project Management: Methodologies and Techniques*. Technische Universiteit Eindhoven.
28. Špundak, M. (2014). Mixed agile/traditional project management methodology–reality or illusion?. *Procedia-Social and Behavioral Sciences*, 119, pp.939-948.
29. Fleming, Q. W. and Koppelman, J. M. (2000), *Earned value project management*, Newton Square, PA: Project Management Institute.
30. Newell, M. W. (2002), *Preparing for the Project Management Professional (PM) Certification Exam*, New York: AMACOM.
31. Kerzner, H. and Kerzner, H.R. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons Publishing: New Jersey: USA.
32. Michael, J., Deepak, T., Venishri, P. and Siow, Y.T. (2014). Ranking the factors that influence the construction project management success-Malaysian Perspective. *Civil and Environmental Research*, 6(1):80-88.
33. Chen, H.L. (2002). Benchmarking and quality improvement: A quality benchmarking deployment approach. *International Journal of Quality & Reliability Management*, 19(6):757-773.
34. Abbassi, G. Y. and Al-Mharmah, H. (2000). Project management practice by the public sector in a developing country, *International Journal of Project Management*, 18(2): 105-109.
35. Mistic, M., Sarkocevic, Z. (2013). Quality tools in project management. Centre for Quality.
36. Centindamar, D., Wasti, N. S. and Beyhan, B. (2012). Technology management tools and techniques: Factors affecting their usage and their impact on performance. *International Journal of Innovation and Technology Management*, 9(5): 1250036.

37. Kerzner, H. and Kerzner, H.R. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons Publishing: New Jersey: USA.
38. White, D. and Fortune, J. (2002). Current practice in project management - An empirical study. *International Journal of Project Management*, 20(1):1-11