

Investigation of Site Managers' Constraints on Construction Resources Utilisation

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Abstract

The capability of controlling and monitoring construction resources and the application of production information to achieve predetermined objectives of scope, cost, time, quality, and clients' satisfaction are the primary function of project managers. However, the applications of this production information are usually hindered by their complexity, ambiguity and inadequacy of information provided by the design team. These often results in various conscious, unconscious, or unavoidable resource wastage. Thus, this paper addresses the restraints on project managers in the optimal minimisation of resource wastefulness during the building production process. The investigation and discussions are based on an action survey, comprising structured verbal interviews and informal discussions with project managers. The research identifies and evaluates problems associated with site managers' constraints and resultant effects upon on cost of construction, time of project delivery and quality of the end product. Design team attitudes towards project change, implication of inefficient communication to effect change, production documents inadequate information and due process protocol constraints the implementation of change at occurrence, are identified as the facilitators of this predicament. The suggestion made in this paper will provide the opportunity for significant waste minimisation procedure. Thus, the implementations will lead to more proactive and efficient building production

Key Words: - Construction Resources, Project Change, Production Information, Project Manager, and Resources Wastage,

1.0 Introduction

There is cohesive belief by scholars that efficient and effective utilisation of construction resources is tied to the efficiency of the practising Site Manager. As the role of construction site manager is crucial to the success of their organisations, site managers need to have sound knowledge of construction and be competent to overcome daily obstacles. The identified potentials and skills of site managers in order to be efficient are social skills, proficiency in decision making, ability to handle problems as they arise, ability to recognise and seize opportunities, and manage change, (Mustapha et al (1998), Griffith et al (2004),

CIOB (2002), and Calvert et al (1995)). Moreover, for efficiency of resource utilisation, the following issues are paramount: achievement of quality at the first attempt, on-time decision-making skills, ability to handle stress, interpretation of design information acumen, good track of site safety record, efficient utilisation of available resources, sound communication, organisational ability and sound technical knowledge, (Fraser, 2000).

The principal role of Site Managers is the ability of managing and executing construction works from inception to completion. In addition, they have to ensure that all construction resources are optimally utilised. Many scholars identify the functional roles of a site manager as planning, controlling, organising, coordinating and forecasting resources usage and implementation. In addition to these, site managers have to motivate other site personnel including operatives towards efficient and effective performance. To achieve these, there is need of evaluation of the construction sequence, assessing the value of output, the productivity against the resources input. Thus, during construction process, the team leader needs to logically integrate the performance of each sector and ensure that the resources are optimally utilised.

For the Site Managers to meet these set objectives the following are paramount: coherent specification of objectives and coherent plan of work, maximisation and efficient resources utilisation, implementation of various operations through proper development of effective communication and mechanism. Additionally, there are project integration and scope management, time, cost and quality management, materials and human resources acumen [Blair (1993), Reh (2005), Hendrickson (2003), BS 6079-1 (2002), and CPG 02 (2003)]. Furthermore, a site manager must have sound communication and risk administration skills.

Thus, this research investigate the constraints on Site Managers being efficient in reducing construction waste: Materials (Ma), Manpower (Mp) and Machinery (Me) and identifies how the effect of these constraints could be abridged.

2.0 Towards Efficient Resources Utilisation

Imperatively, the scenarios of hindrance on Site managers occur through some extrinsic factors which act as a "catalyst". These factors originate externally and act on construction production system and Site Managers functional roles performance. Thus, to Project Smart (2005), Griffith et al (2004), Newcombe et al (1993), APM.BOK (2000) and PMBOK (1996), identify that for Site Managers to be proficient and optimally utilise construction resources the manager should:

2.1 Shared Vision

An effective project leader is often described as someone who has sense of direction and the ability to articulate it. In general, every leader has different styles of leadership, (Blair, 1993). Rationally, a good leader should possess vision, thrive on change and be able to extend boundaries. Visionary leaders enable people to feel they have a real stake in the project. They empower people to experience the vision on their own, offer people opportunities to create their own vision, to explore what the vision will mean to their jobs and lives and to envision their future as part of the vision for the organisation, Project Smart (2000 - 2003).

2.2 Be a Good Communicator

Griffith *et al* (2004) commented that, the ability to communicate with people at all levels is ranked as the most important skill that all team leaders should possess. Project leadership calls for clear communication about goals, responsibility, performance, expectations and feedback. (PMBOK, 1996; APM.BOK, 2000) The project leader is often a mediator between various organisations and within construction project

participants. Therefore, the leader should possess ability to effectively negotiate and use persuasion when necessary to ensure project success, (Newcombe *et al*, 1993).

2.3 Possession of Integrity

One of the most important attributes a project leader must remember is his or her actions, not merely words. Good leadership demands commitment to, and demonstration of, ethical practices. Creating standards for ethical behaviour for oneself and living by these standards, as well as rewarding those who exemplify these practices are responsibilities of project leaders. Cunningham, (2002) comment that, integrity involves the respect for self; respect for others; and responsibility for all your actions.

2.4 Be Enthusiastic

Construction workers want leaders with enthusiasm, with a bounce in their step and with a can-do attitude and dislike leaders who are negative. The workers are more motivated when they have conviction that they are part of a stimulating journey, feel alive and tend to follow a leader with potential attitude: not those who give reasons why few tasks or nothing can be achieved, (Project Smarts, 2000 - 2003).

2.5 Possession of Sympathy and Empathy

There is usually appreciation by the subordinate when the leader acknowledges them with an apparent and distinct vision that they have life outside of work. Thus, good leaders are able to adopt differing leadership styles with different people, or with the same people, but at different times, (The Tea Trust, 2007). Sympathy is an emotional affinity in which whatever affects one correspondingly affects the other, and its synonym is pity, (Wikipedia, 2007). While empathy is ability to recognize, perceive and directly experientially feel the emotion of another. Therefore, good project leaders should be able to blend different types of leadership traits together leading to efficient and effective resources utilisation.

2.6 Competence

To involve oneself in another's cause of action during project execution, workers must be made to believe that the leader knows what he or she is doing. Leadership competence does not however necessarily refer to the project leader's technical abilities in the core technology of the business, (Allen, 1998). As project management continues to be recognised as a field in and of itself, project leaders need to be chosen based on their ability to successfully lead others, not only on technical expertise, as in the past. Noteworthy, expertise in leadership skills is only a dimension in competency. APM.BOOK, (2000), affirmed that, having a precedence winning track record is the surest way of been considered competent.

2.7 Ability to Delegate Tasks

Trust is an essential element in the relationship of a project leader and the project team. The leader needs to demonstrate trust in others through actions and delegation of duties. Delegation is the downward transfer of formal authority from superior to subordinate. These could be measured through how the leader checks, control the subordinate work, delegates authority and allow s people to participate freely in decision making. Individuals who are unable to trust other people often fail as leaders and forever remain little more that micro-managers, or end up doing all of the work themselves.

2.8 Handling Pressure

In a perfect project, the project will be delivered on time, as budgeted and with no problems or obstacles to overcome. A manager with a hardy attitude will need to take problems in their stride. When a good leader encounters a stressful event, they need to consider it interesting and take it as a

"challenge/adventure". The manager should foresee the outcome to be an opportunity to be creative. It is noteworthy that, out of the uncertainty and chaos of change, new innovation does emerge, which leads eventually to the benefits.

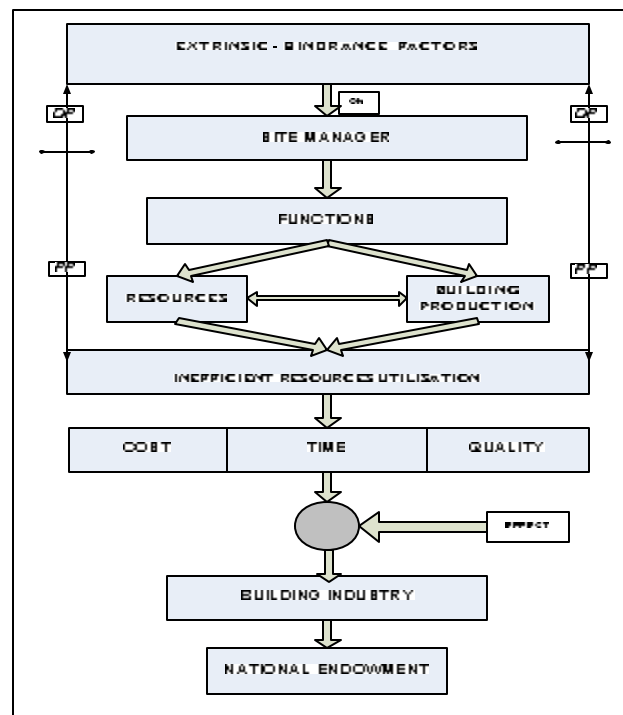
2.9 Team-Building Skill

A team builder can best be defined as a strong person who provides the substance that holds the team together in common purpose toward the right objectives. In order for a team to progress from a group of strangers to a single cohesive unit, the leader must understand the process and dynamic requirements for these transformations. Thus, a team leader needs to know the appropriate leadership styles to be employed at every stage of team development. The leader must also have an understanding of the different team players styles and how to capitalise on each at the proper time, for the problem at hand.

2.10 Problem Solving Skills

Although an effective leader is said to share knowledge, employ joint problem-solving and responsibilities within team, nonetheless, many subordinates expect a leader to have excellent problem-solving skills in-built. Irrespective that the subordinate may have high creative ability, the sub-ordinate usually expect the leader to make a proactive and positive move in problem solving and brain storming. Dinsmore (1990) emphasised that, system integration is required to propel a project in meeting speculated objective of cost, time and quality through people. Also, Bratton et al (1994), comments that the main objective of a site manager is getting things done through people.

Reflecting these facts, Figure 1 illustrates the role of Site Managers within the construction industry with emphasis on efficient resources utilisation vis-à-vis waste management during the building production process. The figure links site managers' hindrance on utilisation of construction resources with the resultant impacts of these inefficiencies in building production cost time and quality, due to imposed extraneous factors, criteria and circumstances.



Key: DP - Design Phase and PP - Production Phase
 Figure 1: A Model towards Efficient Resources Utilisation

3.0 The Research Concept

This research is part of on going PhD research examining Optimum Utilisation of Construction Resources during building production. The overall objective is to establish an operational framework for minimising construction resource wastefulness. Among other propositions and investigations, there is a proactive belief that some factors hinder Site Managers in their bid towards efficient resource utilisation.

4.0 The Research Methodology

Fourteen random samples were drawn from construction site managers who are directly involved in day to day management of the building production processes. The research was triangulated by carrying out both interview and structured questionnaires and linking to the body of knowledge through literature review. During the interviews, site mangers were solicited to clarify how and why the factors listed imposes constraints on the efficient utilisation of construction resources during the production process. These arguments were based on knowledge, attitude and perception, (KAP). The resources under consideration were Materials, Manpower and Machinery, (The 3Ms).

The questionnaires administered were rated from 1 to 5 ranging from very low hindrance to very high hindrance. The results were analysed using likert scale rate summation and presented in Table 1.

5.0 Research findings and Discussions

Table 1 shows the result and ranked order of how the factors under consideration hinder Site managers' efficiencies during building production. From table 1, there are indications that Site Managers are affected by all the factors adversely. It could be observed that, all the factors under consideration have an effect on Site Managers' performance, percentage above average. That is, the majority have percentage above 60% apart from Skill Plant operator availability and Unskilled Labour availability with 55% and 50% respectively.

Factors Under Consideration	Effect Rating	
	%	Rank
1. Sub- Contractor Performance and conformity	85	F1
2. Working/Operation Space And Congestion	83	F2
3. Skilled Labour availability	82	F3
4. Material availability	75	F4
5. Nominated Suppliers Performance	75	F5
6. Time Lapse In Approval Of Change Due to error in Spec.	70	F6
7. Communication With Design Team	68	F7
➤ Architects	75	↑
➤ Structural Engr	71	↑
➤ Mechanical Engr	65	↑
➤ Electrical Engr	58	↑
➤ Estimator	70	↑
➤ Client	68	↓
8. Alteration Response To Effects Change	68	F8
9. Design Team Drawing And, Or Spec. clarity.	68	F9
➤ Architects	75	↑
➤ Structural Engr	77	↑
➤ Mechanical Engr	63	↑
➤ Electrical Engr	60	↑
➤ Estimator	63	↓
10. Project Complexity Subject To Clarification	68	F10
11. Modification Response To Effect Change	60	F11
12. Skill Plant operator availability	55	F12
13. Unskilled Labour availability	50	F13

Table1: Result of Data Analysed

Based on this ranked order and facts deduced from the supportive discussions with the respondents, the subsequent topical issues are deduced.

Sub- Contractor Performances: On many occasions, the decisive factor in selecting subcontractors has generally been the cost; especially, if the bidder has met specified criteria. Thus, the selected subcontractors with no prior experience on the typical construction project create a devastated problem to efficiency. More so, since subcontractors operate within a budgeted cost and additional work or modification usually results in extra cost and negotiation, and often causes delays in its implementation.

Congestion Problems: Large and complex construction projects are often carried out in many urban cities worldwide. The predicaments of this are local government restriction, storage facilities, environmental pollution and sound control, health and safety to the dwellers and problems of adjacent structures are common occurrences. These are perpetual predicaments and distinctly affect performance of Site Manager.

Skilled Labour Availability: Unlike companies in the manufacturing sector, the construction industry is heavily dependent on human resources. In recent years, there have been acute shortages of a skilled labour force. In the current economic climate, the industry is expected to experience considerable skills shortages in both traditional and new skills area, (Mackenzie et al, 2000; Lafortune, 2006 and Roger, 2001). In an urgent need of labour for a specific task in order to avoid delay of subsequently work, in many cases, "doubtful competence" labour is hired to carry out the task. Seldom, Site Manager employs who are available not who are qualify to perform a specific task. This usually involves strict monitoring and control which may jeopardise the role performance of the Site Manager.

Design Team Conventional Belief: The constraints of a Site Manager by the design team (DT) are traditional in construction industry. The scenario is based on fact that there are different professionals that are involved during design stage of a project and each participant is said to be qualified in their respective field. The production information produced by the design team are usually viewed to be "legally" binding on the Site Manager to be followed or adhered to as a "holy book" during the construction process. That is, individual participants of the Design Team see their documents as "good fit" for the Site Manager to execute the project. Ironically, to date there has not been a case of perfect construction documents. The harmonisation of these documents by Site Manager is an obligation and sometimes stressful. More so, design team participants notionally perceived the identification of a shortfall in their documents as a challenge to professional competency. Thus, Site Managers tend to avoid conflict with the design team and these seldom jeopardise the resource efficiency.

The Nature of Construction Production Information: The problems associated with production information could be related to the complex nature of the construction industry, coupled with different professional personnel involving in the design and construction stages. Some of these problems are design errors, design ambiguity, specification error or dimensional inaccuracy. The production information mis-information occurrences during the design stage seldom cause unpleasant issues during production process. These Production Information alterations, modification and implementation do leads to brainstorming problems most especially between the design team and Site Manager. The interactive behaviour of construction participant, the client and the design team with construction team has always been a "situation of interest" in the industry, most especially, if there is cost implication. These cost implications usually append to due-process protocol, delay in approval and sometimes change in construction methods and re-design. Thus, these scenarios do pose constraints and inefficient utilisation of construction resources vis-à-vis inefficiency of the Site Manager to maximised the scarce and pricey resources.

Project Delivery Conventional Success Belief: Conventionally, a construction project is believed to be successful when completed within budgeted cost, time and predicted quality. This conventional success belief seldom leads to a project been completed with avoidable, conscious and unconscious resources wastefulness: Materials, Manpower and Machinery Wastefulness, (3M_w).

6.0 Research Propositions

Based on this research outcome, the following propositions are made:

Partnering and Sense of Belongness: Partnering should be encouraged to major sub-contractors to enhance their sense of belongness. Also, Sub contractors should be made aware that sustainability and client interest are as paramount as their targeted profit.

Adequate Logistic Planning: Proper logistic planning should be made for "delivering-on-time-use" for congested sites. This will in effect reduce waiting time, redundancy and delay of construction participants.

Work force Training and Substantial Bursary Awards: As shortage of construction workers is becoming a global problem. There is need for more skilled labour training in the industry. All construction organisations need to embrace a Construction Industrial Training school before the situation totally become out of hand. Government need to intervene by establishing more trade centres and substantial bursary awards for all participants.

Site Managers' Involvement in Project Design Phase: It is important that Site Manager involves in project design. During this stage, the Site Manager would be able to identify and clarify ambiguity. Moreover, be aware and plan for any complex task ahead. Design Team then should not overlook the benefit of value management and engineering before construction commences. All these will definitely ease construction stage operations, thus, improving Site Managers' performance.

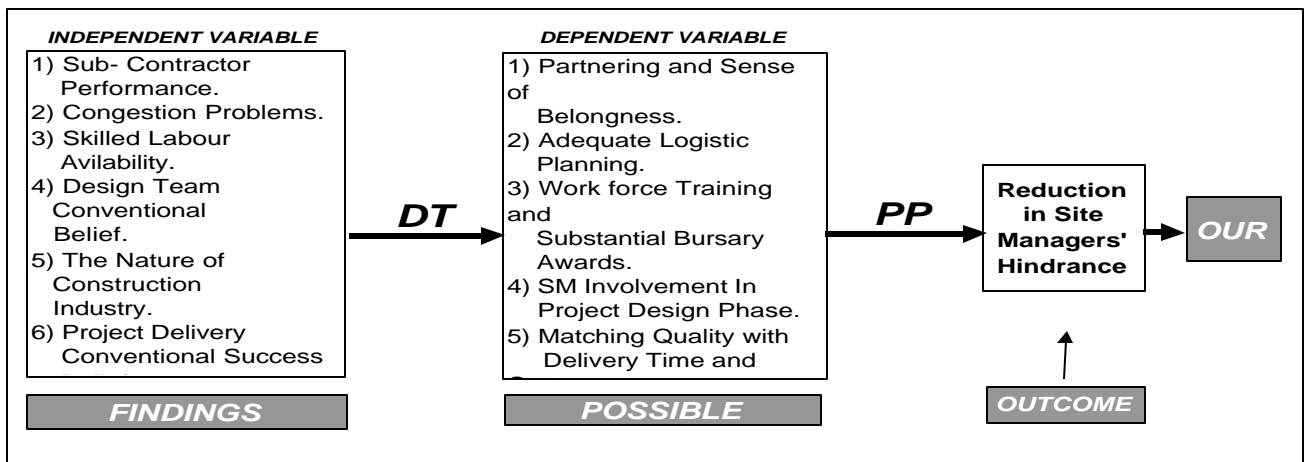
Matching Quality with Delivery Time and Cost: All construction participants should be made aware that project quality is very paramount to project success, saving cost and time for the client interest. There should be an adequate awareness that participants will be compensated when the organisation could save both delivery time and cost of construction without jeopardising quality. That is, it should be clearly stated at the beginning of the project with regular meetings introduced for assessment.

7 0 Summary

Figure 2 illustrates a flow chart of optimal utilisation of construction resources, various independent and dependents variables. Griffith and Watson (2004) emphasised that the principal contracting organisation will only remain a profitable business if it maintains a sustainable competitive advantage over other contractors in undertaking its projects. All this relies upon the efficient and effective procurement and use of construction resources in the industry. In the Construction Procurement Guide CPG- 02 (2003), McPherson stated that the function and the mission of construction industry is to give its customers the best value for money and satisfaction of a job well done.

In conformity, Egan (1998) report that, the areas for changes in UK construction industry are working conditions, skills and training, approaches to design, use of technology and relationships between companies.

Therefore, to achieve these aforementioned objectives in the industry, the hindrance on Site Manager in performances should be at a minimum through the suggested proposition. Hitherto, the industry and the government need to liaise with clients to perform construction processes entirely differently from current practice, as proposed by Egan, (1998).



Key: *DP* - Design Phase; *PP* - Production face and *OUR* - Optimal Utilisation of Resources.

Figure 2: Flow Chart of the Research Outcome.

8.0 Conclusion and Recommendations

This research identifies factors that hinder efficient construction resources utilisation through the Site Manager functional performance. Data were collected through both questionnaires and interviews and triangulated for validity. Likert scale summations were used to obtain rank order of the factors importance. Through interpolation of the findings, it was deduced that, Site Manager hindrance are Sub-Contractor Performance, Congestion Problems, Skilled Labour Availability, Design Team Conventional, Belief, The Nature of Construction Industry, Project Delivery and Conventional Success contributed. All these immensely contributed to Site Manager ineffective performance of roles and functions. The research proposed that, Partnering and Sense of Belongness, Adequate Logistic Planning, Work force Training and Substantial Bursary Awards, SM Involvement in Project Design Phase, and Matching Quality with Delivery Time and Cost could reduce these predicaments and thereby enhance the Site Manager performance. Thus, the industry and the government need to perform construction processes entirely differently from current practice.

As the construction industry is globally working towards lean construction principles and practice, it is believed that, eliminating these hindrances and the application of these suggested propositions will enhance Site Managers' performance and the goals of the clients.

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