



EVALUATION OF FACTORS THAT AFFECT BUDGETED COST THROUGH COMMUNICATION DURING PRODUCTION PROCESS IN SOUTH AFRICA CONSTRUCTION INDUSTRY.

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Abstract:

Construction industry building production processes are confronted with cost restraint to deliver project at time specified and quality expected. Thus, this cost restraint predicament generates the need to evaluate the factors that affect budgeted cost through communication during production processes in South Africa. The methodology adopted for this study is quantitative and qualitative method. Questionnaire survey method was employed to collect data from stakeholders in the construction industry in South Africa and the results obtained are validated by qualitative interview. SPSS software version 22 was used for quantitative data analysis. Findings are poor communication among construction and design team, separation of design and construction during planning and implementation stage, inadequate design details during production process, lack of coordination among stakeholders during production process and lack of team work among workers. Few of the respondents that accepted completing the questionnaire, later returned the uncompleted questionnaires and complained of too busy. The results obtained from the study reveals that efficient communication among the workers during production on site will enhance the delivery of project within budgeted cost and also augment client interest

Keywords: Budgeted cost, Client, Cost restraint, Production process, Time, Quality

1 INTRODUCTION

The aim of this paper is to evaluate the factors that affect budgeted cost through communication during production process in delivery of project at specified budget. The objective of this study is to achieve good communication at initiating, planning, implementation and close-out stage of the building production in delivery of quality project at budgeted cost. Construction industry is fragmented and its activities are not static. Hence, construction operators need effective communication among themselves to enhance delivery of quality project at cost and time expected by the client (Perumal and Abubakar 2011). Communication management includes making collection, circulating and storing building production information. Frayer (1990) confirmed that communication management is quite significant during the production processes, as it is necessary that stakeholders should identify and document relevant information regarding their interest, involvement and effect on building production processes. Also, communication is necessary to get things done: construction manager always use communication to stir up action. Along with circulating information among the workforce to increase productivity, others communicate with the construction manager to get some action from the manager. Also, communication management allows grievances to be voiced and resolved amicably during site meeting. If every on-site workforce is at peace, there would be greater efficiencies and productivities. And even more positively, attitude change can be achieved through group discussion.

Perumal and Abubakar (2011) argued that document standardization during production process enhances internal communication between the construction operators and functions in delivery of quality project. Perumal and Abubakar (2011) further argued that standardization contribute to increase in productivity from one stage to another during construction process. Onyegiri et al (2011) Presented that communication is vital in production process in construction industry, the construction industry activities is challenged with the importance and use of information communication technology (ICT) in delivery of quality project at budgeted cost specified. Onyegiri et al (2011) argued that construction in developed nations have increase information technology and it will increase



further base on their investment in ICT, this has contributed in the increase in productivity of construction industry in advanced nations in delivery of quality project, through speed of work, financial control and improved site communication. Also Wilforss and Lofgren (2007) argued that effective project communication practices and technology have been taken for granted in developing nations, ICT have been reduced to an ordinary issue in supporting realization of the physical design and production process. Aiyewalihinmi (2013) presented a case that communication enhances construction productivity through the quality of information that flow between the construction operations, the workforce and the client representative in delivery of project at accepted budgeted cost. To Emmitt and Gorse (2006) identified communication as a problem in construction industry in delivery of project at cost, time and quality expected during production process. Emmitt and Gorse (2006) further explained that efficiency and effectiveness of building production process strongly depend on quality of communication established between construction team, design team and project managers and contractors.

To Tipili et al (2014) explained that construction process required professionalism communication where project manager, architect and contractor will transfer appropriate and irrelevant information to a design that satisfied client interest. Tipili et al (2014) further explained that as client requirements unfolding effective communication will enhance quality design in achieving client objectives, specification, drawings, bill of quantity, programme of events. Objectives must be communicated to every range of construction operators encountered with during production in order to resolve conflict between construction and design.

2 LITERATURE REVIEW

2.1 Communication during building production

Communication is the ability to convey messages clearly, vividly and strongly among construction stakeholders by either sketches, drawings, writing or spoken word. It is the tool for leadership and supervision in the construction industry. Communication is the means employed by the construction operators to make reasons known and to stimulate action during the production process (Calvert *et al.*, 2002). Similarly, communication is a tool to achieve objectives in the construction industry. Lack of co-ordination, separation of design and construction phases, lack of trust and arguments between stakeholders are all caused by ineffective communication (Emmitt & Gorse, 2003). Likewise, Moore (2002) confirmed that projects depend on communication. While it is a fact that communication itself cannot complete a building production process (it obviously requires construction resources to operate successfully), effective communication can be achieved by investigating a problem before taking a significant decision. The adoption of a correct procedure is a necessity for optimum outcome during a building production process (Calvert *et al.*, 2002).

Emmitt *et al.* (2003) argued that communication is better handled when co-ordination of both design and construction is carried out either by architect or contractor, than it is when the function has separate co-ordinators. If design and construction do have separate managers, then it is best to ensure early exchange of messages on site activity plans. This step is fundamental towards effective planning for building production processes between designers and contractors. Similarly, communication and control in the construction industry is a process that involves service managers to communicate policy formulated at the office, through the contract manager, to the supervisor, on the implementation of the policies on the construction site (Harris *et al.* 2013). Findings by Emmitt and Gorse (2003) revealed that failures in communication cause conflict, confusion, and doubt among construction stakeholders. Further explained by Emmitt and Gorse (2003), division of duty among the stakeholders has knock-on effects on a supply chain and are seen as wasteful steps. The situation is complicated further by the fact that each stakeholder brings partialities in decisions being taken, and this also has an effect on communication.

2.2 Consideration for management principle and practice during construction process via communication



Effective communication management during construction occur when construction management principle and practices are co-opted with operational communication established during production process in delivery of quality project. Maximum management is important during building production processes; success is achievable through adequate resources made available to the project managers via efficient communication process. Likewise, timely approval is necessary for exceptional needs for building production processes through effective communication (Fryer, 1990). Project management can be seen as a number of connected processes. A process is a series of activities directed toward a particular result. Five project management processes are grouped as follows: 1) initiating processes, 2) planning processes, 3) executing processes, 4) monitoring and controlling processes, and 5) closing processes. It is important to understand what is involved in each management process group and how they relate to the nine knowledge areas (Calvert, Bailey & Coles, 1995). The establishment of relationship between the nine knowledge areas in delivery of quality project can be achieved through effective communication established by construction operators at each stage of production process.

2.2.1 *Communication at initiating stage*

Operational communication established at initiating stage enhances building production. Initiating processes are used to start every phase of the building production processes. Also, as connected with the close-out phase, it is at this initiating phase that the idea is formed. It is used to define the requirements needed for building production processes by the client, architect and the project manager. Lavender (1996) supported the argument that to complete a building production process, the initiating processes are vital to ensure that all requirements are met and communicated to construction operators. Client satisfaction and acceptance of the building and its products are usually considered at this stage. The experiences acquired at this stage are documented and all construction resources are reassigned.

2.2.2 *Communication at planning stage*

Planning is a devise used to maintain a workable outline to achieve the requirement needed for the building during production processes through adequate communication. A building production plan is generated to define each knowledge area as it relates to the building during the production process at that point in time. These processes are also used to account for changing conditions in construction and in an organisation. Building production processes are frequently revised during each phase of the construction life cycle (Calvert *et al.* 2002).

As this is a development stage, construction resources needed for the production processes are determined at this stage and communicated across every level of building production. Likewise, cost, time, scope and quality are modified for production and circulate among stakeholders to enhance efficient production processes. Also, risk procurement is well-established at the planning stage in relationship to the budgeted cost available. At this development stage, all the nine management knowledge areas are planned in accordance with the budgeted cost for the production processes. Walker (2007) confirmed that planning, co-ordination and control of a project from conception to completion on behalf of a client requires the identification of the client's objectives, such as utility, function, quality, time and cost, this can be done through effective communication with client. Walker (2007) further suggested that the quality of tools and techniques employed by the contractor and the representative of the client are determined by the knowledge acquired by the project team from previous projects. Sears *et al.* (2008) confirmed that planning is the process of devising of a workable outline of operations that, when put into action, will accomplish the successful establishment of an objective.

2.2.3 *Communication at implementation stage*

Adequate communication must be established at implementation stage by stakeholders to achieve effective production. Implementation processes are employed to make certain that the nine knowledge areas are in line with building production processes, and to produce the deliverable output of the stage that the construction is currently in, or the deliverable of the whole production process within the budgeted cost. Implementation process includes providing leadership, developing the project team, guaranteeing product quality, authenticating building



scope and managing building production processes. Similarly, implementation processes are charged with the responsibility of disseminating information across all ranges of the work force involved in production and procuring resources and delivering the building and its products (Calvert *et al.* 2002). Likewise, Pmbok (2008) supported the argument that management of building production involved managing the project team to achieve the project objectives. Also, Walker (2007) argued that a project manager should instantly solve building production management problems. Further, according to Walker (2007), construction management processes involve construction team members on site, irrespective of the titles of the people in the process. PMBOK (2008) confirmed that the executing process group are responsible for completing the work defined in the building production process management plan to satisfy the building specifications.

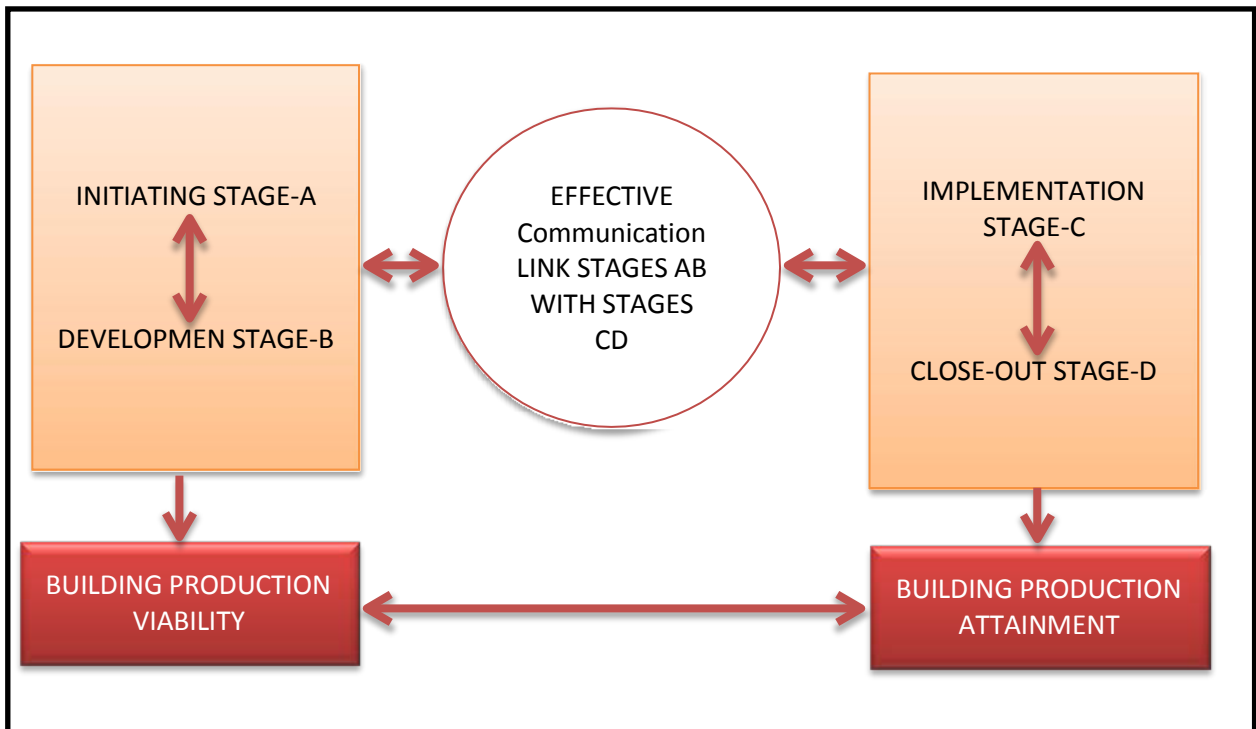


Figure 1: Shown production phases link with effective communication

2.2.4 Communication at monitoring and controlling

Calvert *et al.* (1995) confirmed that controlling processes are charged with the responsibility of guaranteeing that the objectives are met, documented and communicated accordingly to the stakeholders concerned, effective communication enhances construction process. Likewise, building production processes must be frequently monitored and the progress measured against the construction plan to ensure corrective activities are implemented where necessary. Controlling processes comprise performance and status reviews during production processes. Controlling processes are also used to monitor and identify changes and to manage in



agreement with the construction plan. Similarly, PMBOK (2008) confirmed that monitoring and controlling process groups are processes necessary to track, review and regulate the progress and performance of the building production processes. Also, Walker (2007) argued in support of the discussion that there is relationship between integration, monitoring and controlling and achieving efficient building production processes. Walker (2007) agreed that management of the building production process is subjected to external factors, all elements outside the processes. If changes occur on the effects, the monitoring and controlling processes demand a response. Fryer (1990) argued that controlling is a task employed to compare performance with plan. The plan is the yardstick without which the construction team could not control anything, this simply means there must be real communication between the planning and construction team during production. If the project manager does not control performance, the plan is of no value. From this point, it is very clear that planning and controlling are dependent on each other.

2.2.5 *Communication at close-out stage*

Closing-out processes are used to validate the acceptance of the building project and bring it to a logical and conclusive end. To achieve effective delivery of quality project there must be proper link between initiating and close-out team through effective communication during production. The close-out is initiated by the initiating group to bring the production to an end at each phase or at the end of the entire building production process. Also, closing out involves documenting construction files, keeping a record of experienced gained and receiving official acceptance of the building and its products delivered. Likewise, PMBOK (2008) supported the argument that closing processes are processes performed to finalise all activities involved across all ranges of the process to formally end the building production processes.

3.1 **METHODOLOGY OF RESEARCH**

The research evaluates the factors that affect budgeted cost through communication process during production process in South Africa construction industry. Relevant Literatures related to this study were reviewed to generate questionnaires' questions for exploratory study. The exploratory study was conducted within Cape Town, South Africa to know existence of the problem, using non-probability and purposive sampling techniques. The information's were obtained from professionals: architects, clients, site engineers, project managers, contract managers, quantity surveyors and contractors. In addition, observation as participant was explored to obtain additional information and data for the study. 30 closed-ended questionnaires were administered by hand delivery to stakeholders. The finding from the exploratory study indicated that the problem exists, and the results obtained were used to design questions for the main study after taken into consideration all suggestions obtained during the exploratory study.

For the main study close-ended quantitative questionnaire were employed for the data collection. The section 'A' of the questionnaire requested information about respondents' bio-data. Section 'B' was structured to obtained information about the project types, cost of construction and delivery time. Section 'C' obtained information from the stakeholders on how the administrative management of their company is been carry out, while Section 'D' sampled the respondents opinion on information concerning evaluation of factors that affect budgeted cost through communication during production process. The respondents were solicited to rank the itemised factors on Likert scale ranges from: 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree



Table: 1 Objective and Achievement

Objective	Purpose	Achievement
To evaluate the factor that affect budgeted cost through communication in South Africa construction industry	Delivery of project within budgeted cost and time specified	The objective was achieved through review of related literature, Participant observation survey, qualitative interview survey (semi structure interview) and quantitative questionnaire survey methods

SPSS statistic software version 22 was used to analyse quantitative close ended questionnaire, and the study reliability were ascertained by using Cronbach’s co-efficient alpha ranges in value from 0 to 1: the higher the coefficient the more reliable the data. The Cronbach’s alpha coefficient of the 21 factors considered is 0.9: this signifies that the data collected are reliable.

3.2 Research limitations

Few of the respondents that accepted completing the questionnaire, later returned the uncompleted questionnaires and complained of too busy. This makes the response rate to be low. Though, based on the respondents’ bio-data (Table 2), it is believed that the respondent could provide reliable and valid responses.

4.1 DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.2 DATA ANALYSIS

4.2.1 Response rate and respondents details

Data were collected through quantitative survey method, 319 questionnaires were administered to construction stakeholders: the architects, clients, project managers, contract managers, site managers, quantity surveyors and contractors. 54 were duly completed, returned and analyzed

Table: 2 shown the details of respondents that participated in the study:

- 77.8% of the respondents are in construction firm, which is the highest among the partakers of the study.
- The respondents within 1-10years of experience in construction firm have the highest number, followed by 11-20years of experience rank; third age group is within 21-30 years of experience, while the last group is within 31-35years.
- Finding obtained signify that respondents that have age ranges between 21-30years are the majority of workforce working at the project sites studied.

The bio-data of the respondents shows that the participants are knowledgeable with several years of experienced and hold reputable status within their respective organisations. Thus, based on this bio-data, it is believed that the respondent could provide reliable and valid responses



4.2.2 Effect of communication on budgeted cost during production process

The respondents were requested to identify the effect of communication on budgeted cost during production process as shown in Table 3 using Likert scale 1-strongly disagree, 2-disagree, 3-agree, and 4 strongly agree. Survey conducted identify the major factors that affect budgeted cost as poor communication among construction and design team during production with 3.3 mean score, separation of design and construction during planning and implementation with mean score 3.1, inadequate design details during production process with a score mean 3.1, lack of coordination among stakeholders during production process with 3.1 mean, and lack of team work among stakeholders with mean 3.1. The table indicated that poor communication among design and construction team, separation of design and construction during planning and implementation, inadequate design details during production process, lack of coordination among stakeholders during production process, and lack of team work among stakeholders during production, were the effect of communication on budgeted cost. The mean of these major factors are above 3 mean this indicated that the respondents agree that the major factors identified affect budgeted cost. The respondents disagreed that strained relationship among the stakeholders during production process with mean score 2.9 do not have any significant effect in the increase in construction cost, also inadequate communication with client by stakeholders during production process with 2.9 mean have no effect on budgeted cost and individual partialities in decision being taken during production process with mean 2.9 cannot affect budgeted cost meaningfully.

4.2.3 Validation of results

Construct validity is used to ensure that the findings obtained in this study measured what they were supposed to measure. The results from the analysed data were taken to construction sites for confirmation to determine if the results actually answered what they were intended to answer (concerning the aim and objectives of the study). A date was fixed for each interview between the researcher and the professional stakeholders working on site. Two professionals were interviewed in construction site A, and B. The professionals that were interviewed on construction site are discussed presently.

4.1.3 Interview with respondent A

On the 13th of May 2014, interviews were conducted with an experienced architect at 1:30 pm and lasting for 45 minutes on construction site A. The discussion was recorded using Samsung Galaxy Tab 3 Tablet PC Android 7-inch High Resolution. The architect working on construction site A was asked to comment on each question after it was read by the interviewer from a printed copy, to comment on (1) poor communication among construction team and design team members during production process. (2) Separation of design and construction during planning and implementation

The architect stated that communication on site is significant to quality project delivery. While poor communication among construction team and design team will affect the planning and implementation stage of building production process, lack of proper planning at initiating stage will lead to inadequate design, the inadequate design will get worsen the more at implementation stage when poor communication is allow by design team and construction team to be the order of the day on site, the effect of poor communication on project are rework, claims, arguments, delay in delivery time and poor quality job. The architect explained that separation of design and construction during planning and implementation as a result of inefficient communication will have negative effect on project delivery since different managers will handle design and construction stages separately during planning and implementation without adequate interaction will lead delivery of project at increase in budgeted cost.

4.1.4 Interview with respondent B

The interview with an experienced site engineer on construction site B was conducted on Tuesday, the 14th of May 2014 at 1:30pm, in the site engineer's office for a period of 47 minutes. Discussions were recorded using Samsung Galaxy Tab 3 Tablet PC Android 7-inch High Resolution. The site engineer working on construction site B was asked to comment on each question after being read the questions by the interviewer, from a printed copy, to comment on (1) poor communication



among construction team and design team members during production process. (2) Separation of design and construction during planning and implementation. The site engineer explained that poor communication among design team and construction team will have adverse effect on building production process. The stated objective of the client will not be achieved in a situation where the design team and construction are not communicating freely, the client will bear the consequent of this unproductive action as a result of increase in budgeted cost and delay in delivery of project at stated time. The site engineer clarified that separation of design and construction at planning and implementation stage will have resultant effect on construction cost during production because the managers will pursue different objectives different from the general objectives specified for the project in term of cost, time and quality. Site engineer explained further that event of managers not working toward achieving the stated objective will lead to increase in budgeted cost and deliver of poor quality project.

Table 3: shown factors that affect budgeted cost through communication during production process

Significant factors	N	Mini	Max	Mean	Std. D
Poor communication among construction team and design team members	54	1.00	4.00	3.3148	.72226
Separation of design and construction during planning and implementation	54	2.00	4.00	3.1481	.68425
Inadequate design details during production process	54	1.00	4.00	3.1296	.86975
Lack of co-ordination among stakeholders during production process	54	1.00	4.00	3.1111	.76889
Lack of team work among stakeholders during production	54	1.00	4.00	3.1111	.86147
Lack of proper communication with design team by stakeholders during production process	54	1.00	4.00	3.1111	.71814
Blockage in communication flow among stakeholders during production	54	1.00	4.00	3.0926	.89587
Inadequate contractual information during production process	54	1.00	4.00	3.0926	.78352
Division among professionals during production process	54	1.00	4.00	3.000	.77703
Lack of trust among stakeholders during production	54	1.00	4.00	3.000	.77703
Strained relationship among stakeholders during production process	54	1.00	4.00	2.9815	.73947
Inadequate communication with client by stakeholders during production process	54	1.00	4.00	2.9815	.81242
Individual partialities in decision being taken during production process	54	1.00	4.00	2.9024	.87456
Confusion and doubts among stakeholders during production	54	1.00	4.00	2.9024	.87456
Individual interest of agenda during production process	54	1.00	4.00	2.8889	.81650
Segregating duties by stakeholders during production	54	1.00	4.00	2.8704	.84778
Conflicts among stakeholders during production	54	1.00	4.00	2.8333	.88488
Difficulties in understanding languages and terminology used on site among stakeholders during production process	54	1.00	4.00	2.8148	.89177
Difficulties in reading drawings by stakeholders during production	54	1.00	4.00	2.7778	.83929



Cultural diversity among stakeholders during production process	54	1.00	4.00	2.4815	.90576
Social status of individual during production process	54	1.00	4.00	2.3889	.87775

4.1.5 Discussion of findings

Literature reviewed and exploratory study conducted confirmed that communication among workforce is very vital during production process, and it affects budgeted cost significantly. This signified the reason to investigate the effect of communication on budgeted cost during production process. The major finding is poor communication among construction and design team members during production. The consequent of poor communication between design and construction team are rework, poor implementation of design, delay, increase in construction cost, confusion, argument on site over unwarranted issues and delivery of defect project at close-out stage. Also lack of proper relationship among design and construction team will cause delay and cost increase. This will also generate delivery of project at construction cost higher than budgeted cost. Drawings and specifications are means of communication used mostly among construction professionals; the quality expected from these drawings is that it must deliver the message it contained clearly, vividly, accurately, rightly adequately and precisely to the worker on site. Harris et al, (2013) confirmed that design team and construction team do have separate managers, and then it is best to ensure early exchange of message on site activities plan. This step is very significant toward effective plan for building production process.

Separation of design from construction during production process affect budgeted cost, this implies that there was no proper relationship between design and construction team. This will hinder free flow of information during construction phases. The consequential effects of this identified factor are poor construction, mismeasurement, lack of quality assurance of job done, frequent complaints from the side of the client during production. Emmitt and Gorse (2003:12) affirmed that communication is a tool to achieve objectives in construction industry.

5.0 CONCLUSION AND RECOMMENDATION

This study concluded that poor communication among design and construction team causes rework, poor implementation of design, delay in delivery of project at specified time, increase in construction cost, confusion, argument on site over unwarranted issues and delivery of defect project at increase in budgeted cost. The weak relationship among construction and design team causes confusion and increase in construction cost during production process. The study recommended the practicing and establishment of efficient communication at planning and implementation stage during production process.



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