Importance of Efficiency in Communication Management in Construction Projects

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Abstract

Efficiency in communication management is an essential factor for the success of all types of projects but more so in the construction projects due to their nature and complexity. With the increasing growth of construction industry all over the world and with the involvement of multiple stakeholders who many a times are situated in different locations, the construction projects have a rigorous communication environment from planning and design departments to project construction sites. The present study explores the key role of communication in improving the processes of construction organisations managing large scale construction projects. The objective is to present the importance of efficiency in communication management in the overall functions of construction projects and also to identify important communication stages and the effects of inefficient communication management in the construction projects. A study of communication management in construction projects in India is carried out for this purpose. A critical review of literature, questionnaire survey and semi-structured interviews of professionals working at managerial levels in different large-scale construction projects were conducted for this study. The results include identification of four crucial communication stages in context of construction project execution, their degree of relative importance and the major effects of communication problems on the construction projects. The results of this study would be useful to the construction business professionals, especially in the developing countries, as they point out the critical stages of construction projects which need attention.

Keywords: Project Communication, Construction Projects, Communication Management

Introduction

Effective communication management is an essential function of every organisation for the successful implementation all major functions of the organisation like planning, coordination, implementation, monitoring, establishing effective leadership, managerial efficiency, co-operation and industrial peace, morale building and motivation etc. It plays a major role in attaining organisational goals and objectives. Communication management is a prerequisite for managing all types of projects. In fact, it is referred as a life blood of a project by many practitioners. “Projects are run by communications”, says Harold Kerzner(2000). As per Campbell

(2010), "With vigorous project communications, your chances of success soar and your frustration will fall off dramatically." Managing communications is a more crucial function in construction project management, due to its nature and inherent complexity. Though unfortunately, it is often neglected. Hence the present paper attempts to explore the importance of communication management in construction projects.

Construction industry all over the world is growing. With the increasing growth, the structure and the functioning of construction organisations is getting more and more complex. There are many reasons for this. As per Chris M. (2009), Construction industry covers a wide range of projects and every construction project is unique in nature as it involves myriads of interrelated activities, tasks and work packages. Due to these complexities, construction is perceived to be the most adverse business among many industries. The construction project management requires controlled interaction and coordination of various stakeholders during all stages of the project life. Owing to all these factors, communication management has become a crucial function in the entire project management scenario of construction industry. The present paper attempts an analysis of the communication management in the large scale construction projects in India as a case study. Though the study is conducted in context of the construction projects in India, the results may be applied to the construction projects globally and especially in developing countries like India as the project business scenario and methodology is same everywhere.

Construction is the second largest industrial activity in the Indian economy and the success of large scale construction projects is a vital factor for the growth of the Indian economy. As per various research studies, the construction industry in India employs over 32 million people, or 16% of the total working population (Chiang et al 2005) and this number is increasing at over 1 million per year (Majie and Punia 2004). The construction business overall contributes 5.7% of the total GDP in India (Chiang et al 2005). In present scenario of large scale construction projects in India, the project team members are often geographically separated. Multiple project participants are involved in various stages of the construction project life cycle and adding to the complexity, most of these participants vary from project to project. In such situation, efficient communication management is highly required as it can definitely enhance theproject performance. But unfortunately, the efficiency in communication management is often neglected in Indian construction business. Even modern, professionally managed construction companies in India face the problem of lack of efficiency in communication management. Hence, there is a need to clearly define the critical communication stakeholders, the crucial stages of communication in construction project implementation and also the relative importance of these stages, to increase the overall efficiency of the construction organisations.

Research indicates that construction projects in India at present are far more complicated than ever before. As specified by Alashwi and Ingirie(2002) in their work, construction projects involve large capital investments, embrace multi-disciplines, engage widely dispersed project participants, operate on tighter schedules and require stringent quality standards. All these factors increase the need of efficient communication. The objective is to identify different communication stages in context of the phases of construction project implementation and also to identify the degree of importance of various communication stages and the effects of communication problems arising thereof. The paper thus tries to present how communication plays a significant role in all functions and processes of the construction project. After finding out the key issues of construction project communication from review of literature available in this area, semi- structured interviews and a questionnaire survey of the management professionals working in the large scale construction projects in India were carried out. The aim was to identify the degree of importance of communication in different phases of a construction project which would help the construction practitioners in understanding the critical communication areas in project execution which need attention.

Literature Review

"Communications management is the systematic planning, implementing, monitoring, and revision of all channels of communication within an organization, and between organizations; it also includes the organization and dissemination of new communication directives connected with an organization, network, or communications technology. Aspects of communications management include developing corporate communication strategies, designing internal and external communications directives, and managing the flow of information, including online communication (Johnson M., 2012)".

As listed by Kerzner(2000), the definition of effective communication includes following essential factors:

- An exchange of information
- An act or instance of transmitting information
- A verbal or a written message
- A technique for expressing ideas effectively
- A process by which meanings are exchanged between individuals through a common system of symbols

An effective communication includes both sending and receiving messages. Communication in projects could be of any type, i.e. verbal, written, non-verbal and also formal and informal communication and internal and external

communication. Communication management involves effective management of all these aspects of communication in an organisation.

Communication management in projects in many ways is a proactive endeavour from management side to manage the expectations and requirements of all stakeholder groups involvedin the project. The PMBOK® Guide (PMI, 2013a) states: “Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring and the ultimate disposition of project information”. Fundamentally, communication is the way information is exchanged between various entities involved in the process of communication. According to Kerzner (2000), there are critical 'communication traps' within project management functions which should be carefully tackled by the project team. “Poor communication can produce communication bottlenecks, in both the parent and the client organizations (Kerzner, 2000)”.

The research studies about the communication management in construction projects, carried out in different parts of the world have commonly identified inefficient communication as a major reason of failures in construction project implementation. According to the study by Dainty et al. (2006), “Some of the fundamental components contributing to the construction industry's poor performance are its ineffective communication practices, its organizational fragmentation and lack of integration between design and production processes”. Various research works studying the problems in construction projects, like Emmerson (1962), Higgin and Jessop (1965), Latham (1994), DETR (1998) have attributed communication problems to be the main cause of problems in construction projects. As Dainty et. al. (2006) have mentioned, “due to its specific characteristics, the construction industry forms a complex communication environment; as construction is a fragmented and dynamic sector with a project based nature. This makes that many stakeholders operate in frequently changing sets of relationships which are contractually driven. The culture shows a reality of conflicts and lack of mutual respect and trust”. This highlights the need of efficiency in communication management in construction projects.

Unique Features of a Construction Project

As per PMBOK's (2013) definition of project, each construction project is 'unique' and 'temporary' in nature, and so is the management involved. In this definition, the term 'unique' means that every project is different in some way from other projects, and the term 'temporary' means that every project has a definite beginning and an end (PMBOK 2013). Some unique features of the construction projects in India as pointed out by P.K. Joy (1990) are:

- One-time activity - it must be performed correctly the first time every time
- Complexity- it is multidisciplinary because it involves a set of interrelated tasks to be done by specialists
- High cost and time for execution
- High risk of failure
- Difficulty in defining quality standards
- Uniqueness of people relationship
- Feedback mechanism
- Lack of experience of client or owner
- Untrained workforce

These special features are the reason why communication is more critical in construction projects than others.

Multiple Stakeholders: There are different stakeholders in a construction project who have to work in an information environment where communication between different stakeholders takes place.

Fig. 1 illustrates these factors.

Construction projects are multidisciplinary in nature due to many reasons. Most of the times, they are large and for execution of such large projects, many parties are involved. Due to all these typical features uncertainty exists in these projects. The studies confirm that the uncertainty increases with the size of the project and with the increasing number of project participants. In spite of the large size, there is always a pressure to reduce the duration of the delivery process from project stakeholders. This further leads to simultaneous procurement for the project, or it may happen that in certain projects, some phases very often are undertaken simultaneously which obviously require major efforts in terms of coordination and communication between the participants involved (Shohet & Frydman, 2003). In this way, uncertainty often prevails in the planning and execution phases of construction projects. Various research works e.g. Laufer (1991), Laufer and Howell (1993), Cohenca et al.(1994) and Cohenca-Zall (1997) confirm this fact. To manage this particular environment of uncertainty and to avoid chaos, misunderstandings and conflicts, communication management is highly essential.

Role of Communication in Construction Project Execution

Numerous studies have identified communication as a major factor affecting various areas of construction projects. For example, communication is stated to have a significant impact on the safety records of the projects during the design as well as construction phases by Coble and Snow (1996) and Mackanzie et al. (1999). Olson (1982) in his study has discussed the effects of poor communication at management

level on productivity of the crew level in construction projects. To avoid claims and disputes in construction projects, Jergeas and Hartman (1994) have highly recommended keeping good records and effective communications.

Studies done by Walker et al. (2002), Alshawi and Ingirige (2002), Fischer and Froese (1996) about various issues related to construction projects, highlight the fact that intense integration of alliance partners requires excellence in communication at all levels, that is, at application level, system level and business or industry level. They have pointed out that individual information processing systems or management functions of individual functional managers in construction projects need to be planned and aligned well with the project schedule. Haugan (2002) points out that a construction project manager manages multiple projects at the same time and he is required to share resources with team members working on many projects in a shorter duration. According to Haugan (2002), in all such situations, the important management issues could be resolved by good communication management. As per Katranuschkov et al. (2001), "it is essential not only to support the communication processes within the project, but to consider the multi-project work and the individual needs of the players as well."

Role of Effective Communication in Project Success

Biggs (1997) and Tam (1999) have quoted a number of studies in their research work, which highlight the importance of effective communications in project success. As per Tam (1999), "time delays and increased cost in construction projects could be attributed to poor coordination caused by inadequate, insufficient, inappropriate, inaccurate, inconsistent, late information or a combination of them all". It was stated in a study by Thomas et al. (1998) that: "the top thirty potential problems contributing to poor project performance could be classified under five categories, out of which communication problems are listed as the third category and all five categories involve communications to some extent". Green (2001) has linked communication to team effectiveness, integration of work units across organizational levels, effective supervision, job satisfaction, and overall organizational effectiveness.

Deng et al. (2001) say that construction projects currently have a project environment where, extensive physical distance between participants, many a times extending even national boundaries, leads to delays in decision-making. If such project environment persists, there could be wide communication problems, ranging from delays to distortion of messages. This imposes strain on project management in construction (Alshawi and Ingirige 2002). Though there are remarkable advancements in information collection, handling, storage and exchange techniques, the communication problems still occur (Tam 1999). Alshawi and Ingirige (2002) have stated that communication in the construction industry, often takes about 75% to 90% of a project manager's time.

The construction industry is an information intensive environment. Due to this reason, the need of efficiency in information management is important for the successful project performance in construction industry. The effectiveness of most of the construction project processes strongly depends on the quality of communication involved in project related information management. The role of communication is crucial even in supply chain performance of construction projects. As pointed out by Ahuja and Yang (2005), construction projects have a distinctive feature, that is, they have a combination of heterogeneous chains incorporating flow of various categories, such as, the flow of information and documents to assist in decision-making, and the flow of resources to maintain progress of development. As per the empirical evidence available about construction projects, there is a potential to make significant improvements in construction supply chain performance (O'Brien and Fischer 1993). This improvement could be achieved through coordination and efficient communication management.

The construction project management related literature gives various ways to improve the project communication management which ultimately would improve the project performance. According to Nutt (1988), Barrett (1995) and Salisbury (1998), improved communication during the briefing might lead to better decision making. For example, better communication may lead to less haste in moving to solutions and may give better ways of looking at the requirements first. As per Higgin and Jessop (1965), an improvement in the communication within the building team can improve the project performance; whereas a few other researchers like Thomas et.al. (1998) attribute the same to communication between the project teams. As per Franks (1998) and Somogyi (1999) it is the communication between the project manager and the contractors which could reduce failure. Lenard and Eckersley (1997) say that, "more open communication at all levels could lead to innovations". Apart from that, Emmit and Gorse (2003), Brown (2001), Usmani and Winch (1993) in their research works have agreed that "communication improvements in early phases of projects would positively influence the quality as perceived by all stakeholders involved".

Various research works such as Anumba et al. (1997), Anumba and Evbuowan, (1999), Higgin and Jessop (2001) point out that the communication difficulties or disorders during the project processes can directly lead to a sharp increase in the volume of unnecessary expenditure, and also affect the progress and quality of the project. Therefore, communication is essential to the success of large-scale

construction projects. The communication problems are commonly faced in all countries of the world during the construction project implementation. However, in developing countries like India, to manage the problems and difficulties in construction projects is a very critical task as along with these recurrent communication issues, there exists a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues prominently exists. In fact, there is evidence that these kinds of problems have become greater in extent and severity in recent years (Laskar & Murthy 2004). It has been seen that the time and cost over-runs in large scale construction projects in India, have often discouraged owners from undertaking such type of projects. As a solution to this problem, Natarajan (2003) suggests that "the control of mega-projects must be catered-for in the planning stage itself. The parameters to be measured or assessed, the method and frequency of reporting, and the levels at which corrective decisions are to be taken, should all be planned in advance".

It is clear from the review of literature that various research works in this area endorse the crucial role of communication in successful implementation of construction projects. But there is no clarity in research works about the major communication stakeholders in construction projects, stages of communication and which communication stages are more important in project implementation so that more attention could be given to them. The purpose of the present paper is to reduce this gap and explore the said areas.

Research Methodology

The objective of the present paper is to identify crucial communication stages in context of the phases of construction project implementation and also, to identify the degree of importance of various communication stages in large scale construction projects and the effects of communication problems arising thereof. It thus attempts to show how effective communication management plays a key role in the entire cycle of a construction project in context of the sample study of large-scale construction projects in India. To achieve these objectives, semi-structured interviews were conducted with construction industry professionals working at managerial levels in different large-scale construction projects in India and followed by a questionnaire survey.

The Survey Participants' Selection and Data Collection

The participants were selected based on the type of projects they were working in and the domain they were working in. Here in this case, all survey respondents were working at managerial levels in different construction projects in India handling a variety of job responsibilities i.e. Contracts, Quantity Surveying, Planning, Designs, Procurement, and On Site Construction Management etc. All participants of the survey had minimum 10 years of experience. It was ensured that these professionals had the experience of working in different phases of a construction project i.e., planning, execution and closure processes.

Overall sixty five professionals from different sectors of construction industry, such as client, contractor and consultants were approached for the interview and survey purpose of the study. Out of which, 52 responded positively and agreed to answer the research questions resulting in 80 percent turnout. Among the total sample size of 52, forty two percent were from contractor firms, thirty five percent were from client firms and twenty three percent were from consultant firms. There were at least fifty percent of the respondents who had experience of working at both client and contractor firms.

Method

Interviews and a questionnaire survey were the two methods used for this research. In the first stage, face to face interviews were conducted with these professionals and after analysing the results of the interview, a questionnaire survey was mailed to them asking them to rank various communication stages on the Likert scale, i.e. the responses in the five point scale from 'strongly agree' to 'totally disagree'.

In the first stage, i.e. of interviews, these professionals were asked to identify important communication stages, major communication stakeholders and the effects of communication problems during various phases of a construction project implementation, based on their experience. These were open questions and a descriptive answer was expected to correctly understand the scenario. Thus the data was collected in the form of in depth semi-structured interviews. The interviewees were briefed about the objectives of the study and also about the further process to be followed for the dissemination of the results of the interviews. They were asked to answer the questions on the basis of their current or previous project experience. Open questions allowed the interviewees to explain in detail various communication challenges experienced by them during various stages of the construction project. All types of remarks received from them were put into different categories, i.e., the importance of communication in overall project functions, major communication stages during project implementation and the effects of the communication problems arising during these stages. Though there were some differences, mainly in scale, the answers were good enough to give a clear picture of the communication environment as formed by the construction industry in India.

The questions on various communication stages in context of the different phases of a construction project were asked. Along with that the effects of the communication problems

during these stages on the overall project performance were discussed with the participants. They were asked to point out the most crucial effects of communication problems which affect the project performance in their opinion. The major points emerging from their remarks were listed down on the basis of the severity of the effects during various project phases as per their opinion. This list of effects is given in the summarized format in the results section.

From the analysis of the answers given by the interviewees, four crucial communication stages during project life cycle of the large scale construction projects in India were derived. After that, the aim was to determine the relative importance of these four communication stages so that the construction professionals could specifically focus on those stages. For this, a questionnaire survey was conducted which was sent to the same 52 professional through email, in which the level of importance of communication in different communication stages of the construction projects was surveyed. The participants were asked to rank the stages of communication which evolved through their interviews on the basis of a five point Likert scale (5- Extremely important, 4- V ery important, 3- Moderately important, 2- Slightly important and 1-Low importance). The data was then statistically analysed to arrive at the conclusions.

Results And Discussion

If we try to define effective communication in context of the working group in any industry, communication is effective only when the ideas transmitted by the sender get their desired action or reaction from the receiver. As far as the working groups involved in construction industry are concerned, it is always a team work, as all tasks involve multiple participants, i.e. client, quantity surveyor, architect, consultants, specialists, contractor's organization etc. The primary aim of communication in this type of set up is to get things done through these multiple stakeholders. These stakeholders participate in a number of phases or stages of a construction project as every construction project has many distinctive stages during its life cycle. Construction projects could be broadly categorised into three main phases - Pre-project phase, Project phase and Post-project phase. For the study of communication management in the construction project and its effect on the project performance, questions related to the management of different phases of a construction project and the communication challenges arising thereof were asked to interview participants who had an experience of working in different stages of the construction project life-cycle.

On the basis of these interviews with the professionals working in different large scale construction projects in India, four crucial stages of communication system in construction projects were identified with reference to three broad phases of construction projects, i.e. Pre- Project phase, Project phase and Post Project phase. From the analysis of the answers of the interviewees, the communication stages which emerged out to be vital in the overall life cycle of a construction project are: 1) Pre Project phase client and the consultants' communication stage 2) Communication at the beginning of the project phase, amongst various consultants i.e. project consultant team communication stage 3) Communication in the project execution stage, amongst the project consultants and the contractors i.e. project consultants and contractor communication stage and 4) Communication during the actual execution of project, i.e. on site project communication stage.

The nature of these communication stages, their exact role in context of the processes of three main phases of the construction project and the important communication problems during these phases, as evolved from the discussion with the interviewees are given below:

Pre-Project Phase Communication

The pre-project phase aims to examine the needs and the possible options related to the project. There are three general phases under the pre-project phase i.e. Project Initiation Phase, Project Concept Phase and Feasibility Phase. The initiation phase aims to sort out all mentioned information to identify some important project concepts. The project concept phase of a new project in construction is very crucial, as the long term decisions taken in this particular phase may have a significant impact on the further project processes as well as the final cost. A great degree of uncertainty prevails in this phase. After this, the selected project concepts are used as inputs for the feasibility phase.

The interviewees pointed out that communication in the pre-project phase plays a crucial role in further development of a project. If information is not properly processed by the client or not understood by the consultants, there could be many loopholes in planning of the construction projects and if planning fails, it affects execution and control mechanism. The most important communication stage of the construction project communication system at this stage as per the interviewees is:

Client and the project consultants' communication stage: From the inception of the project, till the final completion and close out stage of project, communication between the client and the consultants is a continuous process. It starts with the client's statement of requirements. As the client is the initiator and financer of the project, it becomes necessary that the project is executed to suit the client's needs and requirements. The communication in this stage includes information about the nature and size of the project as well as the availability of funds, project functions and time limitations. The client's communication should be accurate in this case as many stakeholders participate in development of his requirement functions.

The general flow of communication in this case is as follows: First, the architect or quantity surveyor conducts feasibility studies with other consultants appointed to find out if the project is functionally, technically and financially feasible. Second, after making a general outline of client requirements, he communicates it to the members of the design team for further action. All consultants collectively develop the client's brief and the client in the process of granting approval of the work, communicates to the consultants about the modifications or the alterations they want in the project. This communication process continues till the completion of the project and till when the client confirms to the consultants that the design report is exactly as per his brief. To get this confirmation, as Ayeni (1986) says, "the design report must be detailed to include all relevant information required and presented in a manner to be understood by the client". The interviewees of this study found that in Indian context, this is a crucial problem. Most of the times, there is a communication gap in understanding the client's needs by the consultants and on the other hand, in understanding the planning and technical details reported by the consultants to the clients.

Project Phase Communication

The project phase is also referred as project implementation phase or project realization phase. All major activities related to a project take place during this phase. It has broadly four sub-phases: Design Phase, Tendering Phase, Execution Phase, and Closure Phase. During design, tendering, execution and closure phase, multiple teams coordinate with each other and function together to achieve a common goal of project implementation. Communication challenges in these phases are of various nature. The crucial communication stages in this phase as per the opinion of the interviewees are:

Communication amongst various project consultants i.e. project consultant team communication stage: The consultants need to work together to fulfil the client's requirements as a team. Communication between the various consultants involves the effective exchange of information and ideas amongst the design team professionals for the smooth functioning of the project and to accomplish the client's requirements. Preparation of documents for tendering and contracting the physical construction or for procurement of equipment is also a crucial communication aspect in this stage. The quantity surveyors need architectural, structural and service drawings for the project. All these specifications must be definite, clear and concise as they give the standard for quality of materials and the workmanship desired to enable the quantity surveyor to prepare his bill of quantities. The other set of communication is the instructions from the architects or engineers to change the original plan of work which are sent to the quantity surveyor .It is expected that these instructions should be detailed enough so that the quantity surveyor properly establishes the cost implications of the project and gives professional advice. At times, there are changes in the designs which need to be communicated in time and accurately to the client and the important stakeholders of the project, to get their approval.

Most of the interviewees pointed out that, a proper flow of communication from the client to design team, from design team to client and then after evaluation, from consultants to contractors should be followed. If any step of this flow is ignored, it generates a series of conflicts and misunderstandings. The important communication activities in this stage are: a. preparation of the construction contract documents, b. updating and review of design documents, c. providing necessary information to qualified designed professionals, d. contract price negotiation with the qualified contractor, e. interpretation and clarification of contract document ambiguities etc. Hence the next important communication activity as per them in this stage is:

Communication in the project execution stage, amongst the project consultants and the contractor i.e. **Project Consultants and Contractor communication stage:** The consultants plan and carry out studies about the areas affecting the success of the project and pass on this information to the client and the planning team. One major stakeholder gets involved in this communication stage, i.e., contractor. The contractor in fact converts all efforts of the consultants into reality which should be as per the requirements of the client. The quantity surveyor examines the bill of quantities and communicates his findings and recommended actions to the client through a tender report for the purpose of selecting the most suitable contractor. The idea of project tender is communicated to contractors through public advertisements or invitation letters depending on the tender procedures adopted. A similar kind of process is adopted for selection of sub-contractors. To ensure the smooth functioning of the project and also to find out whether the contract provisions are applied or not, the consultants have to regularly communicate and follow up with the contractors. One important aspect of this communication between the consultants and the contractors is an interim evaluation, during which the contractor, quantity surveyor and the design team exchanges project related information.

The participants were of the opinion that the communication between the consultants and the contractor is a crucial stage. They pointed out that the consultants have to provide clear information to contractor without any ambiguity which facilitates the smooth functioning of the construction project. In large-scale construction projects in India, different consultants work together. Their location might be scattered. At times some of the members of design team are

of foreign countries and in such cases communications between them and the Indian contractor firm plays an important role in proper execution of the project. If this is not done properly, project execution doesn't happen as planned. The main contractors frequently outsource some jobs of the project and hence there are many subcontractors working for the same project. The consultants have to communicate properly to these sub-contractors as well. The effects of communication problems in this stage as per the interviewees were: wrong constructions, delays, cost overruns etc. which might occur due to improper communication between the consultants and the contractors.

On site project communication stage: Communication on site is very crucial as it involves all stakeholders responsible for the project. All efforts of design team for visualizing and planning the project as per the client's requirements are practically implemented on site. The interviewees selected for this study were of the opinion that it is the most critical communication stage. They pointed out different processes where role of efficiency in communication is very important at this stage. As per them, communication takes place both in formal and informal ways on site. The formal communication includes the communication between the contractor and the consultants which is mostly in the form of drawing, specifications, schedules and the bill of quantities. Apart from that, the site meetings are very important in terms of communication as in these meetings, the contractor also works closely with the consultants. The site meetings are held regularly on all construction sites, basically to discuss the project's progress, project milestones etc., to solve operational difficulties and also to understand the reasons for the delays which often arise during various stages of the project. During these meetings, contractors and sub-contractors get an opportunity to communicate with the design team and resolve their practical issues. The site meetings therefore serve as a major link between all parties participating in the particular project.

The biggest communication challenge in on site communication as per the interviewees for this study is, the information about variations in designs and other specifications. If these changes are not communicated formally and in written form, it can spoil the project construction activities and disputes might arise out of this. Another important form of on site communication is weekly reports and monthly reports. They are a valuable document for the consultants as these keep them informed about the routine activities on the project site. The construction project reports at times are also used as a reference in case of any dispute at a later stage.

Communication on site includes the communication in contractor's organisation between work area, storage area and control points. The communication between manpower i.e. execution team and materials i.e. store team is very crucial in this stage. This is mainly for the reason that labour force or the entire onsite team should receive regular and timely flow of material and also appropriate information about the usage of the same, for efficient execution. If this does not happen, however efficient the site management is, there would be problems in execution. Another important communication type in this stage is the communication between the managers or supervisors and the work men on the site. It may happen in formal or informal way depending on the organisational set up and norms. The information is passed most of the times, verbally or sometimes in written format.

The interviewees said that the communication with labourers is a very crucial thing on construction sites. Especially, in a country like India, where labourers from different states, different communities, and speaking different regional languages come together, communicating with them becomes a critical issue. The construction managers, site supervisors and the project managers should essentially be able to communicate efficiently with them understanding their problems for the smooth functioning of the site operations. Communicating with them about the minute technical details in the designs, at times is a critical issue. At times, frequent design changes by the consultants and lack of proper communication of the same to the execution team leads to many problems and rework in site execution. Almost all interviewees were of the opinion that on-site communication failures generate a series of problems in project execution. Various problems occur in information management like lack of maintenance of site records, defects in constructed works, rework, conflicts etc. In many cases, poor co-ordination and communication related to design information lead to design problems that cause design errors which ultimately result in delays and cost overruns in construction projects.

Post Project Phase Communication

The post project phase is the last stage of the construction project's life cycle. The materialized deliverables are transferred from the engineers, the architects and/or the general contractors to the owners in the post project phase. The two main stages under post-project phase are: Utilization Phase and Close-down Phase. During utilization phase, the client or the end users make use of the finished project. The communication happens when the performance of the constructed facility is monitored at regular intervals and taking feedback from the end users, maintenance at regular intervals is performed and then the project is finally handed over. Some of the interviewees pointed out that the communication with the client in the final or hand over stage of the construction project is a major communication challenge in this phase. Communication required for change management is important in this stage. But overall weightage given by the interviewees to communication

challenges in this stage was lower; hence no specific critical communication stage during phase could emerge.

Relative Importance of Communication Stages

After finding out these crucial communication stages and the communication problems, a questionnaire survey on the basis of five point Likert scale was carried out to further analyse the relative importance of all these stages. The participants were asked to rank the communication stages of the construction project on the basis of their importance in project execution and the entire project success. The scale specified was 5- Extremely important, 4- Very important, 3- Moderately important, 2- Slightly important and 1-Low importance.

A one-way between subjects ANOVA was conducted in SPSS to compare the responses of participants regarding the importance of communication in various stages of construction project communication i.e. Pre Project phase client and the consultants' communication stage, Communication at the beginning of the project phase amongst various consultants i.e. consultant communication stage, Communication in the project execution stage, of the project consultants and the contractor i.e. project consultants and contractor communication stage and Communication during the actual implementation of project, i.e. on site project communication stage. “There was a significant difference in all four stages of communication at the $p<.05$ level for the four communication stages (F 45.244, $p = .000$)”.

As a statistically significant result was found, a post hoc test was conducted. The Bonaferroni post hoc test was conducted to compare each of the communication stages to every other stage. Post hoc tests using the Bonaferroni correction indicated that the mean difference for all communication stages is significant at the .05 level except for one stage i.e. mean difference between Client and the Project Consultants communication stage and Project Consultants and Contractor communication stage in which case it is .0385. This means that there is a statistically significant difference between all communication stages of a construction project except communication between client and project consultants and between the project consultants and the contractors where the mean difference is not significant.

The SPSS output is described in detail in Tables 1, 2, 3 and 4.

From the above analysis, it is clear that 'On site project communication stage' is considered by the interviewees as the extremely important communication activity across all phases of the project implementation. Its average is 4.6346, highest amongst all parameters. The interviewees pointed out that communication on construction sites is a crucial and dynamic activity. It involves many stakeholders who operate on multiple functions simultaneously. Communicating with the labourers and getting things done in the appropriate way from them, also communicating the safety measures, resolving their conflicts are the most challenging communication activities on sites. There is also a lack of proper documentation and formal communication on sites. Most of the activities are carried out on the basis of verbal instructions which cause multiplication of tasks, redoing the things which are wrongly constructed, lack of knowledge about updated project schedules or design changes etc. on the part of execution team which ultimately affects the project performance. On-site communication failures generate a series of problems in project execution which ultimately result in delays and cost overruns. Various problems occur in information management which includes the lack of maintenance of site records, site coordination issues, accidents due to non communication of safety hazards etc. Defects in many constructed works occur due to lack of proper communication between the consultants and the on site team. Poor co-ordination and communication of design information lead to design problems that cause design error. The interviewees pointed out that coordination, team work and proper chain of communication are very important for the successful implementation of this stage.

The participants have ranked the 'Project consultants and contractor communication stage' as the second most important communication activity during project implementation. Its average is 4.3461, the second highest among the four parameters. The interviewees were of the opinion that most of the times there are problems in project execution due to improper communication between the consultants and the contractors. If the consultants are not able to efficiently communicate their plans and the project blueprint to the contractor in the first stage of the project implementation phase, the things go terribly wrong from the beginning itself. At times, even in the later stages, where the actual construction starts and taking feedback from the contractor and the client, the consultants make certain changes in the initial plans, many problems occur if proper communication doesn't take place. For example, most of the times the consultants make changes in the designs in later stages of the project due to certain reasons which are not properly communicated to the contractors or there are ambiguities in the designs which are not understood by the contractor's team. At times, the consultants and contractors are located at different places. This situation also generates certain communication problems. The effects of communication problems at this stage are delays in project schedule and also at times cost overruns due to wrong constructions which are most of the times the result of lack of proper communication.

'Client and project consultants' communication stage' is ranked as the third important communication activity in phases of a construction project. Its average is 4.3076. In this stage, understanding the client's requirements and planning

accordingly is very important. If proper communication doesn't take place between the client and the consultants, it affects the entire project activities. The consultants have to clearly understand the client's requirements and plan accordingly. Any failure in that leads to conflicts and disturbs the whole cycle of project activities ahead.

'Project consultant team communication stage' is ranked as the fourth important communication activity by the participants. Its average is 3.5769. The consultants have to communicate and coordinate among themselves for various activities as during the entire pre-project phase. A lot depends on their timely coordination and mutually resolving their internal conflicts so that the project planning activities are carried out correctly and also communicated properly to execution teams.

On the basis of the survey results, we can clearly state that all four communication stages pointed out by the interviewees of this research, are important and we need to focus on them for successful project performance. Finding out the most important communication stage, would help the construction business professionals to decide on some appropriate strategies for the management of project processes. It would give them a clear idea about critical communication areas during construction project execution and improve on the communication challenges discussed.

Effects of Communication Problems in Large Scale Construction Projects

The key effects of communication problems during various communication stages on the overall project performance on the basis of the discussion given in the earlier sections of the paper are summarised below. The interviewees were asked to point out the most crucial effects of communication problems which affect the project performance in their opinion. The major points emerging from their remarks were listed down on the basis of the severity of the effects during various project phases as pointed out by the survey participants.

1. On-site communication failures generate a series of problems in project execution which ultimately result in project delays and cost escalations.
2. Various problems occur in information management, such as lack of maintenance of site records, site coordination issues and accidents due to non-communication of safety hazards etc.
3. Defects in constructed works may occur due to miscommunication between the consultants and the contractors or during the onsite communication stage.
4. Poor co-ordination between the multiple stakeholders and ambiguous communication of design information lead to design problems that many a times cause design errors in constructed works.
5. Increased overheads due to delay
6. Effect on Schedule
7. Decrease in quality of work
8. Conflicts between the contractors and the client due to miscommunication

Conclusion

The study attempted to explore the significance of efficiency in communication management in improving the entire cycle of construction projects which ultimately affects the performance of construction organisations. With the increasing growth in the construction business and with the involvement of multiple stakeholders, the construction projects have a communication intensive environment. But unfortunately, the efficiency in communication management is lacking in this sector. The paper tries to reduce this gap and has attempted to identify the crucial communication stages, their relative importance and the effects of communication problems on construction projects.

Structured interviews and a questionnaire survey with professionals working at managerial levels in large-scale construction projects in India were conducted for this purpose. From the analysis of the interviews, four crucial stages of communication in construction projects were derived. They are: 'Client and the project consultants' communication stage, 'Project consultant team communication stage', 'Project consultants and the contractor communication stage' and the 'On site project communication stage'. It was revealed from the questionnaire survey analysis that the 'On site project communication stage' is the most important communication stage amongst all project communication stages. The second important communication stage emerged out to be the 'Project consultants and the contractor communication stage' and the rest two stages, i.e. the 'Client and the project consultants' communication stage' and the 'Project consultant team communication stage' are ranked as the third and fourth important communication stages by the survey participants. The lack of efficiency in communication management generates a series of problems which ultimately result in conflicts, cost escalations and delays. Overall, eight prominent effects of communication problems in large-scale construction projects were identified. All these results clearly reflect that the efficiency in communication management plays a key role in the successful execution of construction projects and affects the performance of the construction organizations.

The paper gives a clear indication about the critical areas in communication management in construction projects which need more attention. The study would help the construction business professionals to understand the significant role of

communication management in project performance, the communication stages and the relative importance of different communication stages in context of the various phases of the construction project execution. The study asserts the point that there is a need to develop a proper strategy to improve communication management in various stages of the construction projects as it largely affects the overall performance of the construction organisations.

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Tables & Figures

Table 1 One way Anova: Descriptives for Respondent Rankings

Communication Stages	**Mean**	**Std. Deviation**	**Std. Error**	**Lower Bound**	**Upper Bound**	**Min.**	**Max**
Client and Project Consultants' communication stage	4.3077	0.46604	0.06463	4.1779	4.4374	4	5
Project Consultant team communication stage	3.5769	0.49887	0.06918	3.438	3.7158	3	4
Project Consultants & Contractor communication stage	4.3462	0.48038	0.06662	4.2124	4.4799	4	5
On Site project communication stage	4.6346	0.48624	0.06743	4.4992	4.77	4	5
Total	4.2163	0.61881	0.04291	4.1318	4.3009	3	5

Note: N= 52, 95% Confidence interval for Mean.

Table 2 Anova

	Sum of Squares	**df**	**Mean Square**	**F**	**Significance**
Between Groups	31.668	3	10.556	45.244	.000
Within Groups	47.596	204	0.233		
Total	79.264	207			

Table 3 Results of Post Hoc Bonaferroni Test (Multiple Comparisons)

(I)Communication Stages	(J)Communication Stages	Mean Difference		95% Confidence Interval		
		(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Client & Project Consultants	Project Consultant team	.7308*	0.09473	.000	0.4784	0.9831
	Project Consultants & Contractor	-.0385	0.9473	1.000	-0.2908	0.2139
	On Site project communication	-.3269*	0.9473	.004	-0.5793	-0.0745

Project Consultant team communication	Client & Project Consultants	-.7308*	0.9473	.000	-0.9831	-0.4784
	Project Consultants & Contractor	-.7692*	0.9473	.000	-1.0216	-0.5169
	On Site project communication	-1.0577*	0.9473	.000	-1.3101	-0.8053
Project Consultants & Contractor	Client & Project Consultants	0.385	0.9473	1.000	-0.2139	0.2908
	Project Consultant team	.7692*	0.9473	.000	0.5169	1.0216
	On Site project communication	-.2885*	0.9473	.016	-0.5408	-0.0361
On Site Project Communication	Client & Project Consultants	.3269*	0.9473	.004	0.0745	0.5793
	Project Consultant team	1.0577*	0.9473	.000	0.8053	1.3101
	Project Consultants & Contractor	.2885*	0.9473	.016	0.0361	0.5408
	* The Mean difference is significant at the 0.5 level					

Table 4 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Communication Stages	208	1.00	4.00	2.5	1.12073
Respondent Rankings	208	3.00	5.00	4.2163	0.61881
Valid N (list wise)	208				

Figure 1 Different Stakeholders of a Construction Project