

# Role of Interface Management in Construction Industry

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**Abstract** –Interface management is evolving construction management practice which plays crucial role in mega projects due to its complex nature. The complexity of large scale construction projects increases due to its multidisciplinary nature, which can be reduced with the aid of interface management. Construction managers mainly focus on cost, time, and quality. The objectives of construction projects can never be achieved unless interface management is given importance. The main objective of this paper is to create awareness among the construction practitioners about interface management. This paper gives an idea on interface management and steps involved in its implementation in a construction project. The causative factors for interfacial issues in a project are also studied. Application IT in the development of interface management is also reviewed. The benefit drivers of implementing interface management are also depicted.

**Keywords:** Interface management, Construction management, IT, Interfacial issues

## 1. INTRODUCTION

Fragmented nature of construction project makes it challenging in bringing together multidisciplinary teams, materials, systems, budget and schedule for definite duration [14]. The disintegration can be under three sections viz. stakeholders, data and technology. The stakeholders in the project can be owner, design consultants, project management consultants, general contractors, subcontractors, labor sub-contractors, equipment suppliers etc., Whenever the project's size, duration and complexity increases, number of stakeholders too increase. The data such as design data, schedule data etc., need to be developed for each facility, components of building even if they are similar. Every stakeholder has their specific system of know-how or technology which is not assimilated with each other [15]. So the interface develops among stakeholders, data and technology.

The experts defined the interface management as “the management of common boundaries between people, systems, equipment, or concepts” [3]. The other two definitions for interface management are “the management of communication, co-ordination, and responsibility across a

common boundary between two organizations, phases, or physical entities which are interdependent”. “Managing the problems that often occur among the people, departments, and disciplines rather than within the project team itself” [1].

The poor interface management practice will lead to interfacial issues like design errors, mismatched parts, systems performance failures, coordination difficulties, and construction conflicts[5]. Now interface management has turn out to be vital area in the project management.

## 2. CLASSIFICATION OF INTERFACE

The interface management can be grouped as physical, contractual and organizational interfaces. Physical interfaces are actual, physical connections between two or more building elements or components. Contractual interfaces are between work packages in general linked with specialist contractors. Organizational interface is the interaction between various stakeholders involved on the project [2]. Organizational interface can be internal or external. These interface can be accounted in three levels viz inter project, intra project, extra project. Inter-project interface occurs between different parties directly involved in project planning and execution. Intra-project interfaces occur within the organization of each independent party, involved in the project. Extra-project interfaces occur between project parties and other parties/organizations which are not directly involved in the project [9].

Interface management can be classified from system point of view as time interface, relational interface, information interface, environmental interface. Time interface refers to interface between different stages of project such as pre development phase, preparatory phase, construction and implementation phase, operation and maintenance phase. Relational interface refers to interface between the different participants. Relational interface can be either contractual or non-contractual interface. Information interface refers to interface developed during the information exchanges between different department and personnel. Environmental interface refers to exchanging of information and energy between the project and the environment [12].

### 3. FRAMEWORK FOR INTERFACE MANAGEMENT SYSTEM

Interface Management System is defined as a “Systematic approach to effectively identify and handle interfaces through whole project lifecycle, with the objective of facilitating the alignment process between stakeholders by defining the interface characteristics, responsibilities of involved parties, and the need time of deliverables”[9]. The workflow of IMS is

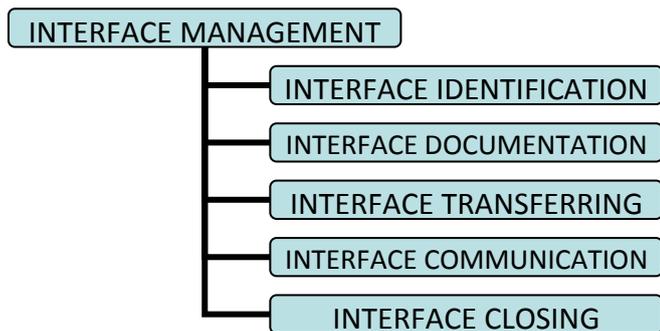


Fig -1: Steps involved in Interface management

Step1-Interface Identification: Interfaces through the project lifecycle need to be identified. Interface is a meeting point between stakeholders, systems, organizations, equipment, construction components and people[9]. Interfaces can be identified using design documents, work breakdown structure, contract documents, project specification, etc[4].

Step 2- Interface Documentation: Once the interface points are identified, the interface information needs to be defined. Interface information includes interface characteristics, involved parties, deadlines, needed documents, etc. The tools like RASCI(Responsible, Accountable, Support, Consulted, Informed) aids in defining the interface information[9].

Step 3-Interface Transferring: The interface points and interface information gathered so far is before awarding the contract. Once the contract is awarded the interface information is transferred to the responsible parties[9].

Step 4-Interface Communication: The transferred information will be reviewed by the responsible parties, if any further interface points need to be added or changes to be incorporated, the responsible parties will communicate with each other and sign an interface agreement to include those changes[9].

Step 5-Interface Closing: Once the accountable party assures the efficiency, accuracy and adequacy of the received deliverables, interfaced agreement is considered to be closed[9].

### 4. CAUSE FACTORS FOR INTERFACIAL ISSUES

Many researches have grouped the causes for interfacial issues from their perspectives. Cause and effect diagram is adopted to illustrate the causes and grouped the causes under people/participants, methods/processes, resources, documentation, project management and environment [6].

People/participants are further divided into sub-factors as poor communication, co-ordination, poor decision making and financial problems. Poor communication creates design errors, assembly conflicts and delays. Co-ordination is vital in both design and construction to enhance the constructability, ensure compatibility of components/subsystems, and minimize conflicts in schedule, site activities, and resource utilization among the contractors. Poor decision making leads to bad decisions in selecting design approaches, project delivery methods, subcontracting strategies, material/ components/ subsystems, construction methods, work sequences or equipment/ tools. Intercompany relationships are easily ruined by financial problems like delayed payments, underbids, cash flow problems, cost disputes [6].

Methods/Process is sub-divided as inferior design in interfaces, construction and assembly problems. Inferior design in interfaces will be created due to lack of consideration for modularity, standardization, component integration, manufacturing and construction. Construction delays, Poor quality of construction, complicated construction processes, poorly designed work sequence and handling methods creates construction and assembly problems[6].

The sub factors of resources are labor issues, material issues, equipment issues, information issues, space conflicts among labor, equipment and materials. Labor issues are mainly created due to lack of labor, cross-functional trained teams being unavailable. Inferior interface between man, machine or product, proper equipment or tools being unavailable lead to equipment issues. Material issues are mainly due to material delays, inaccurate quantity take-off, special materials or long lead items. Lack of accurate information, unstable & delayed information, incompatible software, lack of information standards for application, information iteration loop is the part of information issues. Space Conflicts are due to concurrent activities, poor site organization & maintenance, insufficient space on site [6].

Documentation includes project specifications, drawings, contracts, purchase orders, change orders, project correspondence, etc. Special interface documentation includes interface registers, interface O&M documents, etc. Inadequate specifications and drawings, delayed permits and shop drawing submissions & approval, inadequate contract, change order problems, lack of interface information lead to documentation issues[6].

Though Interface management is one of the aspects of project management, poorly performed sub-contracting, planning and scheduling, quality control, resource allocation, etc. lead to interfacial issues. Inappropriate sub-contracting is due to ignoring interface relationship subcontracting and interface management, inappropriate work breakdown & project decomposition. Planning and scheduling issues arise mainly because of shortened schedule in fast tracking projects, lack of timely schedule update and co-ordination [6].

Environment here is referred to environment of construction project. Weather, geological conditions, local regulations, building codes, trade union practices, cultural diversity of participants are the major threat to environmental issues[6].

The interfacial issues cause factor are put together under five major categories as management factor, information factor, bidding and contracting factor, by-law and regulation factor, technical engineering and site issues factor, other interfacial problems factor[11].

Lack of negotiation, communication, co-ordination among relevant parties involved in the project, lack of project management are named under management factor. All the interfacial problems under information factor are due to information issues leading to delay, missed, inaccurate and insufficient information. The problems concerning the bid and contract which appears in the invitation to bid and contract execution like unclear contract details, poorly written contracts are assembled under bidding and contracting factor. By-law and regulation factor are which occurs when different project parties are unfamiliar with the government auditing protocols, local laws, building codes, etc. Technical engineering and other site issue factors are due to lack of skills, or the complexity of the process and (or) site problems. The other interfacial problems are unexpected changes in material, labor availability and cost, and project type [11].

DEMATEL (Decision Making Trial and Evaluation Laboratory) model is proposed which shows engineering design, managers, communication skills, IT ability to apply, information sharing platform, and profit are most important factors for interface management of the project [12].

## 5. BENEFITS OF IMPLEMENTATION OF INTERFACE MANAGEMENT

The IM benefits are summarized as follows

- Provides the stakeholders a clear understanding on project complexity
- Customer satisfaction on quality, compatibility, and constructability, cost, risk and function perspective is easily met.
- Prior elimination of interfacial issues improves project planning.

- Project complexity and Interfacial issues are reduced due to enhanced work packaging systems
- Communication and co-ordination level among the project participants have upgraded
- Uncertainties in the projects are avoided due to standardised work flow.
- Changes in project delivery system can be updated to a great extent
- Construction practices which reduce the project complexity can be reapplied for future projects.[5].
- Interface management break the project into manageable pieces which can be easily tracked and identified and this majorly applies for mega project.
- IM aids in the development of scheduling and budgeting activities [14].

## 6. CONCLUSIONS

Interface management in current scenario has a diverse impact on project performance in terms of schedule, cost, quality, safety. The review suggests, mega projects which experiences multidisciplinary nature will account many interface points. Each stakeholder should have the awareness of interface management to experience its benefits within a project. The review suggests the factors which cause major threat to the interfacial issues should be identified earlier to have successful implementation of interface management. These factors alter with respect to nature and size of the project.

The review recommends advancement in IT application improves the level of interface management in the organization. The information sharing platforms and database management system have step forward due to progress in IT development in construction industry. Recent IT Tools like BIM(Building Information Modeling),4D CAD, Interface management tools like ACONEX etc. enables the construction practitioners to effectively identify the interface points and to manage interface.

The review suggests further research can be made by measuring the impact of IT application on interface management and project performance indicators directly and also through interface management. The view of every stakeholder on interface management and the hindrances faced by them while implementing interface management can be analyzed. Soon interface management will be viewed as a part of project management plan by the construction practitioners.

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