EFFECTIVE PROJECT INTERFACE MANAGEMENT FOR COMPLEX BUILDING PROJECTS

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ABSTRACT
By reason of technological advancements, many engineering projects are becoming larger and more complex. Numerous stakeholders collaborate with one another throughout the life cycle of a project from varying work cultures and different geographical locations. Improving alignment of stakeholders and minimizing project issues and conflicts can be realized with Interface Management Systems. The matter of identifying and monitoring interfaces is quite a significant challenge. Generally, the links between stakeholders, construction or manufacturing elements and project scopes are Interfaces. Deficiencies in project cost, quality and time in its execution lifecycle or failure after delivery of project could arise as a result of poor Interface Management. Thus, it is obvious that project performance during and after execution is dependent on the Interface management employed. This paper employs a process based approach in the Interface management of large scale projects in the following order: Identification, Documentation, Issuing, Communication and Closing.

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1.0 INTRODUCTION

Designing Buildings Ltd (2021) opines that Interface Management is a solution in handling mega complex projects. Flyvbjerg (2014) said that most mega complex projects fail, with 90% of them having upto 50% cost overruns while many others have overruns of more than 50%. Overrun scenario in the oil and gas industry projects is 64% with 73% schedule delays (Praetor, 2015). Reasons for these projects poor performance are - ineffective communication and collaboration among stakeholders, difficulty in managing multiple scope packages and increasing complexity.

It is a well-known fact that the economic prosperity and quality of life of a people is connected to their industrialization. According to Shore, et al (2012), the industrial facilities are becoming larger and more complex in scale by reason of technological advancement in their operations. Also, the internet has made it feasible for several mega contractors to jointly and remotely deliver projects. Shore et al (2012) opine that good management and sound technological foundation are therefore required for effective planning, designing, constructing, operating and maintenance of such facilities. Electronic Product and process Management Systems (EPPMS) are now available for the execution of such mega projects. EPPMS is used to connect project stakeholders (irrespective of their distances apart) through the internet and system servers. It formalizes and automates work processes and the document management system. It equally manages stakeholder interfaces, project phases and construction elements. While Interface Management (IM) recognizes and communicates interfaces between project parties, construction components are a tool for successful execution.

Morris (1979) highlighted the following Interface management principles: "Tight control of dynamic interfaces is essential to achieving project cost, schedule and scope targets. Static project interfaces should be kept clearly defined through the life of the project. Organizational factors should not be allowed to inhibit required project integration. Project organization structures generally need to change as the project develops. Early firm control of design is essential for effective project control. The design / production interface is the most critical project interface; it is also the most difficult to manage. The required amount of project management effort is a function of project size, speed, and complexity."

1.1 INTERFACE MANAGEMENT IN CONSTRUCTION

According to Notebook (2004), IM is an effective tool employed proactively to avoid or mitigate project issues such as design conflicts, installation clashes, regulatory challenges, new technology application, contract claims, etc. and enhances successful delivery of megaprojects.

Interfaces can be Internal (Intra) when they are within a single contract or scope of work.

Interfaces are External (Inter) when they are between contracts or scopes of work.

They can be Extra- Project Interfaces when project parties and others not involved in the execution such as statutory permits come into play.

The three levels of Project interfaces are shown in Figure 1 below.

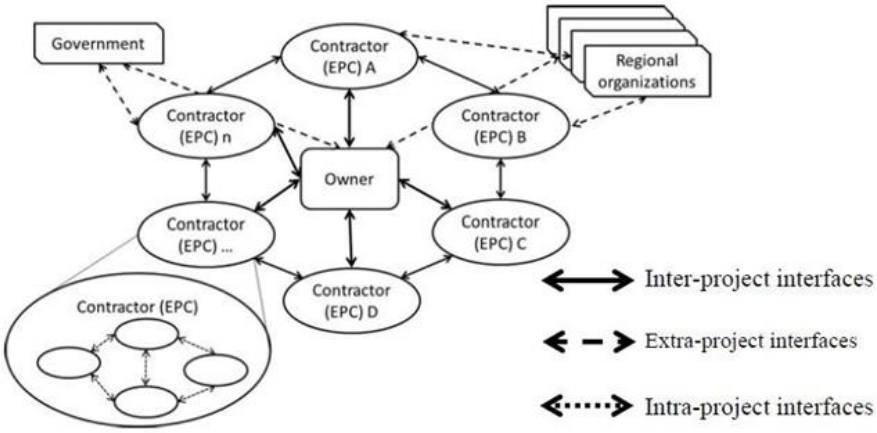

Figure 1 Three Levels of Project Interfaces Courtesy - Shore, S. et al (2012)

Furthermore, interfaces are classified into various categories based on the purposes to be served. According to Pavitt and Gibb (2003); Crumbing et al (2005); Chen et al (2007), these interfaces include but are not limited to: contractual, functional, organizational, physical, social and resources interfaces.

Examples of the application of IM in Construction are:

- Improving project safety and reducing the effect of hazardous processes.
- Establishing error-free communication between the architects, mechanical, electronic and air conditioning system engineers.
- Defining the human dynamics and communication strategies in agile project management
- Creating effective and timely communication between a MEC (Main Electrical Contractor) and an MAC (Main Automation Contractor).

2.0 INTERFACE MANAGEMENT SYSTEM

According to Shore et al (2012), "IMS is a systematic approach to effectively identify and handle interfaces (especially critical ones) through the 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."

The five main steps for executing IMS framework are:

First Step – Interface Identification: in this step, as many interfaces as possible in the project are identified. A brainstorming session of the project team is necessary to achieve this. Alternatively experts in the area of interface identification are engaged.

Second Step – Interface Documentation: the entire gamut of information including characteristics, deadlines, needed documents, parties involved, etc. are defined. Interface documentation process goes on throughout the IMS.

Third Step – Interface Transferring (Package Issuing): once a contract is awarded, all the identified / documented interfaces information is equally transferred to the concerned contractors / parties.

Fourth Step – Interface Communication: Interface Agreements are issued between parties concerned. The interface Manager ensures that all interfacing parties execute these agreements under his jurisdiction for effective management of the interfaces.

Fifth Step – Interface closing: once the parties involved in a particular interface agree on the accuracy, efficiency and completion of communicated tasks, information and deliverables, the interface is considered closed.

2.1 IMS – Roles and Responsibilities

Interface Managers are the contact bridge between all stakeholders in a given project concerning every interface point. Interface Coordinators are also assigned

to various interface points by considering the area, discipline, functionality, complexity and total number of interface points in the project.

The Interface Manager (a high level manager or his designate) is responsible for initiating the IMS process which includes the 5 main steps analyzed above.

The Interface Manager beside assigning tasks to team members and monitoring the status of all interfaces to closing points, also works with other parties to ensure requests are responded to promptly.

2.2 IMS Elements

As a result of the needs and complexity of various stakeholders in a construction project, many interfaces are created. To handle an interfacing point, the parties interfacing could require numerous information to judiciously resolve an interfacing point, hence numerous interface agreements are generated.

The relationship between contract package, interface points and interface agreements are shown in Figure 2 below.

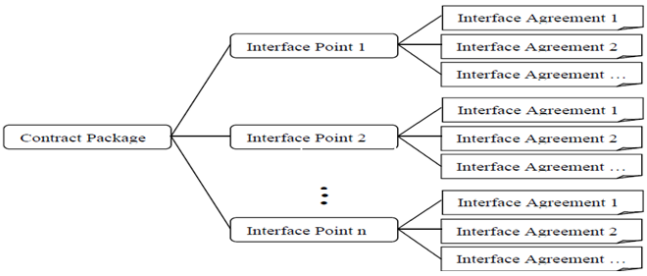

Figure 2: Relationship between contract package, interface points and interface agreements courtesy - shokri, et al (2012)

2.3 IMS Framework

The workflow of the IMS is shown in Figure 3 below

The Electronic Product and Process Management Systems (EPPMS) has the IMS steps which are executed automatically. All contracting parties must therefore have access to this internet based software. The workflow is explained as follows:

First Step – Interface Identification

The definition of Interface which for this model could be physical or virtual points is required. Thus, the interface could be a physical or virtual meeting point between organizations, equipment, systems, stakeholders, construction components and people. The three things that necessitate the creation of interface points are: contractual obligations, regulations, or actual connection of two objects. While there are three levels of interfaces (Inter, Intra and Extra), the Inter – Project interfaces are considered in this case.

Second Step – Interface Documentation

Having identified and approved the interface points, the information related to each interface point has to be defined. Such information include: level of interface point (inter, intra, or extra – project), the interconnecting parties, its related area, discipline and department. Using the RASCI Matrix, the responsibilities of the interconnecting parties involved in the interface point execution are identified. RASCI denotes;

R – Responsible
A – Accountable
S – Support
C – Consulted
I – Informed

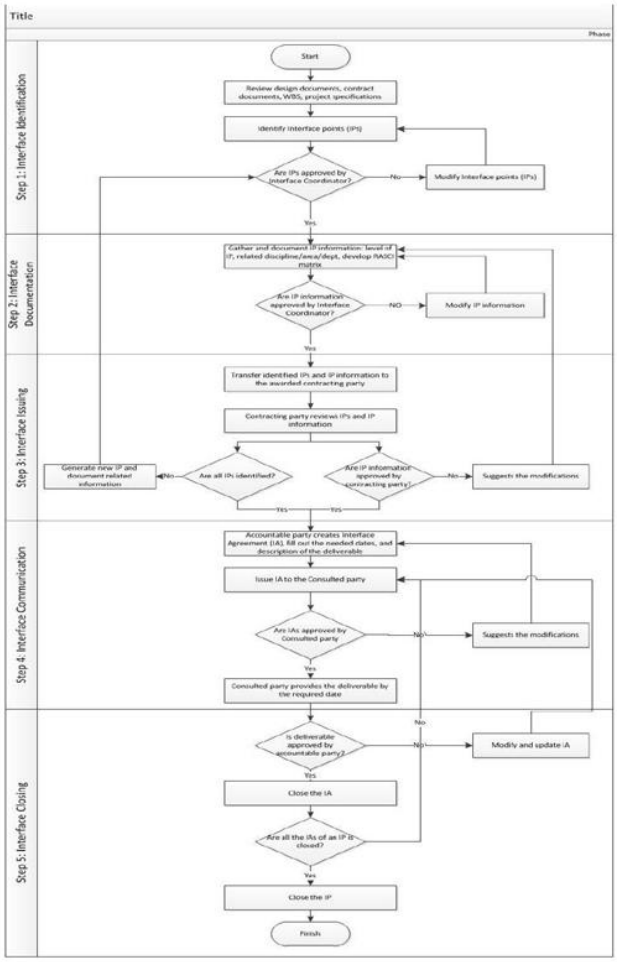

Figure 3: Workflow of the IMS

Courtesy - Shokri, S. et al (2012)

2.3.1 Roles description for Interface execution:

R – Responsible: the responsible party for the overall performance plus approval of the accuracy of interface point characteristics

A – Accountable: this refers to the party that generates the interface agreement and has the legitimate authority to approve the work adequacy and decides when the agreement is closed.

S – Supportive: refers to the party who supports the other to facilitate accomplishment e.g. The party who may grant the other access to site.

C – Consulted: the party that responds to the interface agreements by providing deliverables.

I – Informed: the party that needs to know the status of the interface agreements even if it's for courtesy sake or assist them schedule their work.

The RASCI Matrix helps in reducing project risks while removing ambiguities in job roles and responsibilities.

Table 1 below is an example of RASCI chart.

Table 1. Sample of RASCI Chart

	Owner	PMC	Discipline i	...	Designer
IP 1	R	A	S		I
IP 2		R,A	S		C
IP 3	A	R			S
⋮					
IP n		C	S		A,R

Courtesy: Shore (2012)

Third Step – Interface Issuing: once the contracting party has been awarded the contract, all identified interface points at FEP (Front End Planning) stage are transferred to him. This includes all the interface points in which the contracting

Party is responsible, accountable, consulted or is supporting. Any emerging interface points would however require the approval of the interface coordinator at owner's organization.

Fourth Step – Interface Communication: after a contractor is chosen, all identified interfaces are confirmed / reviewed for approval of accuracy and sufficiency of information given. Newly identified interfaces at this stage must be approved by the Interface coordinator for issuance. The Interface Communication is done through the issuance of Interface Agreements by the Accountable Party under the jurisdiction of the Interface Manager.

Fifth Step – Interface Closing: Interface Agreements are closed once the accountable party approves the accuracy and adequacy of received deliverables. Otherwise, the Interface Manager and his team would review the interface agreements while the consulted party would also review before the other party is informed of the updates and modifications.

3.0 INTERFACE MANAGEMENT AS PART OF ORGANISATIONAL BEST PRACTICE

Formal IM procedures have been developed by major EPC's and owners such as Saudi Aramco, Fluor and Suncor in order to minimize risks in their projects. They have dedicated teams to implement IM principles and practices in their projects. Complex projects such as offshore oil platforms, urban light rail, etc. Would easily benefit from the application of IM.

In a study conducted by Construction Industry Institute (CII, 2014) involving 45 mega - projects, the following conclusions ensued:

- Large complex projects implementing mature IM systems experienced on the average, only 4% cost growth while those not implementing it experienced 18% cost growth on the average. Thus a cost performance of approximately 5 times is experienced via the implementation of IM.
- The cost of implementing IM (tools, software and dedicated team) for a hypothetical US$30bn project is averagely 0.2% which is US$60m while the benefit could be above US$3bn.

CONCLUSION

Large scale projects are complex due to their numerous stakeholders, size and scope. Conflicts are bound to occur due to issues of misalignment between stakeholders and insufficient communication among them. Interface Management arrests these problems besides improving project performance in quality, time, cost and safety. The

project receives added visibility on roles, project description and common boundaries thus leading to seamless execution. It must be noted that more benefits would accrue when IM is integrated with other project management processes such as change management and risk management. IM no doubt aids better and more informed decision making that improves project performance while gaining competitive edge.

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