

Understanding the Importance of Project Planning and Scheduling in Indian Construction Projects

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Abstract

The construction sector in India aims to be the world's 3rd largest construction industry, with a 7.1 percent annual growth rate predicted by 2025. The Indian construction industry is accountable for a 9% share of India's GDP and provides employment to more than 50 million people. India is a project driven country and around 60% of the Indian construction Projects are running behind Schedule. Hence, Planning & Scheduling plays a vital role in completing projects within time and cost. The Project Planning & Scheduling is the second phase of the project life cycle. In this phase, the planner understands the contract and define Project Deliverables/ Key Milestones. The planner then creates a detail project plan (also known as Detailed Work Programme (DWP)) to guide the execution team. Planner breaks the Project Deliverables in Work Breakdown Structure (WBS) and further into activities and assign the required resources to complete those activities. Activities are tasks which needs to be performed by the execution team like excavation, concreting and so on. While resources are Manpower, Equipment and Material which are assigned to these activities for estimation of activities duration. A detail list of WBS and activities are created along with the required resources. All these activities are interconnected (using relationship like FS, SS, FF & SF) from start till end to create a working project plan. The planner then coordinates with Construction Manager/ Project Manager for validation of the project plan. The project planning & scheduling helps to cover the full scope as per contract into a plan which benefits the project by reducing the time, cost, and risk on the project. This phase is a vital step in conducting the construction work smoothly. There is a need to understand the importance of Project Planning & Scheduling in success of a project. Project Planning & Scheduling directly affects the HR functions in an organization. Not limited to this, other departments are affected by the Project Planning & Scheduling phase. There are various available software's like Primavera P6 or MS Project to assist planner in preparation of project plan. Further, AACE provide recommended guidelines (RP) like 39R-06 or 91R-16 on Schedule Development which is very helpful and comes handy while preparing the Detailed Work Programme (DWP). Lastly, Risk Register needs to be prepared, updated and incorporated in project plan.

Keywords—Project Planning, Project Scheduling, AACE, Planner, CPM, Primavera P6, MS Project & Risk Register

I. INTRODUCTION

From olden times till today's technological world, planning is always considered the most significant tool whose importance is growing more with digitalization of construction projects. Project planning is the process of detailing steps for accomplishing the project within a certain time frame by using the

available resources. Those steps are called WBS (Work Breakdown Structure) which further divides into activities leading to preparation of project plan. The project plan clearly defines how the project will be executed, monitored, controlled, and closed. Project Planner/Planning Engineer plays an important role during project planning & scheduling stage. The four important factors

considered during this stage are scope, milestones, deliverables, timeframes, and resources i.e. cost. Detailed Work Programme (DWP) contains various plans like Design Plan, Utility Diversion Plan, Execution Plan, Resource Plan, Budget Plan, Procurement Plan & so on.

II. RESEARCH AIM

Project planning is the process of doing a project step by step by dividing the project into WBS (Work Breakdown Structure) & further into activities and scheduling is the process of linking the activities using relationship like FS, SS, FF & SF and arranging resources and also optimizing the project i.e. Scheduling is the process of arranging the work and also gathering the resources which are required. The main aim of the project is to get the importance of project planning and scheduling, project planner & project controls in the Indian construction sector.

III. RESEARCH OBJECTIVES

There are some objectives of the research are given below:

To evaluate how project planning & scheduling works in the construction sector.

To evaluate how the pre-Project planning is very helpful.

Preparation of Risk Register.

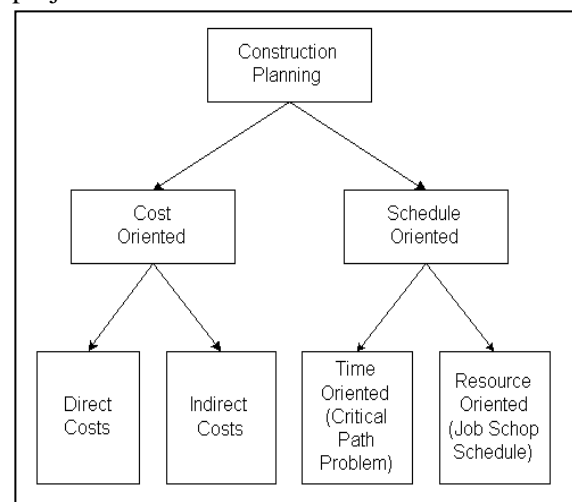
Importance of using AACE international recommended guidelines.

To discuss the preparation of Detailed Work Programme (DWP) using Primavera P6 & MS Project.

IV. BACKGROUND

Project planning and scheduling in the construction sector is the process to know what exactly to do, when to do and what resources are needed to complete the task. Project planning serves as a roadmap for the entire project & project management process by breaking down the scope of work as per contract into WBS and activities while scheduling is the process to identify the resources which are needed to complete those tasks (Prasad, Vasugi, Venkatesan, & Bhat, 2019). This arrangement of the resources along

with the activities is called scheduling. It not only handles the pace of the work but also handles how the tasks are executed. The project management methodology started to grow from 1950 by the CPM method. The Great Wall of China is a big example of project management that was done in the 90s century. The project management techniques are largely based in 1960 on the waterfall technique. So, the concept of scheduling is not new around the world. Mainly, construction planning is a challenging and fundamental activity in the management of a construction project. A good project plan not only calculate timeframe to complete the project but also develop the budget of the project. Hence, developing a construction plan is a fundamental, challenging & very critical task in the management and execution of the project.



Source: (Hendrickson, 2008)

Figure 1: Construction Planning

In this figure, the project plan is described. Through the project plan, the factors which are affecting the construction sector are also described. By planning a task, it can help to reduce the time and budget of the plan. (Muneeswaran, 2020).

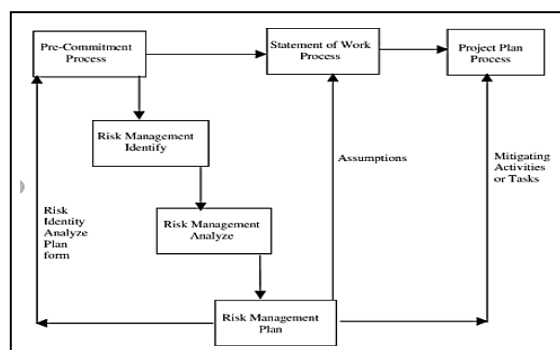
Cost is divided further into direct cost i.e. labour, equipment, material cost and so on while indirect cost i.e. Transportation cost, Overhead cost, Depreciation cost, Taxes and so on. While Schedule is prepared based on 02 types i.e. Time based or resource based.

The construction planning restricts the further extension of the time within which the task or the project must be done. The overall project plan has been divided into some tasks. Those tasks also need some resources to do those tasks within time. The resources are arranged according to the task and through managing those tasks, which are the biggest matter of scheduling of a project plan.

V. LITERATURE REVIEW

The literature review is the section where the whole process of planning and scheduling is discussed.

According to Khun-anod and Limsawasd 2019, there are many challenges in the construction projects (Khun-anod, 2019). Lack of knowledge, skill, and experience are the main three barriers to completing a construction project (Dixit, 2017). The effort directly affects the project's success. Efforts are directly proportional to the success of the project. The pre-project plan is the process to develop sufficient strategies to avoid the risks and arranging resources. Pre-project planning is an owner-driven process. The pre-commitment process, risk management, and statement of the work process are involved in the process of planning (Bhosale, 2017). The pre-commitment is the process of committing to something in advance. Risk management is also an important one in planning. Risk management is the process of controlling threats, identifying, and assessing organizational capital. And the work process is the process the work has been done. And the working procedure is the procedure by which the work is going in step by step.



Source: (Pat Ferguson, 2015)

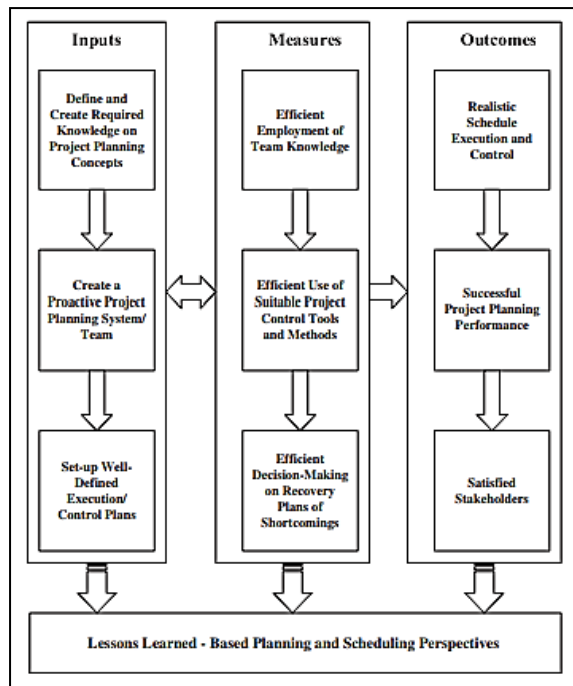
Figure 2: Project Plan

According to Venkateswaran and Murugasan, 2017, the aim of the study is the factors affecting to delay of the project (Venkateswaran, 2017). And the study also determines what factors also affect the budget of the project (Nouban, 2017). There are more than twenty factors that can affect the time and money of the construction. The factors which affect the cost and the time delay of the project are,

- Insignificant project planning.
- Underestimate the schedule of the project.
- Underestimate the cost of the project.
- Bidding procedure.
- Long duration of the process.
- Project execution based on Experience rather than based on Project Detailed Work Programme (DWP).
- Unethical activities.
- Poor Procurement Planning.
- Poor communication with the stakeholders.
- Negligence in the site visit.
- No Risk Management Plan.

Those are the most important factors that affect the project time and the cost of the project. Those are the main factors for which 'planning and scheduling' are very important.

According to (Ryad, 2019), planning is the process of doing something in some specific steps. And the scheduling is the process of gaining resources from the outside and also arranges materials to do those steps (Ryad, 2019). There is mainly the process of suitability and the efficient existing planning method, scheduling the performance and development control, scheduling concept and the knowledge-based study. The process of scheduling and planning goes in some steps. By completing those steps, the full project is completed.



Source: (Aulin, 2015)

Figure 3: Planning and Scheduling

The figure contains the basic formula to complete a project (Hasan M. L., 2019). In the input stage, the project planner needs to have knowledge about the project by going through the contract agreement and need to have a good understanding about the project plan. The DWP is a document which establishes the means of monitoring, controlling, and executing the project. The plan is the main communication vehicle that can run between the start till end of the construction. Measures carried by the efficient deployment of team, team knowledge and sustainable project control tools or the methods used in the project control, decision making, and the recovery plans can further make the overall DWP works efficiently. This all will help in following the realistic schedule and execution control leading to stakeholders' satisfaction and the successful project planning performance.

According to Chowdeswari et al. 2017, the planning process in the construction industry is to develop the project plan and the project documentation. In a construction project, many risks can affect the whole project (Chowdeswari, Optimal planning and scheduling of high-rise buildings., 2017). To maintain the risk measure for the project, we

must prepare a risk register, and project scheduling which can show the relationship between the project activities in order to estimate project timings (Issa, 2017). The risk register can identify the risks of the project and also gives a sufficient mitigation plan. The causes of delay of the projects are insufficient technical knowledge, lack of procurement plan, no manpower planning, no proper project controls department and absence of risk management plan. The risks are the most important thing to handle in any type of project. Proper planning and scheduling can optimize the whole procedure of the project. The project must use those methods to improve the risk management of the project.

The AACE international standard guidelines are the accepted standard and give excellent project management suggestions. The construction sector in India needs to evolve its project control department, and the recommendations will be crucial to the project's smooth progress. There are a number of suggested guidelines, some of which are expanded, that are applicable to project management in the Indian construction business.

AACE recommends schedule development as one of the practices, and the ID for this guideline is 91R-16. This procedure entails converting the project's scope into functionality, feasible milestones, time-duration, time limitations, and other schedule-related data into a schedule model (AACE, 2020). A well-crafted schedule contains sufficient detail to enable effective project management. The many sorts of schedules can be classified into five tiers based on the degree of schedule information. The schedule's highest level is provided by Level 1. The schedule's fifth level is used to manage task needs for the completion of the functionality specified in the schedule. The working schedule is a level five schedule that depicts work demands on a weekly, daily, or hourly basis. The next AACE-recommended guideline for the construction sector is EVM, or "Earn value management," with the ID number 82R-13 (AACE, 2020). The "32 EIA-748-C recommendations" for employing EVM are

defined first in this recommended practice. "Earned value management" (EVM) is a construction project management system that combines time, price, and scope to measure project performance (Chen, 2012). EVM predicts the future based on predicted and observed values, allowing project managers make adjustments as needed. The "Responsibility and required skills for a project planning and scheduling" guideline, with ID 14R-90, is another AACE guideline whose objective is to establish the accountabilities of project planners and scheduling specialists during various project planning stages and schedule creation. This procedure also specifies the abilities and expertise that project schedulers must possess. The execution of project control in the Indian construction sector necessitates the use of competent and experienced personnel, as well as the proper training of workers. Project planning, schedule formulation, and schedule control or management are the three aspects of this approach.

The "Schedule update review," with the ID 53R-06, is the next AACE worldwide guideline. This "schedule update review" recommended practice (RP) is meant to be a guideline rather than a set of rules. As recommended by AACE International, this paper offers instructions for the project scheduler to write a professionally scheduled update or analyze the appropriateness of schedule modifications to be made as a result of a change in project status and progress. This RP is tied to "Total Cost Management" (TCM) progress and performance measurement, as well as change management processes, for building projects (Igwe, 2020). These best practices document outlines guidelines for construction entities delivering schedule updates (contractors) and organizations evaluating schedule submittals (owners or clients) to respond proportionately to the submittal.

Another AACE worldwide guideline is "Developing the project control plan," which has the ID 60R-10. Instead, then being a set of rules, this proposed practice is designed to be used as a guideline (AACE, 2020). The

guideline's purpose is to increase communication among stakeholders involved in the creation, evaluation, and use of project controls information. It is an AACE International recommended practice. This deliverable can be part of a larger "Project execution plan" (PEP), or it can be used on its own to outline the specific approaches that each functional unit, such as engineering, procurement, construction, safety, and quality, will take. All of the aforementioned rules are critical in project management, and the Indian construction industry, in most cases, lacks project control.

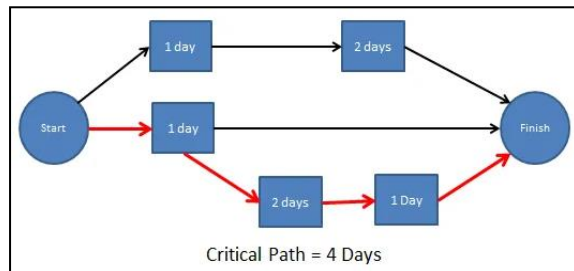
VI. RESEARCH METHODS

The research is based on the importance of the planning and scheduling of the project. The methodology of the project of research is meant for collecting and gathering the data or the information in a relevant manner for exploring the effects of some variable and decision-making process. The methodology section hereby is delivered to include in which way the study will proceed in collecting data after making sampling (Kumar, 2019).

There are various methods used for planning and scheduling like Gantt chart, Critical Path Method (CPM) or Kabana Method. CPM is the most popular method of planning. The CPM method is to create a list of tasks which is required to complete the project, dependences between tasks, resources required to complete those tasks like Excavation quantity can be 1000 Cum and one hydraulic excavator can excavate around 200 cum of soil in one day. Hence, 05 days will be required to complete the task with one hydraulic excavator. This calculation helps us to estimate the time required to complete the task.

In the below mentioned figure, we can easily see various activities along with the time duration required to complete the project. The below figure is also able to show the exact "Critical Path" of the project (highlighted in red) which should be following by the project planner, project manager or by senior management of the project to monitor the overall status. The other paths should also be

monitored at only project manager level as leaving them unmonitored may lead them to be critical in future.



Source: (AcqNotes, 2021)

Figure 4: Critical Path Method (CPM) Model Plan using Finish-to-start relationship

Due to the complexities of the project in modern world, the scheduling plans are mainly created through the software like MS project or Primavera P6 (Lehtimäki, 2017). The planner plays an important role in preparing the Detailed Work programme (DWP).

The programme file i.e. Detailed Work programme (DWP) contains:

- Key Milestones,
- Work Breakdown Structure (WBS),
- Activities,
- Relationships,
- Sequencing of Activities,
- Activity Durations,
- Define Resources,
- Assign Resources to each activity,
- Assign Calendars based on the public holidays and other critical information,
- Assign expenses to activities, if required.

Following extract is taking to analyze the DWP preparation of any successful project using Primavera P6:

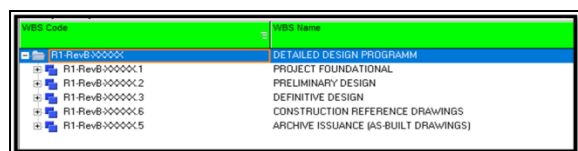


Figure 5: Work Breakdown Structure

#	Activity ID	Activity Name
1		DETAILED DESIGN PROGRAMM
2		PROJECT FOUNDATIONAL
3		KEY MILESTONES
4	PF_KM_100	Commencement of Project
5	PF_KM_110	Commencement date of Lead Design Consultant (issue of LOD)
6	PF_KM_120	Kick off meeting with Contractor
7	PF_KM_115	Appointment of LDC by Concerned Authority
8	PF_KM_130	Finish off Project
9		CONTRACTUAL MILESTONES
10	PF_CM_100	KD-01 Preliminary Design
11	PF_CM_110	KD-02 Definitive Construction ref drawing of Land Reclamation & Greed area and approval
12	PF_CM_120	KD-03 Definitive Construction ref drawing of Bridge First Submission to PMC
13	PF_CM_125	KD-03 Definitive Construction ref drawing of Bridge Re-submission after PMC Comments
14	PF_CM_150	KD-03 Definitive Construction ref drawing of Bridge Approval from PMC/GC
15	PF_CM_130	KD-04 Construction Reference Drawings and approval
16	PF_CM_140	KD-05 Archive issuance (As-built drawings)

Figure 6: Activities under WBS including Milestones

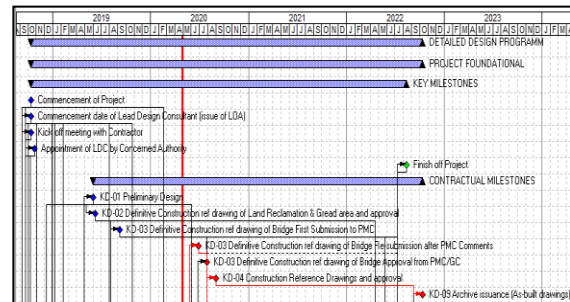


Figure 7: Sequence of activities and relationships between activities

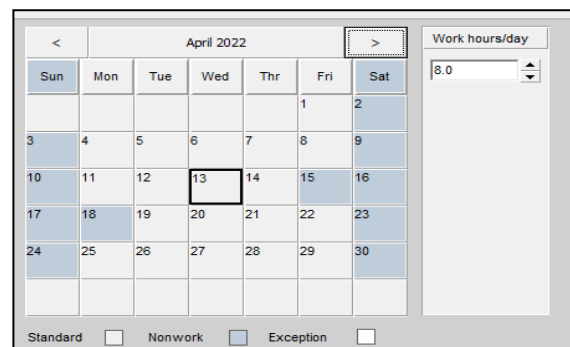


Figure 8: Project Calendar

Activity ID	Activity Name
	Excavator Operator
RT1.1410	Backfilling and leveling at Casting yard
RT1.1411	Development of segment stacking yard
RT1.1413	Erection of batching plant
RT1.1414	Erection of casting yard shed
RT1.1415	Pedestal casting for mould
RT1.1416	Erection of EDT inside segment casting yard
RT1.1417	Installation of boiler (if required)
RT1.1418	Testing and commissioning of batching plant and boiler
AB9520	Excavation grid 1 to 5
RT1.1882	Excavation till bottom of 1st level support system
RT1.1884	Excavation till bottom of 2nd level support system
RT1.1886	Balance soil excavation
RT1.1887	Rock excavation
RT1.1909	Excavation till bottom of 2nd level support system
RT1.1911	Balance soil excavation
RT1.1912	Rock excavation
RT1.1938	Excavation till bottom of 1st level support system
RT1.2000	Excavation till bottom of 2nd level support system
RT1.2002	Excavation till bottom of 3rd level support system

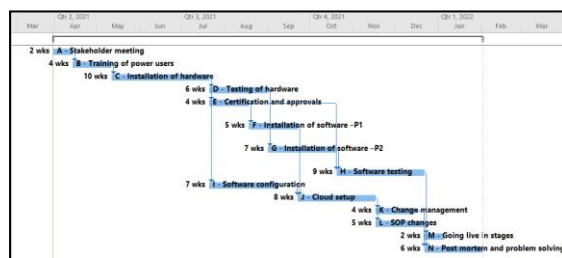
Figure 9: Creating Resources

#	Activity ID	Activity Name
230		Soil Excavation with retaining support system
231	RT1.2139	Excavation upto 1st level of retaining support
General Status Relationships Codes Resources Expenses		
Activity RT1.2139		
Resource Name	Budgeted Units	Budgeted Units / Time
Dump Truck (Trips)	500	25/d
Excavation	100000	5000/d

Figure 10: Assign resources to activities

One Example of Project Plan using MS Project:

Task Name	Duration	Start	Finish	Predecessors	Total Slack
1 Implementation of AI Software	44 wks	Wed 31-03-21	Tue 01-02-22		0 wks
2 A - Stakeholder meeting	2 wks	Wed 31-03-21	Tue 13-04-21		0 wks
3 B - Training of power users	4 wks	Wed 14-04-21	Tue 11-05-21	2	0 wks
4 C - Installation of hardware	10 wks	Wed 12-05-21	Tue 20-07-21	3	0 wks
5 D - Testing of hardware	6 wks	Wed 21-07-21	Tue 31-08-21	4	4 wks
6 E - Certification and approvals	4 wks	Wed 21-07-21	Tue 17-08-21	4	0 wks
7 F - Installation of software -P1	5 wks	Wed 18-08-21	Tue 21-09-21	6	0 wks
8 G - Installation of software -P2	7 wks	Wed 01-09-21	Tue 19-10-21	5	4 wks
9 H - Software testing	9 wks	Wed 20-10-21	Tue 21-12-21	6,8	4 wks
10 I - Software configuration	7 wks	Wed 21-07-21	Tue 07-09-21	4	2 wks
11 J - Cloud setup	8 wks	Wed 22-09-21	Tue 16-11-21	7,10	0 wks
12 K - Change management	4 wks	Wed 17-11-21	Tue 14-12-21	11	1 wk
13 L - SOP changes	5 wks	Wed 17-11-21	Tue 21-12-21	11	0 wks
14 M - Going live in stages	2 wks	Wed 22-12-21	Tue 04-01-22	9	4 wks
15 N - Post mortem and problem solving	6 wks	Wed 22-12-21	Tue 01-02-22	12,13	0 wks



The project schedule modelling allows seeing the big picture on the primary task which is to be completed. The project schedule involves mainly three major items i.e. deliverables, milestones and the activities needed to complete the project. Then the research comes to the analysis of project risk planning. Project risk planning is the process to identify how to carry out the activities or the tasks associated with the risks. The main work of that is identifying the risk of the project and proper mitigation measures against those risks (Chowdeswari, Optimal planning and scheduling of high-rise buildings, 2017). The risk register is where the record of all identified risks is maintained, it also stores the mitigation measures and calculate the risk value.

Steps involved in developing Risk Register

Step 1	Identify the Risks
Step 2	Describe the risk in detail
Step 3	Brainstorm the mitigation measures
Step 4	Identify the Risk Owner like Project Manager or Design Manager
Step 5	Ascertain the Risk Category like Design, Procurement, etc.
Step 6	Identify the Probability of that risk occurring
Step 7	Calculate the “Impact Range”
Step 8	Risk Value will be calculated

ID	Risk heading	Description of the risk	Mitigation Measures	Residual risk	Owner	Category	Present or Stage	Probability Range (%)	Impact Range % of total Project fee	Impact Value (\$M)	Risk Value (\$M)	Status
Resources	Lack of adequate number of required staff	All required staff are available	NA	Project Manager	Financial Risk	Design	Low	0-10%	0-10%	\$0.000	\$0.000	Open
Design Approval from Management	Delay in receipt of approvals	Strong follow up of the relevant party	Unassigned	Project Manager	Time Impact	Design	Low	0-10%	0-10%	\$00.000	\$2.500	Open
Requirement gathering	Softening initial requirement for work to learn from the relevant stakeholders	Right questions to be asked. Properly documented to be clear	Unassigned	Project Manager/ Designer	Time Impact	Design	Low	0-10%	0-10%	\$00.000	\$1.000	Open
Selection	Integration	The all team right people for brainstorming and design generation	Unassigned	Designer	Time Impact	Design	Low	0-10%	0-10%	\$00.000	\$2.500	Open
Delay in the Deliverables	The Deliverables as per contract agreed timeline	Project Monitoring. Progress Status to be checked at the time	Unassigned	Project Manager/ Designer	Time & Financial Impact	Design	Low	0-10%	0-10%	\$00.000	\$10.000	Open
Interface and coordination	Interface between the various teams dedicated for the work	Proper weekly meeting between the teams to be held by Project Manager	Unassigned	Project Manager	Time & Financial Impact	Design	Low	0-10%	0-10%	\$00.000	\$0.000	Open

Figure 11: Sample Risk Register

Interpretive Structural Modelling (ISM) used to analyze the driving and dependence power of the variables. Interpretive structural modelling (ISM) is a well-established methodology for identifying relationships among specific items, which define a problem or an issue. It is structural based on mutual relationship. The major three steps involved in ISM modelling are as follows:

- Identify the elements which are relevant to the problem. This could be done by a questionnaire survey.
- Establish a contextual relationship between elements with respect to which pairs of elements would be examined.
- Analyze the impact.

Hypothesis - A hypothesis is a statement that predicts the relationship between a set of variables. Variables are factors that are likely to change. Relational hypotheses to determine if relationships exist between a set of variables.

Causal hypotheses to determine if changes in one variable cause changes in another.

HR1: Impact of Preparation of Proper Project Plan i.e. DWP on the other variables.

HR2: Impact of the deployment of Planning Engineer for project planning & scheduling on other variables.

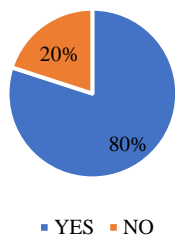
HR3: Impact of having pre-execution risk register on the other variables.

HR4: Impact of the use of software for Planning & Scheduling on the other variables.

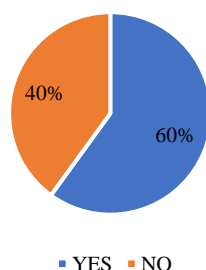
VII. DATA ANALYSIS AND FINDING

50 participants considered for the questionnaire survey. Mainly from Infrastructure & Heavy civil construction industry. Participants include Planning Engineer, Site Engineer, Supervisors, Construction Manager, Project Manager, Project Controls Manager & Sr. Management. Medium and large Organizations are only considered for the survey.

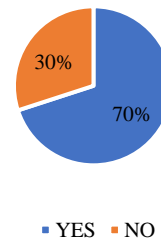
Proper Project Plan increases efficacy of Planning & Scheduling phase



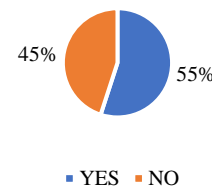
Deployment of Project Planner increases effectiveness of Planning & Scheduling phase



Having pre-execution Risk Register helps mitigate risk and increases productivity of Project Plan (DWP)



Uses of International AACE recommended guidelines increases the effectiveness of Planning and Scheduling phase



VIII. DISCUSSION

Planning is a challenging task but at the same time it is also a fundamental activity in managing any type of construction project. Good monitoring and controlling of construction projects are based on developing the budget and the schedule for the work. In layman term, the project plan is the process that defines the project goals, project aims and objectives. It specifies the task that how the project will proceed, and total time required to complete the project. It also specifies what resources will be required for undertaking the task (Bajjou, 2020). The project plan also gives the information of the team role.

The planning of the project includes the risk register. Now a days, there are various software available to prepare the project plan like MS project and Primavera P6. The project plan is mainly referring to time schedule which involves the steps to complete the project. The project planning also includes documentation of the project and an effective method of creating a flow chart to complete a construction project. A project plan defines all of the work which has to be done in the project and also identifies who

will do that work. The project plan is focused on the scope, time, cost, quality, environment, safety, quality and risk of the work.

There are some basic steps involved in planning & scheduling for successful completion of the project:

- Scope Planning: Specify the requirements for the entire project and in order to create the WBS structure, scope planning for the entire project is required so that the Engineers and the managing authority of the project are able to finish the entire project according to the timeline by fulfilling all the requirements.
- Development of the project schedule: Mapping the overall work of the entire project, develop the entire schedule for the project by creating WBS and activities in detail and implement within the timeline.
- Resource Planning: Planning for the resources is also required so that it is possible to gather all the possible resources, or any extra resources required before start of the project in order to complete the overall project successfully. Otherwise, the overall timeline and the overall cost for the entire project might be hampered.
- Design Planning: One of the most important planning phase where Preliminary, Detailed, Good for construction and As-built drawings programme is prepared.
- Procurement Planning: Besides scope planning and budget planning focusing on the outside vendors and the subcontracting are also required to prepare the procurement of materials and equipment to complete the overall project successfully.
- Budget Planning: To complete the overall project within the budget the planner needs to pre-planned for the estimate budget for the entire project so that they are able to finish their work and also able to measure if any extra cost is required for completing the project.
- Risk Management Plan: Before start any of the projects, the planner needs to list down the possible risks while performing the overall work and also needs to be pre-

planned against those in order to estimate those risks within time. Otherwise, it will lead to cost & time overrun. So, Risk Register needs to be prepared showing probability and impact of risk, thus, calculating the risk value for each risk.

- Communication Plan: For any project, communication plan is required to make a suitable communication between the various stakeholders to have timely decision. Also, the communication between the workers, managers and the supervisors are also required so that there have no difficulties or misunderstanding arises.

Scheduling is the process of providing the resources, relationships, and schedule of the tasks to calculate the completion time (Kanit, 2021). The schedule of the construction is based on the task, material, labor, and the time needed for completing the project. There are many ways to create a schedule which includes curve S, network planning, the scheduling linear, etc. The construction planning and the scheduling are to improve the work efficiency of the project. Effective material management and proper distribution of the material or the resources reduce the cost of the project and reduce the lifetime of the project. Site planning is a task that is done step by step on the site (Hasan, 2019). Planning is the process by which the work simplifies. Scheduling is the process of arranging the resources and managing those steps in a tabular form. The scheduling is the steps of the planning activities. That's why planning and scheduling are very important criteria to do work properly. And reduce the project time and cost of the project.

IX. RECOMMENDATION

Mitigate the limitation of the project planning and the scheduling of the project. These above sections must be improved further, so that the importance of the project planning and scheduling can be focused further and proper planning to be carried out before construction (Saad, 2020). The planning and scheduling can help the project complete within time without cost overruns. The plan can define the work purpose and the schedule of the work can define

the requirements. To complete the project, monitoring and controlling is also important which is not discussed in this research article. Further, the importance of planner is touched upon here but should be discussed in detail. Moreover, Project Controls department impotence needs to be highlighted for successful planning & scheduling. So, the readers and the future researcher can work on roles and responsibilities of Planning Engineer, importance of Project Controls department and preparation of supporting programmes like Procurement, Design, etc. using Primavera P6.

X. CONCLUSION

The research is based on the importance of planning and scheduling in construction. The introduction we have discussed about the project plan, project planner and DWP. In background section, CPM was discussed. After collecting the data from various resources such as online articles and also from journals, this overall research is performed. In the literature review section, pre-project plan was discussed along with the factors affecting project delay. In this article, the challenges of the project planning and scheduling has been described. The methodology section and the methods of the research have been described. Following which process the research has been done which also mentioned in that section. Also, the data were critically evaluated and the result which came-out as the output of the analysis are also satisfy the project aim and objectives. DWP explained in detail with successful projects examples where project plan was prepared using Primavera P6 and MS Project. Risk Register was also explained with example. From the discussion part of this research, it is also possible to gather the various information related to the pros and cons of the project planning and scheduling. In the recommendation section, the requirement of the strategies to improve the planning and scheduling system is mentioned.

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