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AN OVERVIEW OF PROJECT PLANNING APPROACH AND CHALLENGES FACED BY PLANNING PROFESSIONALS IN THE INFRASTRUCTUE SECTOR.

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ABSTRACT.

Project planning and scheduling not alone confines the professional only to manage the schedule, but to analyse the consequences arising out constraints in the form of resources, policy, productivity, space and information. The holistic approach discussed in the study with the inputs from planning professionals across the world emphasis the need for data driven project controls and key stakeholders continued engagement and communication at all levels. The study discuss about the possible extent of data usefulness in mitigating the unforeseen and challenges faced by planning professionals in their approach in planning and scheduling of the projects.

1. INTRODUCTION.

Infrastructure development is one of the key agenda of an government on yearly basis. The spending on infrastructure alone accounts for 6to 9% of any government budgetary allocation in creating public infrastructure, energy infrastructure, transport infrastructure and upgrading the public spaces, growing economies have increased spending on infrastructure to meet the growth demand (Chinnobaiah, 2016). The construction sector involves several stake holders such as financial institutions, government, private investors, contractors, consultants, sub contractors and public. The realisation of the project success is directly associated with the project completion time and budgeted cost. The importance of comprehensive planning, scheduling and delay mitigating measure are of higher priority in the project. The planning professionals knowledge and key expertise in understanding construction procedure, authority approvals timelines, man and machinery resources, associated risks and productivity are key input in project controls. For an example say a project of worth US $8 billion, the expected average cost of delay would be approximately $370 million per year or about $1 million per day, benefit short falls are consequences of delay, because delay results in later opening dates and thus extra months or even years without generating projected revenues (Flyvbjerg, 2007). As financial institutions are one of the key stake holder as they finance the projects and large projects have long construction periods any delay leads to sensitivity of the project finance leading increased debt, increased interest payments and longer payback periods.

Comprehensive project planning is one of the key success factor in mitigating unforeseen delays and overcoming constraints in the form of policy, resources, productivity, information, technology, environment and safety. These constraints occur at different stages of the project and different period. Understanding of this constraint forms the basis of planning to accommodate such constraints in the planning stage is crucial. The below table gives insights into the forms of constraints.

Table 1 Case by Case examples for Major Constraints affecting project planning.

Constraint Type	A case by Example	Planning Measures
Resource Constraint.	A tunnel works milestone was approaching to be completed, but a activity called bracket installation was to be completed and there was shortage of brackets, as its custom made thus it leads to delivery late by 4 Weeks. The milestone got delayed 4 weeks.	An estimate of "Lead Resources" quantity and arrival time was neglected. An experienced planner keeps tab on ''lead Resources''
Information Constraint.	An crucial activity of relocation of cables was not scheduled in the program. A project manager had to reschedule entire excavation activity by a month.	Significant activities succeeding major activity must be scheduled in the program.
Environment Constraint.	An construction activity nearby hospital is avoided during night time, thus scheduling such activity for 24 hours work time in the baseline stage lead to delay.	Intrinsic details are to be address and alternative strategy to be put in place.
Policy Constraint.	Most common constraint faced by planners are the delay in authority approvals which do take higher amount of time than planned.	Lack of understanding of historic data. Planner needs keep historic records of authority turn up.

Productivity Constraints.	Under-estimating or Over estimating of machinery and manpower resources needed to complete a task. Underestimating leads to delay in completion, over-estimating leads to excessive idling of resources.	Optimum planning is done only by communicating with stake holder of the activity.

The table 1 above is an illustrative examples of some of the constraints in the project planning and execution stage. These constraints are usually understood mostly by experience based learning and comprehensive planning involving inputs from all the stake holder. Thus the study carried out here to understand the approach taken by planning engineers in the current industry scenario and their challenges faced during the phase of project execution. The objective is to understand the approach, although very advanced stages of research is being done in the field of project planning and monitoring. The research confines to the theoretical application in most of the cases as in industry and in practical scenario the planning tools are used based on client specifications and commonly known forms of planning. The research extensively suggesting several methods of analysis and approach differs in actual condition of planning, as each project is unique in its own form of execution.

The study conducted here is to understand the basic format of planning in current industry and develop a few mitigating approach in containing the constraints and implement a data collection and quantification approach useful for similar type of projects in future. Currently the world is driven by data, huge data analytics is carried out to develop business across regions.

2. LITERATURE REVIEW.

The planning effectiveness can only be improved with better practices and guidelines to include organization, human and information handling aspects in addition to the planning tools. This can be achieved with changes to the planning policy and prevailing practices by the management (Laufer & Tucker, 1987).

The comparison study of an project was carried out to understand the difference between conventional construction method and against a project management approach consisting of the project management standards with planning, scheduling, resource optimisation and proper monitoring of activities, though the project was small in cost and scope, the approach resulted in reduced cost of 3.14% cost and 23.2% of duration against a conventional approach without having project planning and management principles (Rashmi, Kelkar, & G, 2017).

The integrated master schedule forms the projects roadmap to meet the contract completion milestones. The details and resources loading into the schedule determines the budget for the work. This time phased budget is the performance measurement baseline (PMB). The entire project budget is defined as budget at completion (BAC). Since most projects have some risk associated, a portion to service the risk is set aside as the project value ie., management reserve (MR) and together (MR) added with (BAC) forms contract budget base (CBB) (Subramani, Jabasingh, & Jayalakshmi, 2014). This indeed accounts certain amount of risks and uncertainty arising out of constraints stated in the introduction part and it facilitates comprehensive project planning. Collaborative and multi level planning , multi- constraint consideration, effectively handling of

uncertainty and appropriate analysing of the planning loopholes enables to devise better planning techniques (E & Dawood, 2003)

Use of 4D BIM models in complex space constraint projects to analyse and schedule the activities overcomes to threat of space constraint, as complex projects involve several contractors interface each other to coordinate and complete their respective tasks. The BIM model indeed helps the project to identify the space available for the activities to be constructed as the BIM based 4D model simulates construction sequences (Wang, Weng, Wang, & Chen, 2014).

most of the literature supports the possibilities to overcome constraints in one or the other form, Space constraints during construction activity to be visualised by BIM models to assess the space constraint and plan accordingly, secondly the resources optimisation and applying project management principles in planning and monitoring leads to cost control and derive optimum duration.

Thirdly the allocation of cost to meet uncertain constraints an additional cost allocation is done in the form of management reserve, both management reserve and budget at complete forms the contract budget base. To summarise there have been several studies and research works are being carried out to analyse and control the duration and cost over runs. Thus it is vital to understand the ground condition of planning professionals approach and respectively enhance and optimise the standards to their best use.

3. RESEARCH ANALYSIS AND METHODOLOGY.

To understand the planning and scheduling professionals approach in planning, scheduling, monitoring and their approach in dealing with constraints and delay. An research analysis method of Questionnaire surveying and Online Interviewing was done using surveying tools available in the market.

Survey Respondents: The survey respondents were experienced ''Planning Professionals'' from different countries ranging from different demographics such as Peru, Colombia and Brazil South America, Canada in North America and from several countries in Asia and Middle East.

Most of our respondent were from Middle east and Asia.

Number of Respondents: 53.

Figure 1 Survey Respondents geographic locations.

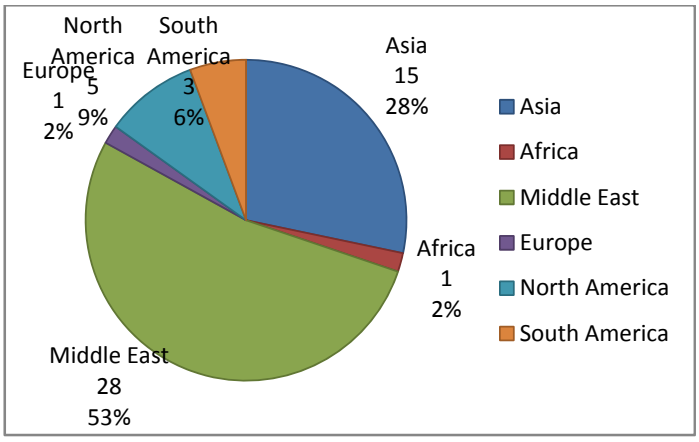
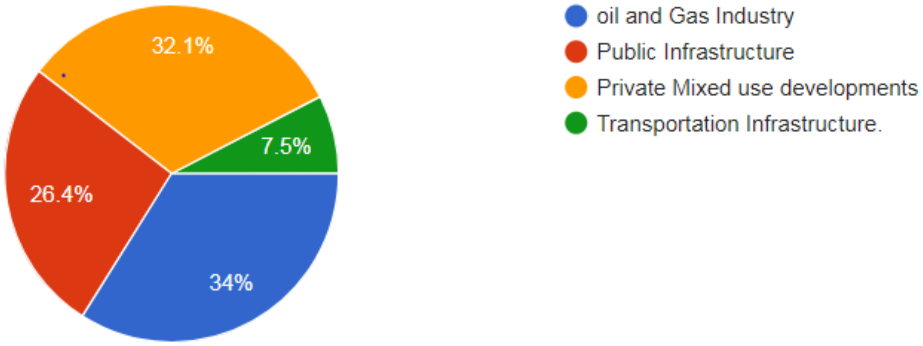


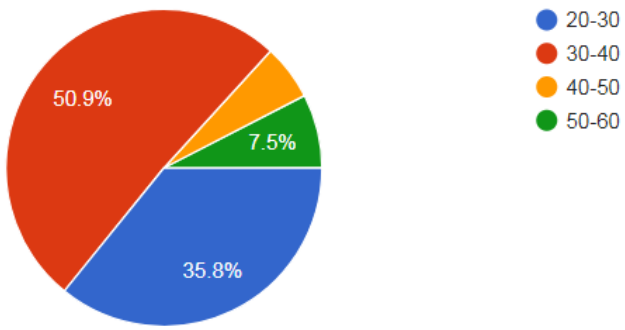
Figure 2 Industry stream of survey respondents.



As per the figure 2 above majority of our questionnaire survey respondents belong to Oil and Gas, Public Infrastructure such as housing, depots, ports and other and 7.5% of respondents belonged to core transportation infrastructure development.

The age group of our respondents mostly 50% were in the bracket of 30-40 years old and they form the major chunk of experienced professional. The total average experience in planning and scheduling to be of 12 years.

Figure 3 Age group of Survey Respondents.

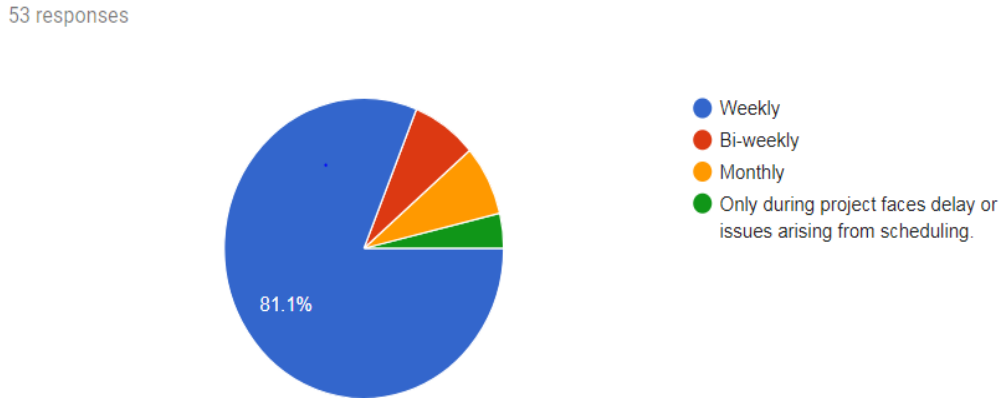


As the average experience of the respondents is 12 years and their input and experience is to be of valuable information. Total of 20 number of questions were designed to understand their experience level and approach in the planning and scheduling. In this study we shall discuss only a few important questionnaire response and highlight key interview question responses from the experienced project planning professionals.

The key important questionnaire are,

- It is about how often the project manager or director review the progress status and consult the planning staff.

Figure 4 Project Manager / Director Reviews of Planning Report & Schedule.



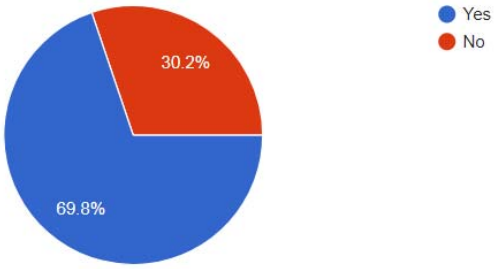
It states that 81% of them have responded that their project head do review the status of the progress on weekly basis and it is indeed a good sign of project control.

- Majority of the respondents have come across a situation as such that their baseline was reviewed at least 3 times in a complete project lifecycle mostly due to the update in a scope of the project or due to the change in contractual, or due to complexity of the project.

- 79% of respondents have indicated that their the projects are monitored weekly by updating Physical S Curve, Financial S Curve, Major works trend charts, program updating.

- 69% of respondents have agreed to have performed Risk Analysis during the project lifecycle.

Figure 5 Percentage of respondents performed risk analysis in project life cycle.

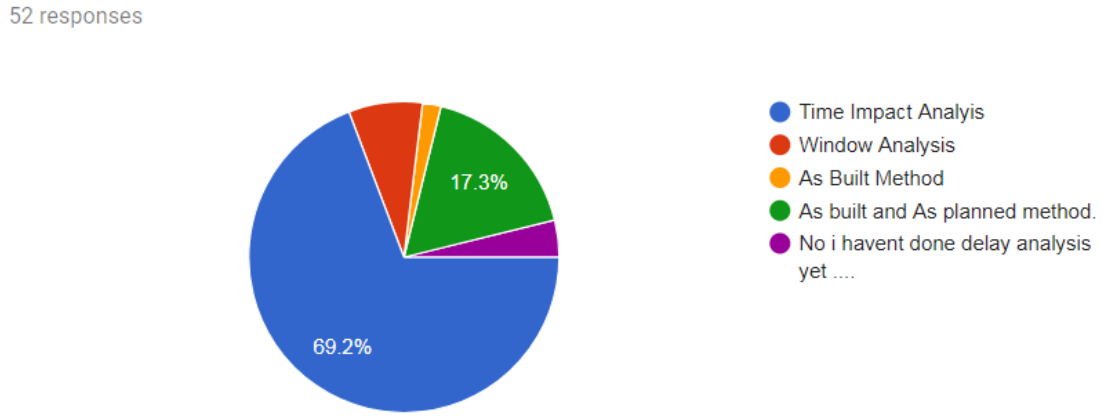


This key information highlights that not only the planning professionals keep on eye project scheduling and monitoring, indeed they are assisting in the risk analysis and risk reporting. this activity allows them to be aware of the upcoming constraints.

- Another key important aspect of the respondents is 85% of them are familiar delay analysis techniques.

The majority of the respondents have agreed that their important and preferred delay analysis technique is Time Impact Analysis, for which most of them have applied this analysis is used more than other methods. The below figure 6 show the percentage of each respondents in using different delay techniques.

Figure 6 Preferred Delay Analysis Technique applied by planning professional respondents.



- Lastly the most of the respondents have emphasised to keep the records of as built and planned schedule as a recorded data in data base. 59% of the respondents feel it is crucially important.

4. RESULTS AND DISCUSSIONS.

The compiled data is research analysis section highlights most of the questionnaire survey response from the experienced planning and scheduling staff. The key emphasis from the above section is that the most of professionals carry out risk analysis, preferred delay analysis technique and importance of data maintenance of projects after closing of the projects.

Data driven productivity: The importance of data is to quantify planned productivity and achieved productivity at the influencing site condition. This data indeed helps the construction companies to analyse productivity turnover of their sub contractor, staff, machinery resources involved and prevailing site condition. For example if a new tender is in place and the similar site condition awaits, the similar team productivity can be assessed more effectively and necessary improvement measures can be applied.

Table 2 Historical Productivity record by data keeping.

Historical Record of Excavation of Peat Clay by team X at Project Y7				
Activity	Quantity A	Planned Productivity = (A)/ Team X	Actual Productivity = (A)/ Team X	Causes / Remarks.
Excavation	1000 m3	3 days	5 days	Team X machinery breakdown frequency high & peaty clay.
Improvement action: Replace machinery & peaty clay area needs additional 1 day work hours.				

Some of the key response to interview questionnaire is.

- Improve planning standards and educate the updated standards to planning professionals.
- Standardize the professional by designing criteria and chartering as Chartered Planning Engineer.
- project communication with all the stake holders leads to successful planning and execution of project successfully.
- Record keeping and data driven planning is the need of the hour.
- Increased regulation standards.

5. CONCLUSION.

The project planning in the current industry standards needs to have constraint trouble shooting strategy, the constraints might be in any form ranging from space, resources, policy, productivity, and environment. Scheduling a project and monitoring alone doesn't solve or mitigate the delay. The action to counter any constraints with the use of past historical data, improved project communication and continued stakeholders engagement will enable the team to mitigate unforeseen circumstance to manageable extent. The survey carried out in this regard with selected planning professional has emphasised that most of the planning staff are involved in risk analysis which is a sign of early involvement in understanding the constraints and the most of the respondents have highlighted to increase the regulations and standards in the planning and scheduling expertise field.

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