

# Towards improving management roles and operational behavior in planning and scheduling: A perspective from Oman construction projects

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**Abstract**—Implementation and control of planning and scheduling of construction project require high level of coordination by all parties involved. Therefore, the management role and operational behavior of each party should be properly addressed. Literature review showed that little research was directed towards identifying and assessing efficiency of such management roles and organizational behaviors. This paper focuses on the analysis and discussion of responses to an open-ended questions survey that examined the practitioners' opinions towards the management roles and operational behaviors. The results revealed common factors regarded as important management roles in promoting the current practice in planning and scheduling. These included: (a) efficient forecast of resources for non-aggressive schedules; (b) effective conformance-measures of schedule quality control; (c) well-defined prioritizing system for resource assignment in scheduling; (d) proficient participation of clients in setting-out the planning roles, needs and constraints; (e) proactive assessment of human and non-human aspects on scheduling performance; (f) fostering new technology or visualization tools for supporting scheduling control; and (g) usefulness of feedback and communicating systems in scheduling. The study provides a new insight towards evaluating the significant project management roles and behaviors for the best likelihoods of enhancing the implementation of planning and scheduling in a more efficient and dynamic way.

**Keywords**— management roles, Oman, operational behaviors, planning and scheduling, project parties, construction projects

## I. Introduction

Construction planning and scheduling represents the roadmap for project professionals and stakeholders for achieving the successful implementation of the project objectives [1, 2]. Planning and scheduling have been practiced with some challenges by all concerned participants [3]. It was argued that proper understanding of effects of managerial attributes or operational behaviors on the project performance can deliver tangible benefits to the construction process [4]. Such benefits can be potentially increased by aligning the operational behaviors with technical issues of the construction projects [5]. A consistency of decision-making regarding such management roles and technical issues should be maintained by the project team [6]. The project team should be competent in turning the project plans and schedules into actions by properly identifying all tasks, resources, constraints and ways of achieving their desired outcomes [7]. In other words, project managers and their planners should take into account

all behavioral attitudes such as management skills and competencies when managing the project plans and schedules. The management roles or factors such as poor communication among project team, lack of effective managers and reluctance in checking the tasks constructability and completeness were considered as undesirable behavioral attributes causing project disputes in terms of slow productivity and increased cost [8].

In view of the above discussion, it is clear that proper identification and assessment of project management roles and operational behaviors in planning and scheduling would help implementation and control of activities in practice. This will lead to efficient implementation of planning and scheduling during the construction process. Recent researchers have focused on the evaluation of the success and failure factors affecting project performance holistically [9-12]. In Oman where this study was implemented, it seems that there was a common concern about insufficient practices of the construction process with regards to the main determinants of the project (time, cost, quality) [13-16]. It can be argued that the ineffectiveness of the construction process can also be contributed to the lack of effective management of planning and scheduling. This study aims to fill this gap by assessing practitioners' opinions on how to overcome deficiencies in the current practice of planning and scheduling of construction projects in Oman.

## II. Methodology

The literature review was used as a preliminary basis in formulating the variables of the main study (i.e. a set of factors or roles) for the sake of gauging respondents' opinions on the applicability and imperative of these factors to their current projects. To achieve this, the main study has adopted a questionnaire-based survey which has been considered as a positivist tool for gathering data about research areas or problems where their theory seems to be adequately presented in the literature [17]. 67 responses from around 120 participants were received, amounting for a total response rate of 55.8% which was fallen within the reasonable limit. This presents discussion of a limited number of respondents representing key personals in their construction organizations. The analysis of the study reported here focused on the following research question: *'What are the management factors or operational behaviors you believe that should be properly considered or preplanned for successful implementation of planning and scheduling?'*

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### III. Results, Discussions and Implications

respondents' conceptual thoughts or concerns towards the most significant management roles and operational behaviors that are improperly considered in the current practice of planning and scheduling. These identified factors were discussed and interpreted as follows

#### A. *Efficient Forecasting of Resources in Planning for Non-Aggressive Scheduling*

Senior engineers from clients and contractors emphasized the importance of “*studying the availability and shortage of resources in the market and accordingly update the planning or reschedule the activities without causing any change in the entire budgeted cost and time framework*”. They stated that “*the impact of resources should be effectively addressed in pre-stages of planning and scheduling*”. This goes in line with suggestion that project managers and planners should precisely forecast or proactively plan all potential impacts of any scarcity or aggressiveness in resources in planning prior to the execution of scheduling [18]. This results emphasized the importance of proactive anticipation and allocation of resources in planning as a significant tool for buffering any shortcut that might result from unexpected variances in the implementation of scheduling [3]. Therefore, consultation of experts to make best decision about the resource forecasting in project planning can help to take the best optimization or decision on all potential risks contributing to the resource criticality ahead of implementation. Further, this also can guide the planning team to realistically re-allocate and re-plan the available resources for scheduling and its contingency in the implementation (i.e. execution). This can improve quality and consistency of the executed schedule with that of baseline scheduling plans.

#### B. *Conformance-Measures of Schedule Quality Control in Regard To Other Aspects*

In real-life practices, scheduling has been experienced as integral part of planning and hence this might restrict proper alignments of the schedule with other major determinants of projects that are cost, quality and procurement plans [19]. This becomes evident in line with the findings from this study, for instance, a project manager (contractor) stated: “*monitor cash flow periodically and follow up with all approvals of materials and documents to get in time, and procurement schedules should also be monitored separately especially for long-delivery items. Another project manager from a different contracting firm suggested: “alternative materials and methods should be in hand to ensure the total quality management of the implementation of the work schedules”*”. Further, a senior engineer (client) mentioned: “*project schedule should be monitored together with the cost and quality aspects*”. This was confirmed by another clients' senior engineer who revealed that: “*optimization of all potential constraints within*

Some useful factors were identified and presented based on the collected data from respondents. This reflects the

the project major axes (time, scope and budget) in planning is necessary to make a more pragmatic schedule”.

The above findings could imply that project managers and their planners should assess performance of the project schedule in correlation with other aspects of quality management and cost control. This can allow them to become more proactive when making-decision regarding the ongoing schedule uncertainties or risks, and hence increase the schedule performance.

#### C. *Well-Defined Prioritizing Systems for Resource Allocation in Scheduling*

The schedule activity-based dependencies, if not identified and managed properly, could lead to aggressive schedules that affect the project outcomes or deliverables [20]. This seems to be a common concern in construction projects, for example, a project consultant asserted: “*starting with management of new activities that don't have any dependency at earliest to compensate unexpected delays in successive activities*”. This could imply that project planners and schedulers must with utmost care identify and analysis all connections, interfaces and linkages among the project activities (i.e. interdependencies) as to not allow them to affect the entire completion time of the work, especially in complex projects with a large number of tasks and resource dependencies. Critical chain concept of buffer management has been experienced as a key tool in recovering such dependency problems especially in complicated schedules with multi-resource constraints [21].

#### D. *Proficient Participation of Clients in Setting-Out Planning Inputs, Needs and Constraints*

The analysis results revealed that practitioners seen this issue as a significant management role that should be adequately considered in project planning and scheduling. In this regard, a junior engineer (contractor) stated: “*all requirements of clients should be considered with the most efficient way and confirmation of resources and other practical problems at sites on the side of clients should be also declared and addressed in planning*”. A contractor quantity surveyor revealed that strong involvement of clients or end-users representatives in planning and scheduling can allow project consultants to design the project based on their needs and capabilities. This was agreed with comments pointed out by a project manager (contractor) who mentioned: “*clients' requirements should be considered and sufficient time should be given. Evaluations of such requirements should be based on technical points of view*”. Inadequate definitions of the work objectives by clients in planning can result in many reworked tasks during execution and thus unrealistic schedules [22]. This would imply that effectiveness of project planning and scheduling can be best achieved by sufficiently assessing the

project objectives from clients' real perspectives, interests and capabilities.

### **E. Sufficient Consideration of Human and Non-Human Aspects in Planning and Scheduling**

It can be argued that consideration of both technical and non-technical issues should be considered with the same level of significance to the implementation of planning and scheduling. However, in practice less management focus is paid to human aspects or operational behaviors which can lead, if they are not properly addressed, to scope disputes of projects, and hence underperformance implementation of project plans and schedules [23-24]. Even though, the project team should always pay more efforts towards quality performance of the technical issues within the main scope of project for the purpose of the time-cost effectiveness [25]. Based on the findings from this study, a senior engineer (client) stated: "health, safety and environment (HSE) issues should be considered in planning prior to the implementation, and monitoring of the construction programs should be considered at sites. Further, the work schedule should be controlled for the presence and impact of human and non-human factors". Additionally, factors such as governmental authorities and permits should be incorporated and involved, for instance, a contractor junior engineer asserted: "government authorities should be involved in assessment of all human and non-human constraints to project planning and scheduling. Clients should maintain proper understanding of non-monetary aspects at various stages of the project. All governmental and municipal issues must be attended ahead of the execution of scheduled tasks". The findings imply that evaluation of all controllable and non-controllable factors from the perspective of both technical and nontechnical issues should be taken into account of project managers and planners to avoid any interrupted flow of the project schedule according to the original plan.

### **F. Adoption of New Visualization Systems to Support Monitoring of the Schedule**

In complex construction projects with a myriad number of tasks, traditional control systems might be incapable to routinely or daily monitor construction schedules. However, this shortcoming can be recovered by adopting new technology or visualization models that can help all parties getting updated instantly and thus controlling their projects in a more proactive manner [26]. On the basis of this study, there is also a need for adopting of such tools or visualization systems to improve monitoring of in-progress schedules. In this respect, a senior engineer (client) mentioned: "adoption of new visualization tools and systems for monitoring the work flow can allow for strong interactions between contractors, clients and consultants and thus periodically reporting the most updated conditions at sites". This idea was supported by another senior engineer (consultant) who commented: "there is a need for such coordinating systems that involve all parties of project in monitoring the schedule programs". This could

imply that project managers in construction firms in Oman should adopt and integrate such visualization tools and monitoring systems with the implementation process of planning and scheduling. This might allow them to track the status of ongoing schedules in a single disciplined environment incorporating all internal and external parties of the project. Further, it might speed-up the process of decision-making for fast tracking of all unplanned deviations in-progress schedules. In this sense, a study found that adoption of 4-D visual models can bring tangible benefits to the construction managers in monitoring the actual progress of the project activities in a more practical and daily manner-based real conditions of the construction sites [27].

### **G. Effectiveness and Reliability of Feedback and Communicating Systems**

The reliability of progress reports regarding the schedule criticality is one of practitioners' concerns based on the analysis results of this study. This means that site managers or supervisors on the part of contractors and consultants must be competent in reporting the most reliable updates of the actual schedule based on their physical observations at conditions of construction sites. In this sense, a contractor project manager (project management office) revealed that: "project managers, contractors, consultants and clients should move with the project with very well flair speed; however, if one string is having problem then the rhythm of the project process would hamper the project with a lot of unforeseen and unwanted situations". This was agreed by a senior engineer (client) who stated that there should be always a provision for strong interactions between clients, contractors and consultants, and also he argued that credibility of the periodic reports of the most updated conditions of schedules at actual sites should be properly maintained. The findings imply that there is a need for a more effective communicating and feedback system among all management levels of project. Such feedback system-based schedule control can be best utilized by integrating it in the adopted visualization systems or models discussed earlier, especially in complex projects with multi-task scheduling.

## **iv. conclusion**

This paper presents results of field survey on the opinions of clients and contractors on management roles and operational behaviors that will lead to improve the implementation of planning and scheduling. The results revealed common factors regarded as important management roles in promoting the current practice in planning and scheduling. These included: (a) efficient forecast of resources for non-aggressive schedules; (b) effective conformance-measures of schedule quality control; (c) well-defined prioritizing system for resource assignment in scheduling; (d) proficient participation of clients in setting-out the planning roles, needs and constraints; (e) proactive assessment of human and non-human aspects on scheduling performance; (f) fostering new technology or visualization tools for supporting scheduling control; and (g) usefulness of feedback and communicating systems in scheduling. The findings from this study might be considered as preliminary in terms of their practical contributions to the development of the management roles theories currently



adopted in planning and scheduling. Nevertheless, the study provides a new insight into the need for more focus and assessment of the management roles and operational behaviors that can potentially affect implementation of project plans and schedules. Construction managers or decision-makers in Oman should properly contemplate these issues amongst other management strategies in their future practicability in project planning and scheduling. Overall, the findings can also be applied to construction projects with common ground in other developing countries.

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