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How to report progress of a construction project- client perspective a case study

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Abstract
The common criteria to assess a construction project's success is to see whether it is completed on time, within budget and according to the project specifications. As construction project contains many uncertainties in the beginning and this goes on throughout the project usually projects completed after or earlier than the contractual finish date. Delay in construction is a common problem that faced with in various countries. The information provided by the site is helping the management team in; measuring progress, health and safety, status of equipment&material. It is vital to get the information as accurately as possible and receiving the information on time is vitally important for management team. This enables the team members to detect the progress and defects at the site. It is proved that due to rework of defective components of construction project detected late, up to 12.45 % of construction cost is wasted. Reporting construction project progress is highly important for project management and stakeholder management as well. While it has influence on the communication flow, also helpful in accelerating the decision-making process. Project management team and consequently project manager should ensure that the upper management clearly see the project progress. Without having clear understanding of the project upper management would struggle to take immediate actions.

Keywords: Project management, ponstruction project management, project monitoring

1. Introduction

The common criteria to assess a construction project's success is to see whether it is completed on time, within budget and according to the project specifications[1]. As construction project contains many uncertainties in the beginning and this goes on throughout the project usually projects completed after or earlier than the contractual finish date[2]. Delay in construction is a common problem that faced with in various countries. Such as ; Malaysian construction delays which is at the range of 10% - 30% (actual work versus planned progress) [3], 70% in international projects [4], 75% of public construction projects in KSA[5]. Construction industry was criticized many times for having low productivity rate in comparison to other production industries [6,7],and using excuses for delays. Sources of delay might be various. In order to avoid these delays or prevent them a decent engineering judgement and project management are required [8,9]. Project management team is expected to achieve the three project direct objectives shown in the figure-1 shown below. Like all the project none of the resources is limitless. Hence, time, scope, cost constraints always have an influence on the decision making towards delivering the project.

In construction projects management teams are required to take on time actions in order to set an effective and productive construction management system [10] and achieve the 3 direct project goals. To have such system the management team should be able to see real situation of the site clearly, which depends on a clear information flow including construction progress [11]. This can be seen an integrated management system[10].

Construction supervisors spend significant portion of their time to analyze the current status of the construction project [12], and yet still the available information is not sufficient to prepare a proper report [13] . Project control is critical to the health of project and has great influence on the planning process [14] which is a base for project control and progress monitoring/ reporting process. The information provided by the site is helping the management team in; measuring progress [11], health and safety [15], status of equipment&material [16]. Mainly three type of information are provided one of which is financial second is quality and the last one is progress [17]. It is vital to get the information as accurately as possible and receiving the information on time is vitally important for management team [18,19]. This enables the team members to detect the progress and defects at the site [20]. It is proved that due to rework of defective

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components of construction project detected late, up to 12.45 % of construction cost is wasted[21,22]. Unless there is proper analysis of the project status, delays are inevitable. Construction management team needs to be able to monitor the construction works at site whenever it is needed. It is not only the current works, but also future works should be analyzed in detail. By doing so possible delays can be terminated. Stakeholder management has great impact in all the construction project management phases [23]. Stakeholders can be defined as; entities, having stakes in a project or who is able to influence the project or can be influenced by the project [24]. The stakeholders in a construction project might have different educational level, culture and profession. Due to these differences stakeholders might have different expectations from the project and also different definition/ perception of project progress[23]. Therefore, setting a proper stakeholder reporting system is crucial for the stakeholder management system. These reports can be seen a communication bridge between the upper management team (stakeholders) and construction project.

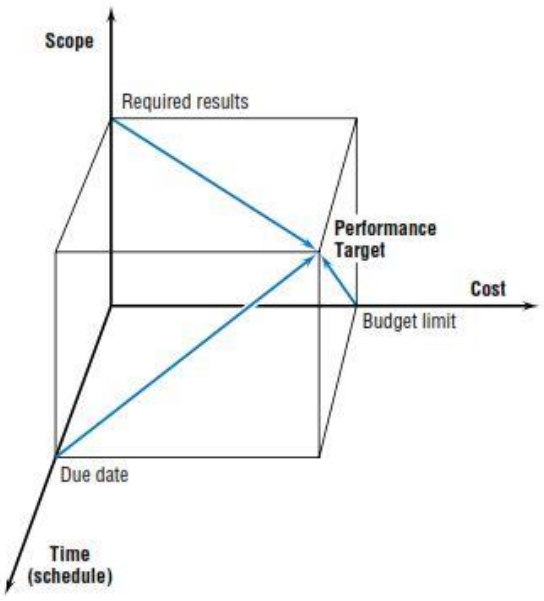

Figure 1.3direct project goals [9]

2.Reasons cause delay

Delay in construction project is defined as any activity that not completed by the given time in the baseline schedule[25]. Construction delay means a time overrun that leads the project completion time goes beyond the contractual finish date [26]. Delay in the construction industry is known as a global problem that is faced with in all the countries[27] and this is the problem that occurs very frequently[28]. Any contractor in the industry inevitably encounters delay somehow[29]. Change orders during the construction is the main reason for the delays [30]. Recent study [31] determines 8 reasons for construction delays which are;

- Client related factors; delay in payments, slow decision making, changes, unrealistic expectations
- Contractor related factors; lack of relevant experience, lack of proper subcontractor management, inadequate planning
- Consultant related factors; preparation of design, long waiting time for design approvals
- Material factors; improper material management (shortage, inadequate quality)
- Labor and equipment factors; supply of equipment,
- Contract factors; change orders, discrepancies in contractual documents
- Contractual relationships factors; major disputes between parties, lack of proper communication,
- External factors; weather conditions, changes in regulations, political factors

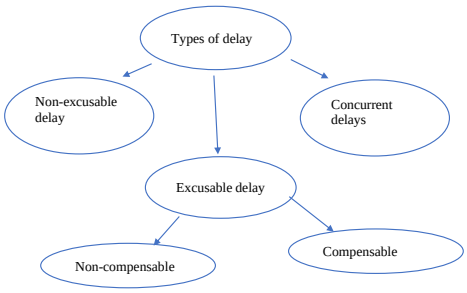

Figure 2: Type of delays [28]

Another study [28] classifies the delays under 3 sections. Any delay caused by either the contractor or its suppliers while the client has no responsibility in, defined as non-excusable delay. No extra time or money granted to the contractor. On the contrary the contractor has to perform corrective actions to cover the delay. Excusable delays are separated to 2 different sections compensable and non-compensable delays. Compensable delays are caused by the owner or his representative. Non-compensable delays on the other and caused by a party who is beyond the control of owner or contractor. This is called "acts of God" in this non-of the contractual party has any responsibility. Various delay factors are shown in the table. Undoubtfullly, these factors are clearly related to the project properties such as its location, client, contractor etc

Table 1: Delay factor in construction projects

Delay Factor	Reference Study
Law and order situation, design changes, availability of funds	[32]
Poor site management and supervision, unforeseen ground conditions, low speed decision making, client based changes.	[33]
Discrepancies in the design documents	[34]
Financial difficulties faced by contractor, shortage of manpower, incompetent technical staff, poor planning	[35]
Client related factors	[4]
Financial problems of the client, price fluctuations,	[36]

3.Earned value management

Getting a definite answer regarding the actual progress of a construction projects is still not easy. Earned value methods is a global standard for project management professionals recommended by APM in order to measure progress[37] . The most important advantage of EVM is that its simplicity and required info (percentage completion of activity and actual costs) [38]. Earned value management contains 3 main metrics; Planned value (PV), Actual cost (AC) and Earned Value (EV). PV means the cumulative planned cost expense amount (Schedule Complete x Budgeted Cost of activity)[39]. Earned value cost equals to activity % complete times budgeted material cost. Application of earned value management in a construction project requires a systemic data entry (once a week, twice a month) [37]. Doing such job is required to deploy a person who is mostly an engineer. This engineer should collect the data from the site team and update the schedule accordingly. Construction activities are various, and the unit to measure the quantity of activities are different as well. For example; the quantity of concrete is explained with m^3 while m^2 is used to measure paintings. Electrical works on the other hand, mostly defined as lump-sum jobs. Therefore, in order to define project progress a common language is needed. At this point earned value management is preferred as it is common language and capable of representing the overall progress of construction work in which various type of activities exist.

4. Case study

The project was constructed in the Middle East. It is 5- star hotel building including 3 basement which

will be used as car parking, 14 upper floors and on the ground floor one public area to be used as restaurant. The client/owner of the project has numerous investments in various cities and most of them are hotel projects. He is an investor and has project management consultancy company (PMC) to represent himself against the contractor. PMC is authorized to review and approve design and anything that has cost/time impact on the project. However, anything with time/cost impact needs to be approved by the client himself in which case the client is the final decision maker. In the beginning of the project the contractor and the project management consultant company agreed on to follow the progress with earned value management. The resource loaded schedule was established by considering the contractual material cost and manhours identified by the contractor.

In the schedule activities were classified as per the BOQ items and, also its location (floor, area). The activity ids have unique codification structure that gives an information of the activity. This would enable the project team seeing the progress as per each BOQ section and floor by floor. The contractor was contacted even before the contract award and informed regarding what types of progress reports are required during the construction, and as per FIDIC he is responsible for providing such reports [40]. Once the contract was signed by all parties, the contractor was given 1 month to prepare detailed, resource loaded schedule. The weight factor of each BOQ section after approval of baseline schedule is shown below.

Table 2: BOQ share portion cost-wise and manhour-wise

BOQ Section	Budgeted Labour Unit (BLU)	Budgeted Material Cost (BMC)	Variance BLU-BMC
General	0.06%	0.00%	0.06%
Site Works	0.48%	0.47%	0.01%
Concrete	19.22%	21.07%	-1.85%
Masonry	7.29%	2.01%	5.29%
Metal	0.91%	1.13%	-0.22%
Wood	0.56%	1.87%	-1.31%
Thermal and Moisture Production	2.06%	1.25%	0.80%
Doors & Windows Installation	0.43%	7.47%	-7.04%
Finishes	19.18%	19.24%	-0.06%
Specialities	1.82%	8.77%	-6.95%
Signages	0.40%	0.11%	0.29%
Conveying	0.13%	3.33%	-3.20%
Mechanical	32.02%	19.82%	12.20%
Electrical	15.45%	13.47%	1.98%
Provisional	0.00%	0.00%	0.00%

The construction management team gathers every week however schedule progress report (based on manhour and cost) is prepared twice a month. The upper management of the client has monthly meeting in which, status of all the construction projects are discussed. In these meeting all the attendees do not have constructional background. In fact most of them have different background such as; finance, management, housing and tourism. Consequently reporting construction progress was a challenge. The recommended reporting structure is presented in the section 6.

5.Problems encountered in the case study

- The first problem that encountered was the submission of shop drawings. The contractor is not allowed to perform the activity unless the related shop-drawing submitted and approved. Even before the contractor requested the project management team suggested to put a time limit for reviewing and approving shop drawings. If the shop drawings were not in the work schedule the contractor might have held the client responsible for delaying the approval duration and this would lead baseless debates and waste the time. Furthermore, the second discussion regarding shop drawings and approvals was that whether any symbolic cost/manhour should

assigned to them or not. Consequently, no resource was assigned to shop drawings.

- Required resources as per contract in terms of cost and man hour based on contractors were assigned to the equipment delivery and its installation. When level-based progress report is produced it was seen that the equipment delays make significant difference as its cost has significant portion in the overall level cost. However, the upper management and even the project managers of the stakeholders in the project do not want to consider this a delay and want to omit this. Some examples can be seen in the table-3. This occurred especially in the basement levels as equipment to be installed there.

Table 3: Man-hourwise cost wise comparison for some equipments

Building Floor	Activity	Costwise % within the floor	Manhour % share f
Basement-3	Fire Pump Set and Valve Installation	4.86%	3.07%
Basement-2	Installation of Central Battery	7.75%	1.07%
Basement-1	Installation of Main Panels	4.32%	2.23%

When monthly progress reports are reviewed it is clear that the increase rate in for cost and manhour is not same. In other words, there is a significant variance between weekly planned progress manhour-wise, and cost-wise. In order to make a deep analysis and understand the project progress having both cost and manhour wise progress data is crucial. If any work is in delay, the currently assigned number of labour and planned number of crew can be compared and the contract may be asked to increase number of workers as identified in the resource loaded work schedule. This provides a great level of details to the client in order to understand and track the project in detail.

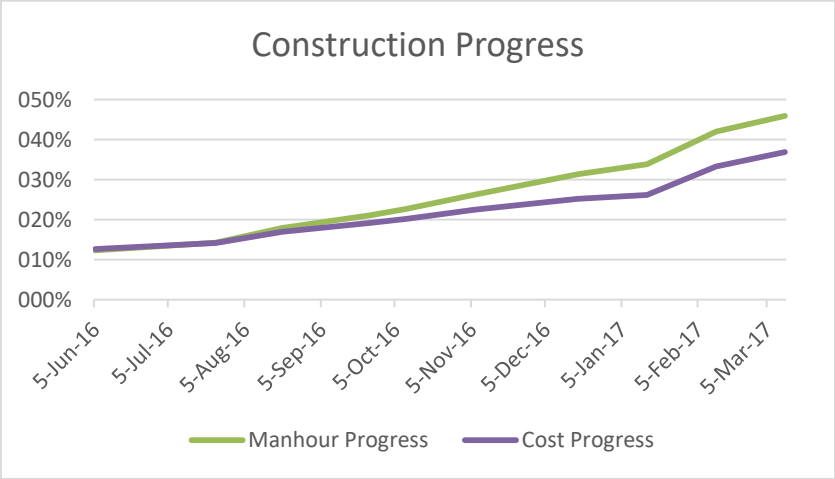

Figure 3: Construction progress curve manhour-wise and cost-wise

Providing cost details are also important This info is useful for finance department of the project as they manage the payments and reserve money in the bank for the Project.

6. Conclusion

Delays are generally lead time-cost trade of problems [41]. Hence, if project management teams are willing to avoid such issues, they should somehow find a way to detect the delays/ potential delays and take care of them. Even though SPI and CPI are common language the upper management team of the companies are still prone to ask for further details. Recent study indicates that even among the professionals using EVM to report project progress is not common [42]. This requires simplify EVM and provide a simpler report to the management teams.

When the construction status is reported to the upper management of the client which contains CEO, CFO and director of the departments are confused with the details presented them. The recommended solutions are shown below;

1. Perception of time in people mind is important however recent study indicates that perception of time in people's mind is different[43]. People tend to relate the time directly with the progress of work. Why the time and physical progress are not directly intercorrelated with each other? The reason the question is asked that the amount of the time passed of the project is not equal to the cost progress. Elapsed time is 20 months/30.5 months = 65.5% while cost progress of the project is 50%. The management struggle to understand the difference. The cost progress and elapsed time should make related and like table 5 it should be computed and make relevant to BOQ sections. This would require a deeper analysis as all the activities do not have the same impact over the project duration.
2. It is necessary to have 2 types of project progress report. 1 must include all the details of the work schedule for the construction management team. This data can be gathered from Primavera P6 easily. Basically, variance of the start and finish dates of the activities and schedule complete versus activity complete must be compared.
3. For the upper management team as they do not need to spend their time concerning in Manhour but focus on the actual progress, the required progress report must be report in the previously agreed format. In order to prepare this report activity physical completion, budgeted material cost of the all the activities must be known.Furthermore, wbs and activity id should be structured in way that the planning engineer can compute these

Table 4 : Time-wise analysis

On going Activities	
BFD-FD>0	Activity is likely to complete earlier than BFD
BFD=FD	Activity is likely to be completed on BFD
BFD-FD<0	Activity is likely to complete later than BFD
Not Started Activities	
BSD- SD>0	Activity is likely to be completed earlier than BFD
BSD=SD	Activity is likely to be completed on BFD
BSD-SD<0	Activity is likely to complete later than BFD

Table-5: Proposed reporting structure

Bill of Quantity Section	Progress Weightage % (W)	Completed (P)	Report Progress
BOQ Section-1	A	EVC/BMC (Y)	AxY
BOQ Section-2	B	EVC/BMC (Z)	BxZ
BOQ Section-3	C	EVC/BMC (M)	CxM

Resource planning and monitoring the progress at the construction site is crucial element of proper management in construction projects. Like comprehensive plan helps decision makers to do follow the schedule and complete the jobs on time, proper progress reports provide opportunity to see the missing works and enable management team take necessary precautions [44]. It is vitally important to set a proper reporting structure in the project. This would be only possible with an integrated management system. On the other this is not enough unless the information flows upward in a correct form. This form should be clear and understandable by the upper management team.

Reporting construction project progress is highly important for project management and stakeholder management as well. While it has influence on the communication flow, also helpful in accelerating the decision-making process. Project management team and consequently project manager should ensure that the upper management clearly see the project progress. Without having clear understanding of the project upper management would struggle to take immediate actions. This problem occurs especially in the environment that has people from different industries with different backgrounds. Therefore, setting a proper progress reporting to the management is one of the key elements in the project success.

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