Main Building Refurbishing Project at NIM

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The case titled Main Building Refurbishing Project (MBRP) at Narmada Institute of Management (NIM) essentially provides a context to the reader to examine the implications of operational uncertainty for managerial decision-making within a framework of project management. The case exhibits an important trade-off between cost and timing of completion of a project and the role of resource planning and resource management in achieving the targets set by a company on these two parameters. Moreover, it also demonstrates the importance of selecting an appropriate project evaluation mechanism to monitor timely completion of the project. To highlight a variety of related issues and opportunities available, to mitigate the effects of unplanned and unexpected deviations in a set of activities from the schedule developed originally in a specific context, the author describes a decision-making environment involving a critical project undertaken by a construction company at NIM, a well-known institute of management.

NIM had awarded the project of refurbishing of the main building on its campus to Mid-India Construction Company (MICC). While awarding the project, the management of the institute had ensured that MICC provided a detailed schedule of activities involved in successful completion of the project. The desired time of completion of the project was suggested by the institute. In response, the company had specified its project-plan reflecting (i) the sequence of activities, (ii) activity-wise work content, (iii) the number of resource-teams to be engaged, and (iv) the cost of completion of each of the activities. To ensure the timely completion of the project in view of the number of activities to be performed in sequence, MICC suggested partitioning of the entire surface area of the building to be refurbished into a number of work-fronts of equal dimensions by which parallel activities with fewer resources on repetitive basis could be performed. Moreover, it also suggested segregating the building surface area as external and internal in order to take advantage of the curing period necessary between a set of activities.

The management of NIM adopted a milestone mechanism based approach to evaluate timely progress of the project and to incentivize MICC to achieve the targets. This mechanism involved retention money which is like the disbursement of amount according to the percentage completion of the project. While the milestone mechanism was well-designed and well-described, it particularly failed to monitor the timely progress in linking the MICC's approach of refurbishing the building front-by-front with the percentage completion of the project. In this regard, the project assessment perspectives adopted by both NIM and MICC were distinct. For instance, 40 percent completion of the project for NIM was not necessarily the same as 40 percent completion of a number of work-fronts created by MICC. This instance in the case essentially provides an opportunity for the reader to recognize the importance of adopting an assessment tool to evaluate project completion that is in sync with the actual implementation of the project, either in parts or in aggregate. Moreover, it also highlights the need of an appropriate monitoring mechanism ensuring that the number of resources used were the same as what was planned initially. In the absence of the latter, MICC had missed its schedule significantly that required re-planning of resources and re-assessment of the project.

As described in the case, in the event of operational uncertainties and consequently lagging behind the original project completion schedule, it is critical for the management of a construction company to modify its schedule in the middle of project execution in order to achieve its timely targets. While any delay and/or alteration in the schedule of project execution has implications for the cost of completion of the project, when faced with operational uncertainties the management of the company needs to make an important and necessary trade-off between cost and time of completion of the project. This case describes the trade-off the management of MICC was facing more than a month after the commencement of the project. MICC was required to determine the number of teams required

and its cost implications so that the timely targets on the remaining project were met. In this regard, developing a variety of options to derive benefits from parallel execution of activities was also critical for the company. For instance, the company could have begun refurbishing multiple fronts of the building simultaneously and/or it could have begun refurbishing both external and internal surfaces of the building in parallel. In either of the alternatives, the resources required were more than those planned earlier, and clearly had undesirable cost implications. On account of this, the case provides enough details to develop various alternatives involving resource planning and resource management and to assess the cost implications of each of the alternatives.

An Illustration

What follows below is an illustration of the scope of operational decision-making within the framework of the problem context described in this case. Various alternatives to address the issues faced by both NIM and MICC are provided below.

MICC planned to complete the entire work - both internal and external refurbishing of the building - by dividing the total surface area into 14 work-fronts of 2,000 sq.m. each for the external surface and 1,473 sq.m. each for the internal surface. It also planned to complete two fronts on each of the surfaces in each month. From Exhibit 3 given in the case, the number of Team-Days required for each work-front as described in Table 1 are provided below.

Table 1: Resources Required for Each Work-front

Activity	Work Content (sqm)	Work Rate (sqm/ team/ day)	Team-Days Required	Sum Total of Team-Days Required
A	2000	250.00	8.00	
B	2000	36.36	55.01	
C	2000	36.36	55.01	
D	2000!	40.00	50.00	314.00
E	2000!	40.00	50.00	
F	2000	41.67	48.00	
G	2000	41.67	48.00	
H	2000	400.00	5.00	5.00
I	2000	33.33	60.01	
J	2000	62.50	32.00	174.01
K	2000	62.50	32.00	
L	2000	40.00	50.00	
M	1743	41.50	42.00	
N	1743	51.26	34.00	152.01
O	1743	51.26	34.00	
P	1743	41.50	42.00	
				645.02

! While analyzing the case the work content for activities D and E are considered as 2000 sq.m. and not 200 sq.m. as reported in the case. One may analyze the problem using the latter as the actual work content, if necessary.

From Exhibit 1 given in the case, it is evident that activities from A to G were required to be completed in sequence. Similarly, activities from I to L were required to be completed in sequence, and so were the activities from M to P. While activity I could began not before activity G was completed and so was the case with activity H, there was no such restriction on activity M. Thereby, the set of activities (i) H, (ii) I to L, and (iii) M to P could be completed in parallel. As mentioned in the case, a 14-day curing period was necessary between activities G and I, and hence, in a 30-day month MICC effectively had only 16 working days. It may be noted that among the three sets of parallel activities, I to L required the maximum number of Team-Days. It is assumed that all the teams were equi-skilled such that they could complete any of the activities from A to P in an identical manner. It is also assumed that a resource team hired once was retained during completion of the entire project. Thereby, by completing the set of activities from A to G and from I to L for each work-front within 16 days was sufficient to ensure completion of the entire project in seven months.

From Table 1, the minimum number of teams required for completing the activities from A to G and from I to L was found to be 31 . Activities from A to G would be completed in the first 10 days of the month that

would be followed by the 14-day curing period. During the remaining 6 days, activities from I to L would be completed. To minimize the number of teams, MICC could complete activities from M to P any time during the month, and activity H could be completed any time during the last 20 days of the month. Thereby, MICC could minimize the number of teams by completing these two sets of activities during the curing period by engaging with the same 31-team-resource used in completing the activities from A to G. It would take approximately five days for them to complete the two sets of activities . Likewise, the minimum number of teams required for completing each work-front was 31. To complete two such work-fronts in each month, and hence, the entire project in seven months, MICC required 62 teams.

From Exhibit 3, it may be noted that the cost of completing each of the activities did not depend on the number of teams engaged, nor did it depend on duration of each activity. The same was valid for the direct supervision cost. Moreover, by completing each of the work-fronts in sequence would have ensured that only one scaffold was sufficient during the entire project. Thereby, the number of teams required for completing the project with the minimum operating cost was the same as the minimum number of teams required for completing the project in seven months, and that was equal to 62. Likewise, Exhibit 3 demonstrates ad-hoc practices adopted by MICC during the resource planning stage.

As described in the case, MICC was lagging behind the schedule of completing two work-fronts during the month after the commencement of the project (Exhibit 4). It may be noted that this delay had no implications for the resources required for completing the remaining work-fronts had. Recall that each of the two sets of 31-team-resource drawn each month to complete a work-front was not engaged for approximately nine days during the curing time of the respective work-front. Likewise, 54 working days of 31-team-resource were available over the remaining six months. MICC could utilize one set of 31-team-resource to complete one incomplete work-front that would require approximately 21 working days as described above. Thereby, without engaging any more resource teams and engaging the existing teams during the curing periods of the subsequent work-fronts over the remaining six months, MICC could complete the two work-fronts that were lagging behind the schedule during the month of December, 2012.

Alternatives

The present analytical approach based on the case facts demonstrates that the cost implications of the number of teams engaged in the project were quite insignificant. Nevertheless, the operational strategy of completing two work-fronts in each month brings out the suboptimal planning practices adopted by MICC. In particular, one can easily reduce the number of teams required for completing the entire project by scheduling 14 work-fronts over the seven-month period, contrary to two work-fronts in each of the seven months, such that the set of activities A to G for the following work-front are completed during the curing period of the previous work-front. Nevertheless, the cost implications of such parallel processing of work-fronts in the setting described in the case were negligible for MICC as the project costs were independent of the number of teams and duration of completion of each of the activities.

To develop effective monitoring mechanism and incentivizing MICC, the milestone mechanism designed by NIM could have been in sync with the progress on each of the work-fronts, rather than linking it with the progress on the entire project as done presently.

While this case provides many interesting perspectives in managerial decision-making, it lacks in a variety specifications necessary in decision-making. For instance, the activity based costs that involve direct labor cost and material cost appear to be independent of the number of resources and duration of each activity. The decision on the number of resources that could be engaged for timely completion of the project had clearly no implications for the cost of the project; this aspect is far from reality. The necessary trade-off between cost and time of project completion can be insightful and realistic if the number of resources utilized, and consequently, duration of each activity are reflected in the cost implications of the managerial decisions. While in a project management context, costs already incurred

are typically sunk costs, the next course of action depends on the opportunity cost associated with the remaining project. The case can be enriched by providing additional information on costs associated with the incomplete project at the time of decision making. Moreover, by providing further details on the cost implications of surpassing the target completion time, one may evaluate the implications for the remaining project by appropriately choosing either the targeted completion time or the targeted project cost as the basis for decision making. One can also examine the implications of the MICC's strategy of creating 14 work-fronts to complete the entire project. In view of the supervision cost and scaffolding cost that are described on the basis of the number of work-fronts, it would be interesting to endogenously determine the optimal number of work-fronts for both internal and external surfaces of the building.

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"Don't equate activity with efficiency. You are paying your key people to see the big picture. Don't let them get bogged down in a lot of meaningless meetings and paper shuffling. Announce a Friday afternoon off once in a while. Cancel a Monday morning meeting or two. Tell the cast of characters you'd like them to spend the amount of time normally spent preparing for attending the meeting at their desks, simply thinking about an original idea."

– Harvey MacKay