Vol-06 Issue 06, June -2022 ISSN: 2456-9348
Impact Factor: 5.004

iJETRM
International Journal of Engineering Technology Research & Management

CONSTRUCTION SCHEDULE MANAGEMENT OF BAGLINGA IRRIGATION PROJECT AT CHIKHALDARA

S. M. Indurkar[1]
Dr. A. R. Mundhada[*2]
[1]PG Student, Prof. Ram Meghe College of Engineering and Management, Badnera-444701
[2]Professor, Prof. Ram Meghe Institute of Technology and Research, Badnera-444701

ABSTRACT
The construction industry is one of the most important activities that contribute towards the economic growth of any nation. However, the sector has been experiencing problems of cost and time overruns. This paper aims at developing an integrated scheduling approach for construction projects during the planning phase from a project owner's perspective. Many projects suffer time and cost overruns due to improper planning, scheduling and execution works that results in several issues like delay in providing facilities, development, reduction in quality of construction and making the project more expensive. Poorly managed projects cost all stakeholders a huge amount not just financially but also psychologically and emotionally. The study has shown that cost and time optimization model could yield impractical results unless double precedence relations are imposed between some activities such as excavation, Earthwork, Pitching and Concreting of a Project. It has also demonstrated that the cost and time budgeted during the planning phase would substantially deviate from actual if the planned construction start date slips from the plan, particularly for short period projects. The proposed approach demonstrated in the paper can sufficiently allow planning engineers to develop a comprehensive construction schedule so that the cost and time overruns in the lowest-bid awarded construction projects can be reduced. The paper provides empirical insights into how a robust construction schedule is developed from an owner's perspective. Cost-time optimization and risk analysis results obtained from manual computation might reduce the reasonable accuracy of the desired cost and schedule integration unless each activity is assigned its own calendar.

Keywords: Construction Project Schedule, time overrun, Cost-time optimization

INTRODUCTION

Completion of the project in due time at the predefined quality and cost is one of the most important concerns. Along with the increase in duration of project implementation, the total cost of the project will be raised due to annual inflation and other introduced costs. The construction industry has now turned out to be one of the major driving forces behind economic development of developing countries. It contributes to high employment opportunity next to agriculture and to income creation for the population, and it also contributes to government revenue through generation of corporate profit tax and income tax from employees. Thus, a small improvement in the construction sector will certainly generate lots of benefits. Most design engineers of public construction projects do not provide a comprehensive design report comprising realistic schedules and accurate measurements of quantities; as a result, cost overrun and time overrun have become a growing concern in the construction industry of developing countries. Scheduling is highly dependent on optimization efforts and various types of uncertain variables; thus, it needs application of tools and techniques. The best approach to provide a robust schedule is a generate-and-test cycle for several alternatives until a satisfactory schedule is obtained. In particular, construction projects are very often delayed and over budgeted. This is not just due to problems faced during project scheduling, but also during related processes such as material procurement and material management. As a number of possible alternatives could be enormous, manual calculation of each alternative and iteration would be impossible.

The objective of the research is planning of construction of Baglinga Minor Irrigation Project situated in Chikhaldara tehsil of Amravati District. The planning of Baglinga Minor Irrigation Project involves each step from Preliminary Investigation to the completion of project. Many researches are carried out for the various projects for scheduling of the construction activities to take care of cost and time overrun. Irrigation project consists of various complex and tedious processes such as surveying and Investigation, Designing and estimating, administrative approval, land acquisition, forest clearance, environmental clearance, Central Water Commission clearance, Maharashtra Water

iJETRM
International Journal of Engineering Technology Research & Management

Resources Regulatory Authority Clearance, Tendering, Execution, etc. Scheduling of such stages are being done in this study. For the project, a case study is done on the Baglinga Minor Irrigation Project. Effective construction scheduling should involve not only scheduling of construction activities but also scheduling of pre-construction activities.

PROJECT CASE STUDY

In this study Baglinga Minor Irrigation Project of Water Resources Department of Maharashtra Government is carried out. The project is situated on Datpadi River of Purna Sub-Basin of Tapi Basin in Chikhaldara tehsil of Amravati District. The length of earthen dam is 730m and height is 31.30 m. The storage capacity of project is 7.285 Mm^3 and irrigation potential is 1324 Ha.

The following sub work breakdown Structure (W.B.S) were taken.

WBS is a grouping of different elements of the project with concern to specific project and it organizes or impinges to determine the overall intent of the project.

1) Preliminary Survey and Site Investigation.
2) Designing of various components of Project.
3) Land Acquisition.
4) Estimating and Costing
5) Planning and Scheduling
6) Tendering
7) Execution
8) Controlling of resources and time management.

Steps involved in Scheduling and Resources allocation to the station work.

1) Creating an ideal schedule
   To create an ideal schedule for any project, first step is to collect data available for the project.
2) Enterprise Project Structure (EPS)
   Create the structure of a company with its branches which is executing the project. This is known as Enterprise Project Structure
3) Organizational breakdown structure (OBS)
   After the EPS, OBS is created which is hierarchy that reflects the persons responsible for the project in the enterprise.
4) Calendar
   The work is carried out in 6 days per week. So the standard 6 day workweek calendar is made with necessary holidays in it. A break of one hour is given in the afternoon.
5) Create a new project
   A project is a set of activates and associated information that constitutes a plan for creating a product or service. The project is created under the respective division in the EPS and assigned in the person charged form OBS to it. The project can be given planned start and must finish dates. The project is assigned a calendar which can be global, resource or project calendar.
6) Work breakdown structure (WBS)
   WBS is a hierarchy of work that must be accomplished to complete the project. Each project has its own hierarchy with top level WBS element begin equal to that EPS nodes or project. Each WBS element may contain more detailed WBS levels, activities, or both.
7) Define activities
   Activities are the fundamental work elements of a project and form the lowest level of a WBS and, are the smallest subdivision of a project. An activity has the following characteristics like activity ID, name, start and finish dates, activity calendar, activity type, activity codes, constrains, expense, successor
8) Relationship between activities
   To form a network, the activities should be connected to each other, which is done by assigning preceding and succeeding activities with significant relation to the activities.
   - Finish to start (FS) relationship.
   - Finish to finish (FF) relationship.
   - Start to start (SS) relationship.
   - Start to finish (SF) relationship.

iJETRM
International Journal of Engineering Technology Research & Management

9) Determining activity duration
When planning the work, the duration is entered in the original duration field. The actual duration can only be entered for the activities, which are completed.
10) Activity dates.
The following are the types of activity dates available in the primavera; actual start, actual finish, planned start, planned finish.
11) Activity cost.
The activity cost is the sum of all the cost incurred to complete the activity.
12) Creating baselines
A simple baseline plan is a complete copy of the original schedule which provides a target against which a project's performance is tracked.
13) Updating schedule
If the project is progressing exactly as planned then only it is needed to estimate progress. If the project is not progressing as planned, many activities are starting out-of-sequence, actual resource use is exceeding planned use, and then update should be done for activities and resources individually. Most projects contain some activities that progress as planned and some which do not. In this case, the best method is to combine the two updating methods.
14) Tracking
Taking window is used for monitoring a project's progress using different types of layouts such s labour costs, project cost, resource forecasting, and resource allocation unit wise and cost wise.
15) Earned value
Earned value is a technique for measuring project performance according to both project cost and schedule. The technique compares the budgeted cost of the work to the actual cost.
16) Claim digger
The claim digger is a schedule analysis tool that enables a company to generate a report that compares selected data fields in a revised project and a corresponding baseline.
17) Project thresholds
Project thresholds consist of parameters assigned to WBS elements; they are used to monitor projects and generate issues
18) Project issues
Project issues are the problems within a schedule that must be addressed before the project can be completed. They can either be created by thresholds or manually.

METHODOLOGY

Background

In this study Baglinga Minor Irrigation Project is considered for case study. The scheduling of various activities from preliminary investigation to the actual completion of project is done.

Project Data Collection

Data required for the study of the case is collected from the Government offices of Maharashtra Government. The Preliminary Investigation Report, Detailed Designs & Preliminary planning helps to further scheduling of various activities.

Project Planning and Scheduling

Project planning involves following major steps:

1) Preliminary investigation
It consist of site selection of project from toposheets, reconnaissance survey, trail bores on alignment of earthen dam, head regulator, Spillway, etc. of Irrigation projects. It also consists of collection of Hydrological data from hydrology Department. Availability of construction material is also taken into consideration.

2) Sampling and Data analysis
The cores obtained from trail bores are then sent to the laboratory for geological investigation. Construction materials to be used there upon are tested in the laboratory to check the various properties of materials. The various constant/values obtained from such tests are considered for the design of various components.

3) Designing and Drawing

iJETRM
International Journal of Engineering Technology Research & Management

Based upon the constants/values of various properties of various construction materials the various components such as earthen dam, head regulator, spillway, tail channel, etc. are designed and drawings are prepared accordingly by the competent design department.

4) **Land Acquisition**
As per Design and Drawing obtained from Design department, the private land required for the execution of project is acquired through the revenue department as per land acquisition act 2013. Government land and Forest land if any required for project may directly be handed over to the Water Resources Department through specified procedure.

5) **Estimating and Costing**
As per Design and Drawing obtained from Design department Quantity surveying is done and estimates are prepared and sanctioned from the competent authority.

6) **Tendering**
As per the sanctioned estimates tender papers are prepared, online tenders are invited and bidders are allowed to participate to have competition.

7) **Execution**
After tender procedure, a contractor is awarded the work for execution at the site. He is responsible to execute the work in specified time limit.

Project Scheduling

Project Scheduling involves the preparation of work program at the beginning of execution of work. The daily output of the various machineries is calculated. Based upon this number of various machineries is deployed at site to complete the work in specified time. The work program is shown in fig. 1.

iJETRM
International Journal of Engineering Technology Research & Management

BYMONTHLY CONSTRUCTION PROGRAMME

Name of Work :- Construction of Earthen Dam, W.W., Approach and Tail channel & Head Regulator of Baglinga M.I. project Tal. Chikhaldara, Dist. Amravati.

Item No.	Item of Work	Unit	Quantity	Ist Month	IInd Month	IIIrd Month	IVth Month	Vth Month	VIth Month	VII Month	VIII Month	IX Month	X Month	XI Month	XII Month
1	Excavation in Soft Strata etc. Complete.	Cum	66526		20000	20000	20000	6526	-	-	-	-	-	-	-
2	Excavation in Hard strata, etc. complete.	Cum	88816	-	20000	20000	20000	10000	10000	8816					
3	Providing and laying drainage arrengment etc Complete	Cum	3731	-	-	1000	1000	1000	731	-	-	-	-	-	
4	Construction of Hearting zone, cot filling etc. Complet	Cum	106199	-		20000	20000	30000	20000	10000	6199				
5	Construction of Casing zone, cot filling etc. Complet	Cum	428478	-		25000	50000	75000	95000	125000	58478				
6	Providing and laying Pitching etc complete	Cum	12402	-							3000	5000	2000	2402	
7	Providing & construction cement concrete M15 etc. complete.	Cum	6669.14	-		1500	1500	1500	1500	669.14					
8	Providing & construction cement concrete M20 etc. complete.	Rmt.	695	-			150	150	150	150	95				
9	Providing and laying TMT Fe415 reinforcement etc. complete	MT	119			20	20	40	20	19					
10	Back Filling etc., complete	Cum	2071						250	250	500	500	500	71	
11	Grouting etc. complete	Kg	99000		15000	15000	25000	25000	25000	4000					

Fig 1: Monthly Construction Program

The daily output of various activities is calculated and machineries are allocated to various activities. The scheduling of important activities are done for every fortnight to complete the execution of work within specified time limit. See Fig. 2 below:

iJETRM
International Journal of Engineering Technology Research & Management

Fig. 2: Work Program on the basis of Daily output

Baglihja Minor Project

Taj Chikhlikhen

Dist. Amravati

Work Program on the Basis of Daily Output

Sr. No.	Name of Item	Revised Quantity	Executed Quantity	Balance Quantity	1-15 March 2022			16-31 March 2022			1-15 April 2022			16-30 April 2022			1-15 May 2022			16-30 May 2022		
					Quantity To Be Executed	Daily Output Required	Machinery Required	Quantity To Be Executed	Daily Output Required	Machinery Required	Quantity To Be Executed	Daily Output Required	Machinery Required	Quantity To Be Executed	Daily Output Required	Machinery Required	Quantity To Be Executed	Daily Output Required	Machinery Required	Quantity To Be Executed	Daily Output Required	Machinery Required
1	Blasting	99990	54722	45268	14400	960	Dumper - 14 Dozer - 1 Water Tanker - 1 Roller - 1	10080	672	Dumper - 11 Dozer - 1 Water Tanker - 1 Roller - 1	8640	576	Dumper - 10 Dozer - 1 Water Tanker - 1 Roller - 1	7200	480	Dumper - 9 Dozer - 1 Water Tanker - 1 Roller - 1	5760	384	Dumper - 9 Dozer - 1 Water Tanker - 1 Roller - 1	0	0	
2	Casting																					
	A) From Available	116830	83638	33192	0	0	0	3600	240	Dumper - 2 Dozer - 1 Water Tanker - 1 Roller - 1	7200	480	Dumper - 3 Dozer - 1 Water Tanker - 1 Roller - 1	9600	640	Dumper - 3 Dozer - 1 Water Tanker - 1 Roller - 1	14400	960	Dumper - 4 Dozer - 1 Water Tanker - 1 Roller - 1	0	0	
	B) Borrow	372620	154316	218284	38400	2560	Dumper - 9 Dozer - 1 Water Tanker - 1 Roller - 2	52800	3520	Dumper - 14 Dozer - 2 Water Tanker - 2 Roller - 2	52800	3520	Dumper - 14 Dozer - 2 Water Tanker - 2 Roller - 2	43200	2880	Dumper - 12 Dozer - 2 Water Tanker - 2 Roller - 2	31600	2240	Dumper - 10 Dozer - 2 Water Tanker - 2 Roller - 2	0	0	
3	Concrete	7512	3766	3746	450	30	Ajax - 1 Water Tanker - 1 Vibrator - 3 Labour - 10	750	50	Ajax - 1 Water Tanker - 1 Vibrator - 3 Labour - 10	750	50	Ajax - 1 Water Tanker - 1 Vibrator - 3 Labour - 10	825	55	Ajax - 1 Water Tanker - 1 Vibrator - 3 Labour - 10	525	35	Ajax - 1 Water Tanker - 1 Vibrator - 3 Labour - 10	450	30	Ajax - 1 Water Tanker - 1 Vibrator - 3
4	Pitching	8834	0	8834	150	10	Blasting Unit - 2 Dumper - 1 JCB - 1 Labour - 5	750	50	Blasting Unit - 2 Dumper - 2 JCB - 1 Labour - 12	1050	70	Blasting Unit - 2 Dumper - 3 JCB - 1 Labour - 16	1950	130	Blasting Unit - 2 Dumper - 4 JCB - 1 Labour - 20	2400	160	Blasting Unit - 3 Dumper - 5 JCB - 1 Labour - 24	2550	170	Blasting Unit - 3 Dumper - 5 JCB - 1 Labour - 24

iJETRM
International Journal of Engineering Technology Research & Management

CONCLUSION AND FINDINGS

Dams are mostly cost effective based on their feasibility study. However, delay in completion of projects causes waste of financial and physical resources; in some cases, projects are so delayed that they have no economic justification and even do not meet the initial goals in terms of their application. It is necessary to identify the factors that lead to the stoppage, stagnation and slow progress of projects by reviewing the projects to prevent delays in future projects. However, due to huge number of problems and unknown factors in performing of a project, it will be impossible to have no delays in projects.

As there is a positive impact of schedule management planning on project management effectiveness, successful implementation of the schedule management plan should be among the key objectives. Moreover, organizations must put in place certain methodologies and strategies that help employees handle the project challenges effectively such that the outcome of the operations is not hampered negatively.

This study was based on analyzing the impact of schedule management plan on the project management effectiveness. Although traditionally project management has been studied and implemented from a broad perspective, of late several methodologies have emerged to further enhance its effectiveness in operations, and schedule management planning is one of them. Schedule management plan helps in time management of each project along with providing the facility of monitoring different tasks in a project. This not only provides the benefit of optimal usage of resources, timely completion of projects, and effective results, but also helps in enhancing the productivity of employees.

In this study scheduling of various activities involved in the construction of Baglinga Minor Irrigation Project is done by calculating the daily output of various machineries and equipment. In this research the planning for the completion of project is considered from the preliminary investigation to Gorge filling of the project. In this study we found out some issues that one has to face during the planning phase and during the construction of the project.

During planning stage, land acquisition is the major issue to be faced by the implementing agency. As far as the land acquisition is concerned, acquisition of forest land is the most complex procedure. It has been seen that delay in completion of the project is mainly due to land acquisition of private and government land.

During Construction stage, the most common hurdle is monsoon and the flood flowing through the river. Electric lines, if any, come under submergence or if crossing the dam, need to be shifted outside the submergence or Dam area. Rehabilitation of the villages under the submergence area of the project is another important aspect. There is total 18 compulsory facilities to be provided to the rehabilitated villages viz. water supply, School building, Roads, Electricity, community hall, etc.

REFERENCES

1. Singh, V.P., Dam Breach Modeling Technology, Kluwer, Dordrecht, Netherlands, 1996.
2. Baba, K., Hirose, T., Environmental Impact Assessment of Dams and Reserviors. Book chapter in Water Storage, Transport and Distribution, EOLSS Publications, 2009.
3. Kheyroddin, A., Asgari, M. (2014). Time Management and Identification of Runtime Optimization Factors in Construction Projects. 8th National Congress on Civil Engineering, Faculty of Civil Engineering, Babol, Iran.
4. Thieme, M. L., Khrystenko, D., Qin, S., Kroner, R. E. G., Lehner, B., Pack, S., Tockner, K., Zarfl, C., Shahbol, N., Mascia, M. B. (2020). Dams and protected areas: Quantifying the spatial and temporal extent of global dam construction within protected areas. Conservation Letters.
5. Al-Hajj, A., & Zraunig, Ma. M. (2018). The Impact of Project Management Implementation on the Successful Completion of Projects in Construction. International Journal of Innovation, Management and Technology, 9(1).
6. Bowen, P. A., Cattel, K. S., Hall, K. A., Edwards, P. J., & Pearl, R. G. (2012). Perceptions of Time, Cost and Quality Management on Building Projects. Australasian Journal of Construction Economcis and Building, 2(2), 48–56.
7. Hyvari, I. (2016). Project management effectiveness in project-oriented business organizations. International Journal of Project Management, 24(3), 216–225.
8. Majeed, M. (2019). Importance of Resource Allocation and Time Management in Project Management. Retrieved October 3, 2019, from https://project-management.com/importance-of-resource-allocation-and-time-management-in-project-management/
9. R.Vidhyasri, R.Sivagamasundari (2018) “Assessment of Influencing Factors in Construction Project Scheduling” International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 8 (2018)

iJETRM
International Journal of Engineering Technology Research & Management

10. Gebrehana DERBE, Yashuai LI , Di WU, Qiuhong ZHAO "SCIENTOMETRIC REVIEW OF CONSTRUCTION PROJECT SCHEDULE STUDIES: TRENDS, GAPS AND POTENTIAL RESEARCH AREAS" Journal of Civil Engineering and Management ISSN 1392-3730 / eISSN 1822-3605 2020 Volume 26 Issue 4: 343–363
11. Paul Shamp, Walden University "Scheduling Strategies for Construction Project Managers Toward On Time Delivery" Walden Dissertations and Doctoral Studies Collection – June 2017
12. D. Suresh & A. Sivakumar "Impact of Schedule Management Plan on Project Management Effectiveness" International Journal of Engineering nad Advanced Technology (IJEAT), Volume 9, Issue 1, October 2019
13. Ramkumar Harikrishnakumar "A Practical Approach to Project Scheduling: Considering Multiple Critical Path Scenarios in Project Network" Department of Industrial & Manufacturing Engineering and the faculty of the Graduate School of Wichita State University July 2017
14. Mona P. Prajapati and Neetu B. Yadav "Buffer Based CCPM Scheduling: A Modern Approach for Indian Constraints" International Conference on Re-search and Innovations in Science, Engineering &Technology Volume 1, 2017,
15. P M Wale, N D. Jain, N R Godhani, S R Beniwal & A A Mir "Planning and Scheduling of Project using Microsoft Project (Case Study of a building in India)" IJRET: International Journal of Research in Engineering and Technology, Volume 12, Issue 3, June 2015.
16. Chester. and Hendrickson (2005). "Cost Impacts, Scheduling Impacts and The Claim Process During Construction." Journal Of Construction Engineering and Management, Vol. 131 No.8, pp.102-107.
17. Hwang, B.G and Leong L.P(2013). "Comparison of Schedule Delay and Casual Factor Between Traditional and Green Construction Projects." Technological and Economical Development of Econom. Vol.192, pp.310-330.
18. K. C. Iyer and K.N. Jha (2006). "Critical Factors Affecting Schedule Performance: Evidence from Indian Construction Projects." Journal of Construction Engineering and Management, Vol.132, pp.871-88.