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Planning and Control Systems In Water and Waste Water Industry.

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Abstract—Massive investments in Water and Waste Water Industry (W&WWI) are made every year in a large number of projects by the central and state government, Public Private Partnership (PPP), financial institutions and others. In order to get commensurate benefit with the cost, it is essential that the projects and programmes are judiciously selected and their plans of implementation are precisely prepared. This paper probes the use of Planning and Control Systems (PCS) in W&WWI for improving investment decisions and project implementation with the help of different schedules, to facilitate support for implementation of PCS during Project Execution. The Schedule for Technical Hindrance and Risk has in depth study with its impact on Project Completion and Cost. The Schedules rationalized periodically, monitored systematically, evaluated concurrently for controlling costs and resources aids to take remedial actions before things become critical. The findings in this paper will offer valuable insights on Planning and controlling the project with the help of Schedules, explicitly for Technical deviations and Project Risks to drive in for timely completion of projects within budgeted costs.

Keywords-Planning and Control System, Monitor, Schedules, Technical Hindrance, Risk.

I. INTRODUCTION

Planning and Control Systems is an art of organizing and managing resources rationally which results timely completion of project and indenting Quality, Time and Cost. The management required for handling these projects is often very different and requires varying technical skills and philosophy entailing the development of Planning and Control Systems. There are different types of Schedules used for execution of Project within defined constraints. Primarily, the use of this Planning and Control Systems is to make sure that a project is delivered within defined budgeted costs for any risks associated with the activities taking place on site. The second, more ambitious challenge is the optimized allocation and integration of inputs needed to overcome the technical deviations captivating the aligned activities that may intrude the progress of Project. The Last Planner System (LPS) developed by Ballard (2000) identifies the activities which are aligned to complete as per their priorities in completion of project.

II. OBJECTIVES

In the new approach of Planning and Control Systems there are several schedules which are added to enhance the monitoring of the project. The Schedules as shown in *Table 1* can be incorporated under project planning which can be updated on Fortnightly basis. The Main objective of this study is

1) To study different schedules for Planning and controlling the project.
2) To study and analyze the schedule of Risk Register and implication on Cost and Time.
3) To study and analyze the schedule of Technical Hindrance and impact on Cost and Time.

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III. WORK METHODOLOGY

The Planning and Control Systems consists of schedules from S0 to S5. The significance of each schedule is important and plays a vital role for delivering the project on time and within estimated costs. *Table 1*showcases the different schedules used in PCS. The different schedules from S0 to S5 covers the different aspects needed in a project life cycle. The schedule templates assist to enter the figures in an easy manner in the spreadsheets. The spreadsheets can be reviewed on managerial level to calibrate the facts and figures in the project timeline. The schedules are elaborated in detail as under:

S0	Progress of Invoice
S1	Schedule of Invoice
S2	Schedule of P&M
S3	Schedule of Staff
S4	Schedule of Risk Register
S5	Schedule of Technical Hindrance

Table 1 Schedule for PCS

PROGRESS OF INVOICE (S0)

Schedule (S0) gives an overlook to the scope of works in the contract and helps to categorize it into Main Activity and their Sub-Activity. The sequential operations of the activities in a project are very beneficial in execution perspective. It enables the Planning Engineer to track the progress of various activity linked with each other. These activities are then bifurcated on Monthly target.

SCHEDULE OF INVOICE (S1)

Schedule (S1) is used to plan the basis for a project budget in the initial stage of project. It is used to calculate the overheads which will be required during the total duration of project. The major work done with the help of this schedule is to monitor the progressing of Invoice in the life of project w.r.t progress as observed in S0. The month wise calculation of the executed quantity in S0 is extracted to arrive at a fairly accurate figure for the month.

SCHEDULE OF PLANT & MACHINERY (S2)

Schedule of P&M provides the availability or requirement of Plant & Machinery on Site. It helps to mobilize the P&M on time and thus avoiding the delay due to non-availability or during demobilization. It gives the action plan to be taken for demobilizing the P&M on site. The date is being freeze and P&M is released on the said date. All the details pertaining to P&M like specification, quantity, make, etc are being specified in the Schedule (S2)

SCHEDULE OF STAFF (S3)

The schedule (S3) is for the staff working on site. The schedule categorise the staff as per their designation, joining date and expected required date on the project site. This schedule enables the Human Resource Management (HRM) to arrange the staff on different ongoing sites and manage the resource effectively and efficiently.

SCHEDULE OF RISK REGISTER (S4)

A Risk register is a tool commonly used in PCS for identifying, analyzing and managing risks. In Projects, Risk is any uncertain event that is, will occur in near future and is, will have a positive or negative effect on the project parameters. To control and mitigate the risks on site as per their classification under different categories the schedule S4 is beneficial.

SCHEDULE OF TECHNICAL HINDRANCE (S5)

There are many factors that contribute to cause of delay in construction projects. These range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment. The important causes of delay includes: approval of drawings; delays in payment to contractors and the resulting cash problems during construction; design changes; conflicts in work schedules of subcontractors; slow decision making and executive bureaucracy in owner's organizations; design errors; labour and inadequate labour skills.

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IV. CASE STUDY

The demand for fresh water in India has continued to increase at a rapid pace. Continuous investment in Water and Wastewater projects has created ample opportunities for Water and Waste treatment Industries in India. The Indian Government has started to support private party participation (PPP) in the W&WW sector and has introduced many regulatory reforms to encourage it.

To have a comprehensive study of the above schedules from S0 to S5 we consider a Case study of Porbandar Under Ground Drainage Project. The Package consists of Water Supply and Under Ground Drainage Project whose execution of the activities is done with the proposed schedules hereby:

ACTIVITY SCHEDULE (S0)

S0 - ACTIVITY SCHEDULE

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB
CONTRACTOR: L&T CONSTRUCTION

Date 09.02.2015

Sr. No	Item	Schedule	Unit	Scope	Weightage 256	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15
						13	14	15	16	17	18	19
1	Excavation	Original	Cum	1107965.98	22.38%	74090	87004	104260	122523	121315	102115	28749
		Actual	Cum	1107965.982	22.38%	46839	70803.2	114895	162301			
		Revised	Cum	1107965.982	22.38%					189605.345	125329.22	43391.5794
2	Pipe Laying	Original	Rmt	629215.4	26.28%	45012	52000	55000	55000	60000	57886	10156.4
		Actual	Rmt	629215.4	26.28%	28226	41252	62654	84730	0	0	0
		Revised	Rmt	629215.4	26.28%	0	0	0	0	111773.70	74515.82	37257.88
A	*PVC*	Original	Rmt	77086	0.93%	6000	6000	6000	4000	4000	1886	
		Actual	Rmt	77086	0.93%	4442	2020	6222	6982			
		Revised	Rmt	77086	0.93%					6065.00	4043.34	2021.66
B	*DWC Pipes*	Original	Rmt	315513.4	8.41%	27012	30000	30000	32000	37000	37000	2911.4
		Actual	Rmt	315513.4	8.41%	10844	19982	29852	36548			
		Revised	Rmt	315513.4	8.41%					69609.70	46406.47	23203.23

Fig 1. Activity Schedule

SCHEDULE OF INVOICE (S1)

The analytical working on the schedule is under progress. The Schedule of Invoice is connected with S0 schedule. The total progress achieved for the month is considered for the Invoice of the month. Since the working of same is under progress the template of schedule (S1) is shown below.

S1 - CONSTRUCTION SCHEDULE

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB
CONTRACTOR: L&T CONSTRUCTION

Date 28.02.2015

Sr. No	Item	Unit	Scope	Rate	Amount (In Lacs)	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15
						13	14	15	16	17	18	19
1	Excavation	Cum	1107965.98	517.55	5734.29	46839	70803.2	114894.5	162300.5	189605.345	125329.2162	43391.5794
		%	1107965.98	517.55	5734.29	4.23%	6.39%	10.37%	14.65%	17.11%	11.31%	3.92%
		Lacs	1107965.98	517.55	5734.29	242.42	366.44	594.64	839.99	981.30	648.64	224.57
2	Pipe					28226	41252	62654	84730	111773.7	74515.82	37257.88
A	PVC	Rmt	77086	307.48	237.02	4442	2020	6222	6982	6065.00	4043.34	2021.66
		%	77086	307.48	237.02	5.76%	2.62%	8.07%	9.06%	7.87%	5.25%	2.62%
		Lacs	77086.00	307.48	237.02	13.66	6.21	19.13	21.47	18.65	12.43	6.22
B	DWC Pipes	Rmt	315513.4	683.26	2155.77	10844	19982	29852	36548	69609.70	46406.47	23203.23
		%	315513.4	683.26	2155.77	3.44%	6.33%	9.46%	11.58%	22.06%	14.71%	7.35%
		Lacs	315513.40	683.26	2155.77	74.09	136.53	203.97	249.72	475.61	317.08	158.54

Fig2. Schedule of Invoice (Template copy)

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SCHEDULE OF PLANT & MACHINERY (S2)

S2 - SCHEDULE OF PLANT & MACHINERY

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB **Date:** 13.02.2015
CONTRACTOR: L&T Construction

Sl. No.	Asset Code	Avl. / Req.	Description of item with specification	Nos.	Owner Code	Spl. code	Requirement		Recd. Date	Rel. Date	Time reqd. for predesp. rep	Remarks
							From	To				
1	New	Avl	Auto level-sl. 236538	1	ECC	-	2-Jan-14	13-Apr-15	2-Jan-14	-	-	-
2	New	Avl	Auto level-sl. 236537	1	ECC	-	2-Jan-14	13-Apr-15	2-Jan-14	-	-	-
3	New	Avl	Auto level-sl. 236536	1	ECC	-	2-Jan-14	13-Apr-15	2-Jan-14	-	-	-
4	New	Avl	Auto level-sl. 236535	1	ECC	-	2-Jan-14	13-Apr-15	2-Jan-14	-	-	-
5	New	Avl	Auto level-sl. 235892	1	ECC	-	2-Jan-14	13-Apr-15	2-Jan-14	-	-	-
6	New	Avl	Auto level-sl. 216923	1	ECC	-	28-Dec-13	13-Apr-15	28-Dec-13	-	-	-
7	New	Avl	Auto level-sl. 217125	1	ECC	-	28-Dec-13	13-Apr-15	28-Dec-13	-	-	-
8	New	Avl	Auto level-sl. 217126	1	ECC	-	28-Dec-13	13-Apr-15	28-Dec-13	-	-	-
9	35993540	Avl	Total Station	1	ECC	-	28-Dec-13	13-Apr-15	28-Dec-13	-	-	-
10	New	Avl	Auto level-sl. 249161	1	ECC	-	15-Feb-14	15-Apr-15	20-Mar-14	-	-	-

Fig 3. Schedule of P&M

SCHEDULE OF STAFF (S3)

S3 - SCHEDULE OF STAFF

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB **Date:** 15.02.2015
CONTRACTOR: L&T Construction

Sr. No	Name	Functional Role	Dsp. Code	Cadre	Requirement		Remarks
					From	To	
	Project Manager						
1	Mr. Subrato Karmokar	Project Manager	C	M1A	01.12.2014	30.05.2015	-
	Planning Office						
2	Mr. Parameswaran	Planning Manager	C	M1A	25.09.2014	30.05.2015	-
3	Mr. Sourabh Tuljapurkar	MIS & Reports	C	O1	25.06.2014	30.05.2015	-
4	Mr. Abhishek Jangale	Client billing	C	O1	01.07.2014	30.05.2014	-
5	Mr. M Prakash	SC Billing & P&M	C	S2	10.02.2014	30.05.2015	-
	Execution						
6	Mr. R L Nogia	In-Charge – Section I	C	M1B	18.12.2013	30.05.2015	-
7	Mr. Ram Nath Gupta	In-Charge – Section II	C	M1B	18.12.2013	30.05.2015	-
8	Mr. Raju Singh	In-Charge – Section III	C	O2	16.12.2013	30.05.2015	-
9	Mr.Prashant Nakade	In Charge- Civil Structure	C	O2	02.0.2015	30.05.2015	-

Fig 4. Schedule of Staff

SCHEDULE OF RISK REGISTER (S4)

S4 - SCHEDULE OF RISK REGISTER

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB **Date:** 22.02.2015
CONTRACTOR: L&T Construction

Risk Identification								Qualitative Risk Assessment			Risk Response Plan		Monitoring and Control		
Sr. No	Status	Risk Category	Risk Event	Cause	Effect	Threat or Opportunity	Primary Objective	Probability	Impact	Risk Matrix	Response Strategy	Response Actions	Resp. Entity	Interval or Milestone Check	Status: Date and Review Comments
1	Active	External	Project not fully funded	Budget Constraints-allocation in doubt or subject to change	Project delayed Approx.	Threat	Time	High	Very High	Probability VH H M L VL; Impact VL L M H VH; X	Mitigate	Project may be divided into 2or 3 phases with options in the contract	Progam Engineer	Monthly	-
2	Active	Design	Inaccurate cost estimate	Unit pricing effected by rock excavation and disposal site issues	EE is Approx.	Threat	Cost	Medium	Medium	Probability VH H M L VL; Impact VL L M H VH; X	Mitigate	Increased unit price for excavation to match rock excavation price	Geotechnical Manager	At completion of subsurface exploration	-

Fig 5.Schedule of Risk Register

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SCHEDULE OF TECHNICAL HINDRANCE (S5)

S5 - SCHEDULE OF TECHNICAL HINDRANCE

PROJECT:PORBANDAR UGD PROJECT
CLIENT: GWSSB **Date:** 26.02.2015
CONTRACTOR: L&T Construction

Identification			Analysis			Planning		Monitor & Control		
Sr. No	Description of Hindrance	Event Date	Projected slippage in completion (In Days)	Completion Date	Extra Cost Incurred in event of completion (In Rs.)	Increase / Decrease in Cost as per ACE	Action taken	Person Resp.	Latest estimated project completion date	Remarks
1	Approval of Drawings	26-12-2014	60	24 Feb 15	-	Increase	Follow up with Client	TSJ	-	WTP Approval
2	Design Changes	19-01-2015	45	5 Mar 15	-	Increase	Expediting	RB	-	-
3	Social Activities	24-01-2015	15	8 Feb 15	-	Increase	Opening avail. Fronts	RLN / RKS	-	Maha Yatra
4	Political Issues	04-02-2015	7	11 Feb 15	-	Increase	Meet with Client	TRT	-	-
5	Contractor Subjects	21-02-2015	20	13 Mar 15	-	Increase	As per subjects their settlement	MK / RKS	-	Non - Receipt of Payment

Fig 6. Schedule of Technical Hindrance

V. SUMMARY

Above live project helps to study and analyze different schedules (S0 to S5) of PCS which enables to study the control parameters for asuccessful completion of project.These schedules prepared in the form of spreadsheets knock the imperative parameters of a project like Cost, Resources, Quality and progress of project. These parameters can be monitored on S-curve and can be transformed to meet the project requirements and achieving our set objectives and goals. These reports form an integral part of Management and Information Systems (MIS) and can also be reviewed at executive level.

Since the thesis work is under working stage the result cannot be outlined and interpreted on S – curve which gives a pictorial view of the project progress along with their parameters. Thus, this paper describes the Planning and Control Systems adopted for Water and Waste Water Industry in India.

REFERENCES

[1] Management Thinking in the Earned Value Method System and the Last Planner System, Yong Woo Kim, Glen Ballard, Journal of Management in Engineering, 2010
[2] Management Control System, Dr. Habibollah Salarzehi, Dr. Baqer Kord, Interdisciplinary journal of Contemporary Research in Business, pg 195-197, 2010
[3] Planning for Resilency: Evaluation of State Hazard Mitigation plans under the Disaster Mitigation Act, Philip Berke, Gavin Smith, Ward Lyles, ASCE, Pg 140-142, May 2012
[4] Estimating Project S-curves using Polynomial Function and Neural Networks, Li ChungChao, Ching-Fa Chien, ASCE,pg 176, March 2009
[5] A Production Planning Support System for Construction Projects By Luis F. Alarcon and Rodrigo Calderon
[6] Planning and Control of Remote ProjectsBy Osama Moselhi and Charles Poulton, ASCE, pg 89-91, 1991

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