OPTIMIZE COST OF CONSTRUCTION PROJECTS USING OPTICON (ERP SYSTEM) SOFTWARE- A CASE STUDY

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ABSTRACT

Enterprise Resource Planning (ERP) is originated in the construction business industry. This project deals with the construction management ERP software "OPTICON" EDU plus is useful tool for civil engineering discipline to work on construction management related aspects of tendering, estimating, planning, scheduling, monitoring, material management, subcontractor management, billing and accounting in an integrated manner in an ERP environment. This availability also provides an opportunity to understand the flow of men machine materials and all resources from estimating, scheduling, procurement to consumption on site. The tracking of resources, subcontractor management Billing and accounting modules help determine cost control of the project and indicates whether the project has a cost overrun or under run. Thus this thesis discusses about tracking of resources, project scheduling, project monitoring and controlling. These modules help determine cost control of the project and indicate whether the project has a cost overrun or under run.MIS reports is the main feature against the established thumb rules and in totality that will help to understand the construction management aspects of project on a per unit basis which is one step towards sustainable development of construction.

Key words: "OPTICON" ERP Software, Estimating, Scheduling, Monitoring and Controlling.

I.INTRODUCTION

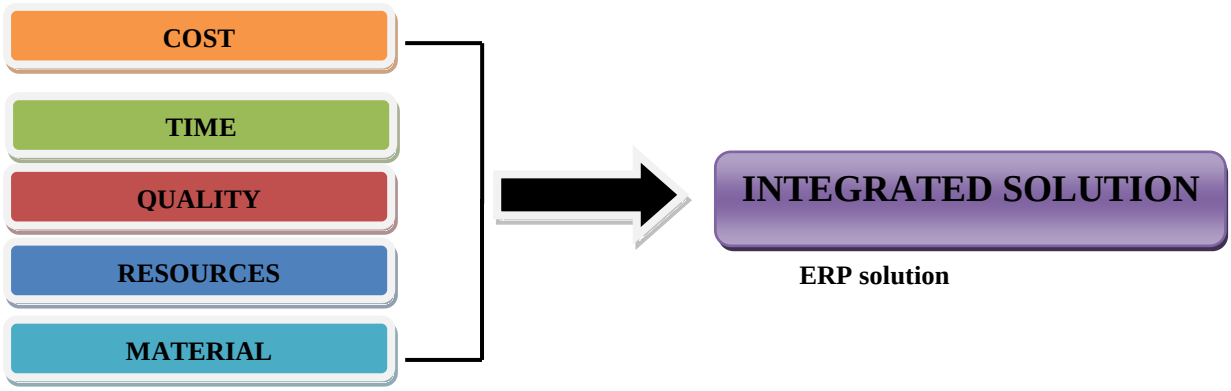
As the complexity and size of the construction projects, management always face problem regarding to cost management and time management. In the conventional process, a firm uses various types of software such as MSP and primavera for scheduling, Estimator for cost estimation and much more for various operations such purchase, billing, tendering and monitoring. Coordination of all this processes generated through use of no. of software's and collection of various reports from various sites is time consuming and consist a cost factor. Moreover there is a risk of transferring wrong information. So, every construction companies need to implement in management system for optimization of cost and time of construction projects**.**

1.1 Importance of the Study

Enterprise resource planning (ERP) is a technique used to integrate resources and material required for completion construction project. The difference between the conventional technique & ERP technique is the optimize cost and time by integrating resources and material. Now days the 90% construction project fails because of cost overrun and time overrun. For this problem Enterprise resource planning (ERP) is the best solution

II.CONCEPT OF ERP

In conventional method five parameters are separated which denotes costs, time, quality, resources and material which gives us general solution for each individual parameter. While the ERP system offers the integrated solution which link all those five parameters together.



2.1 Concept of OPTICON

"OPTICON" is construction management software which is based on ERP system which helps in solving such new challenges in construction business management. It involves web enable ERP system designed for construction business management within built Decision Support and Management system.

The system provides the graphical analysis like:

Planed v/s Actual project progress

Estimated v/s Actual Resource consumption

Periodical resource requirement

Detail analysis of the estimates of the resources.

2.1.1 OPTICON- Information Flow Across Enterprise

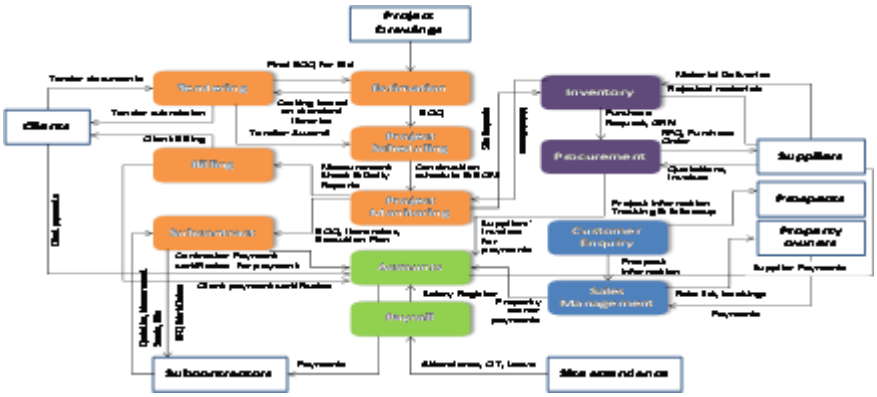
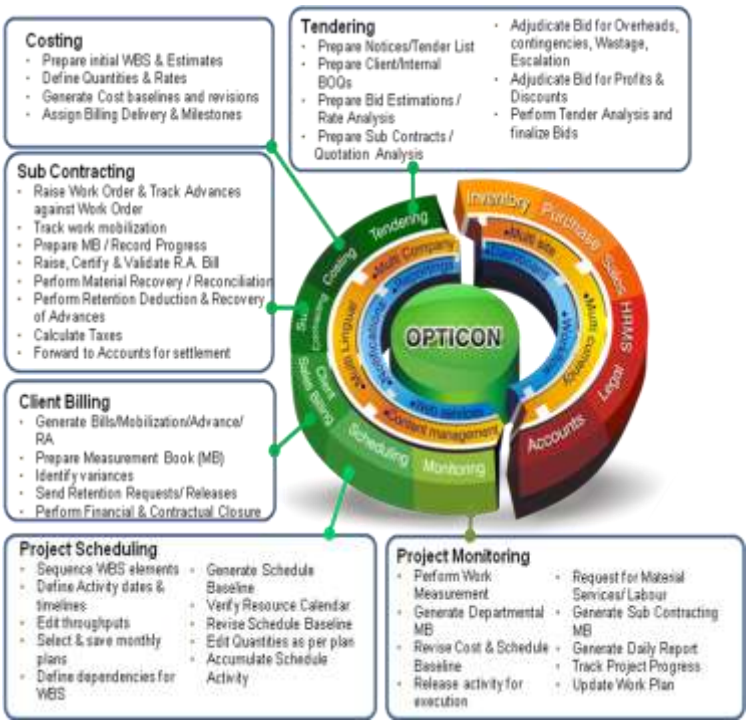


Fig. 1.2 Working of OPTICON (ERP System)

2.1.2 The OPTICON has the following modules

1. Tender Bid Management

2. Project Cost Management
3. Project Schedule Management
4. Project Monitoring and Control
5. Sub-Contract Management
6. Material Procurement
7. Inventory Management
8. Financial Accounting
9. User and system Administration



2.1.2.9 User and System Administration

This module is used for the defining the Organizational Information, Configuration, User Authorization, Approval Work Flows and many master data, which are required and used at a company level. The user will have the access to the processes in which he is authorized to do. This module has Setup, Masters and Report section. In Setup the details of Group Company, Its Structure, Authorization, Organization, Document Numbers, Employees, Financial Year, Approval Work Flows, Site Access Security, Day Book Access Security and Additional Authority are defined.

III.A CASE STUDY

3.1 Head Wise Total Estimate Report

Head wise Estimate report of construction project case study-I in OPTICON software .This report prepared by OPTICON using SOR and Rate analysis report which is prepared in OPTICON before Preparation of Estimate report .This Estimate report help us at the time of preparation of Tender notice of construction project

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Ninaedevi shikshan prasarak mandal, Red-Shirala

Site : Springdale public school

Unit : Building

Sr. no	Item Code	Item Description	Quantity	Unit	Rate	Amount
Work in Plinth(Substructure) – Excavation						
1	03.01.1	Cleaning the building / structure site about 15.0 m all around as directed, with cleaning shrubs.	1.000	Sq.Mtr	5000.00	5000.00
2	03.01.4	Excavation for foundation by mechanical / manual in hard Murom & boulders.	20.000	Cu.Mtr	400.00	8000.00
3	03.01.6	Excavation for foundation by mechanical / manual in hard rock by chiseling.	50.000	Cu.Mtr	750.00	37500.00
Work in Plinth(Substructure) - Excavation Total Amount (Rupee)						50500.00
Work in Plinth(Substructure) - PCC works						
4	03.03.10	Providing and laying in situ, cement concrete M-10.	94.000	Cu.Mtr	4018.10	377701.40
Work in Plinth(Substructure) - PCC works Total Amount (Rupee)						377701.40
Work in Plinth(Substructure) - RCC Works						
5	03.04.12	Providing and laying in situ, cement concrete M -20.	307.000	Cu.Mtr	12728.54	3907661.78
Work in Plinth(Substructure) - RCC Works Total Amount (Rupee)						3907661.78
Work in Plinth(Substructure) - UCR Masonry						
6	03.05.32	Providing un-coursed rubble masonry out trap stones in cement mortar 1:6 in foundations.	22.000	Cu.Mtr	2812.70	61879.40
Work in Plinth(Substructure) - UCR Masonry Total Amount (Rupee)						61879.40
Work In Superstructure – Brickwork						
7	04.03.34	Providing Exposed 230 mm thk brick cavity wall.	97.000	Cu.Mtr	3808.40	369414.80
Work In Superstructure - Brickwork Total Amount (Rupee)						369414.80
Work In Superstructure - Plaster work						
8	04.04.43	Providing internal cement plaster 20mm thick in two coats in cement mortar 1:4.	1,031.000	Sq.Mtr	129.76	133782.56

Work In Superstructure - Plaster work Total Amount (Rupee)	133782.56
Total Amount (Rupee)	**4900939.94**

3.2 Detail Schedule Report

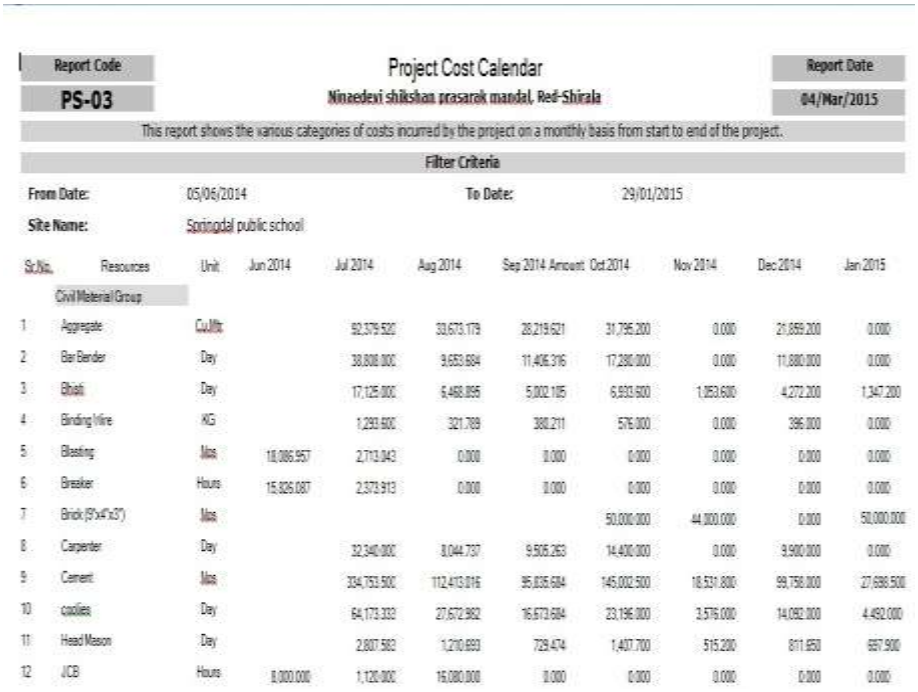
Fig. show that the Detail Schedule of construction project case study-I prepared in "OPTICON. The construction schedule involve Duration , planed start date, planed end date, actual start date, actual end date, predecessor of each activity.

3.3 Item Wise Resource Consumption

Fig Shows item wise planed Vs actual resource consumption on site. It helps to know budget allocated to resources of each item is under run or overrun.

3.4 Project Cost Calendar

In Fig. shows that the project cost calendar of construction site. These project cost calendars represent cost for resources and material required in each month of construction project. It helps us to solve financial problem of owner and also help to minimize risk of time overrun due to financial problem.



Report Code	Project Cost Calendar	Report Date
PS-03	Ninaedevi shikshan prasarak mandal, Red-Shirala	04/Mar/2015

This report shows the various categories of costs incurred by the project on a monthly basis from start to end of the project.

Filter Criteria

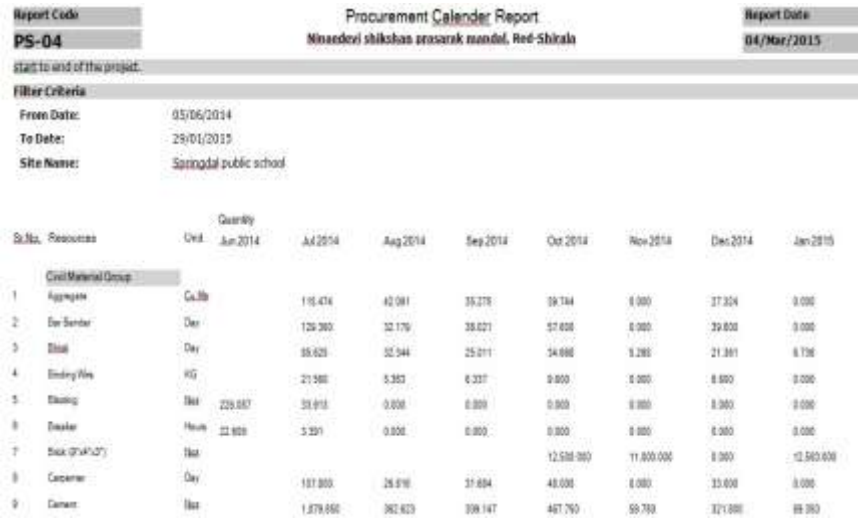
From Date: 05/06/2014 To Date: 29/01/2015

Site Name: Springdal public school

Sr.No.	Resources	Unit	Jun 2014	Jul 2014	Aug 2014	Sep 2014 Amount	Oct 2014	Nov 2014	Dec 2014	Jan 2015
	Civil Material Group									
1	Aggregate	Cu.Mtr.		92,376.520	33,673.179	28,219.621	31,795.200	0.000	21,859.200	0.000
2	Bar Bender	Day		38,808.000	9,653.664	11,406.316	17,280.000	0.000	11,880.000	0.000
3	Bhisti	Day		17,125.000	6,468.895	5,002.185	6,933.600	1,053.600	4,272.200	1,347.200
4	Binding Wire	KG		1,293.600	321.789	388.211	576.000	0.000	396.000	0.000
5	Blasting	Nos	18,086.957	2,713.043	0.000	0.000	0.000	0.000	0.000	0.000
6	Breaker	Hours	15,926.087	2,373.913	0.000	0.000	0.000	0.000	0.000	0.000
7	Brick (9"x4"x3")	Nos					50,000.000	44,000.000	0.000	50,000.000
8	Carpenter	Day		32,340.000	8,044.737	9,505.263	14,400.000	0.000	9,900.000	0.000
9	Cement	Nos		334,753.500	112,413.016	95,835.684	145,002.500	18,531.800	99,756.000	27,686.500
10	coolies	Day		64,173.333	27,672.982	16,673.684	23,196.000	3,576.000	14,092.000	4,452.000
11	Head Mason	Day		2,807.582	1,210.693	729.474	1,407.700	515.200	811.650	697.900
12	JCB	Hours	8,000.000	1,120.000	16,080.000	0.000	0.000	0.000	0.000	0.000

3.5 Procurement Calendar Report

Fig shows material procurement calendar of construction site. These project Material procurement calendars represent procurement of resources and material required in each month of construction project. It helps us to solve problem of delay in procurement of material and also help to minimize risk of time overrun due to procurement of material.



Report Code	Procurement Calender Report	Report Date
PS-04	Ninaedevi shikshan prasarak mandal, Red-Shirala	04/Mar/2015

start to end of the project.

Filter Criteria

From Date: 05/06/2014

To Date: 29/01/2015

Site Name: Springdal public school

Sr.No.	Resources	Unit	Quantity Jun 2014	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015
	Civil Material Group									
1	Aggregate	Cu.Mtr.		116.474	42.081	35.275	39.744	0.000	27.324	0.000
2	Bar Bender	Day		129.360	32.179	38.021	57.600	0.000	39.600	0.000
3	Bhisti	Day		85.625	32.344	25.011	34.668	5.268	21.361	6.736
4	Binding Wire	KG		21.560	5.363	6.337	9.600	0.000	6.600	0.000
5	Blasting	Nos	226.087	33.913	0.000	0.000	0.000	0.000	0.000	0.000
6	Breaker	Hours	22.609	3.391	0.000	0.000	0.000	0.000	0.000	0.000
7	Brick (9"x4"x3")	Nos					12,500.000	11,000.000	0.000	12,500.000
8	Carpenter	Day		107.800	26.816	31.684	48.000	0.000	33.000	0.000
9	Cement	Nos		1,579.650	382.623	308.147	467.750	59.780	321.880	89.350

3.6 Interim Profitability Report

Fig shows interim profitability report of construction site. These project interim profitability reports represent Planed Vs Actual Expenditure of each activity of construction project. It helps us to know whether the construction project has cost overrun or under run at specific time.

Interim Profitability Statement

Report Code		Report Date
PM-085	Ninaedevi shikshan prasarak mandal, Rod-Shirala	04/Mar/2015

Site: Springdale public school Item: All Amount in Rs

Sr. No	Item Code	Item Description	Unit	Planned			Actual			Planned Profit	Actual Profit	Status
				Qty	Rate	Amount	Qty	Rate	Amount			
1	03.01.1	Clearing the building / structure site about 15.0 m	Sq.Mtr	1.000	5,000.000000	5,000.000000	1.000	4,000.000000	4,000.000000	(5,000.00)	(4,000.00)	OVPL (100.000000 %)
2	03.01.4	Excavation for foundation by mechanical / manual in	Cu.Mtr	20.000	400.000000	8,000.000000	18.000	355.555556	6,400.000000	(8,000.00)	(6,400.00)	OVPL (90.000000 %)
3	03.01.6	Excavation for foundation by mechanical / manual in hard rock by chiseling	Cu.Mtr	52.000	750.000000	39,000.000000	49.000	712.244898	34,900.000000	(39,000.00)	(34,900.00)	OVPL (94.230769 %)
4	03.03.10	Providing and laying in situ, cement concrete M-10	Cu.Mtr	61.000	4,018.100000	245,104.100000	57.880	3,990.294993	230,878.486000	(245,104.100000)	(230,878.486000)	OVPL (94.852458 %)
5	03.04.12	Providing and laying in situ, cement concrete M-20	Cu.Mtr	247.300	12,728.540000	3,147,787.942000	241.270	12,721.487602	3,069,313.113800	(3,147,787.942000)	(3,069,313.113800)	OVPL (97.501688 %)
6	03.05.12	Providing unplastered rubble masonry out trap stones in cement mortar 1:6	Cu.Mtr	44.000	2,812.700000	123,758.800000	42.390	2,812.700000	119,230.353000	(123,758.800000)	(119,230.353000)	OVPL (96.340909 %)
7	03.07.8	Filling in plinth and floors with approved hard excavated materials in 15 cm to 20 cm	Cu.Mtr	430.000	0.000000	0.000000	413.300	140.000000	57,862.000000	0.000000	(57,862.00)	OVPL (96.116279 %)
8	04.03.34	Providing Exposed 230 mm thk brick cavity wall	Sq.Mtr	72.000	3,808.400000	274,204.800000	63.850	3,808.400000	243,168.340000	(243,168.340000)	(243,168.340000)	WIP (88.680556%)
9	04.04.43	Providing internal cement plaster 20mm thick in two coats in cement mortar 1:4	Sq.Mtr	719.000	129.780000	93,297.440000	465.000	129.780000	60,338.400000	(93,297.44)	0.000000	NTSD (0 %)
			Total			3,996,133.082000			3,826,088.872800	3,905,094.622000	3,765,750.472800	

IVCONCLUSION

- A conventional case study represents the actual cost required to complete the construction activity at interim stage is 1 lack 70 thousand less than planed cost for these activity with the help of Enterprise Resource Planning system.
- The material management played very important role, In this case study the material was procured with the help of per month procurement calendar reports due to this construction activity completed within duration.

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REFERENCES

1. BooYoung Chung, Mirosław J. Skibniewski and Young HoonKwak, (2009), "Developing ERP Systems Success Model for the Construction Industry", ASCE, 0733-9364, 135:3(207).
2. Jonathan Jingsheng and Daniel W. Halpin, (2003), "Enterprise Resource Planning for Construction Business Management", ASCE, 0733-9364, 129:4(446)
3. Mirosław J. Skibniewski and SaumyenduGhosh, (2009), "Determination of Key Performance Indicators with Enterprise Resource Planning Systems in Engineering Construction Firms", ASCE, 0733-9364, 135:10(965).
4. Syed M. Ahmed; Irtishad Ahmad; Selman Azhar; and SuneethaMallikarjuna, (2003),"Implementation of Enterprise Resource Planning (ERP) Systems in the Construction Industry", ASCE, 978-0-7844-0671-7.

5. Dr.Almahdi M. S. Ibrahim "WHAT ORGANISATIONS SHOULD KNOW ABOUT ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM" European, Mediterranean & Middle Eastern Conference on Information Systems 2010.