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Implementation Based ERP Module for Construction Site Management

MR. Rohit Chaudhari[1], Ass. Prof. Rahul Jain[2]

[1]M. Tech. (Construction Management) Student, Sandip University Nasik, India,
[2]Ass. Prof. Dept. of civil Engineering, Sandip University Nasik, India,

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Abstract - *A significant number of major construction companies embarked on the implementation of integrated information technology solutions such as enterprise resource planning ERP systems to better integrate various business functions. However, these integrated systems in the construction sector present a set of unique challenges, different from those in the manufacturing or other service sectors. There have been many cases of failure in implementing ERP systems in the past, so it is critical to identify and understand the factors that largely determine the success or failure of ERP implementation in the construction industry. This paper presents the process of developing an ERP systems success model to guide a successful ERP implementation project and to identify success factors for ERP systems completion. The paper identifies factors associated with the success and failure of ERP systems, and develops a success model to analyze the relationships between key factors and the success of such systems. The goal of the ERP systems success model is to better evaluate, plan, and implement ERP projects and help senior managers make better decisions when considering ERP systems in their association. Enterprise resource planning ERP was originated in the manufacturing industry. It provides a general working surroundings for an enterprise to integrate its major business management functions with one single common database so that information can be shared and efficient communications can be achieved between management functions. The enterprise resource planning software market has been growing at a very fast pace over the last few years and has been predicted to keep growing rapidly in the long term. Since the functioning of the construction enterprise is different from other domain industries. There is a need to develop a specific construction enterprise oriented ERP. The application under development will provide complete solution to manage the entire functioning of construction firm. Implementing Business Intelligence in the Construction ERP will help managerial staff in decision making. Thus this construction ERP will contribute in overall functioning, growth and development of the construction organization.*

Key Words: ERP Implementation, Enterprise Resource Planning, Construction Organization

1. INTRODUCTION

ERP systems have been widely adopted in industries such as manufacturing because they give a company an integrated platform for taking orders, procuring parts, managing production, and controlling inventory, financials, and distribution.ERP solutions generally are effective at supporting supply chain processes in which a manufacturing company takes an order for product, and uses that product's bill of material (BOM) structure within ERP to trigger the needed materials required to manufacture the product. This closed-loop supply chain process within ERP works well for many manufacturing companies, and has even been enhanced with product configuration capabilities for make-to-order manufacturers. The trouble is, engineering, construction and infrastructure projects aren't based on ordering products, and subsequently, don't use pre-established BOM structures. When it becomes time to start building a new stadium, one doesn't order from a list of stock parts or options. Instead, the challenge revolves around establishing and bidding out many scopes of work. These scopes of work need be estimated, reviewed, approved, and revised as needed. There are often hundreds of changes to scopes of work during a construction project, ranging from significant design changes like expanding a parking lot, to a simpler change such as a substitute material a subcontractor needs to use. As a result, instead of needing an ERP system geared to materials requirements planning, the AEC industry needs an ERP system that is project and asset-centric and geared to estimating scopes of work, managing subcontracts, and exerting control of project costs, timescales, quality and risk.

The main objective of this successful ERP systems implementation and providing factors associated with the success of ERP systems in engineering and construction firms. To do so, the identified factors affecting the success or failure of ERP systems, and develops an ERP system success model to analyze the relationships between factors and the success of such systems

1.2 ERP in Construction

The success of ERP in manufacturing enterprises resulted in its adoption in some large construction companies. Yet, because of the differences in manufacturing and construction processes, ERP adoption in these companies resulted in the integration of financial management processes only. There are many reasons for the discrepancies between manufacturing and construction industries. First, the construction industry is unique in its work environment and the distributed nature of stakeholders. Although it shares many similarities with the manufacturing industry in regard to production processes and systems, it mostly

produces one-of-a-kind, prototype-like products. Also, the construction industry operates project-based activities that are carried out by many different parties which may be geographically dispersed. As different organizational entities, each of the project participants has different goals to accomplish in the project. Furthermore, the amount of information and its time sensitiveness in the construction industry makes it hard to manage. For these reasons, generic or standard ERP systems intended originally for manufacturing or non construction service industries are not able to address the unique business needs of the construction industry. Extensive customization is required to respond to these specific needs. This has been the primary reason to date for the low implementation rate of the ERP systems in the construction industry. In order to address the needs of the construction industry, an ERP system intended for construction related applications should be based in a large part on the life cycle of the project. In addition, it should be compatible with the way construction firms are conducting their business. Industry specific processes and accounting standards should be redesigned and embedded in the system comprehensively. Furthermore, the system should possess the necessary interfaces with standard engineering, scheduling, and office software. Access to information from sources worldwide should be facilitated through the use of the Internet.

2. LITERATURE REVIEW

2.1 Beliz Ozorhon and Emrah Cinar

The major objective of the research reported in this paper is to explore the critical success factors (CSFs) of ERP implementation in the construction industry in developing countries. In this respect, based on an extensive literature review, 14 CSFs were identified and a questionnaire survey was conducted to analyze the role of those CSFs on the performance of ERP implementation. The data is collected from 90 construction firms from Turkey. The statistical analysis results show that top management support and commitment, clear goals and objectives, project team competence, effectiveness of the project leader, and cooperation between team members are the most significant drivers of success. Factor analysis was also employed on the data and the findings suggest three dimensions, namely (1) human factors, (2) organization, and (3) technology. Findings of the research reported in this paper are expected to help senior managers and consultants implement ERP systems in construction firms in an effective manner.

2.2 Sudhanva Kadol, Digvijay Patil, *et.al*

This paper presents an efficient ERP system to manage different departments in accordance with for the managerial the company policies and customer requirements. India is a developing nation, with globalization widely making impact over its economy. It is observed that large amount of development is mostly concentrated towards the country's urban infrastructure. Due to larger population migrating towards cities it is necessary to accommodate and provide basic infrastructural facilities to their ever increasing demands. So it is necessary for the construction enterprises to efficiently manage their functioning and address the customer requirements by balancing the functioning of individual departments in the construction enterprise. Construction ERP is an ultimate solution to manage entire enterprise under a single roof. ERP is responsible for integrating business processes within an enterprise. This will only automate the functioning of Construction Company. To enable decision making tier of the company based upon history and future risks BI and DSS are implemented using feedback logic.

2.3 Hans Voordijk, Arjen Van Leuven and Albertus Laan

In most large Dutch construction firms, Enterprise Resource Planning (ERP) systems have replaced nonintegrated information systems with integrated and maintainable software. The implementation of ERP systems in such firms is a difficult task. So far, ERP implementations have yielded more failures than successes. This study tries to understand the factors that lead to the success or failure of ERP in large construction firms by focusing on the fits between the following pairs of elements in ERP implementations: business and IT strategy, maturity of the IT infrastructure and the strategic role of IT, and the implementation method and organizational change. The premise of this study is that for an ERP implementation to be successful these elements must somehow fit together. Empirical research was conducted through a case, study of three ERP implementations in different business units of a Dutch-based construction firm. Implementing different systems within one company is typical of the way large construction firms in the Netherlands have dealt with ERP. The study shows that the success of ERP implementations depends on consistent patterns between: IT strategy and business strategy, IT maturity and the strategic role of IT, and the implementation method and organizational change.

2.4 Vivek Kumar and Dr. S. Srinivasan

This paper author is focuses on an ongoing development and research activities of MAS (Multi Agent System) for supply chain management and provides a review of the main approaches to supply chain communications as used mainly in manufacturing

industries. Supply chain consist of various components/ identities like supplier, manufacturer, factories, warehouses, distributions agents etc. These identities are involved for supplying raw materials, components which reassembles in factory to produce a finished product. With the increasing importance of computer based communication technologies, communication networks are becoming crucial in supply chain management. Given the objectives of the supply chain to have the right products in the right quantities, at the right place, at the right moment and at minimal cost, supply chain management is situated at the intersection of different professional sectors. This is particularly the case in construction, since building needs for its fabrication the incorporation of a number of industrial products.

3. ENTERPRISE RESOURCE PLANNING IN CONSTRUCTION INDUSTRY

3.1 Enterprise Resource Planning

Enterprise resource planning ERP has its origins in manufacturing and production planning systems. The early systems were created three decades ago with the advent of materials requirement planning MRP. This primarily organized the storage and allocation of production materials. The term ERP was born when the production oriented systems were integrated with purchasing, financials, human resources, and other front-office applications to enhance management of all business operations across the enterprise. The scope of ERP offerings expanded in the mid-1990s to include other back-office functions such as order management, financial management, warehousing, distribution, quality control, asset management, and human resources.

3.2 Construction Enterprise Resource Planning

The availability of resources defines the production capability of a contractor. In general, a construction company can access two categories of resources: Internal resources, which the company owns; and External resources, which the company can obtain from the open market at a price. The common objective is to maximize the usage of the company's internal resources and use the market to balance the company's operation. Given that construction projects are transient in nature, span different lengths of time periods, and require different resources, it is usually very difficult to achieve a balance between the production capability and the actual workload on hand for a construction enterprise all the time. In practice, a construction company has various ways to adjust its operations to approach such a balance. For instance, when the company does not have enough jobs, it may rent out some of its owned equipment and may bid lower prices on new projects. On the other hand, the contractor may rent outside equipment, recruit personnel, or request its employees to work overtime

3.3 Supply chain management

The supply chain has been defined as `the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

SCM views the entire supply chain rather than just the next part or level, and aims to increase transparency and alignment of the supply chain's co-ordination and configuration, regardless of functional or corporate boundaries The basic idea of SCM is to recognise the interdependency in the supply chain, and thereby improve its configuration and control based on such factors as integration of business processes.

There are also other illuminating typologies of SCM. First, there are development issues of SCM, including order information transparency, reduction in variability, synchronizing of material flows, and management of critical resources and configuration of the supply chain. Second, there are strategies for SCM including establishment of stable partnerships, modular outsourcing of components, design for suitability form manufacture, flexible manufacturing technologies, evolution of the supply chain with the product life cycle, and information acquisition and sharing Third, there are levels of SCM that can be distinguished, including initial partnership logistics management and` genuine SCM.

4. DATA COLLECTION AND ANALYSIS

4.1 Questionnaire Survey

In order to investigate the suitability and the implementation status of ERP systems in contractor firms, a detailed questionnaire survey was conducted. The target population was the contractors associated with major trade organizations such as the CMAA, AGC, etc. The questionnaire was made available on the website (http://www.eng.fiu.edu/cm/erp) on October 10, 2002. 12 completed responses were received. Although this number looks small, it was somewhat expected as many small and medium sized contractors are still not familiar

with ERP. Only large construction companies like Bechtel, Bovis Lend lease, Turner Construction, etc. could share their experiences with the researchers. The findings are summarized in the following section.

4.2 Major Findings

❖ **Knowledge about ERP systems and their implementation**

- 58% (7 out of 12) of the respondents were aware of the ERP systems in general.
- 33% (4 out of 12) of the respondents indicated that they were earlier contacted by an ERP vendor about the possible implementation of ERP systems in their organizations.
- 8% (1 out of 12) respondents think that ERP system will work "very well" in their organization and
- 51% (6 out of 12) think that it will work to "some extent". The rest of the respondents are either "not sure" or have the opinion that ERP will "not work" in their setup.
- 58% (7 out of 12) respondents indicate that the ERP systems, if implemented, will be beneficial for their organization.

From the above findings, it can be concluded that a slightly more than half of the respondents are aware of the ERP systems and they think that ERP systems could work in their organizations and will benefit the organization. However, a good number of contractors showed fear that such systems will not work well in their organization due to the small size of the organization, limited resources and not adequate technical skills.

4.3 Research Methodology

In the research reported in this paper, a questionnaire was designed to measure the effects of various factors in ERP implementation success. The survey was administered to the members of the major associations related to construction business that would provide significant information on the perception and practices of ERP systems in the Turkish construction industry. The questionnaires were sent to 152 members of the Turkish Contractors Association (TCA), 127 members of Association of Turkish Consulting Engineers and Architects (ATCEA), and 56 members of The Turkish Employers' Association of Construction Industries (TEACI). These associations represent a major portion of the civil engineering professionals in Turkey. A total of 90 questionnaires were returned out of 335 sent out, resulting in a 27% response rate. The survey consists of three main parts, as follows: General information about the company and the respondent, Type and phase of ERP system in use (if any), and CSFs of ERP implementation.

- **General Information about the Respondents**

The average age of the respondents is 32 years and their experience in construction industry in average is 8 years. About 90% of the respondents are aged less than 40. The average age of the companies that are surveyed is around 20. Among the respondents, 19% have or less and 21% have a total turnover value of. Also, 36% of the companies have or more turnover values. The majority (40%) of the companies have more than 500 employees. Among the respondents, 20% are at managerial level, 24% are at chief level, and 42% are engineers and architects. In terms of the departments, 61% of the respondents work at the technical office, 14% of them work at the construction site, and 11% of them work at the design department.

- **Critical Success Factors of ERP Implementation**

The following table shown as the critical success factors of ERP implementation. In which descriptive statistics of the CSFs based on the 30 responses collected from the construction firms. Result is shown that the two variables Use of consultants and End-user involvement are less than the other variables.

Table- 1: Critical Success Factors of ERP Implementation

Identifier	Variables	Mean	SD	Variance
V1	Top management support and commitment	3	1.57	2.46
V2	Project team competence	3	1.46	2.13
V3	Clear goals and objectives	3	1.48	2.18
V4	Team composition	3	1.44	2.07
V5	Effectiveness of project leader	3	1.43	2.05
V6	Cooperation between team members	3	1.40	1.96
V7	Vendor support	3.5	1.37	1.89
V8	Choice of ERP software package	3	1.55	2.41
V9	Training and support for users	3	1.36	1.86
V10	Choice of ERP modules	3.5	1.52	2.30
V11	Organizational change management	3.5	1.34	1.79
V12	Use of consultants	4	1.33	1.77
V13	End-user involvement	3	1.32	1.75
V14	Startup and testing the system	3	1.35	1.82

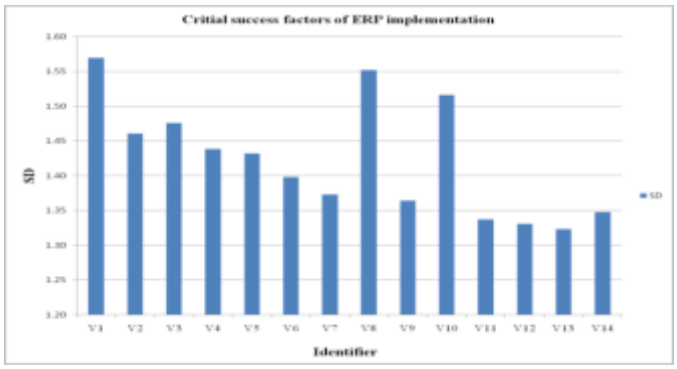

Chart - 1: Critical Success Factors of ERP Implementation

The following chart shown as the critical success factors of ERP implementation. In which descriptive statistics of the CSFs based on the 30 responses collected from the construction firms. Result is suggested that the maximum SD of Top management support and commitment is 1.57 which is are greater than other. And minimum SD of End-user involvement is 1.33 which is less significant.

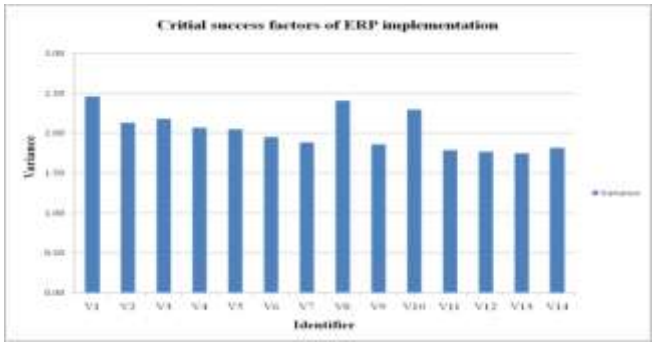

Chart - 2: Critical Success Factors of ERP Implementation

The above chart shown as the critical success factors of ERP implementation. In which descriptive statistics of the CSFs based on the 30 responses collected from the construction firms. Result is suggested that the maximum Variance of Top management support and commitment is 2.46 which is are greater than other. And minimum Variance of End-user involvement is 1.75 which is less significant.

5. RESULT AND DISCUSSION

5.1 Abstract Sheet of Project

In table no 5.76 shows the abstract sheet of project. In that table includes the description of various item their quantity & amount. We have to calculate amount required to complete various items of project with their standard unit. Standard Rates per unit of various items taken from DSR. Finally total cost required to complete project is calculated which include 4% Electrification cost, 3% Water Supply & Sanitation cost & 5% Supervision charges. The cost of project is 2824933.49 Rs. & considering all charges the total project cost is 3163926.00 Rs.

Table- 2: Abstract Sheet

Sr. No.	Description Of Item	Quantity	Unit	Rate (Rs)	Amount
1	Excavation for column pits in soft soil etc.	287.601	Cum	270	77652.27
2	P.C.C. for footing concrete	26.314	Cum	2800	73679.2
3	R.C.C. footing steel	2.754	m tun	4000	11016
4	R.C.C. column up to plinth	2.601	m tun	4000	10404
5	concrete in R.C.C column up to plinth	10.969	Cum	2800	30713.2
6	R.C.C of underground water tank	1.6963	m tun	4000	6785.2
7	concrete in underground water tank	10.946	Cum	2800	30648.8
8	R.C.C lift up to plinth	0.685	m tun	4000	2740
9	concrete R.C.C lift up to plinth	20.8	Cum	2800	58240
10	R.C.C plinth beam	0.438	m tun	4000	1752
11	concrete in R.C.C plinth beam	4.77	Cum	2800	13356
12	Murum filling in plinth	206.91	Cum	550	113800.5
13	P.C.C for plinth 1:3:6	26.314	Cum	2800	73679.2
14	R.C.C column in superstructure	10.76	m tun	4000	43040
15	concrete in column in superstructure	3.21	Cum	10000	32100
16	R.C.C beam	1.6	m tun	4000	4480
17	concrete in R.C.C beam	12.402	Cum	2800	49608
18	R.C.C staircase up to ground	0.4602	m tun	4000	1840.8
19	concrete staircase up to ground	6.067	Cum	2800	16987.6
20	R.C.C lift up to ground	0.439	m tun	4000	1756
21	concrete lift up to ground	4.209	Cum	2800	11785.2
22	R.C.C Basement top	1.473	m tun	4000	5892
23	concrete in basement top	19.25	Cum	2800	53900
24	R.C.C column in first floor	10.52	m tun	4000	42080
25	concrete in R.C.C column in first floor	3.1	Cum	2800	8680
26	Providing brick work for superstructure (0.15 m brick wall)	32.93	Cum	5000	164650
27	R.C.C lintel beam, R.C.C loft & Chajja first floor	0.978	m tun	4000	3912
28	concrete in R.C.C lintel beam, R.C.C loft & Chajja	4.838	Cum	2800	13546.4
29	R.C.C lift up to first floor	12.14	m tun	4000	48560

30	concrete R.C.C lift up to fisrt floor	4.2	Cum	2800	11760
31	R.C.C slab with w. p. finishing	1.74	Cum	8500	14790
32	concrete in slab	37.75	Cum	8500	320875
33	Providing Sand faced plaster for External Wall including scaffolding, curing etc.	172.98	Sqm	435	75246.3
34	Providing Nero Finish plaster for Internal Wall including scaffolding, curing etc	271.44	Sqm	370	100432.8
35	Providing & laying colored glazed tiles for flooring & dado etc	10.08	Sqm	1005	10130.4
36	Providing & laying Vitrified Tile Flooring on a lime mortar bed including filling joints with cement slurry curing ,polishing etc	129.28	Sqm	1150	148672
37	Providing & laying Marble Window frame including filling joints with cement slurry curing ,etc	22.41	Sqm	1800	40338
38	Providing & Fixing C.T.W door with frame & fixture ,oil paint etc. comp.	15.015	Nos	22500	337837.5
39	Providing & fixing Black coated Aluminium Section window with grill& glass fitting etc.	22.41	Sqm	5000	112050
40	Providing Granite Kitchen otta with tile Fitting, Granite cup - Board ,etc comp.	1	Nos	37000	37000
41	Providing S.S. grilling for Staircase ,Balcony & porch etc	226.02	Rmt.	2296	518941.92
42	Providing & applying Oil bond distemper for Internal wall etc. comp	271.44	Sqm	190	51573.6
43	Providing & applying approved quality Cement paint including cleaning & curing etc.	271.44	Sqm	140	38001.6
				Cost	2824933.49
				4% Electrification	112997.34
				3% Water Supply & Sanitation	84748.1
				5%Supervision charges	141246.68
				Total Cost Rs.	3163925.51
				Say Rs.	3163926

5.2 MSP Result

Microsoft project is a project management software product, developed and sold by Microsoft. It is designed to assist a project manager in developing a schedule, assigning, and resources to tasks tracking progress, managing the budget and analyzing workloads.

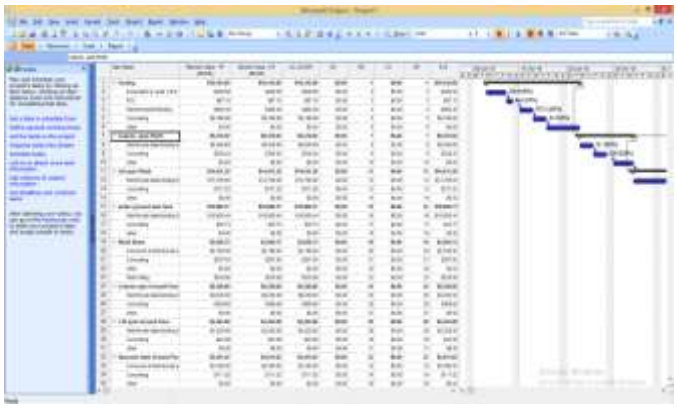

Fig-1: Activity With Baseline

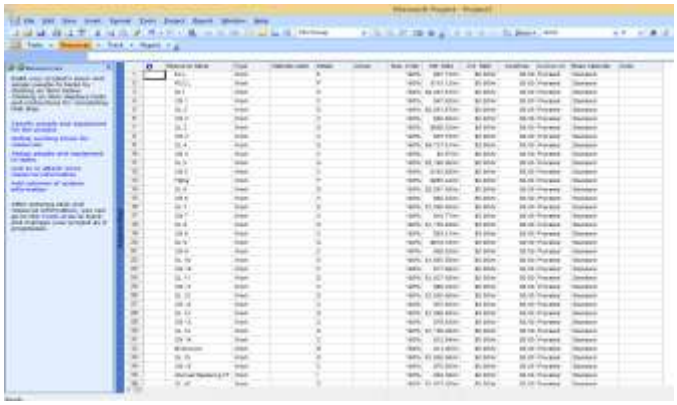

Fig-2: Resource sheet

Table- 3: Cash flow report for project

Year	Quarter	Week	Cost	Cumulative Cost
2018	Q4	Week 39	42355.44	42355.44
		Week 40	761.92	43117.36
		Week 41	37157.12	80274.48
		Week 42	68480	148754.48
		Week 43	0	148754.48
		Week 44	0	148754.48
		Week 45	77830.24	226584.72
		Week 46	0	226584.72
		Week 47	0	226584.72
		Week 48	0	226584.72
		Week 49	0	226584.72
		Week 50	0	226584.72
		Week 51	0	226584.72
		Week 52	0	226584.72
	Q4 Total		226584.7	226584.72
2018 Total			226584.7	226584.72
2019	Q1	Week 0	0	226584.72
		Week 1	39010.4	265595.12
		Week 2	0	265595.12
		Week 3	0	265595.12
		Week 4	21102.72	286697.84
		Week 5	0	286697.84
		Week 6	43513.92	330211.76
		Week 7	0	330211.76
		Week 8	29266.72	359478.48
		Week 9	172.32	359650.8
		Week 10	0	359650.8
		Week 11	0	359650.8
	Q1 Total		133066.1	359650.8
	Q2	Week 12	38430.88	398081.68
		Week 13	0	398081.68
		Week 14	0	398081.68
		Week 15	32733.28	430814.96
		Week 16	98199.84	529014.8
		Week 17	17303.44	546318.24
		Week 18	0	546318.24
		Week 19	92777.6	639095.84
		Week 20	74504.96	713600.8
		Week 21	0	713600.8
		Week 22	155000	868600.8

		Week 23	1925.28	870526.08
		Week 24	0	870526.08
	Q2 Total		510875.3	870526.08
	Q3	Week 25	445333.4	1315859.52
		Week 26	223880.3	1539739.84
		Week 27	0	1539739.84
		Week 28	21192.88	1560932.72
		Week 29	19963.6	1580896.32
		Week 30	0	1580896.32
		Week 31	0	1580896.32
		Week 32	37192.48	1618088.8
		Week 33	1529.36	1619618.16
		Week 34	672	1620290.16
		Week 35	672	1620962.16
		Week 36	672	1621634.16
		Week 37	156925.3	1778559.44
		Week 38	0	1778559.44
	Q3 Total		908033.4	1778559.44
	Q4	Week 39	296889	2075448.4
		Week 40	371718	2447166.4
		Week 41	606.8	2447773.2
		Week 42	614.64	2448387.84
		Week 43	40541.84	2488929.68
		Week 44	0	2488929.68
		Week 45	0	2488929.68
		Week 46	37192.48	2526122.16
		Week 47	1305.36	2527427.52
		Week 48	672	2528099.52
		Week 49	672	2528771.52
		Week 50	672	2529443.52
		Week 51	156507.5	2685951.04
	Q4 Total		907391.6	2685951.04
2019 Total			2459366	2685951.04
2020	Q1	Week 0	641.76	2686592.8
		Week 1	148444.5	2835037.28
		Week 2	445333.4	3280370.72
		Week 3	75435.84	3355806.56
		Week 4	0	3355806.56
		Week 5	0	3355806.56
		Week 6	41156.48	3396963.04
		Week 7	0	3396963.04
		Week 8	0	3396963.04
		Week 9	376.48	3397339.52
		Week 10	37251.12	3434590.64
		Week 11	2287.6	3436878.24
		Week 12	672	3437550.24
	Q1 Total		751599.2	3437550.24
	Q2	Week 13	672	3438222.24
		Week 14	672	3438894.24
		Week 15	387612	3826506.24
		Week 16	1536	3828042.24
		Week 17	0	3828042.24
		Week 18	0	3828042.24
		Week 19	371111.2	4199153.44
		Week 20	297171.8	4496325.28
		Week 21	0	4496325.28
		Week 22	1540.8	4497866.08
		Week 23	39927.2	4537793.28
		Week 24	0	4537793.28

		Week 25	0	4537793.28
	Q2 Total		1100243	4537793.28
	Q3	Week 26	38104.48	4575897.76
		Week 27	1417.36	4577315.12
		Week 28	672	4577987.12
		Week 29	672	4578659.12
		Week 30	672	4579331.12
		Week 31	157037.3	4736368.4
		Week 32	0	4736368.4
		Week 33	222666.7	4959035.12
		Week 34	445333.4	5404368.56
		Week 35	1213.6	5405582.16
		Week 36	0	5405582.16
		Week 37	40286.4	5445868.56
		Week 38	0	5445868.56
	Q3 Total		908075.3	5445868.56
	Q4	Week 39	0	5445868.56
		Week 40	19696.48	5465565.04
		Week 41	19278.24	5484843.28
		Week 42	2658.32	5487501.6
		Week 43	2667.84	5490169.44
		Week 44	2667.84	5492837.28
		Week 45	1669.92	5494507.2
		Week 46	672	5495179.2
		Week 47	672	5495851.2
		Week 48	4255.2	5500106.4
		Week 49	22171.2	5522277.6
		Week 50	22171.2	5544448.8
		Week 51	22171.2	5566620
	Q4 Total		120751.4	5566620
2020 Total			2880669	5566620
2021	Q1	Week 0	14963.6	5581583.6
		Week 1	13522.08	5595105.68
		Week 2	13522.08	5608627.76
		Week 3	6761.04	5615388.8
	Q1 Total		48768.8	5615388.8
2021 Total			48768.8	5615388.8
Grand Total			5615389	5615388.8

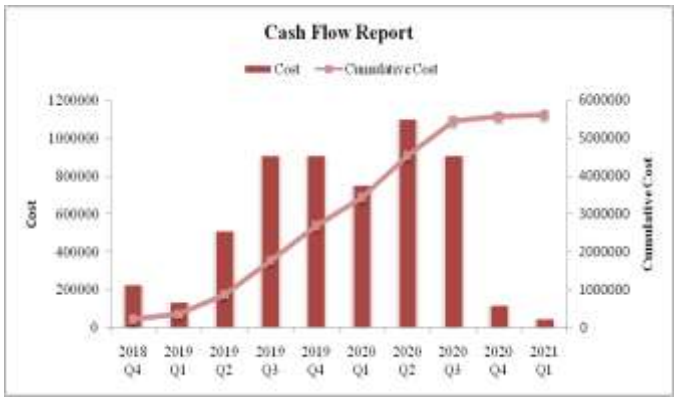

Chart - 3: Cash flow report

Table- 4: Earned value overtime report

Year	Quarter	Week	Earned Value	Planned Value	AC
2018	Q4	2018 Week 39	42355.44	42355.44	42355.44
		2018 Week 40	43117.36	43117.36	43117.36
		2018 Week 41	80274.48	80274.48	80274.48
		2018 Week 42	148754.48	148754.48	148754.5
		2018 Week 43	148754.48	148754.48	148754.5
		2018 Week 44	148754.48	148754.48	148754.5
		2018 Week 45	200641.3067	226584.72	226584.7
		2018 Week 46	200641.3067	226680	226584.7
		2018 Week 47	200641.3067	226680	226584.7
		2018 Week 48	200641.3067	226680	226584.7
		2018 Week 49	200641.3067	247782.72	226584.7
		2018 Week 50	200641.3067	249906.24	226584.7
		2018 Week 51	200641.3067	291296.64	226584.7
		2018 Week 52	200641.3067	291296.64	226584.7
2019	Q1	2019 Week 0	200641.3067	320649.52	226584.7
		2019Week 1	200736.5867	320735.68	226680
		2019 Week 2	200736.5867	320735.68	226680
		2019Week 3	200736.5867	320735.68	226680
		2019Week 4	221839.3067	359166.56	247782.7
		2019 Week 5	221839.3067	359166.56	247782.7
		2019 Week 6	265353.2267	359166.56	291296.6
		2019 Week 7	265353.2267	408266.48	291296.6
		2019 Week 8	294619.9467	506466.32	320563.4
		2019 Week 9	294792.2667	507403.12	320735.7
		2019 Week 10	294792.2667	507403.12	320735.7
		2019 Week 11	294792.2667	618736.24	320735.7

Chart - 4: Earned Value Overtime Report

3. CONCLUSIONS

In recent years, major ERP vendors designed various construction industry specific solutions, but few if any have achieved widely acknowledged application success. For now, construction firms are reacting slowly and cautiously to these solutions. To

change this ambiguity, this research has studied the possible impacts of the C-ERP using both theoretical and practical approaches. The study concentrated on the effects of C-ERP in the project environment. With the aid of system dynamics principles, this study identified the major variables that influence the successful evaluation of C-ERP in the construction industry. Qualitative system dynamics modeling was utilized to study the effect that a variable has on each other

From the present study we drawn the following conclusions,

- ERP is an integrated computer software system that integrates various aspects of the construction industry like planning, organizing, controlling, coordinating and directing
- ERP is efficient planning software which should be applied in all the projects to get quality work within the constraints of money and time.
- ERP also helps in optimum usage of the resources minimizing the wastage thus leading to economy and completing the work within the stipulated time limits.

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