

Impact of Construction Project Execution with and without Project Management Software

V. Subburaj, Ramesh Babu Chokkalingam, M. Shanmugasundaram

Abstract: *The delay of work is common in construction projects. Delay has a major impact on time and cost overrun. Project management helps to avoid or minimize delays in future work. Here in this paper, two private residential apartments are considered for evaluation. One project has been executed using software and the second project has no such process. The first project prepared with time schedule, resource allocation and levelling, estimation, billing and cash flow all the details using the software tools helps to execute the project with more profit and less delay in work execution whereas the other experimental project is not having plan, same less resource, poor execution leads to heavy loss and more stress to the builder.*

Keywords : *Analytical methods, Production models, Theoretical framework, Construction management.*

I. INTRODUCTION

Tamil Nadu has seen high growth in construction activity of all types, residential and commercial. It has been noted that only 30% of the construction projects were completed within the scheduled completion dates and that the average time overrun was between 10% and 30%. The construction industry faces on-going challenges both externally and internally. From an internal view point the increase in the number of features in a project scope, against shorter construction deadlines and restricted budgets raise the complexity of the building construction projects. We may adopt any technology for construction of a project, but completion of work on time and within the budgeted cost is a big issue faced by construction industries. But in our experimental projects one project completed as per schedule using various project management tools and one project get delays of around nearly 10 times the actual duration, which clearly shows the major loss on the project having poor quality engineers and improper supervision with less knowledge on building construction. The main objective is to get more profit and gain in time in a project using software tools is a must, also it releases more stress and strain to the contractor, client as well as the labours. Yu Maemura, Ph.D. et al. (2018) have identified contractual conflicts as a major cause of construction delays in international construction projects, their underlying causes have been rarely explored.

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Connie Tenin Su; et al. (2108) proposes a deterministic and a probabilistic constructive heuristic for solving the project scheduling resource availability cost problem with tardiness

(RACPT), as well as a new mixed integer mathematical formulation with disjunctive constraints and time modeled as a continuous variable. Mei-yung Leung, et al. (2017) investigated the interactions among stressors, stress, performance, and intention to stay for expatriate construction professionals (ExCPs) through the development of a stress.

II. IMPORTANCE OF THE STUDY

Conflicts arises between parties (owner, contractor and/or third party), in regards to file claims for extra compensation or extra time to complete a project. To recover the damages caused by delays, the parties responsible for the occurrence should be identified.

III. PROJECT 1

SOFTWARE USED: AutoCAD, Primavera, MS Project, and Microsoft Excel.

LOCATION STUDY

Location : Subhamnagar, Mahaveersalai, J.Pallavaram, Chennai-117.
Proposed Area : 1393.55 Sq.m
Type of terrain : Plain Terrain
Type of Building : Apartments – Residential tower.
Type of soil : Foundation lies on softy disintegrated rock.
SBC : 36 tonnes/ Sq.m
Type of Footing : Isolated Column footing.

A. PLANNING AND SCHEDULING

For this scheduling process Primavera software is used. In this software, the Organizational Breakdown Structure (OBS) that represents the organisation. The Enterprise Project Structure (EPS) represents how the project is organized. The OBS and EPS are combined together through the responsible manager field on the EPS structure. The responsible manager field is the OBS and this determines what users can gain access to the project. The EPS is further divided into number of work breakdown structure (WBS). After certain the WBS, the activities are created. For those activities, the required resources are assigned.

B. RESOURCE MANAGEMENT

Resource management is the utilization of resources in a planned manner by allocating and leveling them in different tasks with a good model tool implementing leveling using graph.

▪ Resource Allocation

Resource allocation with the help of Primavera can be done for Men, Materials and Machineries. The below mentioned schedule shows some of the samples for resource details obtained from Primavera software tools. The following are some of the tables (samples) for resource details obtained from the Primavera software,

▪ Resource Levelling

Resource levelling is a process in which the finish date of the project can be as per the availability of the resources. But, by running the Primavera and level checker resource levelling can be done in this project it level the resources within the activity. Over allocation done on the project by levelling and without altering the finish date. The following are some of the sample results of leveled resources obtained from the Primavera software.

▪ Budgeting

Budgeting can be framed only by using cost estimation. This budget details clearly shows how the funds can be utilized over time for projects. Budget clearly gives the amount to be spend over a particular period of time, it also include outline plan for money spend and breakdown, Accurate budget will give a better result on how to plan the resources as per schedule and various types of work required to complete the tasks. It also exposes cost constraint for project. This project has resource management, scheduling and BOQ with rates.

IV. CONCLUSION

- ❖ Project Management Model is an effective tool that helps to achieve optimized cost and time duration.
- ❖ The main reason for delay in project 2 is using fewer resources and not increasing the resources using same manpower for all the works which leads to more poor quality of work, the output is zero.
- ❖ The results of this study can be of immense help to the practitioners (clients, contractors and consultants) and academicians.
- ❖ The practitioners can better understand the dynamics of project management and make efforts to reduce the incidences of delays.
- ❖ This project management model will also serve as a baseline for future projects.

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AUTHORS PROFILE



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Ramesh Babu Chokkalingam completed his Ph.D. from IIT Chennai in 2008. He has more than 10 years of experience in teaching and research. His areas of research include pervious concrete, geopolymer concrete, and high volume flyash concrete.



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Table 1 Bill of Quantities with rates for M/s Chellammal Residency

S.No	Description of work	Unit	Qty	Rate/Unit (Rs)	Amount (Rs)
Concrete works and Brick works					
Substructures					
1	Excavation work for basement and foundation	C.ft	35703	8	2,85,624
2	Refilling work	C.ft	16000	6	96,000
3	PCC Concreting for footing	C.ft	1130	116	1,31,080
4	Retaining wall construction	C.ft	5798	135	7,82,730
Ground Floor					
5	Concreting work of beams, columns, roof, lintels and sunshades.	C.ft	3550	252	8,94,600
6	Brick Masonry	C.ft	2600	112	2,91,200
First Floor					
7	Concreting work of beams, columns, roof, lintels and sunshades.	C.ft	2350	298	7,00,300
8	Brick Masonry	C.ft	2955	112	3,30,960
Second Floor					
9	Concreting work of beams, columns, roof, lintels and sunshades.	C.ft	2350	298	7,00,300
10	Brick Masonry	C.ft	2955	112	3,30,960
Third Floor					
11	Concreting work of beams, columns, roof, lintels and sunshades.	C.ft	2350	298	7,00,300
12	Brick Masonry	C.ft	2955	112	3,30,960

Table 2. Resource Allocation using Software

Total		01-Mar-18	14-Dec-18
Assistant Surveyor			
HD1061	Center line marking	07-Mar-18	09-Mar-18
HD1056	Surveying and Boundary marking	08-Mar-18	09-Mar-18
		07-Mar-18	08-Mar-18
Barbender			
HD1581	Column reinforcement for kitchen and s	09-Mar-18	28-Sep-18
HD1636	Kitchen platform	18-Sep-18	19-Sep-18
HD2081	Placing of rods	27-Sep-18	28-Sep-18
HD2071	Beam and roof slab barbending	05-Sep-18	08-Sep-18
HD2061	Column concreting above lintel	27-Aug-18	30-Aug-18
HD2046	Lintel level shuttering and sunshade wc	27-Aug-18	30-Aug-18
HD2031	Column reinforcement upto lintel level	23-Aug-18	27-Aug-18
HD1881	Placing of rods	07-Aug-18	11-Aug-18
HD1871	Beam and roof slab barbending	30-Jul-18	03-Aug-18
HD1846	Lintel level shuttering and sunshade wc	21-Jul-18	25-Jul-18
HD1861	column concreting above lintel	18-Jul-18	21-Jul-18
HD1431	Column concreting above lintel	21-Jul-18	24-Jul-18
HD1416	Lintel level shuttering and sunshade wc	15-Jun-18	19-Jun-18
HD1831	Column reinforcement upto lintel level	12-Jun-18	15-Jun-18
HD1451	Placing of rods	04-Jul-18	07-Jul-18
HD1441	Beam and roof slab barbending	25-Jun-18	29-Jun-18
HD1401	Column reinforcement upto lintel level	15-Jun-18	20-Jun-18
HD1306	Column concreting above lintel	29-May-18	02-Jun-18
HD1376	Kitchen cooking platform	12-May-18	15-May-18
HD1326	Placing of rods	05-Jun-18	06-Jun-18
HD1316	Beam and roof slab barbending	21-May-18	25-May-18
HD1296	Lintel level shuttering and sunshade wc	12-May-18	16-May-18
HD1246	Column reinforcement upto lintel	08-May-18	11-May-18
HD1221	Placing and tying of rod	26-Apr-18	02-May-18
HD1211	Floor slab barbending works	18-Apr-18	21-Apr-18
HD1206	Ramp work	04-Apr-18	07-Apr-18
HD1181	Reinforcement	12-Apr-18	12-Apr-18
HD1161	Retaining wall and column reinforcement	06-Apr-18	07-Apr-18
HD1146	Beam and slab reinforcement	30-Mar-18	02-Apr-18
HD1096	Footing erection and column fixing	26-Mar-18	28-Mar-18
HD1076	Bar bending works for footing and colur	15-Mar-18	17-Mar-18
		09-Mar-18	12-Mar-18
Concrete Mixer			
HD2176	Concreting	26-May-18	11-Sep-18
HD1891	Concreting	10-Sep-18	11-Sep-18
HD1461	Concreting	04-Aug-18	04-Aug-18
HD1336	Concreting	30-Jun-18	02-Jul-18
		26-May-18	26-May-18



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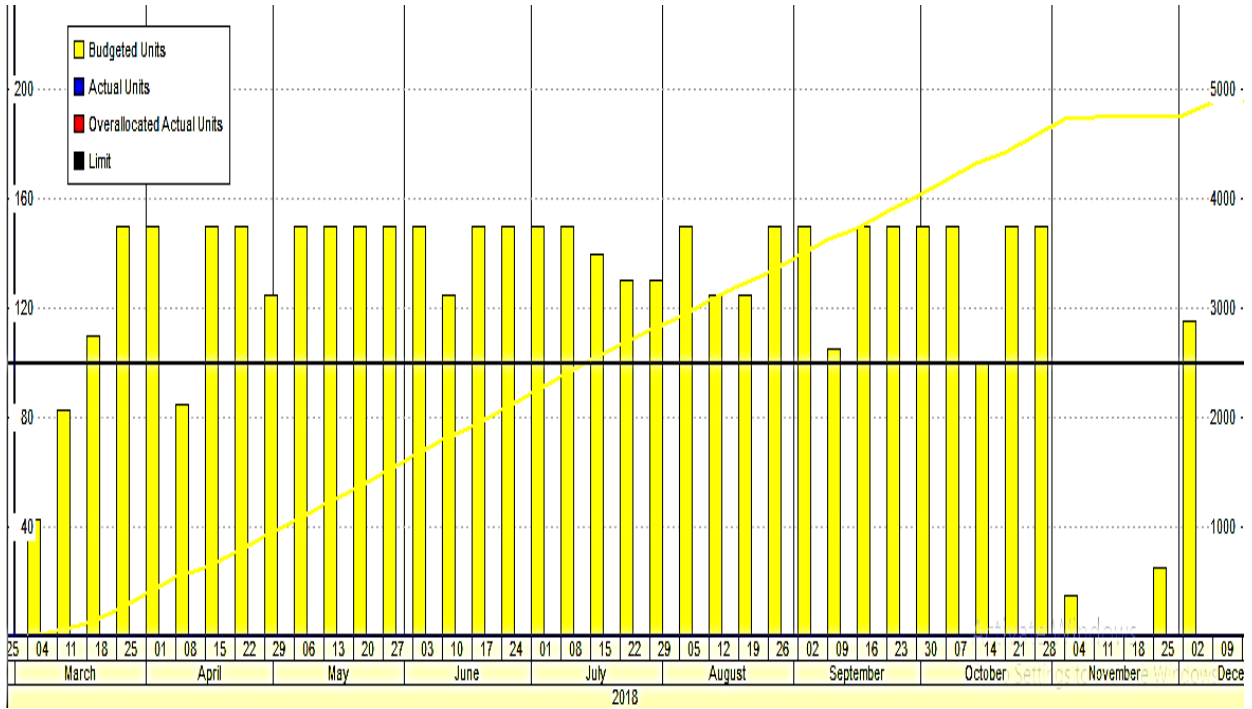


Fig. 1. Resource Levelling for Project Engineer

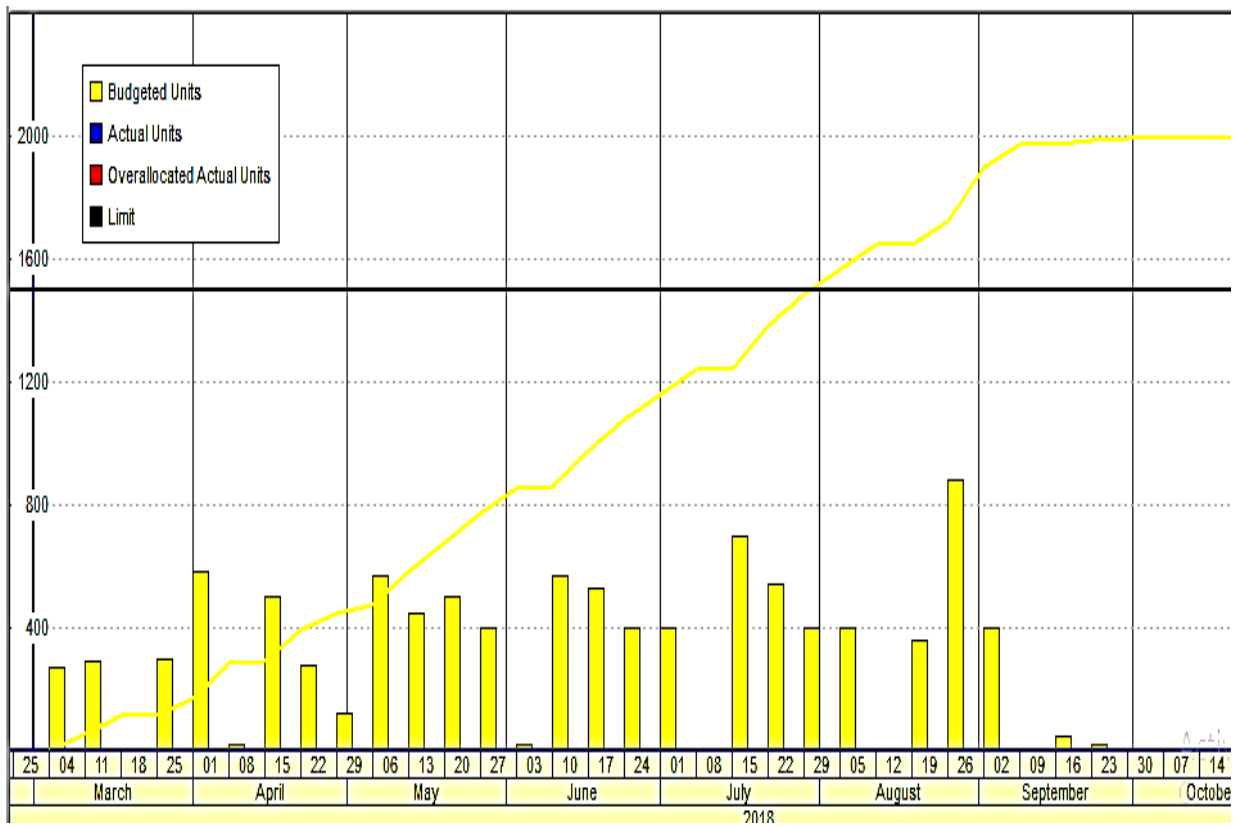


Fig. 2. Resource Levelling for Bar bender

Table 3. MILESTONE ACTIVITIES FOR M/s Chellammal Residency

CHELLAMMAL RESIDENCY - PALLAVARAM - PROJECT MILESTONE SCHEDULE																	
ID	Task Name	Duration	Start	Finish	% Complete	2018	2020	2024	2028	2032	2036						
						'16	'18	'20	'22	'24	'26	'28	'30	'32	'34	'36	'38
0	CHELLAMMAL RESIDENCY	52.14 wks	Thu 01-03-18	Thu 28-02-19	100%												
1	MOBILIZATION	0.57 wks	Thu 01-03-18	Sun 04-03-18	100%												
5	MAIN BUILDING	51.43 wks	Tue 06-03-18	Thu 28-02-19	100%												
6	Sub Structure	5 wks	Tue 06-03-18	Mon 09-04-18	100%												
7	EXCAVATION	3.14 wks	Tue 06-03-18	Tue 27-03-18	100%												
9	Footing	3.57 wks	Fri 16-03-18	Mon 09-04-18	100%												
12	GROUND FLOOR SLAB	6.71 wks	Thu 22-03-18	Mon 07-05-18	100%												
16	Super Structure	12.86 wks	Wed 11-04-18	Mon 09-07-18	100%												
17	GROUND FLOOR TO FIRST FLOOR	2.71 wks	Wed 11-04-18	Sun 29-04-18	100%												
18	Columns/Shear walls	1.71 wks	Wed 11-04-18	Sun 22-04-18	100%												
22	First Floor Slab	1.71 wks	Wed 18-04-18	Sun 29-04-18	100%												
26	FIRST FLOOR TO SECOND FLOOR	4 wks	Mon 30-04-18	Sun 27-05-18	100%												
27	Columns/Shear walls	2.14 wks	Mon 30-04-18	Mon 14-05-18	100%												
31	Second Floor Slab	1.86 wks	Tue 15-05-18	Sun 27-05-18	100%												
35	Second FLOOR to TERRACE FLOOR	3.71 wks	Mon 28-05-18	Fri 22-06-18	100%												
36	Columns/Shear walls	1.71 wks	Mon 28-05-18	Fri 08-06-18	100%												
40	Terrace Floor Slab	1.71 wks	Mon 11-06-18	Fri 22-06-18	100%												

CHELLAMMAL RESIDENCY - PALLAVARAM - PROJECT MILESTONE SCHEDULE																	
ID	Task Name	Duration	Start	Finish	% Complete	2018	2020	2024	2028	2032	2036						
						'16	'18	'20	'22	'24	'26	'28	'30	'32	'34	'36	'38
44	LMR/SHR/LHR Structure	2.43 wks	Sat 23-06-18	Mon 09-07-18	100%												
45	LIFT MACHINE ROOM	2.43 wks	Sat 23-06-18	Mon 09-07-18	100%												
46	Columns/Shear walls	1.43 wks	Sat 23-06-18	Mon 02-07-18	100%												
50	Slab	1 wk	Tue 03-07-18	Mon 09-07-18	100%												
54	STARICASE HEAD ROOF	2.43 wks	Sat 23-06-18	Mon 09-07-18	100%												
55	Columns/Shear walls	1.43 wks	Sat 23-06-18	Mon 02-07-18	100%												
59	Slab	1 wk	Tue 03-07-18	Mon 09-07-18	100%												
63	Internal Finishing	10.71 wks	Mon 24-09-18	Fri 07-12-18	100%												
64	GF - FINISHING	9.71 wks	Mon 24-09-18	Fri 30-11-18	100%												
78	FIRST FLOOR - FINISHING	10.29 wks	Thu 27-09-18	Fri 07-12-18	100%												
92	SECOND FLOOR - FINISHING	8.86 wks	Mon 01-10-18	Sat 01-12-18	100%												
106	LIFTING MACHINE - FINISHING	1.57 wks	Thu 08-11-18	Sun 18-11-18	100%												
110	WATER PROOF - TERRACE	5.43 wks	Sun 07-10-18	Tue 13-11-18	100%												
113	External Finishes	16.86 wks	Tue 30-10-18	Sun 24-02-19	100%												
118	EXTERNAL WORKS	15.43 wks	Tue 06-11-18	Thu 21-02-19	100%												
122	HANDING OVER	0.57 wks	Mon 25-02-19	Thu 28-02-19	100%												



Table 4. Progress report on project 1 & 2

Month	Chellammal Residency – M/s Finetune Builders		Sumangali Apartments – M/s Limra Builders	
	Progress	Review	Progress	Review
Nov'14			First meeting held between Contractor & Client	
Dec'14			Document Photo copies verified	
Jan'15			Both Client & Contractor accepted to start the work	
Feb'15			Problem in Survey No	
Mar'15			So Work not started	
Apr'15			Work not started	
May'15			Survey No problem sorted out so accepted to start the work	
Jun'15			Document preparation occurs	
July'15			Power Of Attorney signed	
Aug'15			Work not started	Due to Improper planning from builder work not started.
Sept'15			Work not started	
Oct'15			Work not started	
Nov'15			Work not started	
Dec'15			Natural Disaster - Flood Came	No planning, scheduling, resource management and tool not used.
Jan'16			So Work not started	
Feb'16			Work not started	
Mar'16			Work not started	
Apr'16			Got the approval	
May'16			Frame work progress	
Jun'16			Frame work progress	
July'16			Frame work progress	
Aug'16			2 Floors Frame work completed	Due to poor quality engineer, work stopped, Also Builder is not a technically qualified person having less knowledge on execution and not to accept new technology makes more delay.
Sept'16			Work Stopped	
Oct'16			Work Stopped	
Nov'16		Scheduling for the project is done with Primavera and MS P. For effective scheduling process the resources are allocated properly according to the availability.	Work Stopped	
Dec'16			Work Stopped	
Jan'17			Work Stopped	
Feb'17			Work Stopped	
Mar'17			Work Stopped	
Apr'17				
May'17			Work Stopped	
Jun'17			Frame work progress	Work started after 9 months
July'17			Frame work progress	
Aug'17			Frame work progress	
Sept'17		Final Floor Frame work completed		
Oct'17			Block work in progress	



Nov'17	Project started		Block work in progress	
Dec'17	Plan - layout prepared using software.		Block work in progress	
Jan'18	PPM- Schedule prepared using software.		Block work / Plastering work in progress	
Feb'18	BOQ & approval processed.		Block work / Plastering work in progress	
Mar'18	Foundation started		Block work / Plastering work in progress	
Apr'18	Foundation completed as per schedule		Block work / Plastering work completed.	
May'18	Ground floor Frame started		Electrical / Plumbing works in progress	
Jun'18	Ground floor Frame completed as per schedule.		Electrical / Plumbing works erection works completed.	
Jun'18	First floor Frame started		Tile flooring started	Due to less awareness and poor knowledge about the field it is very difficult for the builder to get succeed in project
July'18	First floor Frame completed		Tile flooring completed.	
Aug'18	Second floor Frame started		Putty work completed.	
Sept'18	Second floor Frame completed as per PPM		Doors & Windows - Frame fixing work in progress	
Oct'18	Terrace/ Gr Flr – Finishing/MEP work completed		Doors & Windows - Shutter fixing work in progress	
Nov'18	FF - Finishing/MEP work completed as per PPM		Doors & Windows – Frame / Shutter fixing work completed	
Dec'18	SF - Finishing/MEP work completed as per PPM		Work stopped	
Jan'19	Snag / Final works progressed as per PPM		Work stopped	Due to poor performance , Builder got more stress and takes time for him to recover.
Feb'19	Snag / Final other works completed as per PPM		Work stopped	

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Mar'19	All works including lift work completed.		Work stopped	
Apr'19			Compound wall work completed.	Budgeting estimation not done by the builder
May'19			Over head tank. Terrace finishing works completed	
Jun'19			Painting work started.	
Jul'19			Painting work in progress.	
Aug'19			Balance work yet to complete	
Sept'19			Painting works	
			Balance work yet to complete	
Oct'19			MEP & Grill works	