iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** III **Month of publication:** March 2019

DOI: http://doi.org/10.22214/ijraset.2019.3252

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

Time and Motion Study for Flooring Activity of a Residential Building

Ronak Patel[1], Chinmay Acharekar[2], Ajay Chiraboina[3], Rajatkumar Bejankiwar[4], Prof. Vikrant Kothari[5]
[1, 2, 3, 4, 5]*Department of Civil Engineering, University of Mumbai*

Abstract: ***Time & Motion Study is a work measurement technique implemented by recording time of a specified job. Time can be recorded with the help of stopwatch whereas Motion study is performed to eliminate wastes. Under this project, a Residential Building has been selected for performing Time and Motion study considering the main domain as flooring work. Flooring work includes 5 sub processes as mentioned below in methodology. The Project was performed under two conditions i.e. Traditional method (Using mortar prepared on site) and Improved method (Using ready-available mortar i.e. Dry mortar). Data were collected for both the conditions of all 5 sub-processes using stopwatch & motion study was performed to identify the factors influencing the extra time on field. Further data of both methods were analysed & statistical analyses were made by comparing two methods & the reasons for time delay were identified.***

Keywords: Time & Motion study, Residential Building, Statistical analysis, Improved Method, Traditional Method

I. INTRODUCTION

Time & Motion study is a work measurement technique of a particular task by using devices like stopwatch. Time & Motion study is performed to identify the factors influencing the delay & to enhance the efficiency of a particular job. This can be done by breaking a task into a smaller units for example flooring is divided into 5 sub processes namely Water level marking, Mortar Preparation, Thiya Making, Machaan laying &Laying of tiles. Time & Motion study is often used when there are repetitive work cycles of short to long duration, wide variety of dissimilar work is performed or process control elements constitute a part of the cycle. The aim of this project is to find the time of flooring activity & find out the reasons for delay & comparing Conventional & Traditional method by statistical analysis.

II. LITERATURE REVIEW

Rajshri Shrishirmal, Prof. R.R. Salgude[1] in this paper, they have collected data for material handling of bricks and performed the statistical analysis for the same. They observed that work sampling and experienced personnel reduces the rework and optimum numbers of human resources is met. Mohd. Razali Muhammad, Wan Mahmood[2] in this paper, they looked upon productivity priorities like production, cost, time, workforces, quality, flexibility, etc. Mean, standard deviation was found out for lacking factors. They observed increase in productivity, quality improvement and reduced the time per operation by their studies.

Ankit Vekariya, Ashutosh Kumar[3] they performed method study procedure as follows: select record, examine, develop, evaluate , define, install, define. Time study was also performed (lean concept). They observed elimination of human errors and improved accuracy in their study. Nishant J. Khandve[4] in this paper, residential building was selected for project completion , also the concreting work was performed in two parts of a day. It was observed that human efforts were reduced, work scheduling technique the rework, experienced people.

Egwunatum Samuel, Oboreh Snapp[5] carried out work on cost data and cost modeling by time and motion study. A mathematical relation was established which would change accordingly.

Mr. Jigar H. Balar, Mr. Hiren A. Rathod, Mr. Rushabh Shah[6] in this paper, prepartion for time study was made, collection of data by personal site visits were performed, analysis was done by Microsoft Excel tool on activities such as concreting, masonry etc. They found that improvements were successful to achieve project goals and objectives, economy in human efforts and reduction of fatigue was possible.

III. NEED OF TIME AND MOTION STUDY

During the entire construction process, it is observed that a lot of time is wasted for various activities. Due to this time delay, the projects lag and the required output is not achieved. To reduce this time delay, we need to observe the processes, calculate the time and delay reasons. By doing this specific task, a clear picture is observed regarding the actual work.

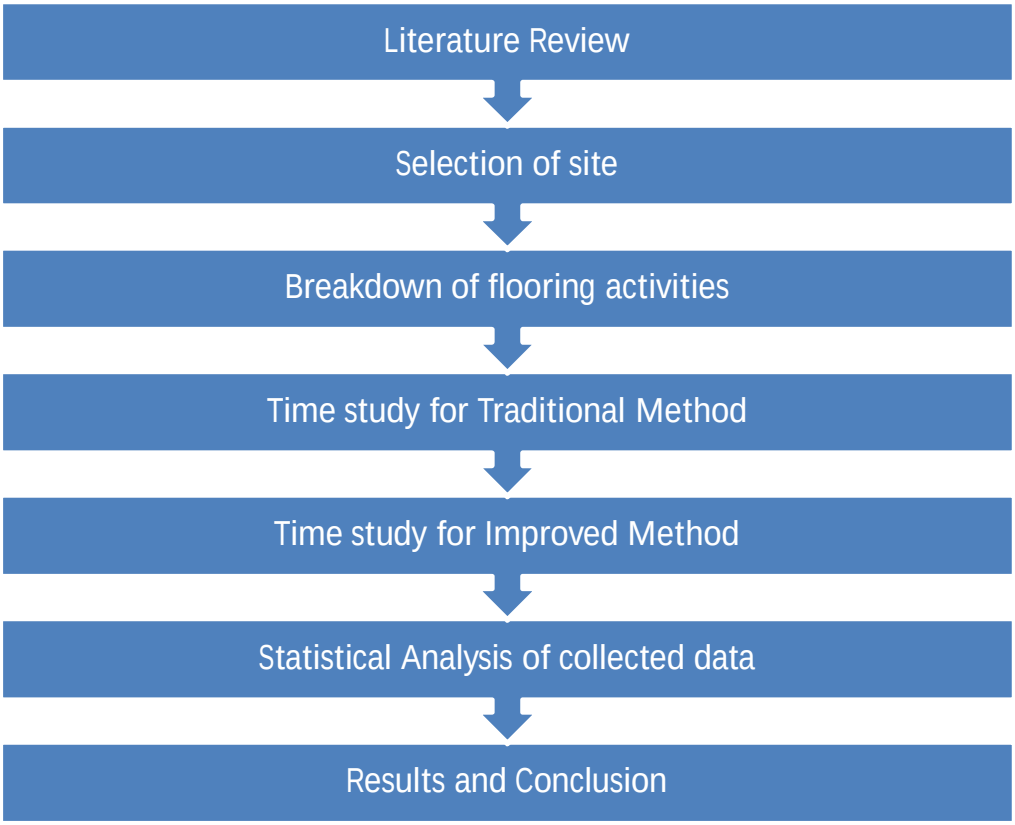
©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

IV. OBJECTIVES

A. Analysis of existing system and identifying the scope of improving the existing system.
B. To study the concept of work study for improvement of productivity.
C. To find the relations between Improved Method and Conventional Method.

V. METHODOLOGY



The Work Breakdown Structure for flooring activity was as follows:

1) *Step (1):* Water Level Marking: In this step, a standard reference mark/indication was drawn at a level of 600mm from floor slab. With the help of long pipe filled with water, points were marked over the entire room with respect to standard mark
2) *Step (2):* Lime Mortar Preparation: After Step 1, required amount of Sand, Lime, Cement and water (Traditional Technique) or Dry mortar, Lime and water (Improved Technique) are transported to the rooms/site. A proper mixture is made, according to the need.
3) *Step (3):* Making of Thiya: A layer of required thickness above the floor slab is made at the corners of rooms or at any intermediate point. Thiya helps to maintain a level of the mixture prepared. Also, thiya help to get any idea of proving any slope required.
   Step (4): Maachan Process: The mixture is now to be spread all over the room. It has to be spread according to thiya layer thickness. The mixture also has to be properly aligned and has to be given a rough finish for the tiles to set properly.
4) *Step (5):* Laying of Tiles: After Maachan is completed, tiles are transported to the room and its laying process is started. Tiles are to be handled properly with care.
5) Traditional Method: This includes the mortar prepared with Cement, Sand, Lime and Water.
6) *Improved Method:* This includes the mortar prepared with readily available Dry Mortar, Lime and Water. The total time was calculated for each of the above process along with the unnecessary time/waste time. Based on the readings, statistical data analysis was carried out which included T-Test, Regression Equation and Correlation Factor.

©IJRASET: All Rights are Reserved

VI. SITE LOCATION

The entire project was performed at the residential building: 'Acme Stadium View'.

1) Location: Building No. 12, Azad Nagar, Off J.P.Road, Behind Apna Bazar, Andheri West, Mumbai 400047.

Fig. 01 Residential Site

VII. OBSERVATIONS AND CALCULATIONS

Table no. 1: Observations for improved method of flooring

				STEP 1: WATER LEVEL MARKING			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	LEVEL MARKING TIME	UNNECESSARY TIME		
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:04:57	0:00:14		
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:03:12	0:00:19		
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:04:59	0:00:28		
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:05:16	0:00:25		
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:02:56	0:00:11		
		53.57		0:21:20	0:01:37		
				STEP 02: LIME MORTAR PREPARTION			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	TIME TO FILL(DRY MORTAR+LIME)	MIXING TIME	WATER MIX	UNNECESSARY TIME
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:50:12	0:17:55	0:05:44	0:06:03
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:16:03	0:10:27	0:04:57	0:06:54
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:27:17	0:09:13	0:05:39	0:01:51
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:13:33	0:03:52	0:08:12	0:04:19
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:06:29	0:03:26	0:02:25	0:01:58
		53.57		1:53:34	0:44:53	0:26:57	0:21:05
				STEP 3: MAKING THIYA			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	MAKING THIYA	UNNECESSARY TIME		
1	LIVING ROOM	23.2	1 MASON	0:09:07	0:00:18		
2	BEDROOM 1	9.91	1 MASON	0:06:10	0:00:33		
3	BEDROOM 2	10.54	1 MASON	0:04:17	0:00:16		
4	KITCHEN	6.75	1 MASON	0:05:46	0:00:53		
5	BATHROOM	3.17	1 MASON	0:02:59	0:00:08		
		53.57		0:28:19	0:02:08		
				STEP 4:MACHAAN			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	SAND LEVELLING	UNNECESSARY TIME		
1	LIVING ROOM	23.2	1 MASON	0:50:52	0:05:15		
2	BEDROOM 1	9.91	1 MASON	0:37:11	0:05:48		
3	BEDROOM 2	10.54	1 MASON	0:34:47	0:06:04		
4	KITCHEN	6.75	1 MASON	0:22:07	0:03:23		
5	BATHROOM	3.17	1 MASON	0:13:29	0:02:09		
		53.57		2:38:26	0:22:39		
				STEP 5: LAYING OF TILES			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	TRANSPORTATION+RETURN TIME	PLACING	UNNECSSARY TIME	
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:04:52	1:38:02	0:07:48	
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:04:35	0:50:21	0:12:59	
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:05:14	0:28:34	0:08:08	
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:06:22	0:22:13	0:03:11	
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:03:17	0:15:39	0:03:33	
		53.57		0:24:20	3:34:49	0:35:39	
			TOTAL TIME	10:32:38			
			UNNECESSARY TIME OBSERVED=	1:23:08			

©IJRASET: All Rights are Reserved

Table no. 2: Observations for traditional method of flooring

				STEP 1: WATER LEVEL MARKING			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	LEVEL MARKING TIME	UNNECESSARY TIME		
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:05:08	0:00:09		
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:03:49	0:00:20		
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:03:09	0:00:17		
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:02:36	0:00:00		
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:03:01	0:00:19		
		53.57		0:17:43	0:01:05		
				STEP 2: LIME MORTAR PREPARTION			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	TIME TO FILL(SAND+CEMENT+ LIME)	MIXING TIME	WATER MIX	UNNECESSARY TIME
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:46:49	0:13:59	0:06:43	0:04:57
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:23:09	0:19:34	0:04:23	0:05:22
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:27:16	0:10:47	0:06:17	0:01:46
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:20:30	0:04:12	0:05:08	0:03:07
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:09:48	0:01:51	0:02:33	0:01:30
		53.57		2:07:32	0:50:23	0:25:04	0:16:42
				STEP 3: MAKING THIYA			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	MAKING THIYA	UNNECSSARY TIME		
1	LIVING ROOM	23.2	1 MASON	0:06:38	0:00:08		
2	BEDROOM 1	9.91	1 MASON	0:05:15	0:00:17		
3	BEDROOM 2	10.54	1 MASON	0:04:27	0:00:30		
4	KITCHEN	6.75	1 MASON	0:04:33	0:00:11		
5	BATHROOM	3.17	1 MASON	0:03:03	0:00:29		
		53.57		0:23:56	0:01:35		
				STEP 4:MACHAAN			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	SAND LEVELLING	UNECESSARY TIME		
1	LIVING ROOM	23.2	1 MASON	0:53:07	0:09:07		
2	BEDROOM 1	9.91	1 MASON	0:34:21	0:07:39		
3	BEDROOM 2	10.54	1 MASON	0:39:52	0:06:04		
4	KITCHEN	6.75	1 MASON	0:25:19	0:04:52		
5	BATHROOM	3.17	1 MASON	0:18:37	0:03:08		
		53.57		2:51:16	0:30:50		
				STEP 5:LAYING OF TILES			
SR.NO.	ROOMS	AREA (m^2)	LABOUR	TRANSPORTATION AND RETURN TIME	PLACING	UNNECESSARY TIME	
1	LIVING ROOM	23.2	1 LABOUR + 1 MASON	0:06:03	1:40:27	0:11:39	
2	BEDROOM 1	9.91	1 LABOUR + 1 MASON	0:04:22	0:38:31	0:12:24	
3	BEDROOM 2	10.54	1 LABOUR + 1 MASON	0:06:37	0:32:44	0:05:57	
4	KITCHEN	6.75	1 LABOUR + 1 MASON	0:05:25	0:28:17	0:03:00	
5	BATHROOM	3.17	1 LABOUR + 1 MASON	0:03:13	0:18:50	0:02:00	
		53.57		0:25:40	3:38:49	0:35:00	
			TOTAL TIME	11:00:23			
			UNNECESSARY TIME OBSERVED=	1:25:12			

A. Improved Method

Table No. 03: Mean time observed for improved method of Flooring.

SR.NO.	PROCESSES	MEAN TIME
1	WATER LEVEL MARKING	0:20:23
2	LIME MORTAR PREPARTION	3:10:12
3	MAKING THIYA	0:36:28
4	MACHAAN	2:37:55
5	LAYING OF TILES	3:42:36

©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

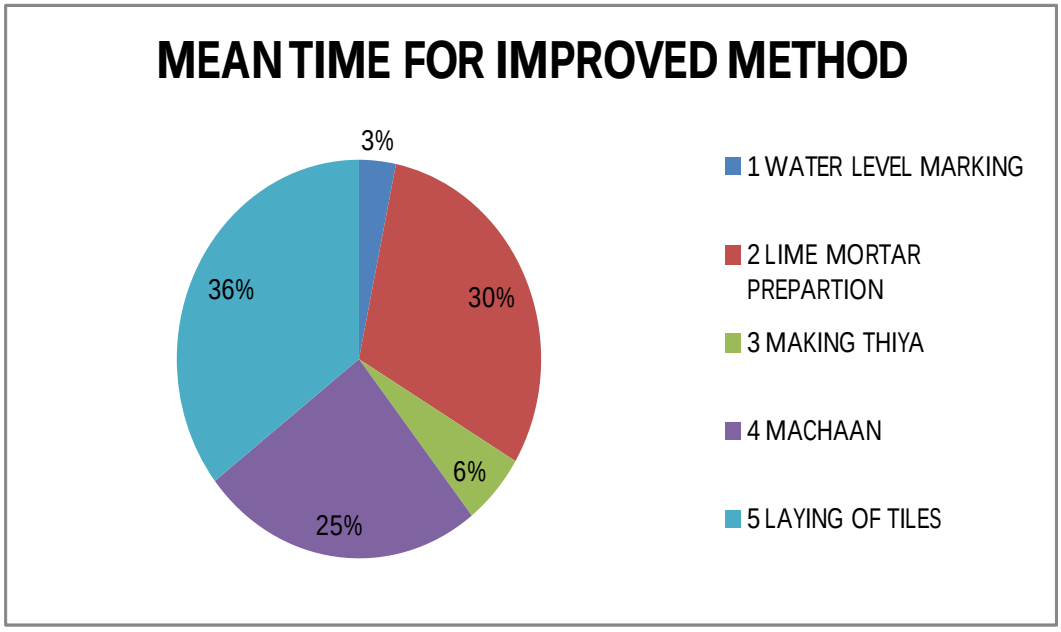


Fig 3: Pie chart for mean time for Improved method

B. Traditional Method

Table No. 04: Mean time observed for Traditional method of Flooring

SR.NO.	PROCESSES	MEAN TIME
1	WATER LEVEL MARKING	0:19:57
2	LIME MORTAR PREPARTION	3:31:48
3	MAKING THIYA	0:25:40
4	MACHAAN	3:00:29
5	LAYING OF TILES	3:49:44

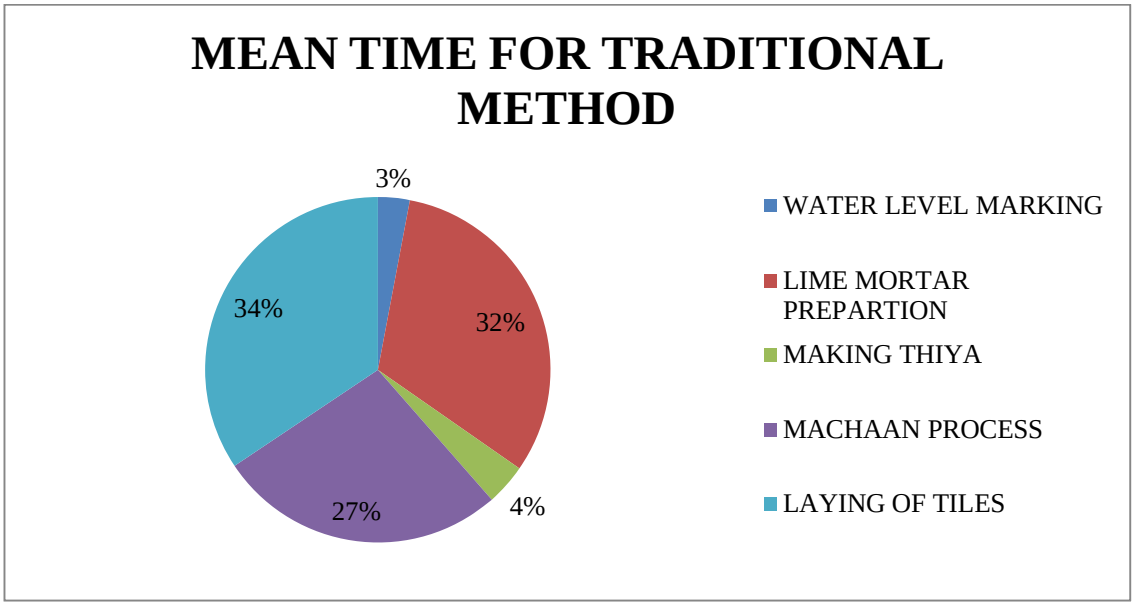


Fig no. 04: Pie chart for mean time for Traditional Method

©IJRASET: All Rights are Reserved

Table No. 04: Statistical calculations for above data (both improved and traditional method of flooring)

Sr.no	Test	Values
1	REGRESSION EQUATION	Y=-0.2535X+13.79266 X- No. of hours for Improved Method Y – Corresponding hours taken by Traditional Method
2	CORRELATION FACTOR	r = -0.214 (This value shows weak relationship between variables)
3	T-TEST	
	SAMPLE SIZE	$N_1 = 5$, $N_2 = 5$ N_1 = Sample size of Improved Method N_2 = Sample size of Traditional Method
	MEANS OF SAMPLES	$\bar{x}$=10.4789 ,$\bar{y}$=11.3161 $\bar{x}$= Mean of Improved Method $\bar{y}$= Mean of Traditional Method
	DEGREE OF FREEDOM	8
	T VALUE (positive value)	9.4655
	T CRITICAL (Tα)	3.3554(FOR D.O.F.=8) (Indicates significant difference between mean)

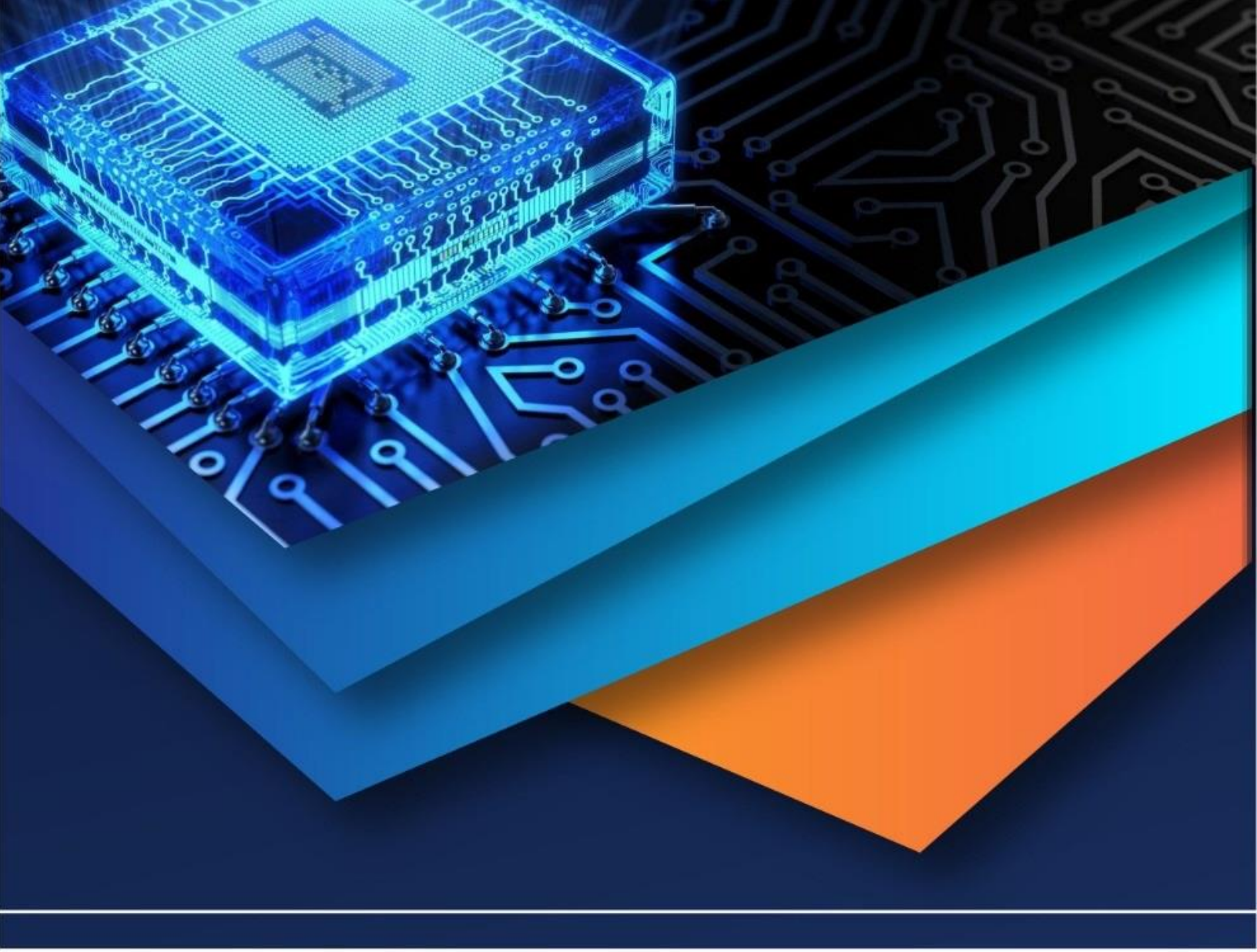
VIII. CONCLUSION

A. Regression equation was established between traditional method and improved method, by using mean, standard deviation etc.
B. By using modern method of approach of flooring, the overall time was reduced to nearly 25-30 minutes, increasing efficiency.
C. The common reasons for delay/unnecessary time were observed:
1) Material shortage
2) Electricity cut-off
3) Equipment breakdown
4) Lack of communication
5) Short breaks
D. Optimum number of workers required for flooring activity is 4-6 workers per flat. This leads to economy and reduction in time.
E. Time and motion study leads to reduction in time and economy, by eliminating errors and incorporating improved techniques.

REFERENCES

[1] Rajshri Shrishirmal, Prof.R.R Salgude,"Time and Motion study of residential site," International Journal of innovative and emerging research in engineering, Vol. 2(6), pp. 2015
[2] Mohd.Razali Muhammad, Wan Mahmood,"Increase in productivity," Productivity improvements through time and motion study," National Conference of Mgmt of Tech. and Tech. Entrepreneurship, pp. 2015
[3] Ankit Vekariya, Ashutosh Kumar,"Review on improvement of workflow and productivity through application of Time and Motion study" I.J.S.R.D. Vol. 2(10), pp. 201
[4] Nishant J Khandve," Productivity Improvements through work study methods," I.J.S.R.D. Vol. 5(4). pp. 2017
[5] Egwunatum Samuel, Oboreh Snapp," Cost model for unit rate pricing of concrete in construction project," I.J.C.E.M, pp. 2015
[6] Jigar H Balar, Hiren A Rathod, Rushabh Shah," Effective time and motion study on Construction Project: A Case on Surat City, I.J.S.R.D Vol . 6(3), pp. 2018
[7] Abdul Talib Bon, Daiyanni Daim, "Time Motion Study in determination of time standard in manpower", Third Conference,2014
[8] Whittaker (Smart Care System), American Institute, 2018
[9] Abdul Talib Bon, Aliza Ariffin, "An Impact on Motion Study on Small Medium Enterprise Organisation", Seminar
[10] Ankit Vekariya, Ashutosh Kumar, "Review on Improvement of Workflow and Productivity through Application of Time and Motion Study Technique", "I.J.S.R.D", Volume 2, Issue 10.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)