The Integration of Application Line of Balance and Six Sigma Methods in Finishing Works at Hotel High Rise Building

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ABSTRACT
Finishing work on high rise building's ratio reaches 30% of the overall cost of development. While in practice, often done in a hurry in order to be resolved within the time planned, this was due to delays in a previous job. Project owners often ask the contractor to accelerate the work in order to reach targets specified the time so that the need for a method that can solve scheduling problems. In this study, the method of integration used a line of balance and six sigma in order to achieve the maximum. Lob a scheduling method used for repetitive building. The application of this method can make efficiency 20% of the time compared with other scheduling methods. Dialakukan validation test to perform alternative 3, wherein the first to use a minimum buffer can make efficiency time by 8.6%, the moderate buffer can make efficiency time by 6.8%, and the maximum buffer can mengefiensikan time amounted to only 0.7% of the duration of the finishing work early. While Six Sigma is used to reduce the defect work results in a hurry due to delays in a previous job. Of NCR gained in the construction of high rise building is obtained a value of 206, which after conversion to a table of six sigma, in the category of Sigma-1 and evaluated DMAIC (Define-Measure-Analyze-Improve-Control) in order to maintain the quality and defect produced.

Keywords *- Line of Balance, Six Sigma, Finishing, High Rise Building*

I. INTRODUCTION

Finishing work on high-rise building projects have a very high risk because of the complexity of the work and the design of tall structures, the weight of a great job, as well as the execution time, takes a long time. In a scheduling system, a project that has a repetitive activity typically use linear balance methods [1]. With this method is felt the most effective and efficient for projects that have a repetitive activity, whether it be horizontal or vertical.

Line of Balance is a simple diagram to show the location and time where the equipment/manpower will work on a particular work item. According to this method can improve efficiency by 20% so that more effcient terms of cost and time [2]. On the other hand, this method prevents fluctuation is very unstable on resources and the quality of the work, which can lead to management becomes uneven [3]. In fact, any work experience crashing

Acceleration of the duration of the project, the quality produced in such work to be not optimal or not as expected in the planning, make defect work will be very high.

The hotel building has a repetition rate which is very large, different scheduling needs of projects other linear and non-linear.

Lob indicates the speed of advancement relations activities to meet performance targets, as media control and monitoring, because it is used to indicate the amount of work that has been completed within a certain time so that the production rate can always be controlled according to the initial plan. This is shown by the lead times [4]. (Sanjaya and Syahrizal 20150)

- Interruptions: termination or suspension of activities within a certain time.
- Restraint: The wait time between the completion of an activity with the start of another activity
- Buffer: The required distance between the two activities. The distance can be a location (buffer location) and time (buffer time).

Advantages of the method are able to know the level of progress of the project per-unit-time on repetitive project scheduling, the calculation is simple and easy to understand visual display. The disadvantage is the dependency relationships between activities that have more than one / diverse that it can slow the duration of the project.

Many find activities that are not needed during the construction process, resulting in waste as a technical error / non-technical, working out of sequence, the activities and movements are repeated, the delay, inputs, and services that do not fit. Six Sigma method capable of

solving problems through the formulation of a problem known as DMAIC (Define, Measure, Analyze, Improve, Control) is a tool that is used to identify problems, analyze, and eliminate sources of variation in a process [5]. Six Sigma aims to help people and processes in order to have high aspirations to deliver products and services that are free of defects or defect [6].

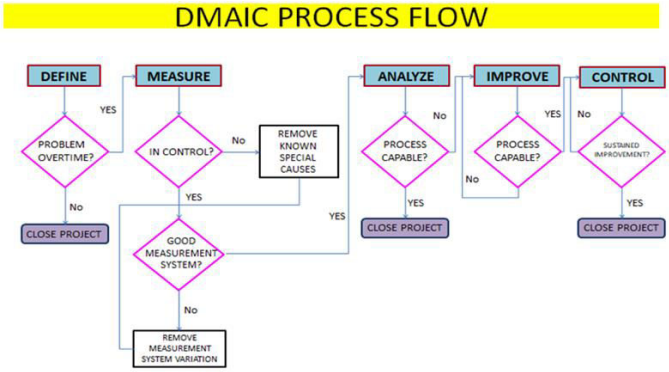

Figure 1. DMAIC process flow
Source: Evans, JR, and Lindsay, WM (2005)

Six Sigma was expecting did not happen defect in the system of comprehensive and flexible Individually controlled through a strong understanding of the facts, data, and statistical analysis, as well as careful attention to managing, improving, and embed business processes [6]. In other words, Six Sigma is a method or technique for controlling and improving the quality of which is a dramatic new breakthrough in the field of quality management.

The term Six Sigma refers to a TQM program with the ability to process very high (up to 99% accuracy). On six sigma quality level provides an indicator of how common abnormalities in activity [7]. Meaning the higher the quality of sigma indicates the process, the less work that resulted in the defect occurs. This method is a continuous effort (continuous improvement Efforts) to decrease the variation of the process in order to improve process capability in delivering products (goods or services) that is free from error (zero defect minimum target of 3.4 Defect Per Milion Opportunities or DPMO) and to delivering value to the customer or the owner (customer value).

II. RESEARCH METHODS

The method used in this thesis is a descriptive-analytical research, namely by making the descriptions in a clear, systematic and detailed information on the facts available, which are then analyzed to obtain the desired facts. The research data was obtained from the distribution of questionnaires to the parties involved or have been involved in finishing tiling work on a high rise building project. Data processing for the results of the questionnaire survey were analyzed using Microsoft Excel 2007 with Relative Important Index (RII) Method. The results will be shown in table form, fishbone diagram based on the variables and the type of analysis used.

The survey questionnaire survey was conducted through offline. In the offline survey, 80 pieces of questionnaires and questionnaires were not returned as much as 15 questionnaires, with a response rate of 81.25%. The results of the analysis of the deployment of questionnaires can be seen that almost all the average value of the factors to be answered quite high.

Percentage of Respondents Position can see as Fig. 2 :

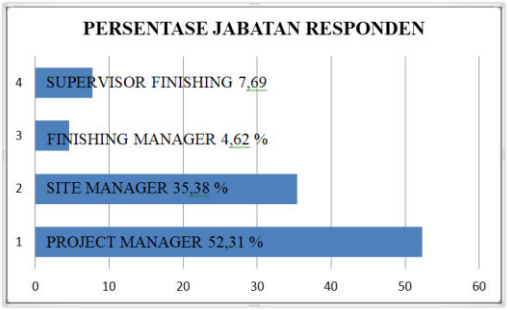

Figure 2. Percentage of Respondents Position

Percentage of Workers Experience can see as Fig. 3:

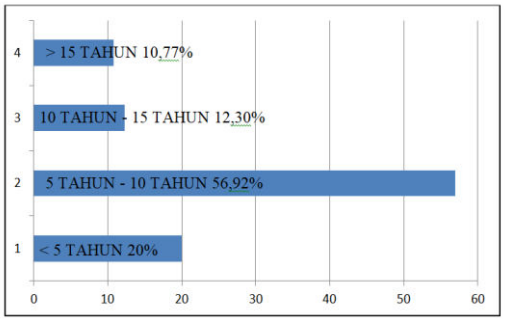

Figure 3. Percentage of Workers Experience

Expected from this statistical data will give a good perception and can be represented in construction projects. Percentage Type Project Who has The Working project at can see as Fig. 4:

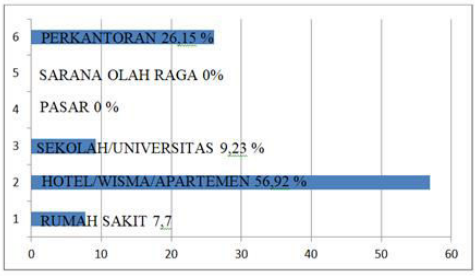

Figure 4. Percentage Type Project

Percentage Type Project Contract as Respondent' Project as shown at Fig. 5 below :

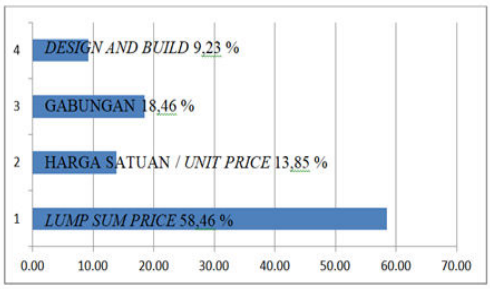

Figure 5. Percentage Type Project

About the type of scheduling used in the course of a project implemented scheduling, the percentage scheduling type used can see Fig. 6 :

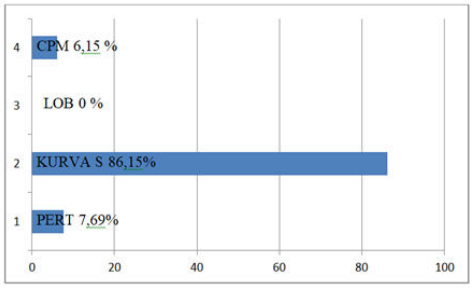

Figure 6. Percentage Scheduling Type Used

In this study, there were 45 (forty-five) factors or variables that affect the scheduling method LOB and Six Sigma in finishing work in building high rise building that has been identified and ranked according to the level created Relative Importance Index (RII). RII all factors are calculated using Microsoft Excel 2010, factors that are grouped into 6 play factors called Planning, Time, Productivity, and Human Resources Management, Design, Materials, and External Factors. Which can be seen in Table 1 below:

Table 1. Main Factors and Sub-Factors Research

MAIN FACTOR	VAR	SUBFACTOR	REFERENCE
plan	X 1	design error	ve et al (2002), Prianto (2012), Riemer (2016)
	X 2	lack of preparation work	odetskaia et al (2011)
	X 3	experience	hir et al (2015), kent et al (2014), sanvido et al (1992),
	X 4	an innovative way of thinking	rduyn 2002
	X 5	details unclear	ve et al (2002), Prianto (2012), doloi et al (2012), Assaf et al (2006)
	X 6	organization structure	oper et al, 2003
	X 7	lack of knowledge about the material	ve et al (2002), Prianto (2012), brodetskaia et al (2011)
Supervisory and Managerial	X 8	schedule is too dense	ve et al (2002), Prianto (2012)
	X 9	lack of control	ve et al (2002), Prianto (2012), brodetskaia et al (2011), Islam et al (2013)
	X 10	lack of teamwork	ve et al (2002), Prianto (2012), brodetskaia et al (2011)
	X 11	lack of information in the field	ve et al (2002), Prianto (2012)
	X 12	material misdirected	ve et al (2002), Prianto (2012)
	X 13	lack of anticipation natural conditions	di et al (2005)
	X 14	delays in the delivery time of materials	ve et al (2002), Prianto (2012), Kim et al (2011)
	X 15	the poor flow of information	ve et al (2002), Prianto (2012)
	X 16	wrong decision	ve et al (2002), Prianto (2012)
	X 17	lack of customer satisfaction	odetskaia et al (2011)
productivity	X 18	human resource capacity	oni et al (2016)
	X 19	Daily construction volume	dukale et al (2014),
	X 20	the availability of resources available	dukale et al (2014),
	X 21	work performance subcon	anfield et al (1994), (Kumaraswamy and Chan (1998), yogeswaran et al (1998)
	X 22	conflicts within the project team	s and jha (2005), Kumaraswamy and Chan (1998) kartam et al (2000), al-Momani (2000)
	X 23	supplier performance in supplying material	anfield et al (1994), (Kumaraswamy and Chan (1998), yogeswaran et al (1998)
	X 24	flow of material resources	an rodriguez (2017), toshniwal (2016)
	X 25	working position	ent, phie, Limanto, & kusuma, 2013)
	X 26	poor quality of project control	ushki et al (2005), arditi et al (1985), kartam et al (2000)
	X 27	maximize the use of resources (tools, material, and human	ekar (2014)
Time	X 28	determination of the duration of the job do not match	akwa and cuplin (1990), kaming et al (1997), Assaf et al (1995), chang (2002), mansfield et al (1994), Kumaraswamy and Chan (1998), ogunlana et al (1996), Frimpong et al (2003)
	X 29	the complexity of the job	bu (1998), kaming et al (1997), Baloi and price (2003)
	X 30	the waiting time to a minimum	ekar (2014)
	X 31	delays in previous work	ahrizal (2015), (Hinze, 2010)
	X 32	top management commitment and dukunganan	nco et al (2010), psychogios et al (2008), Henderson et al (2000), antony (2007), aboelmaged (2010), zu et al (2008), psycholologios et al (2008)
	X 33	risks of the project	bu (1998), Flyvbjerg et al (2003), Baloi and price (2003)
Management and Human Resources	X 34	the lack of availability of skilled labor and qualified	giharto alwi 2002
	X 35	zero defect mentality	ad et al (2006)
	X 36	focus on customer satisfaction	ndholm et al (2002), psychogios et al (2008), Henderson et al (2000), antony (2007), taner (2008)
Cost Design, Materials and External Factors	X 37	lack of quality in the field of documentation	giharto alwi 2002
	X 38	specifications are not clear	giharto alwi 2002
	X 39	delays shopdrawing	giharto alwi 2002
	X 40	design changes	giharto alwi, (2002), van et al (2010)
	X 41	delays in delivery of materials	giharto alwi (2002), van et al (2010)
	X 42	lack of proper materials	giharto alwi (2002)
	X 43	material storage warehouse unfavorable	giharto alwi (2002)
	X 44	ordering materials that are not in accordance with the contract documents	n et al (2010)
	X 45	environmental conditions	Sugiharto alwi (2002)

2.1. Validity test

In testing the validity of theThere are 74 (seventy-four) items influential variable in the application integration methods Line of Balance and Six Sigma in finishing work in building high rise building. Of the 74 (seventy-four) of these variables was reduced to 45 variables are used as an indicator to determine the time and quality of work performance. Which is then validated the results so it is believed that the items in question in this research instrument is a valid result.

2.2. Test Reliability

Reliability indicates an understanding that an instrument is credible and reliable, using Alpha Cornbach analysis, A questionnaire is considered reliable if Cornbach Alpha coefficients greater than or equal to 0.6 [8].

Test Reliability instrument in this study were performed using the Microsoft Excel conducted to 65 (sixty-five) respondents were deployed. Reliability The trial was carried out only one time by calculating the alpha r> (greater) than r table. R value table N = 65 with a significance level of 5% or 0,005 is 0,244.

2.3. Relative Analysis of Important Index (RII)

RII is a quantitative analysis allows a relative, where the higher the ranking (rating) the greater the influence exerted by variables held [9].

Ranked factors that are key to success in finishing tiling work on a high-rise building projects carried out by using RII analysis to find out the views of each party who are or have been involved in finishing work in high rise building.

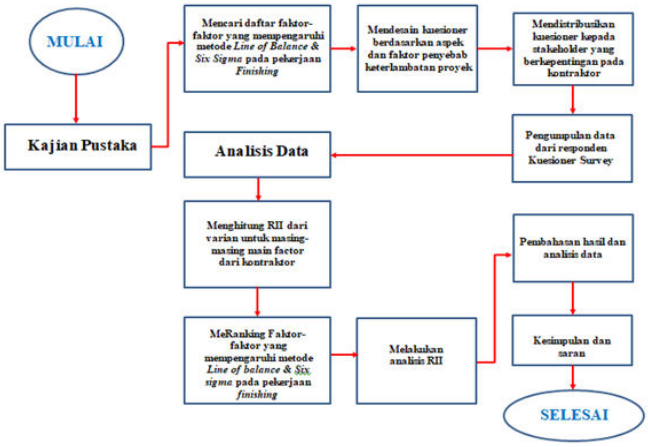

Figure 7. Flowchart RII
Source: Adi, 2014

Important Relative Calculation Index (RII) of the influencing factors in the application integration line method of balance and six sigma in finishing work in building high rise building by the main groups of factors, so these calculations obtained from the most dominant variable.

In this research grouping based on several factors that play into the points in the study and ranked as shown in Table 2 below:

Table 2. Rank of Main Factor

No	*MAIN FACTOR*	JUMLAH SUBFACTOR	TOTAL NILAI RII	*MEAN*
1	Plan	7	5,535	0,79071
2	Design, material, and external factor	9	6,572	0,73022
3	Supervisory and Managerial	10	7,068	0,70680
4	Time	6	4,182	0,69700
5	Produktifitas	10	6,714	0,67140
6	Management and Human Resources	3	1,997	0,66567

III. RESULTS AND DISCUSSION

3.1. Validation Case Studies

Primary data in this research project were used for validation testing is a case study of the construction project Hotel consisting of 18 floors each of its floors there are 13 units of hotel rooms and one of his other tower consists of 18 floors and each floor consisting of 20 units of its rooms.

3.2. Line Of Balance Validation

In this research, authors will examine the finishing work on the tower Yello and applied to the finishing work and only the repetitive tasks that can be scheduled by the method of the LOB. Before making the first created diagram lob logical relationship of dependence of the activity package. Network diagram of a typical package of activities on each floor, as shown below:

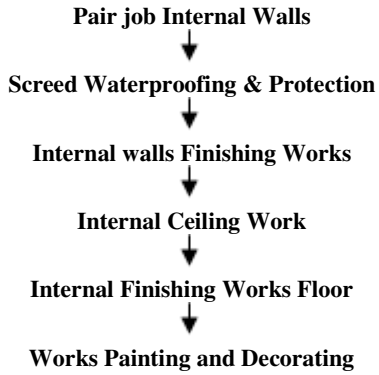

Figure 8. Finishing Work On Building Hotel

After the Start and Finish time of 18 jobs overall employment package wall in the package Finishing the total duration is 17 days/floor multiplied by 18 floors (total of all floor) = 306 days. As for the overall duration of a total duration of 18 floors and 6 Finishing work items.

Seen from the table 4:25 where the duration of each job varies the jobs that follow (successor) faster scheduled from the end of the work that precedes (predecessor) then uses logic dependence finish to finish, whereas when the successor slower scheduled after the first cycle of work items that precede (predecessor) is completed then uses logic dependency Start to Start, for example work water stop and screed protection is a job that follows the (successor) which is faster than the predecessor it is the installation work of internal walls on the day to 306 so that the work of waterproofing and screed protection will expire after 13 days and then cycle or on day 234.

Table 3. LOB Schedule on the project Hotel

PACKAGE LIST OF EACH FLOOR TYPICAL JOB					
NO	ACTIVITY	JOBS PER CYCLE DURATION (days)	DURATION TOTAL (18 FLOOR)	START PACKAGE	FINISH PACKAGE
1	Wall work	17	306	0	306
2	waterproofing job	13	234	85	319
3	Finishing the job floor	17	306	98	404
4	Internal walls Finishing Works	17	306	115	421
5	Internal Ceiling Work	12	216	217	433
6	Works Painting and Decorating	17	306	229	535

Table 3 in the above are table calculations, estimated time of completion for the first floor is on day 200, which is the time of completion of the first cycle in the waterproofing work package (85 + 13 days). Delivery rates for each subsequent floor is every 13 days thereafter. So the total duration of the project completion time is 234 days. The diagram shown in Figure 9

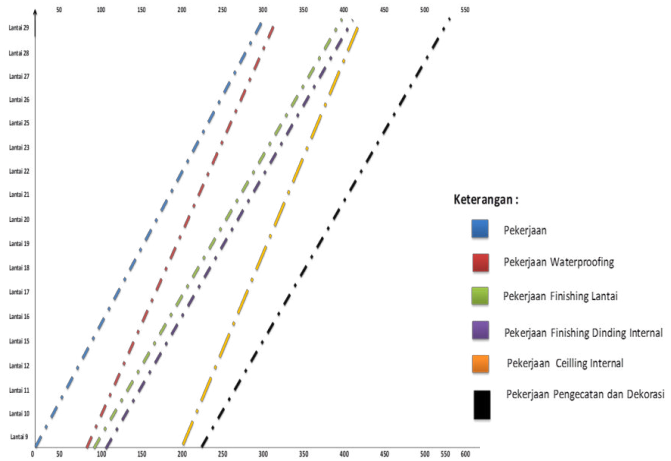

Figure 9. Diagram lob Finishing Works

From the diagram above lob figure 9 no jobs are colliding or becoming konfik between jobs but there is a buffer time or waiting time is relatively long so that the necessary improvement in duration, in order to get the duration of more effective and efficient. In this study, the authors try to make improvements with 2 alternative improvements with minimal buffer time or waiting time job.

The following fixes Such LOB Project:

- alternative 1

In the first alternative, researchers are trying to reduce the duration only on the walls and on the job

The job minus 2 days of normal duration

Table 4. LOB Schedule after the buffer time is shortened (Buffer moderate)

PACKAGE LIST OF EACH FLOOR TYPICAL JOB				
ACTIVITY	PERSIKLUS DURATION OF WORK (days)	DURATION TOTAL (18 FLOOR)	START PACKAGE	FINISH PACKAGE
Wall work	15	270	0	270
Waterproofing	13	234	49	283
Finishing Works Floor	17	306	62	368
Internal walls Finishing Works	17	306	79	385
Internal Ceiling Work	12	216	181	397
Works Painting and Decorating	17	306	193	499

Based on the calculation of Table 4 above, in this study, the authors tried to estimate completion time to work on reducing the wall two days, from the beginning (in table 4) 17 days to 15 days. The duration of the reduction calculation. The total duration of the finishing work is

499 days. Figure 10 is a diagram or chart lob a result of the reduction in the duration of the partition wall work.

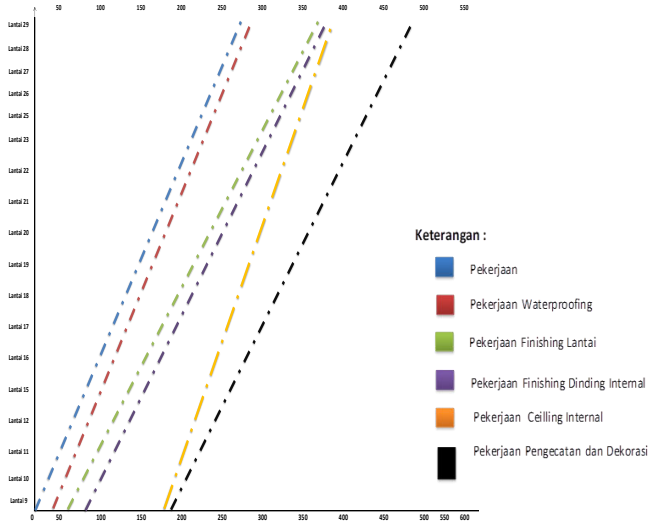

Figure 10. Diagram lob Finishing Work with moderate buffer

In the graph 10 it can be seen that on the job finishing wall and ceiling work still has a buffer time or waiting time is large enough, the researchers tried to reduce the second alternative.

- alternative 2

In the second alternative, researchers are trying still to reduce the duration of work on the wall as an alternative 1, but add a duration for ceiling work as many as five (5) days of each work cycle. Because once analysis of the graph lob after the alternative 1 can be seen still no buffer time or waiting time is still very long in employment wall finishing internal and ceiling, and because of the work of the ceiling has a duration which is smaller than the work of finishing the wall so that the start time of the job calculated from the time the work was completed in the employment ceiling predecessor plus its duration so that the calculation of the job start is calculated from the start of work predecessor plus the total number of ceiling work cycle duration.

Table 6. LOB Schedule after the buffer time is shortened (Buffer minimal)

PACKAGE LIST OF EACH FLOOR TYPICAL JOB					
NO	**ACTIVITY**	**JOBS PER CYCLE DURATION (days)**	**DURATION TOTAL (18 FLOOR)**	**START PACK AGE**	**FINISH PACK AGE**
1	Wall work	17-2 = 15	270	0	270
2	waterproofing job	13	234	49	283
3	Finishing the job floor	17	306	62	368
4	Internal walls Finishing Works	17	306	79	385
5	Internal Ceiling Work	12 + 5 = 17	306	96	402
6	Works Painting and Decorating	17	306	113	**419**

Based on the calculation table 6 above, can be estimated completion time by subtraction and addition of appropriate duration at several work items can shorten the duration of the buffer time or waiting time, which will mengefiesiensikan use of resources. Just by adding the duration of the employment ceiling for 5 days, can be obtained total time duration finished better than alternative 1. Due to add a duration of 5 days in the ceiling work, the work duration successor be equal to the duration of employment predecessornya, which means jobs successor can be started from the start of work package predecessor plus the duration of the work cycles predecessor, which makes the waiting time or buffer time will be reduced, and will make the total duration becomes shorter.

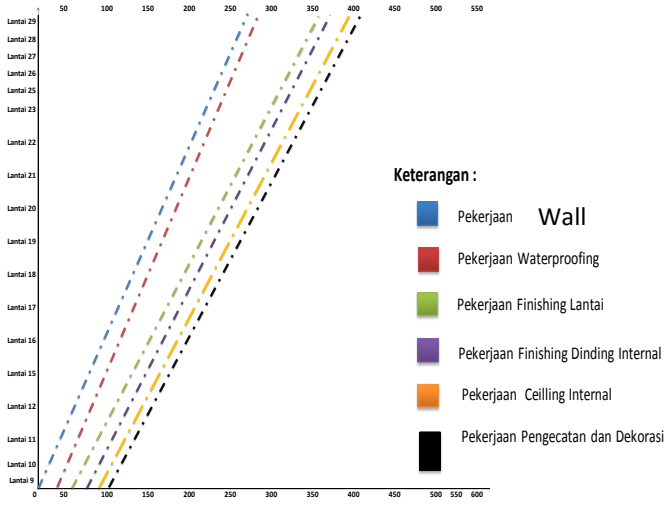

Figure 11. Diagram LOB Finishing Works with alternative 2 (minimum buffer)

From the results of the application of scheduling line of balance that has been done, can create a logical thinking of the line of balance scheduling method :

- In the application line of balance, there should be no jobs are colliding or conflicting with one another.
- Jobs successor may not be completed before the job is finished predecessor.
- If the duration of the work cycles successor smaller than the duration of one cycle presecessor job, then the successor job should start from the finish predecessor jobs package plus the duration of the work cycles successor.
- If the duration of one cycle successor job is greater than or equal to the duration of one cycle predecessornya job, then the successor job can be started from the start of work package predecessor plus the duration of the work cycles predecessor.

3.3. Validation Application of Six Sigma

Six Sigma is a very precise method used by companies that have problems of waste at the same defect, this method is very powerful to handle such problems [10]. This Research will use the method Six Sigma and will be integrated into the methodology DMAIC

Although an ideal governance structure should improve the production efficiency and, at the same time, economize on the relevant transaction costs, different governance mechanisms often present different trade-offs between benefits and costs [11]. To determine the total value of the defect and total employment of the possibility of defects in any checking work (Defect per millon opportunities) can be seen in Figure 12 below

IV. EVALUATION RESULT

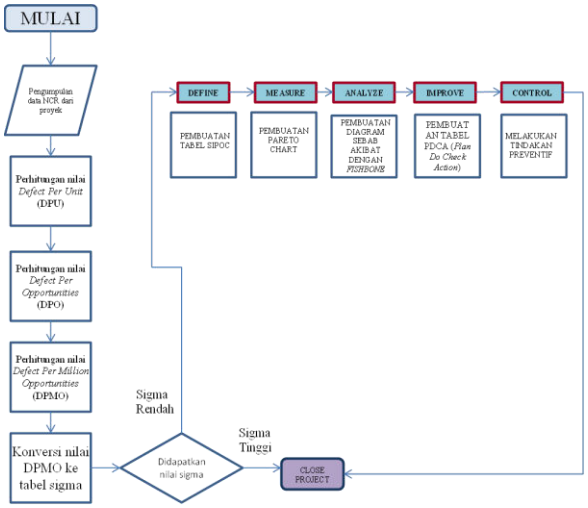

Figure 12. Flowchart Application of Six Sigma

In penelitiaan the application of six sigma method is the project the Development Harris Yello where the project consists of two towers, each tower consists of 18 floors, in this case study that will be examined is the Tower Yello, each floor consisting of 20 units to be handed over to the owner after the checklist. From the checklist is done along with the owner, managed to find the findings of the work that has the quality that is not in accordance with the target, following the results of defect as outlined in the table Non Confermance Report (NCR) on the checks carried out between the contractor and the owner. Find the value of DPMO :

Defect per opportunities fatherly ceiling work glombang:

DPU = D/(U)

DPO = DPU/(O)

DPMO = DPO x 1000000

Where :

U = unit

OP = Opportunities

D = defect

DPU = Defect per Unit

DPO = Defect per Opportunieties

DPMO = Defect Per Million Opportunities

Given:

Amount Defect of NCR = 206 (D)

total Opportunities = 12 (O)

floors = 18 (U)

Number of Units perlantai = 20 units

Asked: DPMO?

DPU = D/(U) = 206/(18) =11.4 Defects per floor

DPU represents the average defect generated on each floor

DPO = DPU/(O) = 11.4/((12 x 18 x 20)) = 0.002638 Defect per opportunity

DPMO = 0.002638 x 1,000,000 = 2,638.88

Sigma of the data shown in the above table for the resulting defect finishing work with a value equivalent to 4.29 2,638.88 DPMO sigma with 99.56% yield following table sigma value.

Table 4:33 Table Relations Sigma and DPMO

SIGMA	***PARTS PER MILLION***
6 Sigma	3.4 defects per million
5 Sigma	233 defects per million
4 Sigma	**6,210 defects per million**
3 Sigma	66 807 defects per million
2 Sigma	308 537 defects per million
1 Sigma	690,000 defects per million

From the table 4:33 sigma value can be concluded that the construction project Hotel Yello has a value of disability and the possibility of his disability on the job a very high impact on the resignation of the target completion of the project, then in the way the writer uses the six sigma method to work the walls, floor and ceiling, where the stages of improving the quality of his work is to apply the DMAIC evaluation as follows:

1. DEFINE

Define an initial step in the method six sigma, This stage is the stage to identify the product, the desire product owner for the best results of each job, and penentuaan the existing problems in the development of hotel projects Yello wherein the process include:

- Selection of projects will dilakuakan the research object is the Tower Hotel Yello
- Selection of occupations studied are finishing work in this regard is the work of the wall, the work floor, and ceiling work.
- Identifying sehinggan owner wishes to know what the standard of quality of work in order to get maximum results.
- Develop project character to describe a project that includes the problems, goals, benefits, limitations, assumptions, scope of project members and the project plan.
- Create table SIPOC (Supplier, input, process, output and customer), every job and can be seen in Table 4:34, 4:35, 4:36, 4:37
- Make a flow diagram that is useful to identify the steps in the process of activity.

2. MEASURE

Measure is a stage to measure the quality resulting from any work, identify the work that refers to CTQ (Critical to quality).

With a Pareto chart, enables us to focus on factors in fixing defects that often occur with the job well. Pareto diagram can address the issue:

- Can know the work item defects that often occur in the project.
- Can find out the root cause of the defect.
- Give focus to the construction team to reduce the defect jobs.

A creative and innovative effort is needed in planning so that it can provide significant added value to the project [12].

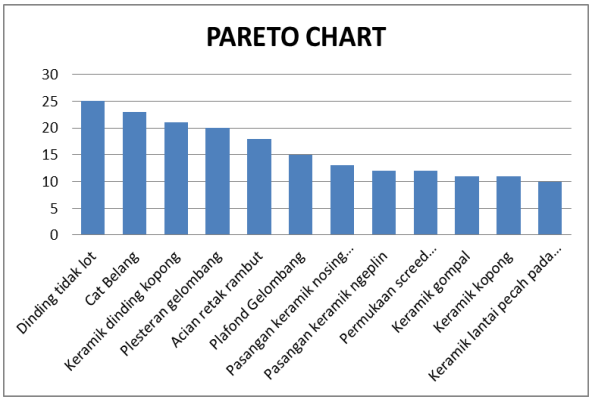

Figure 15. Pareto chart

From Fig.15 found the number of the most common defect is wall walls were not a lot of work, paint stripes, ceramic hollow wall, stucco bumpy, and so on.

3. ANALYZE

To analyze the cause of the defect using fishbone diagrams or charts ishikawa

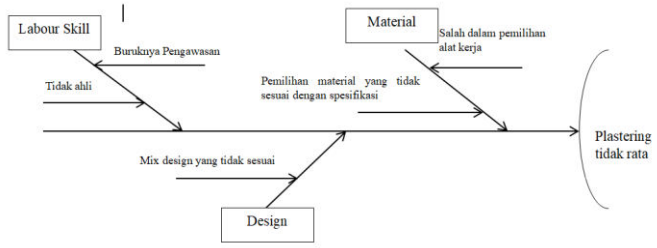

Figure 16. Fishbone diagram plastering work

Fig. 16 a fishbone diagram drawing of work plestering wall, which can be seen that the defect-defect generated in plestering work caused by several factors: workers' skills problems caused by poor supervision on the job and lack of workers in doing the job ahlian plestering. Then the material problems caused by errors in the selection of work tools, as well as the selection of materials that do not conform with the specifications used so that the quality of the work was not up to standard. And design issues are caused due to improper mix design.

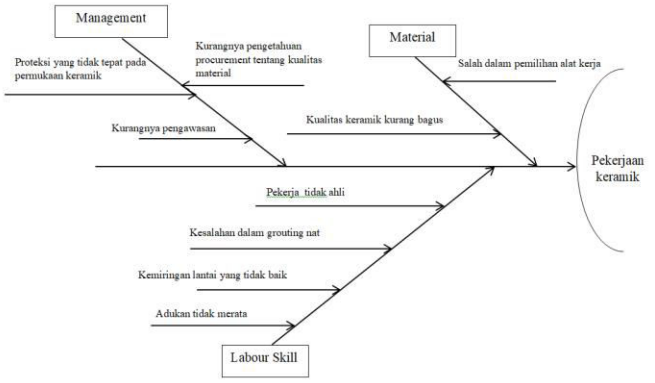

Figure 17. Fishbone diagrams of ceramic work

In Fig. 17 on a fishbone diagram of the work of ceramic, which can be seen that the defect-defect generated in the work of ceramics is due to several factors: management problems caused by lack of knowledge of procurement on the quality of materials, protection ceramic surface that is not appropriate, and lack of supervision on the job. Then the problem is an error in the selection of material working tools, and the selection of a ceramic material that is less good quality. And the issue of workers' skills in doing similar work as mortar pair uneven, the slope of the floor that is not good, the error in the application of grout grouting, and unskilled workers.

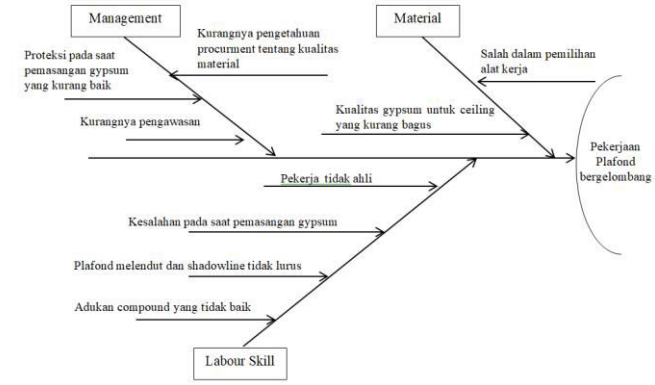

Figure 18. Fishbone diagram ceiling work

In the drawing 4:18 on a fishbone diagram of the job ceiling, which can be seen that the defect-defect generated in the work of the ceiling is due to several factors: management problems caused by lack of knowledge of procurement to quality materials, protective surface gypsum is not appropriate, and lack of supervision on the job. Then the problem is an error in the selection of material working tools, and material selection are not good quality gypsum. And the issue of workers' skills in doing similar work as mortar compound is uneven, an error in the installation of gypsum, ceiling sagging and installation shadowline are not straight, and workers who are not experts in the installation of the ceiling.

4. IMPROVE

At this stage the proposals will be given (brainstorming), with this proposal are expected to enter the project team, what can be done to make the work better, by doing the PDCA (Plan Do, Check, Action). So that defects can be reduced over the job.

5. CONTROL

In the phase control will help us to make observations back if after application of its improvement of the quality of the work can reduce the value of defect work, to examine preventive measures to check against the repair work is carried out as a control plan checklist.

IV. CONCLUSION

A Based on the results of research on the application of methods Line of Balance and Six Sigma in high-rise buildings finishing work that has been carried out and analyzed can be summarized as follows:

1. Penerapan line of balance and six sigma in finishing work building high-rise buildings can be seen in figure drawing flow chart 4:18.
2. From a statistical analysis, obtained 10 (Ten) the factors that most influence in the implementation of integration methods Line of Balance and Six Sigma on the finishing work are all factors that must be considered is the company's experience in doing similar work is a factor which has the highest index values are: 1. How innovative thinking, 2. design error, 3. the company's experience, 4. design changes, 5. delay shop drawings, 6. Details are not clear, 7. the specifications are not clear, 8 . materials that are less precise, 9. lack of control, 10. the time delay of delivery of materials
3. With regard tenth the factors that most influence the LOB application and Six Sigma, later carried out a validation test to obtain the efficiency of the finishing work on high-rise buildings with the results :
   - In the validation lob researchers conducted tests with 2 alternate with moderate buffer time with a total time of 499 days from 535 days total time difference of 36 days. Minimum buffer with a total time of 419 days out of 535 days total time difference of 116 days.

- For the application of six sigma, from NCR value of 206, the data for defect generated sigma finishing work with a value equivalent to 4.29 2,638.88 DPMO sigma. And after that was done the evaluation by using evaluation DMAIC (Define, Measure, Analyze, Improve, and Control) in order to reduce the defect of existing jobs (reducing the number of NCR) with the rising value of the parameter sigma.

4. From the research that has been done, it can be concluded that the application of the method line of balance and Six Sigma can improve the performance and quality of time at work finishing high-rise buildings in accordance hypothesis.

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