The Influence of Layout Planning and Quality Control to the Factory Productivity in Gajah Tunggal, Ltd Plant-A, Tangerang (Case study: Gajah Tunggal, Ltd.)

Review of Integrative Business & Economics Research

Tukhas Shilul Imaroh
Mercubuana University

Agil Tri Prastya
Mercubuana University

ABSTRACT

The increasing competition requires companies to perform efficiently and have strong quality control. This research was conducted to test and to analyze the significance of the layout effect on productivity as well as to examine and to elaborate the significance of the effect of quality control on productivity. The samples were 150 employees with non-probability sampling technique with using convenience sampling technique. Data were analyzed in structural equation model (SEM) by assessing the measurement model, through a confirmatory factor analysis (CFA) by testing validity and reliability of the latent construct and then continued by structural model evaluation. The results show that the layout significantly influences the productivity variables and that quality control significantly influences productivity.

Keywords: Layout, Quality control, and Productivity.

1. INTRODUCTION

Industrial companies concerns to the production process and quality control when the production process takes place. This becomes essential because the level of productivity will be better if quality control is noticed and to be improved. In mid-2016, Gajah Tunggal,ltd has the the largest tire production in Southeast Asia in where productivities decrease and target is not reached. This is caused by many products that not accordance to the production standards, a defect in the product and inefficiency of the layout production. The Competition in the rubber tire industry continues to increase along with the increasing number of motor vehicle users as well as the growing number of rubber tire businesses, This condition impact to the profitability of the company.

Therefore, Gajah Tunggal,Ltd should maintain the quality of product as the basis to raise profitability.

In this study formulated the problems of research are how does the layout and quality control having significantly effects on productivity

The objectives of the research are testing and analyzing the significance of the layout and quality control effects on productivity.

The contributions that can be given such us it can be applied in real practice about strategies to improve the productivities and better quality. In addition, this study can serve as a basis for further or similar research and more in-depth research.

2. LITERATURE REVIEW

Layout is all the effort to set the room in such a way that support the productivity of the organization (Ahmad,2007). According to Haming and Nurnajamudin (2014) layout is one

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

of the operational strategic decisions that also determine the efficiency of the company's operations in the long term. A layout that can indicate the features of the layout of the operational facility's layout with the type of product or service produced, and the conversion process. A good layout will contribute to improving the company's productivities. Layout planning and modification are always required in every company. The need to modify is caused by the following factors of (1) product design changing (2) demand volume changing, (3) possibility replacement facilities to be absolutely new look, (4) new product addition (5) existence of unsatisfactory work environment condition (6) risk work accidents in production process (7) cost savings, (8) support shifting / expanding market location of company products.

Russell and Taylor in Murdifin Haming and Mahfud Nurnajamudin (2014), the purpose of the layout is to minimize material handling costs, improve the efficiency of space utilization, increase the efficiency of factory labor, reduce process constraints, and facilitate communication between workers, workers with supervisor and workers with company customers.

Quality according to Gaspers (2007) is anything that is able to fulfill the expections or customer needed. Quality control is the techniques and operational activities used to be the quality requirements. Quality control involves the following activities (1) evaluating actual performance, (2) comparing actual with target (3)taking action on the difference between actual and target.

The needs of customers are always growing day by day, resulting in demands on the quality of goods is also changing. This requires the company as a producer of goods or services always make various improvements continuously. In accordance with aspects of the development of customer needs.

Heizer and Render (2011), productivity is the ratio of results of goods and services divided by enter of resources such as labor and capital . The process of making goods and services requires the conversion of resources into goods and services. The more efficient we make this transformation, the more productivity will be and the added value added into the goods or services provided.

Increased productivity can be achieved in two ways: reduction of input while keeping output constant or increasing output while keeping the input constant. Both reflect increased productivity. From an economic point of view, the inputs are labor, capital, and management that are integrated into a production system. Management creates a production system that produces a transformation process from input to output.

Based on the theoretical basis that has been discussed previously concerning the effect of layout and quality control on productivity, then can be prepared a framework of theoretical thinking and can be described below :

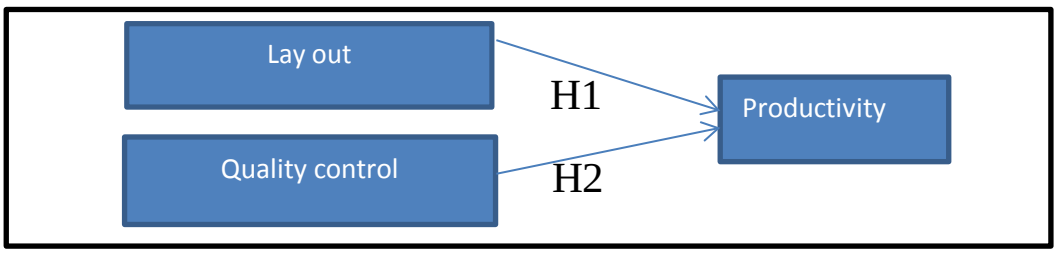


Figure 1. Research Framework

The theoretical framework presented above illustrates that productivity is strongly influenced by the layout and quality control.

Hypothesis

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Based on literature review and research framework, then formulated hypothesis is:
H1: Layout has significantly influence on productivity.
H2: Quality control has significantly influence on productivity

3. METHOD

The study used survey method with population of all employees of Gajah Tunggal,Ltd, Plant-A, Jatake – Tangerang. The sample of research are 150 employees. This research used non-probability sampling technique which presented with convenience sampling technique. The data analysis was done in SEM analysis and linear structural relationship (LISREL) model, then evaluated the measurement model by confirmatory factor analysis (CFA) by testing the validity and reliability of the latent construct then followed by SEM. Overall by assessing the feasibility of the model through the criteria of goodness of fit.

Table 1. Estimation Technique Model

Considerations	Selected Techniques	Remarks
100-200 sample size and normality assumptions are met	*Maximum likelihood* (ML	ULS and SLS usually do not generate chi-square test , because it does not attract the attention of researchers
200-500 sample size and normality assumptions are met	Maximum likelihood (ML) and Generalized Least square (GLS)	When the sample size is less than 500 , the result of GLS is quite good
Sample size > 2500 and the assumption of normality is less filled	*Asymptotically Distribution Free (ADF)*	ADF is less suitable when the sample size is less than 2500

4. RESULT AND DISCUSSION

Gajah Tunggal,Ltd is the largest rubber tire manufacturer in Southeast Asia, producing and distributing high quality rubber tires for passenger cars, SUV's / light trucks, off-road, industries and motorcycles. It also manufactures and distributes other related rubber products such as synthetic rubber, tire yarn, inner tube, flap, o-ring and more. In 2010, the company undertook the development of TBR rubber tire production capability which aims to meet the needs of the rubber tire market at domestic and foreign.
Characteristics of respondents by age:

Table 2. Characteristics of Rrespondents by Age

Old (Year)		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-25	16	10.7	10.7	10.7
	26-30	69	46.0	46.0	56.7
	31-40	47	31.3	31.3	88.0
	≥ 41	18	12.0	12.0	100.0
	Total	150	100.0	100.0	

Source: Pprocessing Result with SPSS 20 program

Validity Test of Variables

Data processing, tested fit model of measurement for each research variable. Using factor analysis model with standardize loading factor (SLF) value, valid if it has SLF value higher

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

than 0,50. SEM is using LISREL 8.8 program. The results of fit test of measurement model for each research variable are shown as follows:

Layout Variables

In this test, three indicators were observed about the tested layout variables, by obtaining Chi-square results = 0.00, df = 0, P-value = 1,00000 and RMSEA = 0.000.

Test validity of layout variables

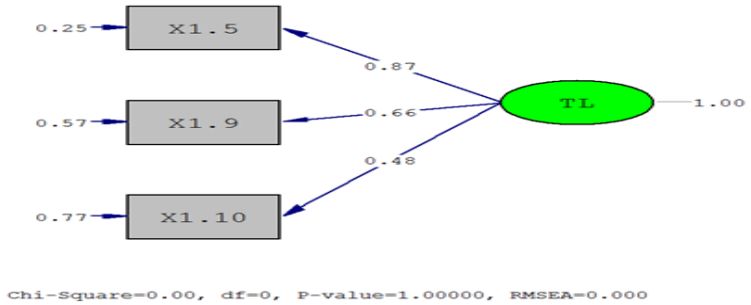


Figure 2. Variable of Layout Measurement Model
Source: Processing Result with LISREL 8.8 program

Based on validity test with confirmatory factor analysis, in SEM, there are observed indicator that have value of SLF $\geq$ 0,50 ie X1.5, X1.9 so that model observed was valid.

Quality Control Variables

In this test,3 indicators are observed about the quality control variables that have been tested, by obtaining the results Chi-square = 0.00, df = 0, P-value = 1.00000 and RMSEA = 0.000.

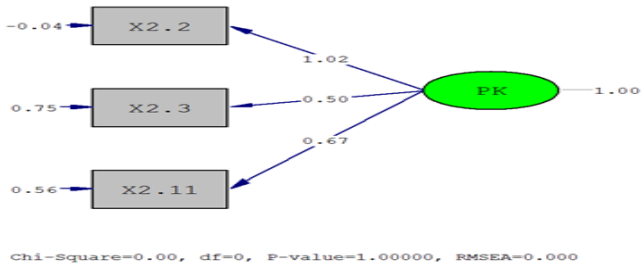


Figure 3 Measurement Model of Quality Control Variables
Source: Processing Result with LISREL 8.8 program

Validity test with confirmatory factor analysis of three observed indicators included in SEM, there are observed indicator that have value of SLF $\geq$ 0,50 that is X2.2, X2.3, X2.11 so that model observed was valid.

Productivity Variable

In this test seven indicators of productivity variables that have been tested, by obtaining Chi-square results = 73.52, df = 14, P-value = 0.00000 and RMSEA = 0.169.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

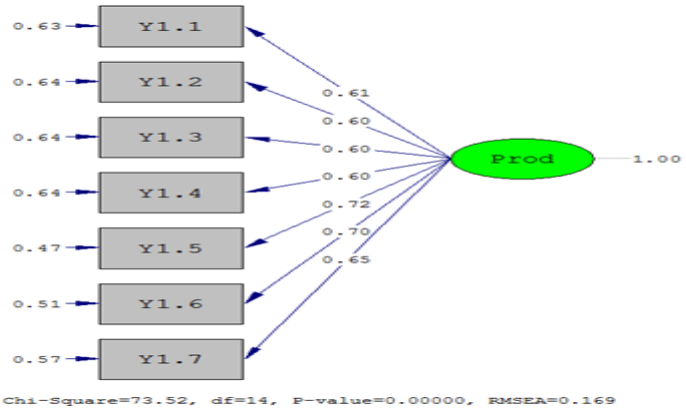


Figure 4 Variable Production Measurement Model
Source: Data Processing Result with LISREL 8.88 program

Validity test with confirmatory factor analysis of seven indicators observed including in SEM, there are observed indicators that have value of Standardize Loading Factor ≥ 0,50 ie Y1.1, Y1.2, Y1.3, Y1.4, Y1.5, Y1 .6, Y1.7 so that the observed model was valid

Overall Matching Test of Measurement Model

Testing the measurement model of the overall variables in the study aims to see the suitability of the model with the data. The overall fit test results of measurement model are as follows:

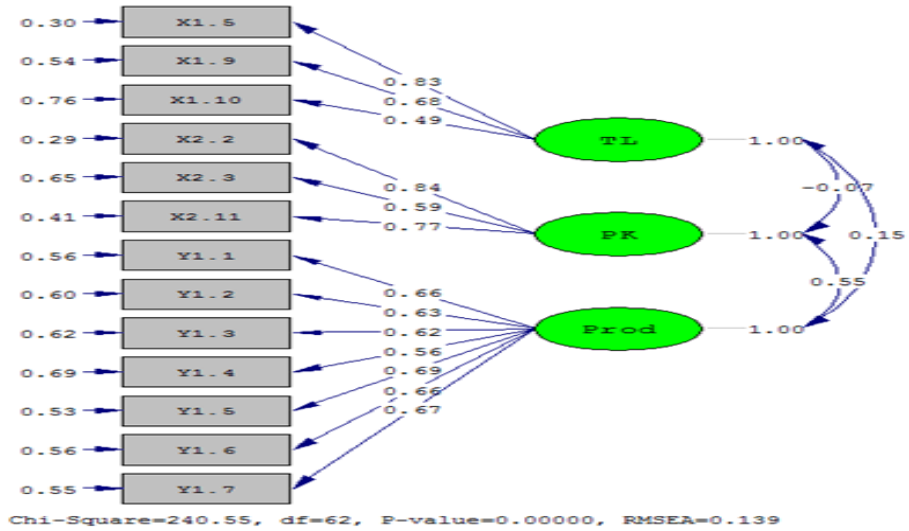


Figure 5 Constructive Measurement Model of Research Variables (Non Modified)
Source: Data Processing Result with LISREL 8.88 program

Reliability Test of Variable

Reliable layout variable. This is seen from the CR value of 0.7 and the value of VE of 0.5. A variable is to be reliably if it has a CR value of 0.7 and/or a VE value of ≥ 0.5.of 0.6. A variable is to be reliably if it has a CR value of 0.7 and/or a VE value of ≥ 0.5. Reliable Productivity Variables. This is seen from the CR value of 0.74 and the value of VE of 0.51. A variable is to be reliably if it has a CR value of 0.7 and/or a VE value of ≥ 0.5.

Overall Fit Test of Measurement Model

The results of the overall suitability test of the measurement model are shown in Figure 6 below:

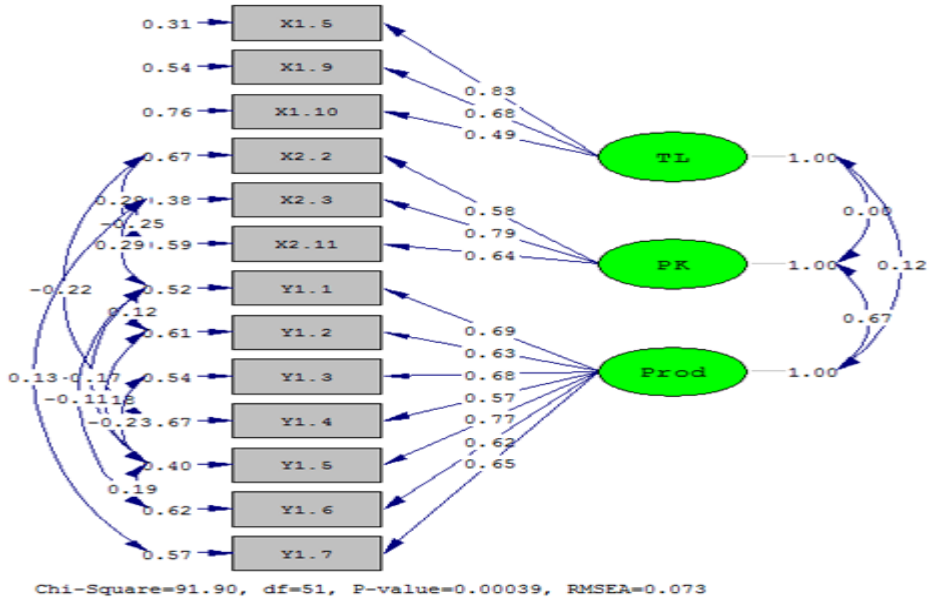
ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Results of Fit Test of Measurement Model (Non Modified)

No	GOF size	Fit Target Level	Estimation Results	Fit Rate
1	Root Mean Square Error of Approximation (RMSEA) P (Close Fit)	RMSEA ≤ 0,08 p ≥ 0,50	0.139	Bad Fit
2	Normal Fit Index (NFI)	NFI ≥ 0,90	0.77	Bad Fit
3	Non-Normal Fit Index (NNFI)	NNFI ≥ 0,90	0.76	Bad Fit
4	Comparative Fit Index (CFI)	CFI ≥ 0,90	0.81	Marginal Fit
5	Incremental Fit Index (IFI)	IFI ≥ 0,90	0.81	Marginal Fit
6	Relative Fit Index (RFI)	RFI ≥ 0,90	0.71	Bad Fit
7	Goodness of Fit Index (GFI)	GFI ≥ 0,90	0.80	Marginal Fit
8	Adjusted Goodness of Fit Index (AGFI)	AGFI ≥ 0,90	0.71	Bad Fit

Source: Processing Data Results with LISREL 8.8 program

The results of the fit test model of construct variables research are not to be fit because the RMSEA has a value more than 0.08 so it needs a modification model. Furthermore, the researcher modified the model shown in Figure 7.



Results of Fit Test Model (Modified)

No	GOF Size	Fit Target Level	Estimation Results	Fit Rate
1	Root Mean Square Error of Approximation (RMSEA) P (Close Fit)	RMSEA ≤ 0,08 p ≥ 0,50	0.073	Good Fit
2	Normal Fit Index (NFI)	NFI ≥ 0,90	0.92	Good Fit
3	Non-Normal Fit Index (NNFI)	NNFI ≥ 0,90	0.94	Good Fit

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

4	Comparative Fit Index (CFI)	CFI ≥ 0,90	0.96	Good Fit
5	Incremental Fit Index (IFI)	IFI ≥ 0,90	0.96	Good Fit
6	Relative Fit Index (RFI)	RFI ≥ 0,90	0.88	Marginal Fit
7	Goodness of Fit Index (GFI)	GFI ≥ 0,90	0.91	Good Fit
8	Adjusted Goodness of Fit Index (AGFI)	AGFI ≥ 0,90	0.85	Marginal Fit

Source: Processing Result with LISREL 8.8 program

Based on the table, the results of fit test model of its variable construct measurement is stated good fit because the RMSEA and six of the eight GOF have the value of good fit. In accordance with the goodness of fit a model can be assessed good fit if there is at least one goodness of fit size that has a good fit value. So the model used in this study can be declared in accordance with the data.

Structural Model Test

After tested the fit measurement model and obtained good fit sizes GOF so that the model used in accordance with the data, then perform the structural model test, consisting of the model fit overall test and causal relationship analysis. As follows :

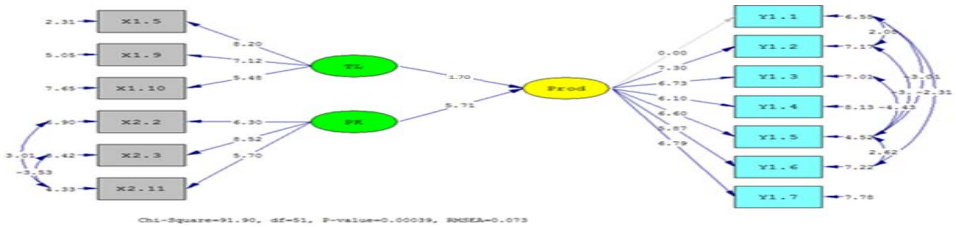


Figure 4.6. Structural Model (*T–Value*)
Source : Processing Result LISREL 8.8 program

Structural Test Results of Research Model

No	GOF	Fit Target Level	Estimation Results	Fit Rate
1	Root Mean Square Error of Approximation (RMSEA) P (Close Fit)	RMSEA ≤ 0,08 p ≥ 0,50	0.073	Good Fit
2	Normal Fit Index (NFI)	NFI ≥ 0,90	0.92	Good Fit
3	Non-Normal Fit Index (NNFI)	NNFI ≥ 0,90	0.94	Good Fit
4	Comparative Fit Index (CFI)	CFI ≥ 0,90	0.96	Good Fit
5	Incremental Fit Index (IFI)	IFI ≥ 0,90	0.96	Good Fit
6	Relative Fit Index (RFI)	RFI ≥ 0,90	0.88	Marginal Fit
7	Goodness of Fit Index (GFI)	GFI ≥ 0,90	0.91	Good Fit
8	Adjusted Goodness of Fit Index (AGFI)	AGFI ≥ 0,90	0.85	Marginal Fit

Source: Processing Result with LISREL 8.8 program

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

It can be seen that the results of the structural fit test of the research model, the model match value shows good value, seen in six of the eight GOF sizes that have a good fit match value. This means that the overall value of fit structural model research shows good fit.

Hypothesis Testing Research

Testing is done by identifying at the significance of each variable relationship. The test is performed by using t-test statistic, and LISREL to establish t-test statistic at error rate (α) of 0.05 or 5%, estimated value of causal relation of structural model tested and hypothesis test result with t value t, where the t value of ≥ 1.67. The results can be seen in Table 4.7 below.

Table of Hypotesis Test Results

Hypothesis	Structural Path	T-Values	Information	Conclusion
H1	layout → Proudctrivety	1,70	Supporting Hypotesis Data	Layout is signifantly influence to the productivity
H2	Quality Control of → Proudctrivety	5.71	Supporting Hypotesis Data	Quality control is significantly influence to the productivity

Source: Processing Results with LISREL 8.8 program

Table showed that the results of statistical test on the research model for construction variables of layout has a negative and significant effect on productivity, it is indicated by the value of t variable is above 1.67 that is equal to 1.70. This means that there is significantly influence of layout variable to productivity variable hence the first hypothesis (H1) in this research accepted.

While the qtuality control variables significantly affect the productivity variables, it is indicated by the value of t variables that are above 1.67 that is 5.71. This means that there is a significant influence between the variables of quality control on productivity so that the second hypothesis (H2) in this study is accepted.

DISCUSSION

Effect of Layout to the Productivity

Based on the results of hypothesis testing on the variable layout of productivity variables in Gajah Tunggal,Ltd. Plant-A Tangerang shows that the layout variable has a significant influence on productivity variables. This means that the better of layout, the better of productivity. Companies should focus on the layout of production process tools to improve productivity, as well as to run production.

Effect of Quality Control to the Productivity

Based on the results of hypothesis testing on the quality control variables to productivity variables indicate that the quality control variables significantly effect on productivity variables. This means that the better of quality control of the product, the better the productivity as well. Good quality delivers customer satisfaction and increases purchasing.

5. CONCLUSION AND RECOMENDATION

The research can be summed up that there are significantly influences between layout on productivity and between quality control on productivity as well.

Recommendation for the company that the Gajah Tunggal,Ltd needs to focus to the layout production processes and quality control to increase productivity.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

REFERENCES

[1] Gaspersz, Vincent. 2007. Total Quality Manajemen. PT Gramedia Pustaka
[2] Heizer, J. & Render, B. 2011. Operations Management. Tenth Edition. Pearson, New Jersey, USA.
[3] Kusnendi, 2007. Model-Model Persamaan Struktural, Satu dan Multigrup Contoh dengan LISREL. CV Alfabeta, Bandung.
[4] Murfidin Haming dan Mahfud Nurnajamuddin. 2014. Manajemen Produksi Modern: Operasi Manufaktur dan Jasa. Jakarta: Bhumi Aksara.
[5] Purnama, Nursya'bani. 2006. *Manajemen Kualitas Perspektif Global. Ekonisia*, Yogyakarta
[6] Sitinjak dan Sugiharto, 2006. LISREL. Graha Ilmu. Yogyakarta
[7] Wijanto, S.H. 2008. Structural Equation Modelling dengan Lisrel 8.8 Konsep dan Tutorial, Graha Ilmu, Yogyakarta.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)