The Effect of Product Development and Product Quality on Consumer Satisfaction at PT. Langgeng Perkasa in Cikarang

Iyus Rustandi Universitas Pasundan, Bandung, Jawa Barat, Indonesia E-mail :iyus.rustandi@unpas.ac.id

ABSTRACT

This study aims to determine the effect of product development and product quality on consumer satisfaction at PT. Langgeng Perkasa in Cikarang. The method used is explanatory research with analytical techniques using statistical analysis with regression, correlation, determination and hypothesis testing. The result of this research is that product development has a significant effect on customer satisfaction by 45.2%, hypothesis testing is obtained t count > t table or (8.809 > 1.986). Product quality significantly affects consumer satisfaction by 41.4%; hypothesis testing is obtained t count > t table or (8,153 > 1,986). Product development and product quality simultaneously significantly affect consumer satisfaction with the regression equation Y = 10.689 + 0.393X1 + 0.345X2. The contribution of influence is 52.1%.

Keywords: Product development, product quality, consumer satisfaction.

INTRODUCTION

Industries that produce goods and services must be able to produce a product that is acceptable to consumers. A main principle of buying is to increase the dominance (mastery) of national and international markets. Buyers, be they individual consumers, industrial companies, or government entities, are now increasingly emphasizing the customer satisfaction they seek for the goods they pay for, with a renewed concentration on the economy of superior products and services, safety, serviceability and reliability. Prudence in buying is increasing, especially for industrial companies and even more so for consumers. The level of consumer satisfaction is caused by two main factors, namely internal and external factors of the company. The company's internal factors include the decline in product quality, product development, and customer service to experience saturation or a decrease in product value in the market. External factors occur because they are out of reach, such as changes in consumer tastes, government policies, the emergence of substitute goods, and new competitors' entry.

Every business in high competition always competes with similar industries. In order to win the competition, business people must pay full attention to product quality. Attention to quality has a positive impact on business in two ways: production costs and revenue (Gaspersz, 2005:3).

Product development and quality control carried out in the company include developing the industry to be more advanced, producing or making one product and releasing other products. As well as quality control of raw materials, quality control during the production process and quality control of the final product.

control technique Quality is a and management, measuring the quality characteristics of the output (goods and services), then comparing the measurement results with the output specifications desired by the user and appropriate taking corrective actions if discrepancies are found between actual and standard performance. In controlling the process, we try to quickly investigate a process disruption, and corrective action can be taken immediately before too many units are not suitable (defective). All of this is done so that customer satisfaction is met and the company is no exception in order to predict the company's articles of association.

The impact on production costs occurs by making products that have a high degree of confirmation to standards so that they are free from the level of damage. The impact on increasing revenue occurs through increased sales of high-quality products with high prices.

One of the company's goals is to increase profits, especially from operating activities. Therefore, company managers in making decisions are aimed at increasing profits. Business strategies to increase competitive advantage can be done through quality improvement efforts.

Companies that use quality as a strategic tool will have a competitive advantage over their competitors in controlling the market because not all companies can achieve quality superiority. In this case, the company must produce high-quality products, low prices, and process and delivery can be on time. Production processes that pay attention to quality will produce products that are free from damage. It can avoid waste and inefficiency to reduce unit production costs, and product prices can be more competitive.

The step in implementing quality control is determining the right planning before production, coupled with product standardization, especially in improving guality. There is a close relationship between product quality, customer or consumer satisfaction and company profitability. The higher the guality, the higher the customer satisfaction and vice versa, the lower the quality, the lower the customer satisfaction and in this case supports higher prices and lower costs. Therefore, quality improvement programs or QIPs (Quality Improvement Programs) usually increase company profitability (Philip Kotler, 2008:67).

Thus, if a company wants to determine the guality of a product or make high-guality products, it must pay attention to 3 factors: production costs, production functions, and the outer appearance of the product. Production costs that are too high will affect the selling price of the product to be expensive. A quality production function is by consumer needs. So that the product can be used optimally by consumers. The outward appearance or model, or product packaging greatly influences consumer decisions before they use the product.

PT. Langgeng Perkasa is one of the companies engaged in galvalume with the basic material for producing steel alloys that prioritizes product quality that is concerned with demand product models.

Quality is defined as the totality of the characteristics of a product that supports its ability to satisfy specified or defined needs to increase internal and external customer satisfaction (Gaspersz, 2005:5).

Based on this basic understanding of quality, it appears that quality is always customer-focused (focused customer quality). Quality in statistical process control is how well an output (goods and services) meets the specifications and tolerances set by the company's design department.

This study aimed to determine the effect of product development, product quality, and the simultaneous effect of product development on consumer satisfaction at PT. Lasting Mighty in Cikarang.

1. Product Development

Development is often called innovation, namely the process of creating new ideas and implementing them in practice. Innovation is new ideas in products, so the results are better. Incorporate organizations, innovation takes two forms: product innovation, which produces new goods or services or improvements to existing ones, and process innovation, which results in new ways of doing a process.

2. Product quality

Products are not only in the form of tangible goods but can be in the form of services, so products can provide different satisfactions so that companies are required to be more creative and have a broad view of the products produced. According to Kotler and Armstrong (2017: 299) argues "Product quality is the ability of the product to perform its function, this includes the time of use of the product, reliability, ease of use and repair, and other values. Product quality can be viewed from two points of view: an internal point of view and an external point of view.

3. Consumer Satisfaction

According to Ferrinadewi (2014: 97), in the attitude model, three components form attitudes in customer satisfaction: cognitive, affective, and conative.

a. Cognitive is knowledge and customer perception, obtained through experience with an attitude object and information from various sources. This knowledge and perception are usually in belief; namely, the customer believes that the product has several attributes. This cognitive is often also referred to as customer knowledge and trust.

b. Affective describes the emotions and feelings of customers showing a direct and general assessment of a product, whether the product is liked or disliked, whether the product is good or bad.

c. Conative shows a person's actions or behavioural tendencies towards an object; conative is related to the actions or behaviour carried out by a customer (likelihood or tendency) and is often also referred to as intention.

4. Model Study

According to Sugiyono (2018), "The research model is a synthesis that reflects the relationship between the variables studied and is a guide for solving research problems and formulating hypotheses in the form of a flow chart equipped with qualitative explanations". In this study, the research model is made as follows:





5. Research Hypothesis

According to Sugiyono (2018: 63), "the hypothesis is a temporary answer to the research problem formulation, where the problem formulation is stated in a statement sentence". Thus, the hypothesis that the researcher proposes is as follows:

H1: It is suspected that product development has a significant effect on consumer satisfaction at PT. Lasting Mighty in Cikarang.

H2: It is suspected that there is a significant effect of product quality on consumer satisfaction at PT. Lasting Mighty in Cikarang.

H3: Allegedly, there is a significant effect of product development and product quality simultaneously on consumer satisfaction at PT. Lasting Mighty in Cikarang.

METHOD

This type of research is quantitative research, using data analysis techniques in instrument testing, classical assumption test, regression, correlation coefficient, coefficient of determination and hypothesis testing. The population in the study amounted to 96 respondents PT. Langgeng Perkasa in Cikarang with a sample of 96 respondents.

1. Test Instrument

(a) From the test results obtained, all product development variable questionnaire items obtained a 2-tailed significance value of 0.000 <0.05; thus, the instrument is valid.

(b) From The test results obtained that all items of the product quality variable questionnaire obtained a 2-tailed significance value of 0.000 <0.05, thus the instrument is valid.

(c) From The test results obtained that all questionnaire items on the consumer satisfaction variable obtained a two-tailed significance value of 0.000 < 0.05; thus, the instrument is valid.

(d) From the results of reliability testing, the following results were obtained:

RESULT and DISCUSSION

Table 1. Reliability Test Results

Variable	Cronbach's Alpha	Alpha Critical	Information
		Standard	
Product development (X1)	0.731	0.600	Reliable
Product quality (X2)	0.686	0.600	Reliable
Consumer satisfaction (Y)	0.657	0.600	Reliable

Based on the test results above, the overall product development variable (X1), product quality (X2), obtained a Cronbach alpha value greater than 0.600. Thus declared reliable.

2. Test Classic Assumption

a. Normality test

The results of the normality test using the Kolmogorov-Smirnov Test are as follows:

Table 2. Kolmogorov-Smirnov Test . Normality Results

	Tests of No	rmality				
	Kolmogoro	Shapiro-Wilk				
	Statistics	df	Sig.	Statistics	df	Sig.
Consumer satisfaction (Y)	.089	96	.056	.971	96	.034

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the test results in the table above, a significance value of 0.056 is obtained where the value is greater than the value of = 0.050 or (0.056 > 0.050). Thus, the assumption of the distribution of the equations in this test is normal.

b. Multicollinearity Test

Multicollinearity test was carried out by looking at the Tolerance Value and Variance Inflation Factor (VIF). The test results are as follows:

Table 3. Multicollinearity Test Results with Collinearity Statistics.

Coefficients^a

		Unstandardized Coefficients		Standardized Coefficients	Collinearity S	tatistics
Mode	el	В	Std. Error	Beta	Tolerance	VIF
1	(Constant)	10,689	2.835			
	Product development (X1)	.393	.086	.438	.557	1,794
	Product quality (X2)	.345	.094	.352	.557	1,794

a. Dependent Variable: Consumer Satisfaction (Y)

Based on the test results in the table above, the tolerance value for each independent variable is 0.557 < 1.0, and the Variance Inflation Factor (VIF) value is 1.794 < 10; thus, this regression model does not occur multicollinearity.

c. Autocorrelation Test

The test was carried out with the Darbin-Watson test (DW test). The test results are as follows:

Table 4. Autocorrelation Test Results

Model Summary ^b						
			Adjusted R	Std. The error of		
Model	R	R Square	Square	the Estimate	Durbin-Watson	
1	.722a	.521	.511	2.485	2,099	
- Dradietane (Constant) Draduet quality (XQ) Draduet development (X1)						

a. Predictors: (Constant), Product quality (X2), Product development (X1)

b. Dependent Variable: Consumer Satisfaction (Y)

The test results in the table above obtained the Durbin-Watson value of 2,099; the value is between the intervals 1,550 - 2,460. Thus the regression model stated that there was no autocorrelation disorder.

d. Heteroscedasticity Test

The results of the heteroscedasticity test are as follows:

		Coeff	icientsa			
		Unstandardized		Standardized		
		Coe	fficients	Coefficients		
Mode	9	В	Std. Error	Beta	t	Sig.
1	(Constant)	2,283	1.640		1.392	.167
	Product development (X1)	089	.050	243	-1.781	.078
	Product quality (X2)	.080	.054	.201	1.472	.144

a. Dependent Variable: RES2

The results of the test using the glejser test obtained the value of Sig. > 0.05. Thus, the regression model has no heteroscedasticity disorder.

3. Descriptive Analysis

This test is used to determine each variable's minimum and maximum scores, mean scores, and standard deviations. The results are as follows:

Table 6. Results of Descriptive Statistics Analisis Analysis Descriptive Statistics					
Ν	Minimum	Maximum	mean	Std. Deviation	

Product development (X1)	96	31	48	37.95	3.964
Product quality (X2)	96	27	44	38.18	3.627
Consumer satisfaction (Y)	96	32	46	38.76	3.553
Valid N (listwise)	96				

Product development obtained a minimum variance of 31 and a maximum variance of 48 with a mean score of 3.795 with a standard deviation of 3.964. Product quality obtained a minimum variance of 27 and a maximum variance of 44 with a mean score of 3.818 with a standard deviation of 3.627. Consumer satisfaction obtained a minimum variance of 32 and a maximum variance of 46 with a mean score of 3.876 with a standard deviation of 3.553.

4. Quantitative Analysis.

This analysis is intended to determine the effect of the independent variable on the dependent variable. The test results are as follows:

a. Multiple Linear Regression Analysis

Multiple linear regression test results are as follows:

		(Coefficientsa			
		Unst Co	andardized efficients	Standardized Coefficients		
Mode	el	В	Std. Error	Beta	t	Sig.
1	(Constant)	10,689	2.835		3,771	.000
	Product development (X1)	.393	.086	.438	4,559	.000
	Product quality (X2)	.345	.094	.352	3.663	.000

Table 7. Multiple Linear Regression Test Results

Based on the test results in the table above, the regression equation Y = 10.689 + 0.393X1 + 0.345X2. From these equations, it is explained as follows:

1) A constant of 10,689 means that if there is no product development and product quality, then there has been a customer satisfaction value of 10.689 points.

2) The regression coefficient of product development is 0.393; this number is positive, meaning that every time there is an increase in

product development of 0.393, consumer satisfaction will also increase by 0.393 points.

3) The regression coefficient of product quality is 0.345; this number is positive, meaning that every time there is an increase in product quality of 0.345, consumer satisfaction will also increase by 0.345 points.

b. Correlation Coefficient Analysis

The results of the correlation coefficient test are as follows:

Table 8. Results of Correlation Coefficient Testing of Product Development on Consumer
Satisfaction.

	Correlations	b	
		Product development	
		(X1)	Consumer satisfaction (Y)
Product development (X1)	Pearson Correlation	1	.672**
	Sig. (2-tailed)		.000
Consumer satisfaction (Y)	Pearson Correlation	.672**	1
	Sig. (2-tailed)	.000	

The test results obtained a correlation value of 0.672, meaning that product development strongly relates to consumer satisfaction.

Table 9. Results of the Correlation Coefficient of Product Quality on Consumer Satisfaction. Correlationsb

		Product quality	
		(X2)	Consumer satisfaction (Y)
Product quality (X2)	Pearson Correlation	1	.644**
	Sig. (2-tailed)		.000
Consumer satisfaction (Y)	Pearson Correlation	.644**	1
	Sig. (2-tailed)	.000	

The test results obtained a correlation value of 0.644, meaning that product quality has a strong relationship to consumer satisfaction

Table 10. Correlation Coefficient Test Results Product Development and Product Quality Simultaneously Against Consumer Satisfaction.

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.722a	.521	.511	2.485		
– – – – – – – – – – – – – – – – – – –						

a. Predictors: (Constant), Product quality (X2), Product development (X1)

Based on the test results obtained, a correlation value of 0.722 means that product development and product quality simultaneously have a strong relationship to consumer satisfaction.

c. Coefficient of Determination Analysis The results of testing the coefficient of determination are as follows:

Table 11. Results of Testing the Coefficient of Determination of Product Development on Consumer Satisfaction.

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
1	.672a	.452	.446	2,644			
a Bradiatara: (Capatant) Braduat development (V1)							

a. Predictors: (Constant), Product development (X1)

Based on the test results, the determination has an influence contribution of 45.2% on value is 0.452, meaning that product development consumer satisfaction.

Table 12. Results of the Coefficient of Determination of Product Quality on Consumer Satisfaction.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.644a	.414	.408	2,734		

a. Predictors: (Constant), Product quality (X2)

The test results obtained a determination contributes to 41.4% influence on consumer value of 0.414, meaning that product quality satisfaction.

Table 13. Results of Testing the Coefficient of Determination of Product Development and Product Quality on Consumer Satisfaction.

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
1	.722a	.521	.511	2.485			
a. Predictors: (Constant), Product quality (X2), Product development (X1)							

The test results obtained a determination value of 0.521, meaning that product development and product quality simultaneously contribute 52.1% influence on consumer satisfaction, while other factors influence the remaining 47.9%.

d. Test Hypothesis

Partial hypothesis test (t-test)

Hypothesis testing with a t-test is used to determine which partial hypothesis is accepted.

The first hypothesis: There is a significant effect of product development on consumer satisfaction.

The second hypothesis: There is a significant effect of product quality on consumer satisfaction.

Table 14. Hypothesis Test Results Product Development Against Consumer Satisfaction.

			Coefficientsa			
Unstandardized Coefficients		Standardized Coefficients				
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	15,886	2,611		6.085	.000
	Product development (X1)	.603	.068	.672	8.809	.000

a. Dependent Variable: Consumer Satisfaction (Y)

Based on the test results in the table above, the value of t arithmetic > t table or (8.809 > 1.986), thus the first hypothesis proposed that there is a significant influence between product development on consumer satisfaction is accepted.

Table 15. Hypothesis Test Results Product Quality on Consumer Satisfaction.

			Coefficientsa			
		Unstandardiz	zed Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	14,691	2,965		4.954	.000
	Product quality (X2)	.630	.077	.644	8.153	.000

a. Dependent Variable: Consumer Satisfaction (Y)

Based on the test results in the table above, the value of t count > t table or (8,153 > 1,986); thus, the second hypothesis proposed a significant influence between product quality and consumer satisfaction is accepted.

Simultaneous Hypothesis Testing (F Test)

Hypothesis testing with the F test is used to determine which simultaneous hypothesis is accepted.

The third hypothesis There is a significant influence between product development and product quality on consumer satisfaction.

Table 16. Hypothesis Test Results Product Development and Product Quality on Consumer Satisfaction.

	ANOVAª								
Model		Sum of Squares	df	Mean Square	F	Sig.			
1	Regression	625,220	2	312.610	50,626	.000b			
	Residual	574,269	93	6.175					
	Total	1199,490	95						

Based on the test results in the table above, the calculated F value > F table or (50.626 > 2,700), thus the third hypothesis proposed that there is a significant influence between product development and product quality on consumer satisfaction is accepted.

Discussion

1. The Effect of Product Development on Consumer Satisfaction

From the analysis results, the product development variable has a significant effect on consumer satisfaction with a correlation value of 0.672, meaning that the two variables have a strong relationship with a contribution of 45.2%. Testing the hypothesis obtained the value of t count > t table or (8.809 > 1.986). Thus, the first hypothesis proposed a significant effect between product development and customer satisfaction is accepted.

2. The Effect of Product Quality on Consumer Satisfaction

From the analysis results, the product quality variable has a significant effect on consumer satisfaction with a correlation value of 0.644,

CONCLUSION

a. Product development has a significant effect on consumer satisfaction with a correlation

meaning that the two variables have a strong relationship with a contribution of 41.4%. Testing the hypothesis obtained the value of t count > t table or (8,153 > 1,986). Thus the second hypothesis proposed a significant effect between product quality and customer satisfaction is accepted.

3. The Effect of Product Development and Product Quality on Consumer Satisfaction

From the results of the analysis, it was found that product development and product quality variables had a significant effect on consumer satisfaction with the regression equation Y =10.689 + 0.393X1 + 0.345X2, the correlation value of 0.722 means that the two variables have a strong relationship with the contribution of the influence of 52.1% while the rest 47.9% influenced by other factors. The calculated F value obtains hypothesis testing> F table or (50.626 > 2,700). Thus the third hypothesis proposed a significant effect between product development and product quality on consumer satisfaction is accepted.

value of 0.672 or strong with a contribution of 45.2%. Hypothesis test obtained value of t count > t table or (8.809 > 1.986). Thus there is a significant influence between product

development on customer satisfaction at PT. Lasting Mighty in Cikarang.

b. Product quality significantly affects consumer satisfaction with a correlation value of 0.644 or strong with 41.4% influence. Hypothesis test obtained value of t count > t table or (8,153 > 1,986). Thus there is a significant influence between product quality on consumer satisfaction at PT. Lasting Mighty in Cikarang.

c. Product development and product quality significantly affect consumer satisfaction with a correlation value of 0.722 or strong with a contribution of 52.1% influence while other factors influence the remaining 47.9%. Hypothesis test obtained value of F arithmetic > F table or (50.626 > 2,700). Thus there is a significant influence between product development and product quality simultaneously on consumer satisfaction at PT. Lasting Mighty in Cikarang.

REFERENCES

- Algifari. (2015). "Analisis Regresi untuk Bisnis dan Ekonomi". Yogyakarta: BPFE.
- Anjani, R. (2019). Tata Kelola Adminitrasi Keuangan, Dan Pembangunan Desa Tepi Laut Kabupaten Bengkulu Utara. *Jurnal Pengabdian Masyarakat Bumi Raflesia*, 2 (2).
- Arikunto, Suharsimi (2014). "Prosedur Penelitian Suatu Pendekatan Praktek". Jakarta: Rineka Cipta.
- Asmawi, M. (2017). The effect of compensation, empowerment, and job satisfaction on employee loyalty. *International Journal* of Scientific Research and Management, 5(12), 7590-7599.
- Candra Dery Bagus, dkk. "Pengaruh Inovasi Produk Dan Brand Image Terhadapkep Keputusan Pembelian Pada Olivia Cake" Jurnal Aplikasi dan Bisnis. E-ISSN: 2407-5523, Hal. 86-91

- Ghozali, Imam, 2011. "Aplikasi Analisis Multivariate Dengan Program SPSS".
- Gifani Auliannisa, Syahputra. 2017. "Pengaruh Citra Merek Terhadap Keputusan Pembelian Produk Smartphone Oppo Pada Mahasiswa Universitas Telkom" Jurnal Bisnis dan Iptek. Vol.10 No.2, Hal. 82-92
- Gumilang, Ratna Risa. 2019. "Implementasi Digital Marketing Terhadap
- Hanaysha, Jalal, Haim Hilman, Noor Hasmini Abdul-Ghani. 2014." Efek Langsung dan Tidak Langsung dari Inovasi Produk dan Kualitas Produk pada Citra Merek: Bukti Empiris dari Industri Otomotif " Jurnal Internasional Publikasi Ilmiah dan Penelitian. Manajemen Bisnis Vol.4. Edisi 11, Hal.2-5
- Indah, Rasyid, Tri. 2018."Pengaruh Inovasi Produk Dan Harga Terhadap Keputusan Pembelian Sepeda Motor Dikota Tangerang Selatan" Jurnal Perspektif. Vol.16 No.1, Hal. 40-49
- Jasmani, J. (2019). Pengaruh Orientasi Pasar Dan Inovasi Produk Terhadap Keunggulan Bersaing Pada PT. Ragam Baja Nusantara. Disrupsi Binis, 2(1).
- Jasmani, J. (2019). Pengaruh Product Development Dan Promotion Mix Terhadap Peningkatan Penjualan Yang Berdampak Pada Keunggulan Bersaing. Jurnal Ekonomi Efektif, 1(2).
- Jasmani, J. (2019). Pengaruh Promosi Dan Pengembangan Produk Terhadap Peningkatan Hasil Penjualan. Jurnal Semarak, 1(3).
- Jasmani, Jasmani, and Denok Sunarsi. "The Influence of Product Mix, Promotion Mix and Brand Image on Consumer Purchasing Decisions of Sari Roti Products in South Tangerang." *PINISI Discretion Review* 1.1 (2020): 165-174.

- Kevin Keller dan Amstrong (2017) *Prinsip-prinsip Pemasaran*, Edisi Kedua Belas, Jilid Satu, Jakarta: Erlangga.
- Kotler & Keller (2016) *"Manajemen Pemasaran"*. PT. Macaman Jaya Cemerlang. Jakarta.
- Kotler (2016) *"Manajemen Pemasaran"*. Edisi Keempat belas, Jakarta: PT. Indeks.
- Lupiyoadi (2016) *Manajemen Pemasaran Jasa,* Edisi 4, Jakarta: Salemba Empat.
- Mani, J. (2017). Pengaruh Persepsi Merek Dan Kualitas Pelayanan Terhadap Kepuasan Pelanggan (Studi Kasus Pada PT. Bisma Narendra Di Jakarta). Jurnal Mandiri, 1(2), 187-206.
- Suhaily, Lily dan Syarief Darmoyo. 2017. "Pengaruh Kualitas Produk, Harga Persepsi Dan Citra Merek Terhadap Keputusan Pembelian Diperoleh Kepercayaan Pelanggan (Studi Pada Produk Elektronik Merek Jepang)" Jurnal Fakultas Ekonomi dan Bisnis. Vol.21 No.22, Hal. 5
- Tambunan, Elisabet dan Marupa Siregar. 2018. "Pengaruh Promosi Dan Inovasi Produk Terhadap Keputusan Pembelian Batik Azzahra Medan" Jurnal Mutiara Manajemen. Vol.3 No.1, Hal. 3-9
- Wulandari, Dwi ajeng dan Farah Oktafani. 2017. "Pengaruh Brand Image Terhadap Proses Keputusan Pembelian Sepatu Nike Pada Mahasiswa Komunkikasi Dan Bisnis Telkom University Bandung" Jurnal Ekonomi dan Bisnis. Vol. No.1, Hal. 50-58