Information Technology Capital Expenditure Analysis Using Cobb Douglas Production Function at PT. XL Axiata Tbk

1st Muhammad Kevin Yudistira
School of Industrial Engineering
Telkom University
Bandung, Indonesia
Kevinydstr@student.telkomuniversity.ac.id

2nd Lukman Abdurrahman
School of Industrial Engineering
Telkom University
Bandung, Indonesia
abdural@telkomuniversity.ac.id

3rd Ari Fajar Santoso
School of Industrial Engineering
Telkom University
Bandung, Indonesia
arifajar@telkomuniversity.ac.id

Abstrak*—Investasi teknologi informasi mengacu pada biaya siklus hidup lengkap dari semua atau sebagian dari proyek TI, termasuk biaya berkelanjutan yang terjadi setelah proyek atau sistem diterapkan. Sebuah perusahaan berbasis IT, PT XL Axiata, menjadi studi kasus dalam penelitian ini dan topik penelitiannya. Tujuannya adalah untuk mengetahui bagaimana nilai investasi TI mempengaruhi keberhasilan PT dan bisnis berbasis teknologi informasi lainnya. OneXL Axiata. berarti bahwa organisasi telah meningkatkan jumlah investasi TI yang telah dibuat. Dari laporan tahunan XL Axiata untuk periode 15 tahun dari tahun 2006 hingga 2020, data yang digunakan untuk penelitian ini diturunkan. Variabel Ekuitas (K), variabel Tenaga Kerja (L), dan variabel belanja modal TI (I) merupakan variabel yang digunakan dalam penelitian ini. Dengan bantuan teknik regresi linier berganda dan regresi nonlinier, fungsi produksi Cobb Douglas dari penelitian ini diperiksa. Setelah dilakukan penelitian, diperoleh temuan dengan menggunakan metode regresi linier berganda karena ternyata selisihnya mendekati 0,05% dengan nilai pendapatan yang sebenarnya. Selain itu, penelitian yang menggunakan fungsi produksi kaca ganda Cobb menghasilkan nilai 0,378 untuk investasi TI yang dilakukan oleh Bank Mandiri selama 15 tahun terakhir. Dengan nilai TFP sebesar 2433.328 > 1 maka nilai investasi tersebut memiliki produktivitas yang tinggi.

***Kata Kunci*— cobb douglas, Nilai Investasi TI, XL Axiata, SPSS, Regresi.**

Abstract—Information technology investment refers to the complete life cycle costs of all or a portion of an IT project, including ongoing expenses incurred after the project or system has been put into place. An IT-based corporation, PT XL Axiata, served as the case study in this study and the research topic. The goal is to determine how IT investment value affects the success of PT and other information technology-based businesses. OneXL Axiata. means that the organization has increased the amount of IT investments that it has made. From XL Axiata's annual report for the period of 15 years from 2006 to 2020, the data used for this study was derived. The Equity variable (K), the Manpower variable (L), and the TI capex variable (I) are the variables used in this study. With the help of multiple linear regression and nonlinear regression techniques, this study's Cobb Douglas production function was examined. After doing the research, findings were acquired utilizing the multiple linear regression method since the difference was found to be 0.05% close to the actual value of income. Additionally, the research utilizing the Cobb doubleglass production function yielded a value of 0.378 for the IT investment made by Bank Mandiri over the course of the last 15 years. With a TFP value of 2433,328 > 1, the investment value has a high productivity.

Keywords— cobb douglas, IT Investment Value, XL Axiata, SPSS, Regression.

I. INTRODUCTION

We as users must be able to understand knowledge in the field of information technology to keep up with current technological developments. Information technology itself has a meaning as a factor that is very supportive and supports humans to take advantage of the various conveniences produced by technology (Hasugian, 2018). The value of information technology (IT) refers to the value of IT itself. IT value is added value due to the use of managed IT resources to improve company performance. This value is given as a monetary quantity which can be expressed as an index ratio. The value of IT is very important for business which will be used to ensure whether the implementation of IT in the organization has a positive impact and benefit for the business and understanding the use of IT in the workplace (Iman Saufik, 2021).

Production is the transformation of two or more resources (inputs) into one or more outputs (products).

With this knowledge, production activities combine several inputs to produce outputs. As a direct solution when compared to other production functions, the Cobb Douglas production function was chosen for this study from among many other production functions currently used (Amalia, 2014).

II. LITERATURE REVIEW

A. Information Technology

Menjelaska Technology is the result of the evolution of hardware (hardware) and software (software) based on knowledge, current consumer demands, and the times. Information technology is a breakthrough in the field of information that helps humans in performing daily tasks such as collecting and sharing information. Williams and Sawyer claim that information technology is an engineering field that integrates computers and high-speed communication networks for data, speech, and video transmission (Sutarman, 2019).

B. Investment in Information Technology

Successful IT investment involves more than just gaining a competitive advantage. Investment in IT must also be able to sustain the competitive advantage it has generated. Perhaps this second criterion is more challenging than the first requirement (creation of competitive advantage). The ambiguous relationship between IT investment and firm's financial performance can be described from the perspective of the competitive advantage.

1. Invesment Objective of information Technology

There are at least 5 different types of goals for purchasing these technological tools when considering the strategic function of information technology, including (Ekawati, 2015):

a. a company's or a business's ability to survive: The company recognizes that information technology is unavoidable in its associated industries.
b. Enhance performance: The use of information technology in particular industries or tasks is anticipated to reduce or improve how various corporate resources are allocated.
c. Increasing the effectiveness of businesses: In order to be effective, one must "do the right thing.".
d. Obtaining a Significant Competitive Advantage: By creating technology that other companies do not yet have, the corporation hopes to get a competitive edge over them and overtake its rivals in the market.
e. Using IT as Infrastructure: Having a corporate website, using it for communication, utilizing office productivity tools (like word processors, spreadsheets, presentations, databases), installing LAN networks, and other practices are now standard for businesses, and the entire device has evolved into a necessary component of the business infrastructure.
f. investment for this infrastructure category, the leadership will often conduct a benchmarking exercise with other businesses in comparable industries and with roughly the same business size.

C. Production Function

Producers are those who arrange different inputs to produce outputs. In the production process, production components are indispensable because without these components, production activities cannot represent the technology used by a business, industry, or the economy as a whole (Rambe & Hariani, 2018).

Every production process, according to Boediono (1989), has a technological basis which is often referred to as a production function in theory. The relationship between the level of output and the level of utilization of inputs is shown by the production function, which is a function or equation. The production function has the following mathematical form (Hidayah, 2012).

$$Q=f(X_1,X_2,X_3,\ldots\ldots\ldots\ldots,X_n) \quad \text{(II.1)}$$

Descrption:

Q = rate of production (output)

$X_1,X_2,X_3,\ldots\ldots\ldots\ldots,X_n$ = using a variety of inputs

D. Cobb Douglas Production Function

A Cobb-Douglas function is a power function with at least two variables, one of which is a variable that describes Y (the dependent variable), and the other is a variable that describes X (the independent variable). Regression is usually used to resolve the relationship between Y and X because it takes into account how changes in Y will affect changes in X (Jono, 2016).

One of the most frequently used varieties of production functions in productivity analysis is the productivity measurement model based on the Cobb Douglas production function technique. The Cobb-Douglas model is basically a power function that represents a non-linear regression equation (Jono, 2016). The Cobb Douglas

production function formula is as follows (Lin, 2009):

Q= αK^(β_1) L^(β_2) I^(β_3) (II.2)

Description:

Q : rate of production (output)

α : constant

K : equity input

L : labor input

I : capex IT input

β_1: elasticity of equity input

β_2: elasticity of labor input

β_(3): elasticity of capex IT input

The following equation represents the logarithm of the previous equation (Kalbarqi, 2021):

$$\text{Log } Y = \log a + b1 \log X1 + b2 \log X2 + \log \quad \text{(II.3)}$$

1. Total Factor Productivity (TFP)

Total Factor Productivity is a residual that shows a shift in a production process and is seen as an efficiency that happens in a manufacturing process :

TABLE II-1
TOTAL FACTOR PRODUCTIVITY

occurrence	explanation
ΔTFP < 1	Less productivity results from investment.
ΔTFP = 1	Productivity is stagnant due to investment.
ΔTFP > 1	High productivity investments

E. Production Elasticity

The percentage change in output as a result of the percentage change in inputs is known as the elasticity of production. The definition of production elasticity can be written as follows in a straightforward manner (Putra, 2015):

$$E_Q = \frac{\%\ perubahan\ output}{\%\ perubahan\ input}$$

The following are the characteristics of the elasticity of production inputs:

- The condition is elastic if ε<1
- The condition is elastic if ε>1

Ceteris paribus, if the input increases by 1%, the output will also increase by that elasticity.

F. Return to Scale

There are three possible states for return to scale (Putra, 2015):

TABLE II-2
RETURN TO SCALE

Condition	explanation
$\beta_1 + \beta_2 + \beta_3 = 1$	Constant Return To Scale
$\beta_1 + \beta_2 + \beta_3 > 2$	Inscreasing Return To Scale
$\beta_1 + \beta_2 + \beta_3 < 1$	Decreasing Return To Scale

1. **Constant Return To Scale:** The output will change exactly in the same proportion (in the same direction) as the factors of production (inputs) if the inputs are changed in the same proportion.
2. **Inscreasing Return To Scale:** When the inputs (factors of production) are modified in the same proportion, the output will also change (in the same direction), but by a larger amount.
3. **Decreasing Return To Scale:** The output will fluctuate (in the same direction) less if the factors of production (inputs) are altered in the same proportion.

G. Regression

There are numerous further uses, including the following (Wardana, 2020):

1. Using the value of the independent variable, estimate the average and value of the dependent variable.
2. to verify the theory on the dependency characteristic.
3. estimating the average value of the independent variable based on the value of the independent variable beyond the sample range.

H. Classic Assumption Test

1. Normality Test

the normality assumption test is to assess whether or not the data stored in each variable is regularly distributed. If the data are regularly distributed, parametric statistics can be applied to them.

TABLE II-3
PARAMETER VALUE SIGNIFICANCE

significance of value	Meaning of Value
xn < 0,05	There is an abnormal distribution of data
Xn > 0,05	Normal data dissemination

2. Multicolinearity Test

The purpose of this test is to determine whether or not there is a strong correlation between the independent variables in a multiple linear regression model and the independent variables.

TABLE II-4
PARAMETER VALUE OF VIF AND TOLERANCE

Parameter		Meaning of value
Nilai *Tolerance*	Xn > 0,10	Multicollinearity does not exist
Nilai VIF	Xn < 10,00	
Nilai Tolerance	Xn ≤ 0,10	Multicollinearity exists
Nilai VIF	Xn ≥ 10,00	

3. Heteroskedasticity Test

The goal of the heteroscedasticity assumption test is to determine whether the variance of the residuals from one observation to another is **unequal.**

TABLE II-5
HETEROSCEDASTICITY TEST PARAMETERS

Parameter	Pattern	Definiton
Scatterplot's data distribution	Create a specific pattern • Wavy • Widen • Narrowing	occurrence of heteroscedasticity
	Has no pattern generation A. Distributed on the Y-axis above and below the number o.	No heteroscedasticity exists

4. Autocorrelation Test

The autocorrelation test is a relationship between a series of intermittent observations that determines whether there is a correlation between a period t and the prior period (t -1).

The crucial values of DL (Durbin Lower) and DU (Durbin Upper) from the Durbin Watson statistical table were then used to compare the findings obtained by DW to these critical values.

I. Hypothesis Testing

1. Coeffecient of Determination Test (R)

This experiment aims to see whether numerical estimates of the predicted data may be used to determine how closely the regression line corresponds to the actual data.

2. Fisher's of Variance Test (F)

The Fisher variance test examines the impact of independent variables on dependent variables.

TABLE FISHER'S TEST OF VARIANCE HYPOTHESIS

Hypothesis	**explanation**
H0	All dependent variables are not influenced by any independent variables.
Ha	The dependent variable is influenced by at least one independent variable.

3. Test of Significants Test (T)

determines whether each independent variable's impact on the dependent variable is significantly influenced by the regression model that was utilized.

J. SPSS

One of the many statistical programs that is well-known among its users is SPSS (Statistics Program for Social Science). .

III. METHOD

A. Conceptual Model

A conceptual model is a way of thinking that demonstrates deliberation between determinable factors that are important for research analysis (Sinulingga, 2014).

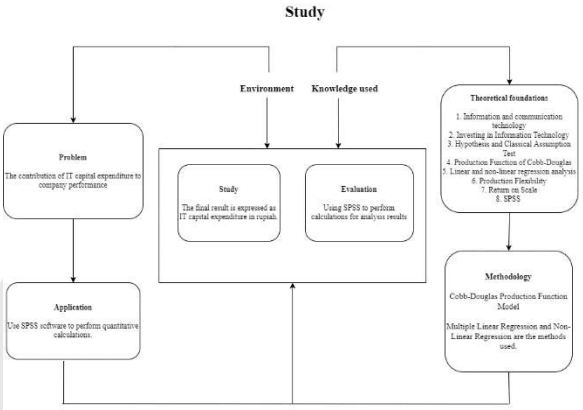

FIGURE III. 1
CONCEPTUAL MODEL

It can be seen on Figure III.1 which explains the research framework this is the research framework for information systems, which is based on the theoretical model shown in the top graphic.

IV. RESULT AND DISCUSSION

On October 6, 1989, PT Grahametropolitan Lestari began operations as a general commerce and services firm. Currently, Axiata owns the majority of XL Axiata's shares through Axiata Investments (Indonesia) Sdn. Bhd. (66.25%), treasury shares (0.53%), and the general public

(33.22%). Thus, XL Axiata is a division of the Axiata company ("Group"), the biggest telecoms conglomerate in Asia. The group's subsidiaries and other organizations include Celcom (Malaysia), Dialog (Sri Lanka), Robi (Bangladesh), Smart (Cambodia), and Ncell (Nepal).

FIGURE IV. 1
XL AXIATA LOGO

THE VALUE OF THE COMPANY:

TABLE IV- 1
VALUE OF THE COMPANY

I (Uncompromising Integrity)	Have high ethical standards, zero tolerance for unethical behavior
T (Teamsynergy)	Full of enthusiasm for working together, ensuring all processes are carried out to achieve common goals
S (Simplicity)	Doing our best to provide solutions that are easy to use and exceed expectations
XL (Exceptional Performance)	always enthusiastic in giving the best performance

(SUMBER: (PT XL AXIATA, 2020))

B. XL Axiata Secondary Data

The annual report of PT XL Axiata from 2006 to 2020 is used as a secondary data source for computations in this study. Table IV-2 displays some of the information that has been collected and is required to deliver the intended outcomes:

TABLE IV-2
XL AXIATA SECONDARY DATA 2006-2020 (IN BILLION RUPIAH)

Years	Equity(K)	Labor(L)	Capex IT (I)	Revenue (Periodt)
2006	4.281	494	4.027	6.466
2007	4.465	574	6.868	8.365
2008	4.308	723	11.382	12.156
2009	8.803	778	5.283	13.880
2010	11.715	904	4.848	17.637
2011	13.693	1.199	6.522	18.468
2012	15.370	941	10.176	21.278
2013	15.300	937	7.394	21.350
2014	13.961	1.160	7.095	23.569
2015	14.092	1.788	4.146	22.960
2016	21.209	1.157	5.584	21.341
2017	21.631	1.892	6.998	22.901
2018	18.343	1.677	7.456	23.001
2019	19.122	1.606	7.995	25.150
2020	19.137	1.614	6.105	26.018

The data from PT XL Axiata that has been normalized with SPSS is shown in the Table IV-3:

TABLE IV-3 XL
AXIATA NATURAL DATA LOGARITHM RESULTS

Years	lnK	lnL	lnI	LnPeriodt
2006	8.36	6.20	8.30	8.77
2007	8.40	6.35	8.83	9.03
2008	8.37	6.58	9.34	9.41
2009	9.08	6.66	8.57	9.54
2010	9.37	6.81	8.49	9.78
2011	9.52	7.09	8.78	9.82
2012	9.64	6.85	9.23	9.97
2013	9.64	6.84	8.91	9.97
2014	9.54	7.06	8.87	10.07
2015	9.55	7.49	8.33	10.04
2016	9.96	7.05	8.63	9.97
2017	9.98	7.55	8.85	10.04
2018	9.82	7.42	8.92	10.04
2019	9.86	7.38	8.99	10.13
2020	9.86	7.39	8.72	10.17

(SOURCE: ANNUAL REPORT PT. XL AXIATA FROM 2006-2020)

In Table IV-2, the letters "K" stand for the firm's equity, "L" for its workforce, "I" for its IT spending costs, and "Periodt" for the amount of money the company made during the given period of time.

1. XL Axiata Equity Bar Chart

Data on XL Axiata's equity is displayed in a bar chart in Figure IV.2 below. The data was obtained from XL Axiata's annual reports from 2006 to 2020.

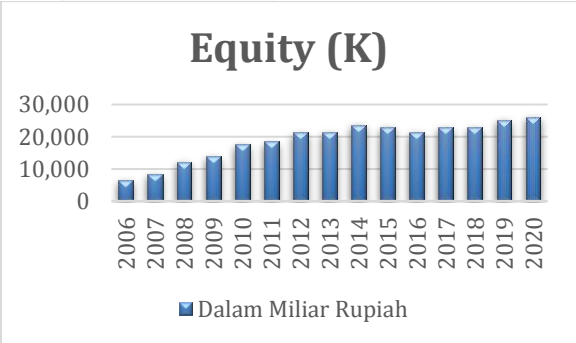

FIGURE IV. 2
XL AXIATA EQUITY BAR CHART 2006-2020

2. XL Axiata Labor Bar Chart

The salary and benefits in the financial statements for the years 2006 through 2020 are used to calculate labor costs.

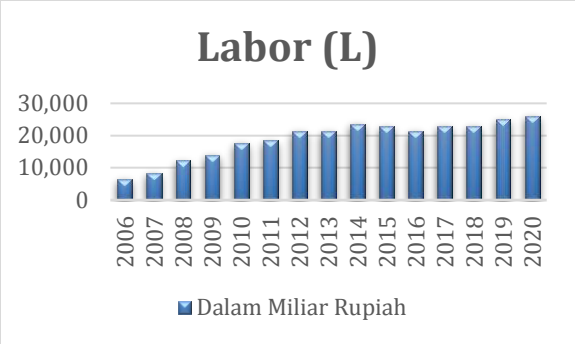

FIGURE IV. 3
XL AXIATA LABOR BAR CHART 2006-2020

3. XL Axiata IT Capital Expenditure Bar Chart
Information on IT spending costs is derived from computers and software in XL Axiata's financial statements for the years 2006 to 2020.

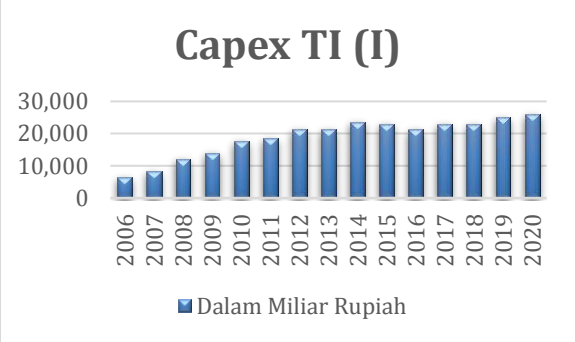

FIGURE IV. 4
XL AXIATA IT CAPITAL EXPENDITURE BAR CHART 2006-2020

4. XL Axiata Revenue Bar Chart
Revenue data on XL Axiata is taken from the financial summary table in XL Axiata's annual report from 2006-2020.

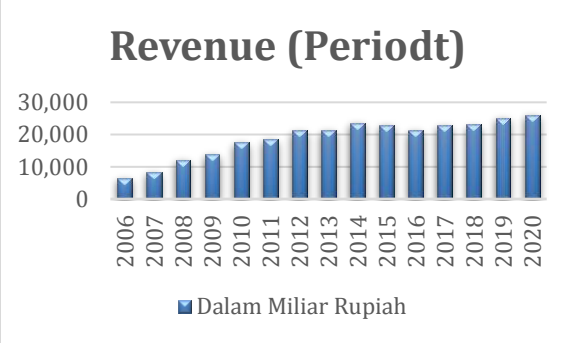

FIGURE IV. 5
XL AXIATA REVENUE BAR CHART 2006-2020

C. Classical Assumption Result
1. Normality Test
The normality test is used to examine the residual data distribution and decide if it is or is not normal.

TABLE IV-4
PARAMETERS OF NORMALITY TEST VALUE

significance of value	Meaning of Value
xn < 0,05	There is an abnormal distribution of data
Xn > 0,05	Normal data dissemination

The following are the results of the normality test using SPSS:

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		15
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2264.540012
Most Extreme Differences	Absolute	.120
	Positive	.107
	Negative	-.120
Test Statistic		.120
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

FIGURE IV. 6
ONE SAMPLE DATA KOLMOGORV-SMIRNOV

According to Figure IV.6, the Asymp.sig value's normality test result (2-tailed) is 0.200.

2. Multicollinearity Test

TABLE IV-5
PARAMETERS OF MULTICOLLINEARITY TEST

Parameter		Meaning of value
Nilai *Tolerance*	Xn > 0,10	Multicollinearity does not exist
Nilai VIF	Xn < 10,00	
Nilai *Tolerance*	Xn ≤ 0,10	Multicollinearity exists
Nilai VIF	Xn ≥ 10,00	

As a consequence of multicollinearity testing with SPSS, the following results were obtained:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2433.328	3059.757		.795	.443		
	Equity(K)	.686	.196	.652	3.371	.006	.337	2.965
	Labor(L)	4.166	2.594	.312	1.605	.137	.336	2.981
	Capex IT (I)	.376	.339	.126	1.110	.287	.988	1.012

a. Dependent Variable: Revenue (Periodt)

FIGURE IV. 7
MULTICOLLINEARITY ASSUMPTION TEST RESULTS

According to the following explanations, each dependent variable's multicollinearity test results:

1. The VIF value for the equity variable (K) is 2.965 < 10. The Tolerance value is also 0.337 > 0.10 in this case. It can be said that the equity variable does not exhibit multicollinearity.
2. The VIF value for the labor variable (L) is 2,981 < 10. Additionally, the tolerance value is 0.336 > 0.10 It can be said that the labor variable is not multicollinear.

3. Heteroscedasticity Test

TABLE IV-6
PARAMETRIC SCATTERPLOT GRAPH

Parameter	Pattern	Definiton
Scatterplot's data distribution	Create a specific pattern • Wavy • Widen • Narrowing	occurrence of heteroscedasticity
	Has no pattern generation B. Distributed on the Y-axis above and below the number o.	No heteroscedasticity exists

According to the outcomes of processing with SPSS version 22, the heteroscedasticity test curve is shown in Figure IV.8 as follows:

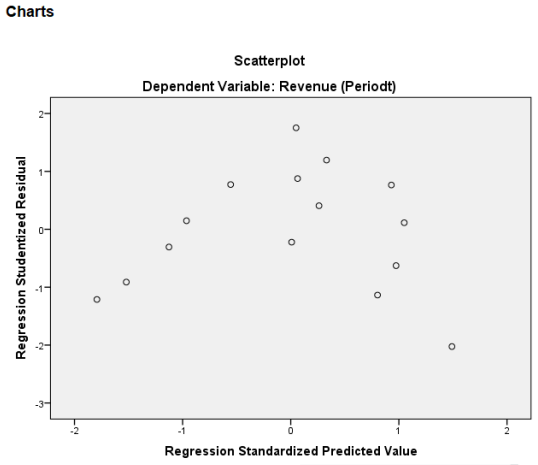

FIGURE IV. 8
HETEROSCEDASTICITY TEST RESULTS WITH SCATTERPLOT GRAPH

As a result, analysis of the scatterplot graph demonstrates that there is no heteroscedasticity.

4. Autocorrelation Test

The Durbin-Watson method is employed in this test.

1. **-**The null hypothesis is rejected if the Durbin-Watson value is more than or equal to (4-dL) or less than dL, indicating the presence of an autocorrelation.
2. If the Durbin-Watson value is between (4-dU) and dU, the null hypothesis is accepted, indicating that there is no autocorrelation.
3. There won't be either a positive or negative autocorrelation if the Durbin-Watson value is between dU and dL or (4-dU) and (4-dL).

The following are the outcomes of the Durbin-Watson test using SPSS :

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.928[a]	.861	.823	2554.746	.869

a. Predictors: (Constant), Capex IT (I), Equity(K), Labor(L)
b. Dependent Variable: Revenue (Periodt)

In accordance with the Durbin-Watson Table in Appendix 14, it will then be compared to the table values. A dL value of 0.814 and a dU of 1.750 are obtained from the table, which has a significance level of 5% and a data volume (n) of 15 and 3 independent variables. The Durbin-Watson value, which is 0.869 and falls between dL and dU or (4-dU) and (4-dL), is 0.814 < 0.869 < 1.750, indicating that neither positive nor negative autocorrelation was produced in this data.

D. Hypothesis Test Result

1. Coefficient of Determination Test (R2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928[a]	.861	.823	2554.746

a. Predictors: (Constant), Capex IT (I), Equity(K), Labor(L)

FIGURE IV. 10
THE R HYPOTHESIS TEST (SOURCE: DATA PROCESSED IN SPSS)

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2. Varian's Fisher Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	444641874.8	3	148213958.3	22.709	.000[b]
	Residual	71793980.52	11	6526725.502		
	Total	516435855.3	14			

a. Dependent Variable: Revenue (Periodt)

b. Predictors: (Constant), Capex IT (I), Equity(K), Labor(L)

FIGURE IV. 11
TEST HYPOTHESIS F (SOURCE: DATA PROCESSING IN SPSS)

Determine the values of dfN1 and dfN2 before attempting to find Ftable.
dfN3 = n
independent variables = 3
dfN4 = n
independent variables = 3 dfN5 = n samples n independent variables - 1 = 15 - 3 - 1 = 11

3. Significance Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2433.328	3059.757		.795	.443
	Equity(K)	.666	.198	.652	3.371	.006
	Labor(L)	4.165	2.594	.312	1.605	.137
	Capex IT (I)	.378	.339	.126	1.118	.287

a. Dependent Variable: Revenue (Periodt)

FIGURE IV. 12
HYPOTHESIS T TEST (SOURCE: DATA PROCESSING IN SPSS)

Use the equation (Sig/2, N-K)
t table = (Sig2, N-K)
t table = (0.05/2, 15-4) = 0.025, 11 = 2.201.

a. Ellipse Information System implementation produces Equity Variable (K) Tcount > Ttable (3,371 > 2,201) as a result of H01 being rejected and Ha1 being accepted. So, one could claim that the Income Variable is partially caused by Equity.
b. Variable Cost of Labor (L) Since H02 is approved and Ha2 is denied, the Ellipse Information System implementation results in Tcount > Ttable (1,605 2,201). Therefore, it is possible to claim that labor costs contribute to the income variable.

E. Result of the data analysis

1. Classical Assumption Test

No	Assumption Test Type	Method	Conclusion
1	Normality	One Sample Kolmogorov-Smirnov	Fulfill
		Probability Plot of Regression Standardized Residual	Fulfill
2	Multicollinearity	Tolerance	Fulfill
		Variance Inflation Factor	Fulfill
3	Heteroscedasticity	Scatterplot	Fulfill
4	Autocorrelation	Durbin-Watson	Fulfil

The findings of the classical assumption test are presented in Table IV-13, demonstrating the test's applicability and suitability for usage with multiple linear regression analysis.

2. Hypothesis Test

TABLE IV- 8
HYPOTHESIS TEST CONCLUSION

No	Type of Hypothesis Test	Conclusion method	
1	R Test (R2)	The independent variable can provide insight into the dependent variable.	
2	F Test	The presence of at least one independent factor that has an impact on the dependent factor	
3	T Test (T)	labor	Impact on Income
		Capital	No impact on income
		Capex TI	No impact on income

F. Multiple Linear Regression Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2433.328	3059.757		.795	.443
	Equity(K)	.666	.198	.652	3.371	.006
	Labor(L)	4.165	2.594	.312	1.605	.137
	Capex IT (I)	.378	.339	.126	1.118	.287

a. Dependent Variable: Revenue (Periodt)

$$Revenue = \alpha + (\beta 1\ x\ lnK) + (\beta 2\ x\ lnL) + (\beta 3\ x\ lnI) \quad \text{(IV- 6)}$$

The natural logarithm of equity, labor expenses, and IT capex (Ln in K, L, and I) is used in this equation

$$Revenue = 2433.328 + (\ 0{,}666\ x\ lnK) + (4{,}165\ x\ lnL) + (0{,}378\ x\ lnI)$$

Description:
α=2433.328
β1=0,666
β2=4,165
β3=0,378
Using Microsoft Excel and the equation in formula IV-6, a linear regression test is calculated.

TABLE IV- 9
TABLE OF LINEAR REGRESSION RESULTS

lnPeriodt (SUM LN)	Eksponensial Periodt	Difference Result
2467.85616	6438.172464	-28
2468.70789	8349.859572	-15
2469.83864	12209.87098	54
2470.35364	13904.94762	25
2471.14129	17676.65285	40
2472.51701	18398.05074	-70
2471.76743	21375.48535	97
2471.60482	21375.48535	25
2472.4394	23623.56477	55
2474.03289	22925.38292	-35
2472.58675	21375.48535	34
2474.76573	22925.38292	24
2474.14418	22925.38292	-76
2474.03068	25084.36443	-66
2473.97027	26108.07676	90
2471.983785		**10**
		0.05%

(SOURCE: CALCULATED USING MICROSOFT EXCEL)

Table IV-9 explains how to obtain the value of the linear regression by first locating the difference in the original data and then entering it into a linear formula.

G. Linear Regression Test

Parameter Estimates

Parameter	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
a	24.099	33.248	-49.080	97.278
b1	.423	.129	.140	.706
b2	.228	.148	-.098	.553
b3	.120	.132	-.170	.411

FIGURE IV. 17
TABLE OF PARAMETER ESTIMATES (SOURCE: DATA PROCESSED IN SPSS)

Consequently, this is the equation:

Revenue = $\alpha K\ \beta 1 L\ \beta 2\ I\ \beta 3$
(IV-7)

Revenue = 24.099 K^0,423 L^0,228 I^0,120
Description:
α = 24.099
$\beta 1$ = 0,423
$\beta 2$ = 0,228
$\beta 3$ = 0,120

Using Microsoft Excel and the equation in formula IV-7, a nonlinear regression test is calculated.

Periodt	Difference periodt
9223806.70	-9217340.699
10359172.06	-10350807.06
11426873.04	-11414717.04
14337282.08	-14323402.08
16571084.32	-16553447.32
19562952.57	-19544484.57
20504526.91	-20483248.91
19676400.66	-19655050.66
19774678.08	-19751109.08
20543278.56	-20520318.56
22918728.40	-22897387.4
26562644.69	-26539743.69
24285174.74	-24262173.74
24679469.10	-24654319.1
23928526.08	-23902508.08
	-18938003.87
	-99834.84%

(SOURCE: CALCULATED USING MICROSOFT EXCEL)

Table IV-10 explains that the difference value from the original data must be found before entering it into the nonlinear formula to determine the nonlinear regression result.

H. The Development of the Cobb Douglas

The value of the linear regression test compared to nonlinear regression is less and closer to the original income at XL when compared to the findings of the average difference between linear and nonlinear regression. The equation leads to the following result:
Description:
α=2433.328
β1=0,666
β2=4,165
β3=0,378
Revenue = α K^β1 L^β2 I^β3
(IV-8)

Revenue =$2433.328\ K^{0,666} L^{4,165} I^{0,378}$

I. Discussion of the Cobb Douglas Equation Result

1. Total Factory Productivity

TABLE IV- 11
TOTAL FACTOR PRODUCTIVITY SITUATION

occurrence	explanation
ΔTFP < 1	Less productivity results from investment.
ΔTFP = 1	Productivity is stagnant due to investment.
ΔTFP > 1	High productivity investments

It can be determined that an investment has high productivity if ΔTFP >1 (23433,328 >1) is measured over a 15-year period.

2. Variable Coefficient Elasticity

1. 1. The income set can be increased by increasing labor expenses by 1% (one percent) and equity by 0,666% in order to anticipate future output.
2. It is possible to predict future output by decreasing the set of income by 1% (one percent) and raising the building capital by 4.165%.

3. Return to Scale

The result Return to scale is:
α=2433.328
β1=0,666
β2=4,165
β3=0,378
$\gamma\ (t)$ = 4,165 (L) + 0,666 (K) + 0,378 (I) = 5,209
= 5,209 > 1
Thus, it can be concluded that the case study for this final project saw an increase in Return to Scale or variable outcome scale over a fifteen-year period under escalating circumstances.

V. COMPARISON RESULT OF DATA

The financial data needed to calculate the value of IT in this study were all obtained from the annual reports of XL Axiata, Telkom Indonesia, Bank Mandiri, and Bank BNI within 15 years starting from 2006 to 2020.

TABLE V- 1
PT XL AXIATA LINEAR REGRESSION DIFFERENCE RESULTS

Years	lnPeriodt (SUM LN)	Eksponensial Periodt	Difference Result
2006	2467.85616	6438.172464	-28
2007	2468.70789	8349.859572	-15
2008	2469.83864	12209.87098	54
2009	2470.35364	13904.94762	25
2010	2471.14129	17676.65285	40
2011	2472.51701	18398.05074	-70
2012	2471.76743	21375.48535	97
2013	2471.60482	21375.48535	25
2014	2472.4394	23623.56477	55
2015	2474.03289	22925.38292	-35
2016	2472.58675	21375.48535	34
2017	2474.76573	22925.38292	24
2018	2474.14418	22925.38292	-76
2019	2474.03068	25084.36443	-66
2020	2473.97027	26108.07676	90
	2471.983785		10
			0.05%

(SOURCE: CALCULATED USING MICROSOFT EXCEL)

A complete explanation of Table V-1 is explained in Appendix 3. After performing calculations using linear regression, the values of , 1, 2, 3 are obtained, namely:
α=2433.328
β1=0,666
β2=4,165
β3=0,378
The values of α, β1, β2, β3 have been obtained, then the next step is the numbers obtained are entered into the formula for the Cobb Douglas linear regression equation listed in Table V-2.

Cobb Douglas Equation Linear Regression Formula = (α)+(K x β1)+(L x β2)+(I x β3)

TABEL V- 2
COBB DOUGLAS EQUATION LINEAR REGRESSION XL AXIATA

The results of the Cobb Douglas Equation analysis using Linear Regression	
α	2433,328
β1	0,666
β2	4,165
β3	0,378
Cobb Douglas Equation	$2433{,}328\ K^{0{,}666}L^{4{,}165}I^{0{,}378}$

Then the Cobb Douglas XL Axiata equation is obtained as follows:

$$Income = 2433{,}328\ K^{0{,}666}L^{4{,}165}I^{0{,}378}$$

A. Comparative Analysis
B. . Comparative analysis in this section is seen with two types of tests to calculate how much influence it has on company performance and is presented in units of currency (billions) (Abdurrahman, 2019).

TABLE V- 9
COMPARISON 3 IN EACH COMPANY

Perusahaan	Values of β3
XL Axiata	0,378
Telkom Indonesia	0,264
Bank Mandiri	8,898
Bank Negara Indonesia	6,150

The comparison of IT values of XL Axiata, Telkom Indonesia, Bank Mandiri, and Bank Negara Indonesia is shown in Table V-6. The value of IT contribution in each company is shown in the linear regression table with the average difference. XL Axiata has a score of 0,05%, Telkom Indonesia has a score of 0,072%, Bank Mandiri has a score of 0,04%, and Bank Negara Indonesia has a value of 0,022%.

Thus, the telecommunications sector has the lowest IT capex variable value, namely Telkom Indonesia at 0,264%, XL Axiata at 0,378%, Bank Negara Indonesia at 6,150%, and Bank Mandiri at 8,898%.

VI. CONCLUSION

A. Conclusion

1. Information Technology Capital Expenditure using Cobb Douglas production function has a significant influence on the performance of XL Axiata company.
2. The Cobb Douglas production function results from an IT investment at PT XL Axiata show that the value of information technology has increased annually over the past 15 years as evidenced by the TFP value, which is 2433,328 > 1.
3. IT productivity has a significant impact on XL Axiata, according to calculations. The average in the results table differs to 10, or a percentage of 0,05%. 0,05 is the value of the contribution of the elasticity of the IT variable.
4. When XL Axiata, Telkom Indonesia, Bank Mandiri, and Bank Negara Indonesia's information technology investment analysis results are compared, the outcomes of IT Capex differ.

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