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MACHINE TO MACHINE (M2M) CONNECTIVITY BUSINESS FEASIBILITY ANALYSIS AND STRATEGY DEVELOPMENT CASE STUDY OF PT XYZ, A COMPANY IN INDONESIA, WITH SWOT ANALYSIS

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Abstract
From 2016 to 2018, the number of new Very Small Aperture Terminal (VSAT) customers at PT XYZ declined. According to Safrian (2018), VSAT is included in quadrant two of the (Strength, Weakness, Opportunity, and Threat) SWOT diagram, so it requires diversification to create new opportunities and increase revenue. This research was conducted to analyze the feasibility of using M2M as a form of diversification. M2M was compared with VSAT using the Return on Investment (ROI) method and performance testing. Alternative M2M business strategies are also using the SWOT analysis. From the ROI results, M2M had 74%. M2M connectivity can provide more benefits with more efficient investment. From the performance test, M2M latency of 33ms is in the outstanding category, while VSAT of 596ms is in the poor category. The SWOT analysis found that the company entered quadrant one, with the strategy chosen being the SO strategy, which focuses on developing M2M technology.
Keywords: *M2M, VSAT, SWOT, ROI*

INTRODUCTION

PT XYZ is one of Indonesia's largest Very Small Aperture Terminal (VSAT) service providers, with the number of remote points currently reaching tens of thousands spread throughout Indonesia. Of the total customers, 56% are banking (used for Automated Teller Machines (ATMs), branch offices, etc.). However, the data shows that the number of new VSAT customers is declining in the Jabodetabek area. This, of course, will affect the revenue obtained by the company. Figure 1 compares data on the number of new customers and revenue obtained from 2016 to 2018.

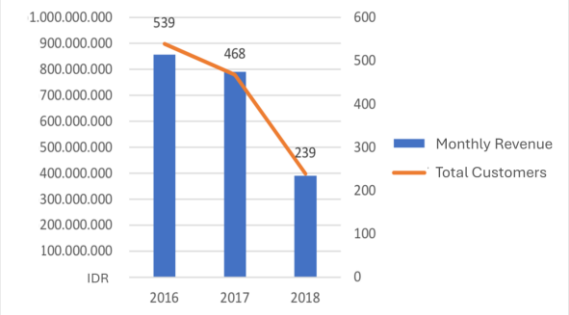

Fig.1. Revenue Obtained by The Company

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Several conditions caused this decline. First, customer locations such as ATMs are in malls and multi-tenant buildings, so cable lengths do not meet standards. If the cable length exceeds the standard, the link will not work. Second, there is no space for placing a VSAT antenna at the customer's location, considering that the minimum diameter of the antenna used is 1.8 meters. Third, the rental of cable shafts in several multi-tenant buildings has caused costs to skyrocket, and according to research, the company's business is not feasible to continue. These conditions often occur and cause customers to cancel their subscriptions. According to a previous research journal in [1] entitled Development of VSAT Connectivity Business Strategy Case Study of PT, ST's strategy is creating new products such as cellular-based M2M technology. M2M is a cellular-based device with a smaller size compared to VSAT. With M2M, it is hoped to replace the role of VSAT in delivering connectivity to customers. This research was conducted to analyze the feasibility of using M2M access compared to VSAT access using the Return on Investment (ROI) method and performance testing as well as alternative M2M business strategies that might be taken to increase the number of customers and revenue obtained by the company using the SWOT analysis.

Very Small Aperture Terminal (VSAT)

VSAT is a station that sends and receives data to and from satellites [2]. VSAT architecture is divided into two segments. First, Ground segments, also called the earth segments, are the segments where the device is on the earth. The devices are the hub station and Network Monitoring System (NMS) that functions for monitoring and network management systems and Remote earth stations, which are VSAT antennas located at the customer's location. Second is the space segment. It is a segment in outer space with a device in the form of a satellite that functions as a repeater.

The VSAT remote device is divided into three more parts. First is Indoor units. The indoor unit is a device installed in the customer's server room as a modem for signal modulation and demodulation, as well as a cable to connect the modem to the outdoor unit with a maximum length of approximately 100m. The second is Outdoor units. The outdoor unit has an antenna and RF device for transmitting and receiving satellite signals. Figure 2 is an example of a VSAT outdoor unit and Figure 3 is a simple VSAT architecture.

Fig.2. VSAT Outdoor unit

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(source: https://www.digisat.org/satcom-technologies-1184-l-band-antenna)

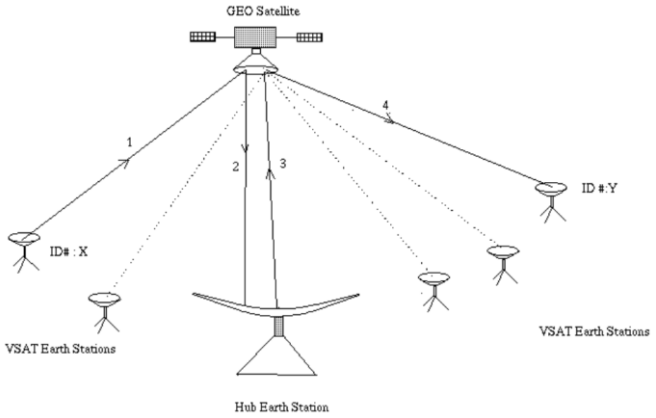

Fig.3. VSAT Architecture
(source: https://krypton.mnsu.edu/~ga8997yd/whatis_vsat.htm)

Machine to Machine (M2M)

Machine-to-machine (M2M) communication is a form of data communication involving one or more entities that does not require human interaction or intervention in the communication process [3]. M2M is also called Machine Type Communication (MTC) in 3GPP. M2M communications can be carried out over cellular networks. In M2M communications, the role of the cellular network is as a transportation network. Figure 4 is the architecture of M2M.

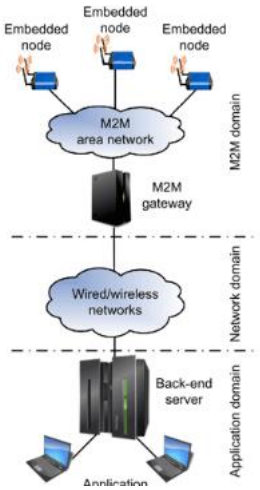

Fig.4. M2M Architecture
(sourve: https://www.semanticscholar.org/paper/Machine-to-Machine-Communication-Architecture-as-an-Bojkovic-Bakmaz/989ccc60dfef30a525c0c0e47c30ae54973f6f54)

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Delay

Delay (Latency) is the time required for data to travel the distance from origin to destination. Distance, physical media, congestion, or long processing times can influence delay. Table 1 shows the delay categories and the delay amount based on the international standard TIPHON – ETSI [4].

Table 1. TIPHON – ETSI Standard

Latency Category	***Delay* (ms)**
Very Good	< 150 ms
Good	150 ms s/d 300 ms
Average	300 ms s/d 450 ms
Poor	> 450 ms

The consequences of high latency include slow application access and inappropriate data received because of data loss.

Return on Investment (ROI)

Return On Investment (ROI) is a method used to measure a company's ability to generate profits based on the assets it owns. Assets are assets in the form of objects or rights controlled by the company, which can be measured using rupiah currency units. The ROI formula is as follows[5].

$$ROI = \frac{Earning\ AfterTax\ (EAT)}{Total\ Assets}$$

Where:

Total assets are total investment costs (CAPEX) + operating costs (OPEX).

Swot Analysis

The analysis used for this research is SWOT analysis. The SWOT matrix describes how management can align the company's opportunities and threats with its strengths and weaknesses[6]. The results of this SWOT matrix are four alternative combinations of strategies. The following are the four types of combination strategies produced.

1. SO Strategy *(Strength - Opportunity)*. The result of this combination is to obtain a strategy to seize existing opportunities with the company's strengths.
2. WO Strategy *(Weakness - Opportunity)*. The result of this combination is to obtain a strategy to minimize weaknesses with existing strengths.
3. ST Strategy *(Strength - Threat)*. This combination results in obtaining a strategy to minimize existing threats with the company's strengths.
4. WT Strategy *(Weakness - Threat)*. The result of this combination is to obtain a strategy to minimize the company's weaknesses and avoid existing threats.

Table 2 is a SWOT Matrix based on four alternative combinations of strategies [7]. EFAS is an abbreviation for *External Strategic Factor Analysis Summary*, which is an external factor. At the same time, IFAS is an abbreviation for *Internal Strategic Factor Analysis Summary*, which is an internal factor.

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Table 2. EFAS and IFAS

EFAS/IFAS	STRENGTH (S)	WEAKNESS (W)
	Determine internal strength factors.	Determine internal weakness factors.
OPPORTUNITIES (O)	**STRATEGY - SO**	**STRATEGY - WO**
Determine external opportunities.	Create strategies using strengths to overcome opportunities	Creating strategies that overcome weaknesses by exploiting opportunities.
THREAT (T)	**STRATEGY - ST**	**STRATEGY - WT**
Determine external threats.	Creating strategies that use strengths to overcome threats.	Create strategies that minimize weaknesses and avoid threats.

The result of the SWOT matrix is a SWOT analysis diagram used to determine the grand company strategy. Figure 5 is an example of a SWOT diagram.

Fig.5. SWOT Diagram

The diagram is divided into four quadrants with the following explanation.

1. The first quadrant is a favorable condition where the company has the power to take advantage of existing opportunities. The company can implement a strategy to support an aggressive growth policy *(growth-oriented strategy).*
2. The second quadrant is a condition where the company faces many threats but still has internal strengths that can be utilized. The strategy that the company can implement is a long-term strategy using diversification. Diversification is the creation of new strategies and new products to create opportunities in the future.
3. The third quadrant is an enormous market opportunity, but the company has internal weaknesses. The strategy that can be implemented is to minimize internal weaknesses so that the advantages can be taken from existing opportunities.
4. The fourth quadrant is a condition where the company faces various internal threats and weaknesses. The strategy that can be implemented is *a damage control strategy* to minimize and control losses, so they do not increase.

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METHODS

Types of Research.

In this research, a qualitative approach was used. The qualitative approach is an approach taken in research oriented towards natural phenomena that are naturalistic so that it cannot be carried out in the laboratory but rather in research in the field.

Research Subjects and Objects

The research subjects are company leaders with the research object being the company's internal conditions in the form of strengths and weaknesses and the company's external conditions in the form of opportunities and threats.

Data Types and Sources

There are two types of data used in this research. Primary data is from the field, both company data and data from interviews and discussions with company leaders. Secondary data is data from literature studies.

Data Collection Techniques

Data collection techniques were carried out through interviews and discussions with company leaders. The data obtained is then given a weighting and rating for SWOT analysis and the grand strategy.

RESULTS AND DISCUSSIONS

Analysis of Return on Investment

The following assumptions were made to conduct this analysis.

1. This analysis will compare ROI values between VSAT and M2M.
2. The data taken is the number of new banking customers (ATM) and revenue obtained in 2018.
3. The amount of data taken is only 56% of the total, with the assumption that 56% is the banking segment (ATMs) with a speed of <64 Kbps.
4. The M2M selling price is the same as the VSAT selling price, so it can be assumed that the revenue obtained will be the same for the same number of customers.
5. Currently, the company's M2M access is collaborating with other companies as providers of M2M equipment with a rental system based on the requested speed. Table 3 is data on the number of customers and revenue in 2018 based on the assumptions above.

Table 3 Revenue and Number of Customers

Year	Revenue Per month	Number of customers	Revenue for one year
2018	IDR 218.668.826	134	IDR 2.624.025.916

CAPEX and OPEX calculations

In calculating ROI, first find out the total investment costs, namely the total of CAPEX and OPEX. Following are the calculations.

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M2M

Table 4. CAPEX and OPEX M2M

Investment	Need	Price	Volume	Total Cost
CAPEX	Cisco ASR1002x	IDR75.239.172,00	1	IDR75.239.172,00
	Radius	IDR5.460.315,00	1	IDR5.460.315,00
	Modem seluler	IDR2.507.092,00	134	IDR335.950.328,00
	Sim Card	IDR50.000,00	134	IDR6.700.000,00
	DCP	IDR3.750.000,00	1	IDR3.750.000,00
	Cisco 1811	IDR2.200.000,00	1	IDR2.200.000,00
OPEX	APN	IDR3.125.000,00	1	IDR3.125.000,00
	Preventive Maintenance per year	IDR2.000.000,00	134	IDR268.000.000,00
	M2M Rent	IDR6.000.000,00	134	IDR804.000.000,00
Total				IDR1.504.424.815,00

VSAT

Table 5. CAPEX and OPEX VSAT

Investment	Need	Price	Volume	Total Cost
CAPEK	1 Transponder	IDR26.159.400.960,00	1	IDR26.159.400.960,00
	1 Hub VSAT	IDR18.000.000.000,00	1	IDR18.000.000.000,00
	VSAT remote	IDR17.439.600,00	134	IDR2.336.906.400,00
OPEX	Preventive Maintenance remote per year	IDR2.000.000,00	134	IDR268.000.000,00
	Preventive Maintenance Hub VSAT	IDR720.000.000,00	1	IDR720.000.000,00
Total				IDR47.484.307.360,00

ROI Calculation

Table 6 compares M2M and VSAT ROI from the CAPEX and OPEX data.

Table 6. M2M and VSAT ROI

Detail	VSAT	M2M
ROI	-0,9447391	0,74420542
ROI dalam persen (%)	-94%	74%

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The ROI results show that the M2M ROI is higher and has a positive value, namely 74%. This can mean that M2M connectivity can provide more benefits with more efficient investment. With these results, M2M can be used as a substitute for VSAT access if VSAT installation is impossible at the location. M2M access can increase the company's service coverage. By increasing the coverage, more customers can be obtained; thus, the company's revenue will also increase.

Performance Tests

A ping test carries out the performance test to determine the latency on VSAT and M2M access. Table 7, Figure 6, and 7 are the test results.

Table 7. Ping Test Result

Number	Media	Latency		
		Min	Max	Average
1	VSAT	559	661	596
2	M2M	27	40	33

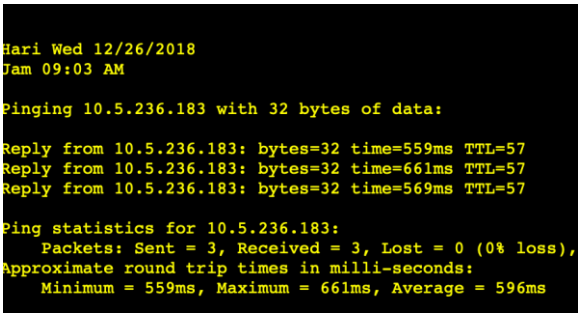

Fig.6. VSAT Ping Test

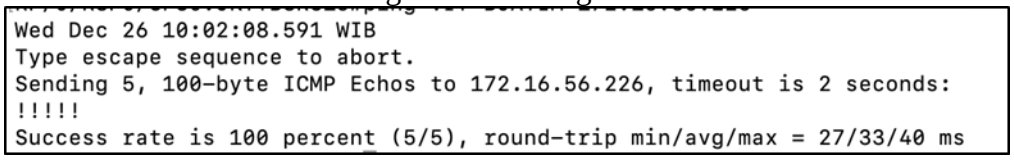

Fig.7. M2M Ping Test

From the test results the latency of M2M access is better than VSAT access. Based on ETSI standards, M2M latency of 33ms is in the very good category, while VSAT of 596ms is in the poor category. The consequences of high latency include slow application access, inappropriate data received due to missing data, and even access failure (the application cannot be accessed).

SWOT Analysis

Data collected from the field is categorized into two conditions, namely internal conditions and external conditions. Each of these conditions has several factors and is given a weight and rating by the company leadership. The weight value of each factor starts from 0.0 (not necessary) to 1.0 (most important) based on the influence of each factor on the company's strategic position. Meanwhile, the rating value starts from 1 for poor to 4, which is an outstanding factor in the company's condition.

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Internal Factor Analysis

Table 8 are the internal factors selected with their weighting and rating.

Table 8. Internal Factor Analysis

Factor	Num	Detail	Weight	Rating	Value
Strengh	1	Strong brand and good service	0,25	4	1,00
	2	Competent human resources	0,20	3	0,60
	3	Diverse services	0,15	4	0,60
Subtotal			0,60	11	2,20
Weakness	1	Budget that depends on the parent company	0,05	2	0,10
	2	R&D is less active in M2M development	0,30	4	1,20
	3	High employee turnover	0,05	2	0,10
Subtotal			0,40	8	1,40
Total			1,00	19	3,60

External Factor Analysis

Table 9 are the internal factors selected with their weighting and rating.

Table 9. External Factor Analysis

Factor	Num	Detail	Weight	Rating	Value
Opportunity	1	Development of cellular technology (5G)	0,30	4	1,20
	2	High bandwidth requirements	0,20	4	0,80
	3	The high growth of multi-tenant building construction	0,20	4	0,80
Subtotal			0,70	12	2,80
Threat	1	Price competition with competitors	0,10	2	0,20
	2	Many new competitors and the entry of cellular operators into the M2M business	0,10	3	0,30
	3	High customer demands and turnover	0,10	3	0,30
Subtotal			0,30	8	0,80
Total			1,00	20	3,60

From the analysis diagram, it is found that the company's condition is in quadrant 1, which means the company can grow by utilizing the company's internal strengths in order to take advantage of existing opportunities.

SWOT Analysis Diagram

After knowing the weighting and rating of each factor, the next step is to create a SWOT analysis diagram to determine the company's grand strategy by first determining the value of each factor and the differences so that they can be mapped.

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Value of Internal and External Factors

In making a SWOT analysis diagram, the total value of the weighting is required to be multiplied by the rating for each internal and external factor. Following are the values obtained.

a. Strength factor value +2.20
b. Weakness factor value +1.40
c. Opportunity factor value +2.80
d. Threat factor value +0.80

1. Difference between Internal and External Factors

From the factor values obtained, the difference in each factor is taken so that it can be mapped on the SWOT analysis diagram. The following are the differences between each of these factors.

a. The difference in internal factors (value of strength factors minus weaknesses) is +0.80
b. The difference in external factors (the value of the opportunity factor minus threats) is +2.00

2. Mapping Values on the SWOT Analysis Diagram

The differences obtained are then mapped into a SWOT analysis diagram. Figure 8 is the mapping.

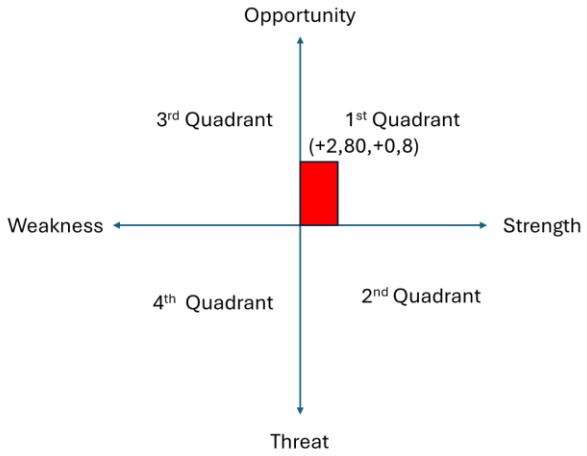

Fig.8. Mapping Values

From the analysis diagram, it is found that the company's condition is in quadrant 1, which means the company can grow by utilizing the company's internal strengths in order to take advantage of existing opportunities.

SWOT Matrix

Table 10 is the SWOT matrix and alternative strategies obtained based on the factors obtained.

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Table 10. SWOT Matrix

EFAS/IFAS	STRENGTHS (S)	WEAKNESS (W)
	1. Strong brand and good service. 2. Competent human resources. 3. Diverse services.	1. Budget that depends on the parent company. 2. R&D is less active in M2M development. 3. High employee turnover.
OPPORTUNITIES (O)	**STRATEGY - SO**	**STRATEGY - WO**
1. High bandwidth requirements. 2. High growth in multi-tenant building construction. 3. Development of cellular technology (5G). 4. High bandwidth requirements. 5. High growth in multi-tenant building construction. 6. Development of cellular technology (5G). 7. High bandwidth requirements.	1. With competent human resources to carry out research on cellular-based M2M technology and develop M2M products which supports company services.	1. Streamline the existing budget and allocate part of the budget to conduct M2M technology research. 2. Create a reward and remuneration system for employees to reduce high turnover rates / increase loyalty.
THREAT (T)	**STRATEGY - ST**	**STRATEGY - WT**
1. Price competition with competitors. **2.** Many new competitors and the entry of cellular operators into the M2M business. **3.** High customer demands and turnover.	1. Collaborate with mobile operators to develop M2M.	1. Streamline and allocate part of the budget to research M2M devices based on cellular technology to become a new business opportunity.

The following alternative strategies that might be implemented based on existing factors were selected by discussing them with company leaders.

1. SO Strategy. Conduct research and develop mobile-based M2M products. Advantages: With M2M technology, we can deliver services with even better quality (low latency, high bandwidth) and are more flexible to use as long as they are within cellular coverage (it does not require a large space like VSAT and does not use cables). Disadvantages: It requires a large amount of funding allocation for its development.
2. WO strategy. Increase internal loyalty. Advantages: High loyalty can increase speed and comfort in work. Disadvantages: It requires a large amount of funding allocation for its development.

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3. ST Strategy. Cooperate with mobile operators to develop M2M. Advantages: Working together will accelerate M2M development. Disadvantages: Needs a detailed internal study.
4. WT strategy. Budget efficiency and allocating budget for M2M technology development. Advantages: With an adequate budget, M2M development can be realized more quickly. Disadvantages: Needs a detailed internal study.

Based on the results of the SWOT analysis diagram and alternative strategies obtained, one primary company strategy was chosen, namely the S-O strategy. The S-O strategy focuses on developing M2M technology as a substitute for VSAT access because it can deliver services with even better quality (low latency, high bandwidth) and is more flexible to use as long as it is within cellular coverage (does not require a large space like VSAT and does not use cables).

CONCLUSIONS & RECOMMENDATIONS

The ROI results show that the M2M ROI is higher and has a positive value, namely 74%. This can mean that M2M connectivity can provide more benefits with more efficient investment. With these results, M2M is suitable to be used as a substitute for VSAT access if VSAT installation is not possible at the customer's location. M2M access can also increase the reach of company services. The number of customers and revenue obtained by the company will increase by increasing reach.

The performance test found that the latency of M2M access was better than VSAT access. Based on ETSI standards, M2M latency of 33ms is in the very good category, while VSAT of 596ms is in the poor category. The consequences of high latency include slow application access, inappropriate data received due to missing data, and even access failure (the application cannot be accessed).

From the research results on the SWOT analysis diagram, it was found that the company entered quadrant 1 with a difference in strength and weakness factor values of +0.80 and a difference in opportunity and threat factor values of +2.00. In this condition, the company can grow by utilizing the company's internal strengths in order to take advantage of existing opportunities. Based on the results of the SWOT analysis diagram and alternative strategies obtained, one primary company strategy was chosen, namely the S-O strategy. The S-O strategy focuses on developing M2M technology as a substitute for VSAT access because it can deliver services with even better quality (low latency, high bandwidth) and is more flexible to use as long as it is within cellular coverage (does not require large space like VSAT and does not use cable).

REFERENCES

[1] Andromeda, S., & Krisnadi, I. (2018). Pengembangan Strategi Bisnis Konektivitas VSAT Studi Kasus PT XYZ Area Jabodetabek dengan Analisis SWOT Matriks VSAT Connectivity Business Strategy Development Case Study of PT XYZ with SWOT MATRIX.

[2] Sari, M. R., & Saputra, K. H. (2022). Analisis Quality of Service (QoS) Jaringan Very Small Aperture Terminal (VSAT). Jurnal Vocational Teknik Elektronika Dan

Informatika Http://Ejournal.Unp.Ac.Id/Index.Php/Voteknika/Index Vol. 10, No. 1, Maret 2022. http://ejournal.unp.ac.id/index.php/voteknika/index
[3] Antón-Haro, C., & Dohler, M. (2015). Introduction to machine-to-machine (M2M) communications. In Machine-to-machine (M2M) Communications: Architecture, Performance and Applications (pp. 1–23). Elsevier. https://doi.org/10.1016/B978-1-78242-102-3.00001-0
[4] T. Pratama, "Perbandingan Metode PCQ, SFQ, Red dan FIFO pada Mikrotik sebagai Upaya Optimalisasi Layanan Jaringan pada Fakultas Teknik Universitas Tanjungpura," Jurnal Sistem dan Teknologi Informasi (JustIN), Vol. %1 dari %2Vol 3, No. 1 (2015), no. Universitas Tanjungpura, 2015.
[5] Widya, T., Raden, S., Hidayat, R., & Sulasmiyati, S. (n.d.). Earnings per Share (EPS), Market Value Added (MVA) (Vol. 46, Issue 1).
[6] Poppy Rufaidah. 2014. "Manajemen Strategik. Cetakan Ketiga Oktober 2014." Bandung : Humaniora.
[7] Rangkuti, Freddy. 2014. "Analisis SWOT Teknik Membedah Kasus Bisnis, Cetakan Ke-14." Jakarta: PT. Gramedia Pustaka Utama.