

THE EFFECT OF USING QRIS ON BSI MOBILE BANKING ON MSMEs CUSTOMER SATISFACTION IN MEDAN

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Article history: received 13 June 2024; revised 21 June 2024; accepted 21 July 2024

DOI: <https://doi.org/10.33751/jhss.v8i1.10595>

Abstract. The purpose of this study was to determine the effect of using QRIS in the BSI Mobile Banking Application on MSME customer satisfaction in Medan, this research was conducted at MSMEs in Medan. The type of research used is quantitative research. Sampling using saturated sampling technique, because researchers only took a sample of MSME respondents totaling 42 respondents. The data collection technique uses a questionnaire that has been tested for validity and reliability. The data analysis technique used to answer the hypothesis is multiple regression, classical assumption test, t test, f test, coefficient of determination. The results of the research conducted show that the coefficient of determination (adjusted R square) is 0.564 or 56.4%. That the use of QRIS in the BSI Mobile Banking Application partially affects MSME Customer Satisfaction in Medan.

Keywords: QRIS usage; customer satisfaction, MSMEs

I. INTRODUCTION

Technological developments in the digital era have now penetrated almost all aspects of life ranging from shopping, transportation, finance, tourism and even donating and other economic desires can be accessed digitally. The development of digital technology has changed the lifestyle of today's society, people's lives are close to Gadgets and the internet and are supported by service facilities based on digital technology making community activities easier by using Smartphones in the palm of their hands. This encourages the development of digital technology-based businesses. One of the technological developments in the financial sector is Fintech (Financial Technology). Fintech is one of the innovations in the financial sector that refers to modern technology. According to Clayton, the innovation aims to introduce practicality, ease of access, convenience and cost-effectiveness. Fintech, which has been included in the conventional financial system, is slowly entering the sharia system. The existence of Fintech is growing so that sharia-based fintech appears so that it makes it easier for customers and will affect the formal Islamic financial industry such as Islamic Banks, Islamic BPRs, BMTs and other formal financial industries where transactions in the Islamic financial industry still use a lot of physical evidence in their transactions and have not used much technological advances that are growing. (Ansori, 2019)

Islamic banking in Indonesia now provides convenience for its customers to transact. Financial services at this time have evolved over time, although financial services have always used a touch of technology, such as Automated Teller Machines (ATMs), credit cards and so on,

but in today's increasingly sophisticated technological era, various digital technology-based services have emerged that can answer the needs of the community. With the growth of technology developed by humans, humans have not stopped combining payment systems that are used to practice everyday life. So that technology creates electronic money (E-Money) which in its use can be done on electronic media connected to the internet. (Wira, 2014) E-Banking (Electronic banking) service is one of the efforts of the bank to facilitate transactions for its customers. EBanking transactions can be done anywhere, anywhere in the world as long as there is a service network and can be accessed, transactions can be carried out for 24 hours. E-Banking services can make it easier for customers to receive information, carry out communication and carry out banking transactions through electronic media such as ATM services, EDC machines, SMS Banking, Phone Banking, and Mobile Banking.

Payment using QRIS (quick response code Indonesian standard) is a Mobile Banking payment system with a choice of 2 savings facilities, namely wadiah savings and mudharabah savings. Payment through QRIS is done by scanning the barcode, enter the nominal amount of payment, then enter the pin and the transaction is complete. At Bank Syariah Indonesia the service application is called BSI Mobile, this application is integrated with a customer database that can be accessed by customers and the bank in charge. This database will automatically be connected regarding various transaction activities carried out by the relevant customers. (Mirza, 2014) Bank Syariah Indonesia is aware of the needs of customers and continues to develop and provide sharia-based services, especially in BSI Mobile services.

The threat of cyber crime in Indonesia. Indonesia is the fastest growing connection in the world. Unfortunately, Indonesia ranks first in the number of cybercrime in the world and second in the world for hacking crimes. The closer the relationship between technology and financial services, where financial activities can be done anytime and anywhere, the greater the potential for more sophisticated crime threats. No sector is more vulnerable to this threat than the financial services sector such as banking and especially fintech. Although the most common cybercrime is related to malware (viruses), the most worrying is the crime related to financial transactions such as fictitious transactions, carding (using other people's credit cards), fraud in the marketplace, which of course also extends to the fintech area. The big risk of this is the loss of customer trust which is precisely the main basis for the future growth of fintech. (Hendro, 2018) Based on research conducted by Josef Evan Sihalo, Atifah Ramadani and Suci Rahmayanti Journal with the title "Implementation of the Quick Response Indonesian Standard Payment System for the Development of MSMEs in Medan" it can be concluded that perceived benefits have no effect on this interest shows that the existence of QRIS can help MSME traders to experience development and facilitate transactions by only providing one QRIS in the store will be able to serve all payment applications using the QR Code. (Evan, 2018) I Wayan Arta Setiawan and Luh Putu Mahyuni also conducted research with the title QRIS in the Eyes of MSMEs: Exploration of Perceptions and Intention of MSMEs Using QRIS, the conclusion of this study shows that the intention of MSMEs to use the QRIS feature is formed by perceptions of usefulness, ease and understanding of QRIS. this research has implications for entrepreneurs, both bank and non-bank institutions that develop QRIS. Given the significant contribution of MSMEs to the development of QRIS. QRIS should be designed to further optimize its payment function. (Wayan, 2020). Based on the background of the problems and previous research that have been described, further research needs to be conducted on how the influence of QRIS on the payment feature in BSI Mobile for Umkm actors in Medan city. Does it provide satisfaction to customers with non-cash transactions. So the author poured in a title this is The Effect of QRIS Use on the BSI Mobile Banking Application on MSME Customer Satisfaction in Medan.

II. RESEARCH METHOD

The type of research used in this research is field research with a quantitative approach. The measurement of variables in this study uses a Likert scale. As a tool to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena. In conducting research on the variables to be tested, each answer will be given a score. Respondents must choose one of the available answer categories, then each answer will be given a certain score (5,4,3,2,1). Each respondent will be summed up and this sum is the total score. According to Sugiyono, population is a generalization area consisting of objects / subjects that have certain qualities and characteristics set by researchers to study

and then draw conclusions. (Bungin, 2018) Population is a group of objects that are used as research targets. Therefore, the research population is the whole of the research objects which can be humans, animals, symptoms, values, events, life attitudes and so on, so that these objects can be a source of research data. The population to be taken in this study are micro, small and medium enterprises (MSMEs) in Medan City totaling 42 MSME actors. The sampling technique in this study is simple random sampling, according to Sugiyono simple random sampling is a way of taking samples from members of the population at random without regard to strata (levels) in the population members. So it can be concluded that random sampling is sampling without looking at random levels of the existing population by providing the same possibility for each element in the population to have the opportunity to be selected and sampled.

Table. 1. Likert Scale

Statement	Weight
Strongly Agree	5
Agree	4
Disagree	3
Disagree	2
Strongly Disagree	1

Source: Sugiyono (2006:86)

So the sample taken from this study was 42 respondents of Micro, Small and Medium Enterprises in Medan City. The type of data used in this study is to use primary data. Primary data is data that is collected by an individual or an organization directly from its object. Primary data in this study was obtained through the distribution of questionnaires or questionnaires to MSMEs in Medan City. The data collection techniques used are questionnaires and interviews. Collecting data by distributing questionnaires in the form of a list of questions to 42 MSMEs in Medan City which were sampled. The questionnaire is given in the form of multiple choices, this is done so that respondents do not experience difficulties in answering the questions given on the statement questionnaire sheet. Making direct observations on the object under study, namely MSMEs in Medan City, with predetermined criteria. Collecting data and information obtained from books and internet sites related to this research.

In quantitative research, what is said to be data analysis is an activity carried out after obtaining data from respondents. This data analysis activity is an activity in grouping data based on variables and characteristics of each respondent, tabulating data based on variables, performing calculations to get answers to predetermined problem formulations, and performing statistical calculations to test predetermined hypotheses. The validity test aims to measure whether a question item is valid or not. Whether or not a question item is valid can be seen by comparing t-count with r-table, the data can be said to be valid if t-count is greater than r-table (t-count > r-table). A valid instrument means that the measuring instrument used to obtain data (measure) is valid. A

questionnaire is said to be reliable if someone's answer to the statement is consistent or stable over time (Imam Ghozali: 2005). According to Sukestiyarno (2017), the normality test aims to test whether the regression, regression of confounding or residual variables has a normal distribution. If this assumption is violated, the statistical test performed will be invalid for a small sample size. Multiple Linear Regression Test, Simple linear regression analysis is used to determine the effect between one independent and one dependent variable displayed in the form of a regression equation. The independent variable is denoted by X while the dependent variable is denoted by Y. Hypothesis Test, This test is to determine whether the effect of each independent variable on the dependent variable is meaningful or not. The test is carried out by comparing the tcount value of each independent variable with the tcount value. t table with a 5% error rate ($\alpha = 0.05$). If the value of t count \geq t table, then the independent variable has a significant effect on the dependent variable. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

III. RESULT AND DISCUSSION

A. Validity and Reliability Test

By contrasting the estimated r value with the r table value, a significant test is performed to determine the level of validity. The degree of freedom (df) in this situation is equal to n-k, where k is the number of constructs and n is the number of samples. If r count (for each question item can be seen in the total correlation of the corrected item set) is higher than r table and the r value is positive, then the question item is said to be valid. In this case, the amount of df can be calculated as 42-1 or df = 41 with alpha 0.05 to get r table 0.

Table 2. Validity Test Results

Variables	Question Item	Total Correlation	R table	Description
Use of Qris (X1)	X1.1	0.678	0.1191	Valid
	X1.2	0.725	0.1191	Valid
	X1.3	0.680	0.1191	Valid
	X1.4	0.795	0.1191	Valid
	X1.5	0.685	0.1191	Valid
Customer Satisfaction (Y)	Y.1	0.857	0.1191	Valid
	Y.2	0.849	0.1191	Valid
	Y.3	0.906	0.1191	Valid
	Y.4	0.851	0.1191	Valid
	Y.5	0.909	0.1191	Valid

Source: Data in research using IBM SPSS V (2024)

Each question item has a positive r count > than r table (0.1191), as seen in the table above. As a result, the questionnaire is considered valid. The reliability test aims to assess the reliability and consistency of respondents in answering questions presented in the form. Based on the level of precision and stability of a measuring instrument, the test results will show whether a learning tool can be trusted or not. criteria used to assess the dependability or unreliability of

research instruments. One of them is to compare the calculated and table values at the 95% transparency level (5% significance). The calculation will show the Alpha value in the following table if the test is carried out using the Cronbachl Alpha method:

Table 3. Reliability Test Results

Reliability Test	Reliability Coefecient	Cronbrach Alpha	Description
QRIS Usage Variable	5 Question items	0.746	Reliable
Customer Satisfaction Variable	5 Question items	0.923	Reliable

Source: Data in research using IBM SPSS V (2024)

Each variable has Cronbach Alpha > 0.60, as seen from the summary table above. various Variables (Qris Usage and Customer Satisfaction) can be said to be reliable.

Normality Test

The normality test aims to determine whether the dependent and independent variables in the regression model are normally distributed or not. Utilizing the Normal P-P Plot and examining the spread of the data will allow you to determine if the data is normal. Data is considered normal if its distribution on the graph shows a straight line pattern. The normality test table can be considered normally distributed if the Kolmogrov-Smirnov sig value is greater than 0.05. The following is the research normality test:

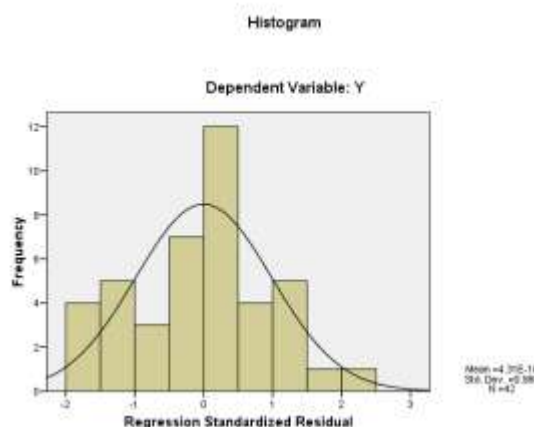


Figure 1. Normality Test Results

Source: Data in research using IBM SPSS V (2024)

It can be concluded from graph1 above, which is used to test normality, that all variables are normally distributed because the histogram curve is parabolic and not a straight line.

The Kolmogorov-Smirnov calculation is then used. If the asymptotic significance value of the variable data (2-tailed) is greater than 0.05, a normal distribution for the data can be inferred. Below are the results of the Kolmogrov-Smirnov calculation that SPSS used to determine the normality of all variables:

Table 4. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Standardized Residual
N		42
Normal Parameters ^{a,b}	Mean	,0000000
	Std. Deviation	,98772960
Most Extreme Differences	Absolute	,144
	Positive	,074
	Negative	-,144
Kolmogorov-Smirnov Z		,936
Asymp. Sig. (2-tailed)		,344

a. Test distribution is Normal.

b. Calculated from data.

Source: Data in research using IBM SPSS V (2024)

Judging from the results of the normality test of all variables using the Kolmogrov-Smirnov calculation above is 0.344 and greater than 0.05, it can be concluded that the variable data is normally distributed.

Normal P-P Plot of Regression Standardized Residual

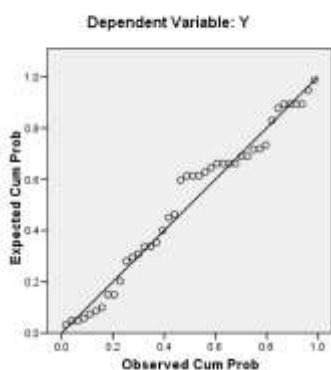


Figure 2. Normality Test Results

Source: Data in research using IBM SPSS V (2024)

From Figure 2 above, it shows that the data spreads around the diagonal line and follows the direction of the diagonal line, so the regression model fulfills the assumption of normality.

Multicollinearity Test

Multicollinearity test aims to determine whether there is a significant relationship (correlation) between independent variables. The multicollinearity test with SPSS is shown in the Coefficient table, namely in the Tolerance column and the VIF (Variance Inflated Factors) column. Tolerance is an indicator of how much variability of an independent variable cannot be explained by other independent variables. If the tolerance value is greater than 0.10 and if the VIF value is less than 10.00, it is stated that there is no multicollinearity.

Table 5 Multicollinearity Test

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.	Correlations			Collinearity Statistics		
		B	Std. Error	Beta				Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	5,787	3,269			1,770	,084						
	X	,711	,164	,564		4,325	,000	,564	,564	,564	1,000	1,000	

a. Dependent Variable: Y

Source: Data in research using IBM SPSS V (2024)

From the results of the multicollinearity test carried out, it is known that the variable inflation factor (VIF) of the three variables of Qris Usage (X1) is equal to 1,000, funding decisions and the results obtained from the three variables are smaller than 10, so it can be assumed that there is no multicollinearity between the independent variables in the regression model.

Heteroskedasticity Test

The Heteroscedasticity test aims to test whether in the regression model there is an unequal variance. Heteroscedasticity is a condition where the variance of the confounding error is not constant for all values of the independent variable, where this test aims to test whether in the regression model there is an inequality of variance from the residuals or one other observation. To detect it, it can be seen from the points that spread above and below the number 0 on the Y axis on the Scatterplot graph. The results of the Heteroscedasticity statistical test obtained in this study are as follows:

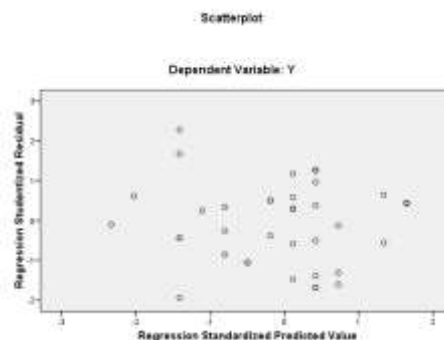


Figure 3 Heteroskedasticity Test

Source: Data in research using IBM SPSS V (2024)

The results of the heteroskedasticity test show that the dots do not form a clear pattern. As can be seen, the points spread above and below the number 0 (zero) on the Y temperature. So it is concluded that there is no heteroscedasticity in the regression model. Thus the assumptions of normality, multicollinearity and heteroscedicity in the model can be met.

Multiple Linear Regression Test

Table 6. Multiple Linear Regression Test Results

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta				Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	5,787	3,269			1,770	,084					
	X	,711	,164	,564		4,325	,000	,564	,564	,564	1,000	1,000

a. Dependent Variable: Y

Source: Data in research using IBM SPSS V (2024)

From table 6 above, it can be seen that the results of the equation model for the variable Effect of Using Qris in BSI Mobile Banking on MSME Customer Satisfaction in Medan obtained are as follows:

$$Y = 5.787 + 0.711 (X) + \epsilon$$

Based on the results of the equation obtained, the meaning and meaning of the coefficient of the Effect of Using Qris on Mobile Banking BSI on MSME Customer Satisfaction in Medan can be explained as follows:

1. The constant value (c) of 5,787, this means indicates that if the variable Use of Qris is equal to zero, the MSME

Customer Satisfaction in Medan is equal to 5,787 with the assumption that other variables are constant.

- The use of Qris (X) 0.711, this means that if the independent variable, namely the use of Qris, increases by 1%, it will increase MSME Customer Satisfaction in Medan by 0.711%.

Hypothesis Test

T test statistics

The t test aims to determine whether the independent variable or the use of Qris partially or individually has a significant effect on the dependent variable or MSME Customer Satisfaction in Medan.

Table 7. Statistical T Test Results

Model	Coefficients ^a					Correlations			Collinearity Statistics	
	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Zero-order	Partial	Part	Tolerance	VF	
1 (Constant)	5,787	.289	1,770	.084						
X	.711	.164	4,325	.000	.564	.564		1,000	1,000	

a. Dependent Variable: Y

Source: Data in research using IBM SPSS V (2024)

Formula for finding t-table = $\alpha : n - k - 1$
 = 0.05: 42 - 1 - 1
 = 0.05: 40

T - table = 1.65291

The use of Qris (X) has a t value of 4.325. This value is greater than the t table (1.65291) with a t sig value (0.000) <0.05. So that testing the research hypothesis is H_a accepted and H₀ rejected. This explains that partially the use of Qris in BSI Mobile Banking affects the satisfaction of MSME customers in Medan.

R Square Test

The coefficient of or aims determine much the of the variable (Qris Mastery) the variable (Customer Satisfaction) to know of the variation that is by independent variable.

Table 8. R Square Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.564 ^a	.319	.302	3,44850	.319	18,704	1	40	.000	1,638

a. Predictors: (Constant), X

b. Dependent Variable: Y

Source: Data in research using IBM SPSS V (2024)

The results of the coefficient of determination test provide meaning, that 56.4% of the use of Qris on BSI Mobile Banking affects MSME Customer Satisfaction in Medan.

A technology is defined as a measure by which a person believes that a computer can be easily understood and used. Where the higher a person's perception of the ease of use of the system, the higher the utilization of this technology. According to David, if the perceived ease of using the system and can explain that the new system can be accepted by users. In this case, the use of QRIS technology offered by BSI bank to prospective and existing customers, namely MSME players in Medan City. Based on the research results, the use of Qris (X) has a t value of 4.325. This value is greater than the t table (1.65291) with a t sig value (0.000) <0.05. So that testing the research hypothesis is H_a accepted and H₀ rejected. This explains that partially the use of Qris in BSI Mobile Banking

affects the satisfaction of MSME customers in Medan. This is supported by Yang Y Liu in Andrian Septa Yogananda's research, which states that QRIS technology naturally facilitates buying and selling transactions that are easier than usual. In addition, QRIS technology can also speed up transactions where buying and selling conditions can be done in a faster time than before which requires buyers to manually calculate the transaction nominal and the seller receives, calculates, and manually records the sale and purchase transaction. In addition to this, the use of QRIS BSI in transactions at MSME outlets in Medan City can also increase efficiency in making transactions. In running a business, it is a condition where using something new in buying and selling will increase efficiency when making transactions so that it can improve the performance of the business.

This is in accordance with the theory that the author conveyed in the previous chapter, namely with the current payment convenience, namely QRIS. Its use is a positive trend among businesses and consumers. Bank Indonesia sees the benefits of this payment method to encourage economic efficiency, accelerate inclusive finance, and advance MSMEs. The QR Code National Standard is needed to anticipate technological innovation and the development of payment channels using QR Codes which have the potential to cause new fragmentation in the payment system industry, as well as to expand the acceptance of national non-cash payments more efficiently.

IV. CONCLUSIONS

The use of Qris (X) has a t value of 4.325. This value is greater than the t table (1.65291) with a t sig value (0.000) <0.05. So that testing the research hypothesis is H_a accepted and H₀ rejected. This explains that partially the use of Qris in BSI Mobile Banking affects the satisfaction of MSME customers in Medan. BSI must continue to increase customer satisfaction with MBanking. The bank must introduce and explain financing to customers who do not understand the existing financing. This can attract interest for customers in financing at BSI.

REFERENCES

- [1] Andri Soemitra, Bank dan Lembaga Keuangan Syariah, Jakarta: Kencana Prenada Media Group, 2009
- [2] Bambang Sunggono, Metodologi Penelitian Hukum, Jakarta: Raja Grafindo, 1997.
- [3] Burhan Bungin, Metode Penelitian Kuantitatif: Komunikasi, Ekonomi, dan Kebijakan Publik serta Ilmu-Ilmu Sosial Lainnya, Jakarta: Kencana, 2005
- [4] Cellatin Aktas, The Evolution and Emergence of QR Code, Inggris: Cambridge Scholars Publishing Lady Stephenson, 2017
- [5] I Putu Agus Eka Pratama, E-Commerce, E-Bisnis dan Mobile Commerce. Bandung: Informatika. 2015

- [6] Abi Fadlan dan Rizki Yudhi Dewantara, “ Pengaruh Persepsi Kemudahan dan Persepsi Kegunaan Terhadap Penggunaan Mobile Banking (Studi Pada Mahasiswa Pengguna Mobile Banking Universitas Brawijaya)”, *Jurnal Administrasi Bisnis (BIS)*, Vol. 62. 2018.
- [7] Andrian Septa yogananda, I Made Bayu Diragantara, “Pengaruh Persepsi Manfaat, Persepsi Kemudahan Penggunaan, Kepercayaan dan Persepsi Resiko Terhadap Minat Untuk Menggunakan Uang Elektronik”, *Diponegoro Journal Of Management* Vol 5, No.4, 2017
- [8] Davis, F.D. “ Technology Acceptance Model for Empirically Testing New End-User Information System Theory and Result” *Massachusetts Institute of Technology (MIT)* 1989
- [9] Difa Restiti, dkk, “Pengaruh Media sosial Terhadap Pengetahuan Tentang Quick Response Code Indonesian Standard (QRIS), *Jurnal Perbankan Syariah UIN Datokarama Palu*, Vol. 3, No. 2, 2021.
- [10] Dita Mica Sekarini dan I made Sukresna, “Analisis Pengaruh Persepsi Manfaat dan Citra Merek Terhadap Keputusan Pembelian Melalui Persepsi Nilai pelanggan Sebagai Intervening”, *EJurnal* 5, 2016
- [11] Erna Pasanda, dkk. *Technology Accepted Model Pada Penggunaan Teknologi dalam Proses Pembelajaran Akuntansi (Pend Doktor Ilmu Akuntansi Universitas Hasanuddin : Vol.2. No.1. 2020*
- [12] Ferry Hendro Basuki dan Hartina Husen, *Analisis Swot Financial Technology Pada Dunia Perbankan Di Kota Ambon : Survei Pada Bank di Ambon, Jurnal Manis* Vol. 2 No.1 2018
- [13] Gabriella Junita Tobing, Lastuti Abubakar, Tri Handayani, *Analisis Peraturan Penggunaan QRIS Sebagai Kanal pembayaran Pada Praktik UMKM Dalam Rangka Mendorong Perkembangan Ekonomi Digital, Jurnal Hukum Kenotariatan*, Vol. 06 No 03 Desember 2021
- [14] Goleman, Daniel ; Boyatzis, Richard ; Mckee, & Perdana. *Blueprint Sistem Pembayaran Indonesia. Bank Indonesia : Menavigasi Sistem Pembayaran Nasional di Era Digital. Journal of Chemical Information And Modelling*. Vol 53. No. 9.
- [15] Hadi, S. dan Novi, *Faktor-faktor yang mempengaruhi Penggunaan Layanan Mobile Banking, Jurnal Ekonomi dan Bisnis*, Vol.5 No. 1, 2015.
- [16] Hanif Astika Kurniawati, Wahyu Agus Winarno, Alfi Arif, *Analisis Minat penggunaan Mobile Banking Dengan Pendekatan Technology Acceptance Model (TAM) Yang Telah Dimodifikasi, Akuntansi, Fakultas Ekonomi dan Bisnis, Universitas Jember : Vol IV (1), 2017.*
- [17] Hesti Respatiningsih, “Manajemen Kredit Usaha Mikro Kecil dan Menengah (UMKM)”, *Jurnal Manajemen dan Bisnis* No.1
- [18] I Wayan Arta Setiawan dan Luh Putu Mahyuni, *QRIS di Mata UMKM : Eksplorasi Persepsi dan Intensi UMKM Menggunakan QRIS, E-Jurnal Ekonomi dan Bisnis Universitas Udayana* 9.10 2020.
- [19] S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, “A novel ultrathin elevated channel low-temperature poly-Si TFT,” *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.
- [20] M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, “High resolution fiber distributed measurements with coherent OFDR,” in *Proc. ECOC’00*, 2000, paper 11.3.4, p. 109.
- [21] R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, “High-speed digital-to-RF converter,” *U.S. Patent* 5 668 842, Sept. 16, 1997.
- [22] (2002) The IEEE website. [Online]. Available: <http://www.ieee.org/>
- [23] M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: <http://www.ctan.org/tex-archive/macros/latex/contrib/supported/IEEEtran/>
- [24] *FLEXChip Signal Processor (MC68175/D)*, Motorola, 1996.
- [25] “PDCA12-70 data sheet,” *Opto Speed SA, Mezzovico, Switzerland*.
- [26] A. Karnik, “Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP,” *M. Eng. thesis, Indian Institute of Science, Bangalore, India*, Jan. 1999.
- [27] J. Padhye, V. Firoiu, and D. Towsley, “A stochastic model of TCP Reno congestion avoidance and control,” *Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep.* 99-02, 1999.
- [28] *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification*, IEEE Std. 802.11, 1997.