Characteristics of Innovation as Determinants of Voluntary Adoption of Mobile Money in Indonesia

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ABSTRACT

Humans are faced with technological developments that can have life-changing social impacts. The presence of technology in society is now inevitable, such as mobile money for all activities in daily life. A quantitative approach is used to find innovation characteristics as a determinant of the technology adoption process through the Innovations Diffusion Theory (IDT) method. This study describes the voluntary adoption of mobile money, in contrast to adoption due to regulation. The adoption process in IDT states that individual decisions are determined by the main predictor, namely the characteristics of the innovation. This quantitative survey takes Link Aja respondents as mobile money users. Data processing using Structural Equation Modelling (SEM) with LISREL 8.70. Relative Advantage, Compatibility, Trialability, and Observability positively influence the adoption of mobile money. Trialability does not have a positive influence on the adoption process. The importance of the five innovative characteristics in influencing the adoption process and implications for researchers and practitioners. IDT can be used to predict how the process of adoption of mobile money effectively. It needs socialization by providing basic knowledge that can build understanding.

Keywords: *Relative Advantage; Compatibility; Complexity; Trialability; Observability; Mobile Money*

1. INTRODUCTION

The significant change in various countries is cellular phones' ability to function financially with mobile payments [1] [2]. Mobile operator electronic money is called e-money MNO (Mobile Network Operator) or mobile money. The growth of mobile phones worldwide, including many developing countries, has driven financial infrastructure to provide dynamics and transform innovation in the financial sector [3].

The advantages of this new payment method are in terms of mobility, convenience, cost-effectiveness, and location of services. Mobile money is analysed to have become an essential part of payment transactions in the financial industry, although it is still in the process of growth [4]. Managing e-money for MNO for financial services business is a complex ecosystem. The company invests in providing future returns as one of the pillars of growth [5]. Mobile money is a convergence between telecommunications infrastructure and microfinance [6].

Various studies have shown that using cell phones and their convergence with the internet is a fascinating research object. However, there has not been much research on cellular phones with the extension of electronic money function. Electronic money or digital money is seen as a substitute for conventional forms of money in the future [7] [8] [4] [9] [10].

Research proved that cell phones have several characteristics that make them suitable for payment purposes. Humans have cell phones and carry them with them, making payment methods easily accessible at any time. Compared to computers, cellular phones are more personal and natural, facilitating payment methods by placing personal data. The ability to access mobile network coverage makes a provided solution to the challenge of financial exclusion. [11] [12] [13] [14] [15].

Studies explain that since adolescence, humans cannot be separated from cell phones as the primary means of communication with family and friends [16] [17]. Another study confirms that children and adolescents use cell phones as the primary communication device [18]. Then cellular phones were studied to increase spending [19], and cell phone use was studied to improve productivity [20]. Cellular phones as a lifestyle can combine several services at once and enter digital economies through products and services [21].

People often take their smartphones with them to enjoy some daily routines [22]. Cellular phones are helpful as a device for conducting economic transactions by connecting sellers and buyers so that consumers can easily find the desired product [23]. The development of cellular technology is continuous and has now entered the 5G era with various new capabilities [24] [25] [26].

In Indonesia, there is a combination of electronic money license holders between Banks and Non-Bank Institutions, making various choices for the public to choose the type of e-money [27]. Bank of Indonesia as a regulator, issued this mobile money license to 4 cellular operators in 2016 [28], but only T-Cash, transformed into LinkAja, still exists in 2021 [29] [30]. Although the community has adopted cellular phones with multiple advantages, individuals still consider adopting or rejecting mobile money. In this study, the character of innovation is used to analyse the process of adopting mobile money voluntarily, which is part of modern life in the digital era.

IDT consist of five significant innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability [31]. Rogers describes Relative Advantage as how innovation is perceived as better than the previous idea. This construct is one of the best predictors of adopting an innovation. Compatibility is the degree to which an innovation is perceived to be consistent with the adopter's existing values, past experiences, and potential needs. Complexity is how the innovation is perceived as relatively difficult to understand and use. Trialability is the degree to which an innovation can be tried on a limited basis. These characteristics explain the adoption of innovations and the decision-making process of mobile money.

2. METHOD

The research's objective is how innovation characteristics become a determining factor in adopting mobile money. This study uses a survey method to collect data to test the research model. Researchers took samples using purposive sampling, namely by determining a survey sample of mobile money users and at least having a length of stay for six months.

This study uses SEM as a statistical analysis method to see the effect of a causal relationship between the independent and dependent variables to explain the observed correlation by making a causal relationship between variables. This research uses a representative sample SEM analysis technique and data processing using SEM with LISREL 8.70.

The conceptual model used to solve a problem is usually formed within the research framework using the scientific method and shows the relationship between the variables in the analysis. The independent variables used in this research are Relative Advantage, Compatibility, Complexity, Trialability, Observability, and the independent variable is Adoption. These variables will positively influence the adoption of mobile money, as presented in Figure 1 as follows.
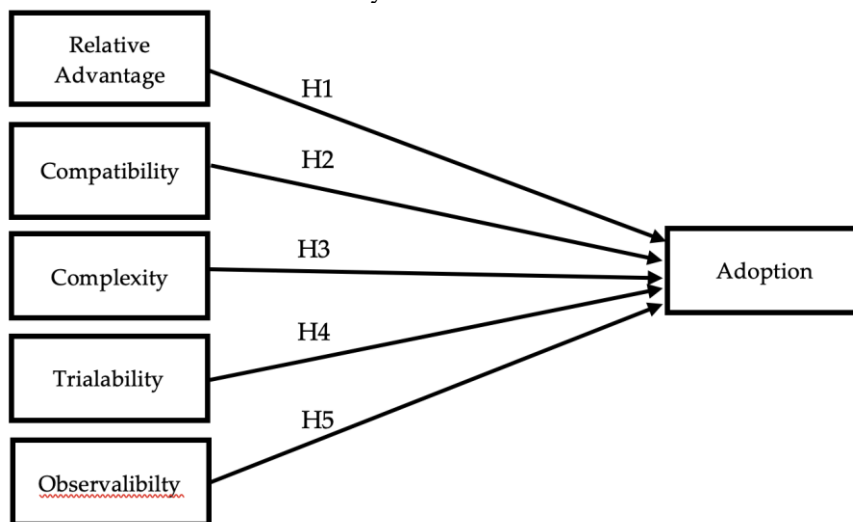
Figure 1 Conceptual Research Model

Based on the framework, the hypotheses can be defined as below.

2.1. Relative Advantage

H1: Relative Advantages influence the Adoption of mobile money.

Research consistently finds that the perception of Relative Advantage affects adoption. Several IDT studies show that users feel that the Relative Advantage is higher, so users will feel they are at a higher level of benefit from a system. This relative advantage is the main predictor for the mobile money adoption process.

2.2. Compatibility

H2: Compatibility influences the adoption of mobile money

Research has shown that previous experience with similar technologies is associated with perceived ease of using technological innovations.

2.3. Complexity

H3: Complexity influences the adoption of mobile money

Empirical studies provide evidence that Complexity has a significant negative impact on interest in using.

2.4. Trialability

H4: Trialability influences the adoption of mobile money

When an innovation can be tested on a limited basis to know the use of a system, individuals will improve their performance

2.5. Observability

H5: Observability influences the adoption of mobile money

If others can observe innovation results, this will affect what individuals feel to improve their performance

All measures were assessed via a four-point Likert type scale ranging from "strongly disagree" (1) to "strongly agree" (4) in Table 1 as follows.

Table 1 Questionnaire Design Summary

| Variables	Questions Design
Relative Advantage	1. Seeing the benefits of mobile money made me want to use it. 2. Mobile money has advantages that other e-money does not have 3. When compared to other forms of e-money, mobile money provides more benefits
Compatibility	1. Using mobile money services according to my lifestyle 2. Using the mobile money service according to my payment activities 3. I believe that mobile money services are compatible with cell phone technology
Complexity	1. I have no difficulty in getting mobile money information 2. I have no difficulty activating the mobile money service 3. I have no difficulty in understanding how to use mobile money 4. I have no difficulty in making mobile money transactions
Trialability	1. I had the opportunity to try mobile money before deciding to use it 2. I have the opportunity to try mobile money with enough time 3. There is a mobile money service that I can try 4. I have the opportunity to try various functions of the mobile money service
Observability	1. Easy for me observing how other people use mobile money services 2. I have no trouble explaining to other people how to use mobile money services 3. I am aware that there are advertisements for mobile money services
Adoption	1. How many times have you used mobile money in the last 6 months? 2. How often do you use mobile money? 3. How often do you top up mobile money?

3. RESULT AND DISCUSSION

3.1. Results

Characteristics of respondents include gender, age, and duration of adopting mobile money. The table below shows that most respondents are female, 147 people or 73.5 percent, and male respondents are 53 people or 26.5 percent. Based on age group, the most respondents were the age group 17-36 years (Y Generation) as many as 187 people or 93.50 percent, followed by the age group up to 37-52 years (X Generation) as many as seven

respondents or 3.50 percent, and the age group under 17 years (Z Generation) as many as six respondents or 3.00 percent. The largest group of mobile money users is from the Millennials generation. The following is an explanation of the respondents' characteristics.

This research found that Relative Advantage, Compatibility, Trialability, and Observability positively influence the adoption of mobile money, and Trialability does not positively influence the adoption process of mobile money. The statistical hypothesis testing results are described in Figure 2-3.
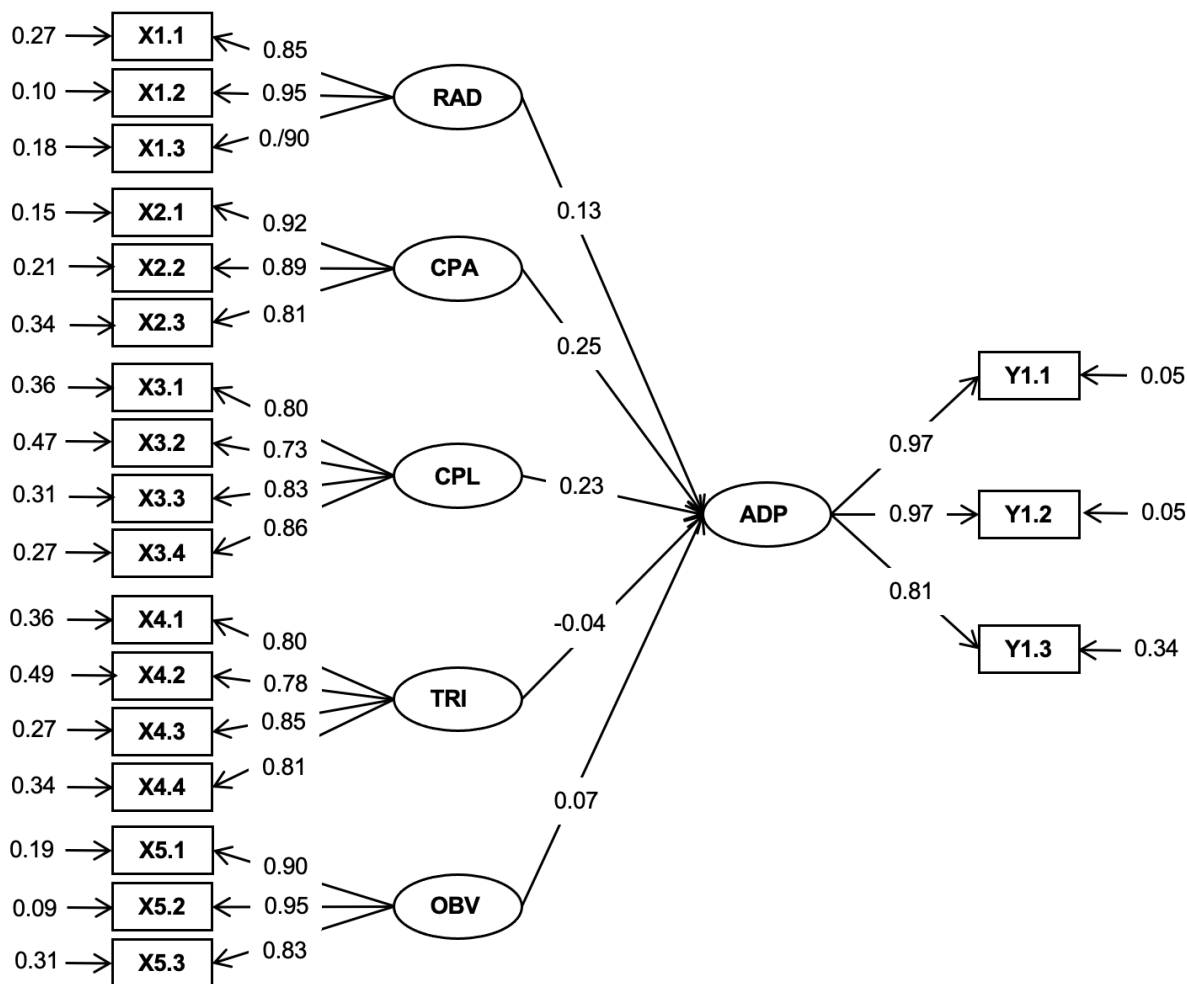
Table 2 Respondent Demographics

Demographic Characteristic		Frequency	Percentage
Gender	Man	53	26.5%
	Woman	147	73.5%
Length of stay	6-12 month	112	56.0%
	1-2 years	77	38.5%
	> 2 years	11	5.5%
Age	≤ 16 years	6	3.00%
	17-36 years	187	93.50%
	>36 years	7	3.50%
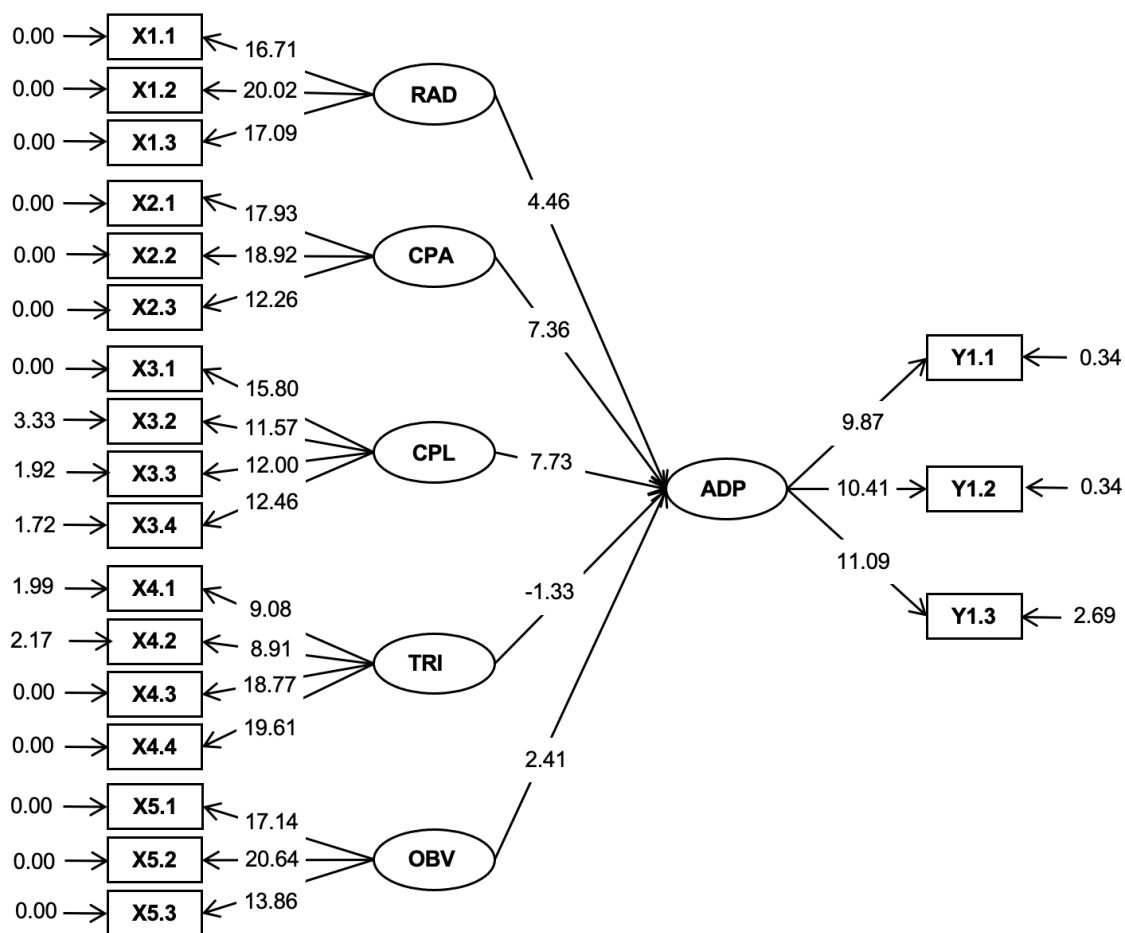
Chi-Square=209.90, df=128, P-value=0.00001, RMSEA=0.057

Figure 2 T-statistic

Chi-Square=209.90, df=128, P-value=0.00001, RMSEA=0.057

Figure 3 Standardized Loading Factor

Table 3 Statistical Hypothesis

Hypothesis	Parameter	Statistical Hypothesis		SLF	T-stat	Summary
		H0	H1			
1	$\gamma1$	$\gamma1=0$ Relative Advantage does not have a positive effect on the Adoption of mobile money	$\gamma1>0$ Relative Advantage has a positive influence on the Adoption of mobile money	0.13	4.46	Significant
2	$\gamma2$	$\gamma2=0$ Compatibility does not have a positive influence on the Adoption of mobile money	$\gamma2>0$ Compatibility has a positive influence on the Adoption of mobile money.	0.25	7.36	Significant
3	$\gamma3$	$\gamma3=0$ Complexity does not have a negative effect on the Adoption of mobile money	$\gamma3<0$ Complexity has a negative influence on the Adoption of mobile money	0.23	7.73	Significant
4	$\gamma4$	$\gamma4=0$ Trialability does not have a positive effect on the Adoption of mobile money	$\gamma4>0$ Trialability has a positive influence on the Adoption of mobile money	-0.04	-1.33	Not Significant
5	$\gamma5$	$\gamma5=0$ Observability does not have a positive influence on the adoption of mobile money	$\gamma5>0$ Observability has a positive influence on the adoption of mobile money	0.07	2.41	Significant

3.2. Discussion

Effect of Relative Advantage on Adoption. The results in the hypothesis test table show a loading value of 0.13 and a t-stat of 4.46. The t-stat value is greater than 5% alpha t-table, which is 1.96, meaning that Relative Advantage has a significant influence on the adoption of mobile money use. Seeing the benefits of mobile money, comparing it with other forms of electronic money, and the various advantages of mobile money are attractive for users. This is similar to research conducted on e-commerce adoption among small medium enterprises [32], big data adoption [33], and We Chat Pay as electronic money [25].

Effect of Compatibility on Adoption. The results in the hypothesis test table show a loading value of 0.25 and a t-stat of 7.36. The t-stat value is greater than 5% alpha t-table, which is 1.96, meaning that Compatibility has a significant influence on the adoption of mobile money use. Using mobile money services according to lifestyle, supporting payment activities, and being compatible with mobile phone technology are important factors for users to accept mobile money. Other research shows compatibility plays an important role in the process of adopting the use of mobile applications [34] and the adoption of management accounting innovation [35].

Effect of Complexity on Adoption. The results in the hypothesis test table show a loading value of 0.23 and a t-stat of 7.73. The t-stat value is greater than 5% alpha t-table, which is 1.96, meaning that Complexity has a significant influence on the adoption of mobile money use. If people don't have complexity in getting cellular money information, it's easy to activate cellular money services, understand how to use cellular money, and have no difficulty in making mobile money transactions, the adoption process will go well. Complexity is an important factor in other studies in the adoption process [36].

Effect of Trialability on Adoption. The results in the hypothesis test table show a loading value of -0.04 and a t-stat of -1.33. The t-stat value is smaller than 5% alpha t-table, which is 1.96, meaning that Trialability does not have a significant effect on the adoption of mobile money usage. The opportunity to try before deciding to use it with sufficient time, being able to try various existing functions is not a determining factor in the process of adopting mobile money. In this research, trialability has no significant role in increasing the adoption rate. However, other studies related to trialability are one of the success factors for successful adoption [37] [38].

Effect of Observability on Adoption. The results in the hypothesis test table show a loading value of 0.07 and a t-stat of 2.42. The t-stat value is greater than 5% alpha t-table, which is 1.96, meaning that Observability has a significant influence on the adoption of mobile money use. Observing how other people use mobile money services, being able to explain to others how to use mobile money services, and knowing about marketing communications programs are determining factors of the mobile money process. In computer-related research, observability is a key determinant of successful adoption [39] and it plays an important role in technology adoption intention [40].

4. CONCLUSION

Mobile money is an extension of cellular phone services beyond basic connectivity. Additional server-based electronic money services through mobile applications cannot be tested first, like other application services. The mobile money application is indeed different from other mobile applications, usually there is free service for a certain period before the customer uses it.

This study specifically analyses Indonesian who have characteristics as Asian who are open to the development of digital technology. Data shows that cellular phone penetration exceeds the total population, more than 355 million subscribers [41] and Indonesia is the fifth most internet engaged country in the world [42]. The evolution of the global e-money network platform has occurred in almost all countries and can reduce the occurrence of cash transactions. This is supported by the more effortless penetration of cellular phones in the community. [43]

The research proposes a conceptual framework for examining user adoption of mobile money in Indonesia. The implication of this study is IDT can be used to predict how the process of adopting mobile money effectively through innovation characteristics. Another implication for future research can be more specific to analyse various choices of electronic money transactions. The growth of mobile phones around the world, including in several developing countries, has driven financial infrastructure to provide dynamics and transform innovation in the financial sector.

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REFERENCES

[1] S. Chatterjee, "A Sociological Outlook of Mobile Phone Use in Society," International Journal of Interdisciplinary and Multidisciplinary Studies (IJIMS), vol. 1, no. 6, pp. 55–63, 2014.

[2] J. C. Aker, "Migration, Money Transfers and Mobile Money: Evidence from Niger," The Fletcher School and Department of Economics, Tufts University, Medford, MA, 2018.

[3] D. Shrier, G. Canale, and A. Pentland, "Mobile Money & Payments: Technology Trends," Massachusetts Information of Technology, 2016.

[4] G. B. Adaba and D. A. Ayoung, "The development of a mobile money service: an exploratory actor-network study," Information Technology for Development, vol. 23, no. 4, pp. 668–686, Oct. 2017, doi: 10.1080/02681102.2017.1357525.

[5] A. Islam, S. Muzi, J. Luis, and R. Meza, "Does Mobile Money Use Increase Firms' Investment? Evidence from Enterprise Surveys in Kenya, Uganda, and Tanzania," Policy Research Working Paper, World Bank Group Development Economics Global Indicators Group, 2016.

[6] W. Nan, X. Zhu, and M. Lynne Markus, "What we know and don't know about the socioeconomic impacts of mobile money in Sub-Saharan Africa: A systematic literature review," Electronic Journal of Information Systems in Developing Countries, vol. 87, no. 2, Mar. 2021, doi: 10.1002/isd2.12155.

[7] G. Camera, "A Perspective on Electronic Alternatives to Traditional Currencies," Chapman University Digital Commons, Economic Science Institute, 2016.

[8] L. Grzybowski, "The role of network effects and consumer heterogeneity in the adoption of mobile phones: Evidence from South Africa," Telecommunications Policy, vol. 39, no. 11, pp. 933–943, Dec. 2015, doi: 10.1016/j.telpol.2015.08.010.

[9] C. N. Gichuki and M. Mulu-Mutuku, "Determinants of awareness and adoption of mobile money technologies: Evidence from women micro entrepreneurs in Kenya," Women's Studies International Forum, vol. 67, pp. 18–22, Mar. 2018, doi: 10.1016/j.wsif.2017.11.013.

[10] C. Bukari and I. Koomson, "Adoption of Mobile Money for Healthcare Utilisation and Spending in Rural Ghana," Network for Socioeconomic Research and Advancement, 2020.

[11] P. Reiting, A. Mladenow, C. Strauss, and G. Kotsis, "Drivers and influencing factors in mobile payment acceptance," PervasiveHealth: Pervasive Computing Technologies for Healthcare, vol. Part F166737, 2020, doi: 10.1145/3401895.3402073.

[12] S. F. A. Hossain, Z. Xi, M. Nurunnabi, and K. Hussain, "Ubiquitous Role of Social Networking in Driving M-Commerce: Evaluating the Use of Mobile Phones for Online Shopping and Payment in the Context of Trust," SAGE Open, vol. 10, no. 3, Jul. 2020, doi: 10.1177/2158244020939536.

[13] I. Koomson, C. Bukari, and R. A. Villano, "Mobile money adoption and response to idiosyncratic shocks: Empirics from five selected countries in sub-Saharan Africa," Technological Forecasting and Social Change, vol. 167, Jun. 2021, doi: 10.1016/j.techfore.2021.120728.

[14] R. B. Malinga and G. Maiga, "A model for mobile money services adoption by traders in Uganda," Electronic Journal of Information Systems in Developing Countries, vol. 86, no. 2, Mar. 2020, doi: 10.1002/isd2.12117.

[15] C. N. Gichuki and M. Mulu-Mutuku, "Determinants of awareness and adoption of mobile money technologies: Evidence from women micro entrepreneurs in Kenya," Women's Studies International Forum, vol. 67, pp. 18–22, Mar. 2018, doi: 10.1016/j.wsif.2017.11.013.

[16] B. R. Garris, L. Lester, E. Doran, and A. Lowery, "iBusy: Research on children, families, and smartphones. Proceedings of the National Organization for Human Services," East Tennessee State University, pp. 99–109, 2017.

[17] P. Nishad and A. Singh Rana, "Impact of mobile phone addiction among college going students," Advance Research Journal of Social Science, 2016, doi: 10.15740/HAS/ARJSS/7.1/000-000.

[18] K. Kopecký, F. D. Fernández-martín, R. Szotkowski, G. Gómez-garcía, and K. Mikulcová, "Behaviour of children and adolescents and the use of mobile phones in primary schools in the czech republic," International Journal of Environmental Research and Public Health, vol. 18, no. 16, Aug. 2021, doi: 10.3390/ijerph18168352.

[19] C. Aron Bwana and M. L. Nooseli, "Impact of Mobile Phone Related Spending on Rural Community in Kenya: A Case Study of Kiabuya Village in Homabay County," International Journal of Information and Communication Technology Research, vol. 4, no. 8, 2014.

[20] R. Sarwar WAHLA and A. Ghafoor AWAN, "Mobile Phones Usage and Employees' Performance: A Perspective from Pakistan," International Journal of Academic Research in Accounting, vol. 4, no. 4, pp. 153–165, 2014, doi: 10.6007/IJARAFMS/v4-i4/50.

[21] D. J. Teece, "Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world," Research Policy, vol. 47, no. 8, pp. 1367–1387, Oct. 2018, doi: 10.1016/j.respol.2017.01.015.

[22] C. Mombeuil and H. Uhde, "Relative convenience, relative advantage, perceived security, perceived privacy, and continuous use intention of China's WeChat Pay: A mixed-method two-phase design study," Journal of Retailing and Consumer

Services, vol. 59, Mar. 2021, doi: 10.1016/j.jretconser.2020.102384.

[23] M. Kiba-Janiak, "The use of mobile phones by customers in retail stores: a case of Poland," Economics & Sociology, vol. 7, no. 1, pp. 116–130, 2014, doi: 10.14254/2071.

[24] Cheng Xiang, Heriot-Watt, X. Gao, and X.-H. You, "5G Wireless Communication Systems: Prospects and Challenges: Cellular Architecture and Key Technologies for 5G," IEEE Communications Magazine, 2014.

[25] A. Shaik, R. Borgaonkar, S. Park, and J. P. Seifert, "New vulnerabilities in 4G and 5G cellular access network protocols: Exposing device capabilities," in WiSec 2019 - Proceedings of the 2019 Conference on Security and Privacy in Wireless and Mobile Networks, May 2019, pp. 221–232. doi: 10.1145/3317549.3319728.

[26] A. Huertas et al., "Towards the autonomous provision of self-protection capabilities in 5G networks," Journal of Ambient Intelligence and Humanized Computing, 2019.

[27] Bank Indonesia, "Licencing," Central Bank Republic of Indonesia. https://www.bi.go.id/en/fungsi-utama/sistem-pembayaran/perizinan/default.aspx

[28] Bank Indonesia, "Daftar Penyelenggara Uang Elektronik yang Telah Memperoleh Izin dari Bank Indonesia Per Agustus 2016," Central Bank Republik of Indonesia. https://www.bi.go.id/id/sistem-pembayaran/informasi-perizinan/uang-elektronik/Contents/Default.aspx

[29] PT XL Axiata Tbk, "Penutupan Bertahap XL Tunai 2020." https://www.xl.co.id/id/xltunai

[30] CNN Indonesia, "Indosat Masih Gantung Nasib Paypro." https://www.cnnindonesia.com/teknologi/2018111 5070751-213-346673/indosat-masih-gantung-nasib-paypro

[31] E. M. Rogers, Diffusion of Innovation, 5th ed. New York: The Free Press, 2003.

[32] K. Y. Sin, A. Osman, S. N. Salahuddin, S. Abdullah, Y. J. Lim, and C. L. Sim, "Relative Advantage and Competitive Pressure towards Implementation of E-commerce: Overview of Small and Medium Enterprises (SMEs)," Procedia Economics and Finance, vol. 35, pp. 434–443, 2016, doi: 10.1016/s2212-5671(16)00054-x.

[33] H.-M. Chen, R. Kazman, and F. Matthes, "Association for Information Systems AIS Electronic Library (AISeL) Demystifying Big Data Adoption: Beyond IT Fashion and Relative Advantage Recommended Citation," DIGIT 2015 Proceedings. Paper 4., 2015, [Online]. Available: http://aisel.aisnet.org/digit2015http://aisel.aisnet.org/digit2015/4

[34] S. Min, K. K. F. So, and M. Jeong, "Consumer adoption of the Uber mobile application: Insights from diffusion of innovation theory and technology acceptance model," Journal of Travel and Tourism Marketing, vol. 36, no. 7, pp. 770–783, Sep. 2019, doi: 10.1080/10548408.2018.1507866.

[35] C. Ax and J. Greve, "Adoption of management accounting innovations: Organizational culture compatibility and perceived outcomes," Management Accounting Research, vol. 34, pp. 59–74, Mar. 2017, doi: 10.1016/j.mar.2016.07.007.

[36] P. Poutanen, W. Soliman, and P. Ståhle, "The complexity of innovation: an assessment and review of the complexity perspective," European Journal of Innovation Management, vol. 19, no. 2, pp. 189–213, 2016.

[37] M. Ali, S. A. Raza, C. H. Puah, and H. Amin, "Consumer acceptance toward takaful in Pakistan: An application of diffusion of innovation theory," International Journal of Emerging Markets, vol. 14, no. 4, pp. 620–638, Sep. 2019, doi: 10.1108/IJOEM-08-2017-0275.

[38] G. Changchun, M. J. Haider, and T. Akram, "Investigation of the Effects of Task Technology Fit, Attitude and Trust on Intention to Adopt Mobile Banking: Placing the Mediating Role of Trialability," International Business Research, vol. 10, no. 4, p. 77, Mar. 2017, doi: 10.5539/ibr.v10n4p77.

[39] K. J. Hayes, "Trialability, observability and risk reduction accelerating individual innovation adoption decisions," Journal of Health Organization and Management, 2015.

[40] M. C. Tsai, J. F. Wang, and Y. T. Chen, "Effect of social identity on supply chain technology adoption of small businesses," Asia Pacific Management Review, vol. 26, no. 3, pp. 129–136, Sep. 2021, doi: 10.1016/j.apmrv.2020.12.001.

[41] International Telecomunnication Union, "Statistic ITU ," 2020. https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

[42] S. Tiwari, "Beyond Unicorn. Harnessing Digital Technologies for Inclusion in Indonesia ," The World Bank, 2021.

[43] G. M. Cobla and E. Osei-Assibey, "Mobile money adoption and spending behaviour: The case of students in Ghana," International Journal of Social Economics, vol. 45, no. 1, pp. 29–42, 2018, doi: 10.1108/IJSE-11-2016-0302.