

Is Digitalization Really Matter on SMEs?

Rulyanti Susi Wardhani¹, Muhammad Qomaruddin Ridwan¹, and Alim Bahri¹

¹Universitas Bangka Belitung, Indonesia

Abstract. Digitalization has penetrated various sectors, including SMEs. This paper aims to empirically prove whether digitalization has an impact on the value-added and productivity of SMEs. Using the Innovation Theory by Rogers we analyze the perception of 156 SMEs who have digitized their business. The result says that there is enough evidence that digitalization has an impact on the productivity and value-added of SMEs. This evidence supports the Innovation Theory that digitalization can increase productivity and value-added in companies including SMEs by increasing operational effectiveness and efficiency. Stakeholders, especially the government must encourage SMEs to digitize their business by taking supportive policies and providing incentives for SMEs who digitize.

Keyword. SMEs, Digitalization, Value-Added, Productivity, Performance

1. Introduction

Small and Medium Enterprises (SMEs) play crucial roles in developing regional economic with a substantial contribution to GDP and job creation [1]–[7]. Despite marvelous contributions, SMEs still lack some aspects, such as financial access, marketing, and digitalization [8]–[10]. SMEs face a lack of resources available to do financial records and reporting [11]–[13]. The absence of financial reports inflicts SMEs cannot access funds from financial institutions, and SMEs face capital constraints in developing their businesses. Governments in various countries have made multiple efforts to reduce the problems faced by SMEs [14]–[16], including the Indonesian Government [17]–[19] through training and assistance in access to financing and promotion by utilizing digitalization [20].

Digitalization has become an important catalyst for increasing productivity and competitiveness [21], [22]. Applying digital technology may improve business processes, increase operational efficiency, and create value-added [23]. Toward digitalization, SMEs can open up opportunities, expand market reach, and improve the quality of products and services. This process involves the utilisation of technology such as e-commerce, social media, digital business management systems, and electronic payment [24]–[26]. Using the innovation theory by [27] which explain that innovation will add value as of business processes become more effective and efficient, this research engage structured interviews with 157 SMEs in the Bangka Belitung Islands Province to obtain a general overview of the influence of digitalization on the productivity and added value of SMEs.

Previous studies regarding digital transformation in SMEs were mostly conducted in more developed regions [28]–[30] or at the national level [31], [32], as of this research provides a new perspective that is relevant for island regions with different challenges and opportunities. This research aims to analyze digital transformation's influence on SMEs' productivity in the Bangka Belitung Islands Province, considering the low level of adoption of digital technology among SMEs in the Bangka Belitung Islands Province compared to other regions in Indonesia [33]. Not only contributes to the scientific literature on digital transformation and SMEs this research also has a practical impact for government to make policy in order to improve SMEs capacity so they can compete in the global market.

2. Literature Review

Using Innovation Theory by [27] which explains how companies can create new value through the development of new products, processes, and business models. In the context of SMEs innovation can be an opportunity for SMEs to innovate in their business in terms of purchasing materials, production process, packaging, marketing, and payment [34]–[37]. Through innovation SMEs may develop new products, as well as new business models, which is lead to increase productivity and competitiveness [38].

Productivity is a concept that measures efficiency and effectiveness in producing output (results) using certain inputs (resources) in a certain unit of time [39], [40]. In simple terms, productivity can be interpreted as the ability to produce more with fewer resources. Productivity is important in increasing the value of a business. Companies will always try to increase productivity to maintain the sustainability of their business [41]. By having more products and services company will have the opportunity to earn revenue which lead to profit and business sustainability. Productivity is also defined as adding value to a good or service [42], [43].

Value added from a product perspective is the value attributed to a product as a result of a particular process, so theoretically, the further downstream the process is applied, the greater the added value that can be formed [44], [45]. Value-added analysis is generally carried out using the Hayami method that identifying the some components, such as inputs, outputs, material prices, selling prices, labor costs, and contributions from other inputs. The Hayami method has advantages, namely being able to determine the amount of added value and output and being able to determine the amount of compensation for owners of production factors [46].

2.1 Digitalization and Productivity

Digitalization plays a crucial role in driving productivity improvements, particularly through its alignment with Rogers' Innovation Diffusion Theory 2019. According to this theory, innovation adoption follows a process where new ideas, practices, or technologies are introduced and gradually accepted by individuals or organizations, resulting in enhanced effectiveness and efficiency [27]. Digitalization, as an innovation, transforms traditional business processes by automating operations, streamlining workflows, and facilitating data-driven decision-making [22]. SMEs, in particular, stand to gain significantly by incorporating digital tools such as cloud, artificial intelligence, and digital payment systems into operations [47]. These technologies reduce the time and resources required for routine tasks, allowing businesses to focus on core operational activities such as product development, customer service, and market expansion [48]. By adopting digital solutions, SMEs can overcome resource constraints, scale operations more effectively, and create a more agile business environment conducive to sustained productivity growth [26].

Had researched the productivity of SMEs globally, the results state that SMEs still face a lack in increasing productivity by [49]. This is due to the milt of adoption of technology and digitalization. However, with the development of technology in the last decade, the results need to be reviewed. This is because recent research shows that MSMEs have adopted digitalization into their businesses [48], [50]–[52]. In the context of SMEs digitalization covers terms of purchasing materials, production process, packaging, marketing, and payment [34]–[37]. Through digitalization SMEs may develop new products and services, as well as new business models, will be better able to increase productivity and competitiveness [38]. Based on the Innovation Theory by [27] and recent studies findings we propose the hypothesis as :

H1: Digitalization incrlleases productivity of SMEs

2.2 Digitalization and Value-Added

Value-added represents the incremental value generated through the transformation of inputs into outputs that hold greater worth, encompassing product refinement, innovation, and enhanced service delivery [44]. Digitalization empowers SMEs to maximize value-added by enabling them to perform more stages of production and service delivery independently [53]. By adopting digital tools such as automated manufacturing systems, digital design technologies, and e-commerce platforms, SMEs can reduce their reliance on external intermediaries, thereby capturing a larger share of the value chain [54], [55]. According to [27] Innovation Diffusion Theory, organizations that adopt innovative practices can optimize their operations, improve the quality and uniqueness of their offerings, and create differentiated products, leading to higher value-added. Digitalization allows SMEs to control multiple stages of their operations, including procurement, production, packaging, marketing, and sales, thus streamlining processes and retaining more value within the organization [56].

Empirical evidence supports the impact of digitalization on value-added activities in SMEs. [57] highlight how digital tools foster innovation and enable SMEs to develop customized products and services, enhancing their value proposition. Similarly, [58] find that digitalization streamlines production processes, improving operational efficiency and minimizing dependency on third-party providers. Emphasize that e-commerce platforms or direct sales channels enable SMEs to bypass traditional distribution networks, capturing additional value through direct engagement with consumers by [59]. When SMEs integrate these technologies, they gain the ability to execute core operations independently, retain more of the profit margins, and enhance their competitiveness in the market. Based on the Innovation Theory by [27] and recent studies findings we propose the hypothesis as :

H2: Digitalization increases value-added in SMEs

3. Research Methods

To get an overview of the impact of digitalization on the productivity and added value of SMEs, data collection was carried out through a questionnaire distributed via Google Forms to SMEs actors. The questionnaire contains questions about the business profile and perceptions of SMEs actors about the implementation of digitalization, productivity, and added value after they have digitized. Responses to perceptions are measured using a Likert Scale consisting of 1: strongly disagree; 2: disagree; 3: agree, and 4: strongly agree. To get a better overview and strong external validation we follow [60] that state the minimum amount of sample as formulated which is formulated by multiplying the total number of questionnaire questions by 10. In the questionnaire, there are 12 questions to capture the perceptions of SMEs actors regarding the influence of digitalization on productivity and added value, so the minimum sample size in this study is 120.

Digitalization is measured with Rogers's model which was modified for this research purpose and consists of five questions including that the company has carried out digitalization and will continue to develop it. Productivity adopts the dimensions of [39], [40] which consists of four questions about the effectiveness and efficiency of business operations. Value-added is measured by the Hayami model used [61] which consists of three questions about how far SMEs carry out their business process. The collected data is processed and then tested using SEM-PLS to obtain an overview of the perceptions of SMEs actors regarding the influence of digitalization on productivity and value-added in their businesses.

4. Result and Discussion

After data collection, 156 respondents were obtained, which is a number that meets the minimum sample requirement of 120 samples. The following are the characteristics of the respondents:

Table 1. Characteristics of Respondents

Years-Business	Number	%	Years-Digitized	Number	%
< 1 year	0	0	< 1 year	1	0,6
1-5 years	105	67,3	1-5 years	138	88,5
> 5 years	51	32,7	> 5 years	17	10,9

Source: Research Data

Table 1 shows 105 SMEs that have run their business for 1-5 years and 51 SMEs that have run their business for over 5 years. There are 1 SMEs do digitalization for less than 1 year, 138 respondents have been digitalizing for 1-5 years, and 17 respondents have been digitalizing for more than 5 years. Based on this description, it is known that the respondents have been established for quite a long period and have been digitized. The descriptive analysis is presented in the table below:

Table 2. Data Description

	Sample	Mean	Minimum	Maksimum	Std. Dev
DG	156	3,54	1,00	4,00	0,49
PRO	156	3,47	1,00	4,00	0,55
VA	156	3,52	1,00	4,00	0,54

Source: Research Data

The table above shows the distribution of the variables of this research. Data was measured using a 4-point Likert Scale. The distribution of the digitalization variable shows a minimum value of 1 and a maximum value of 4, with an average of 3.54, and a standard deviation of 0.49. The distribution of the productivity variable shows a minimum value of 1 and a maximum value of 4, with an average of 3.47, and a standard deviation of 0.55. The distribution of the value-added variable shows a minimum value of 1 and a maximum value of 4, with an average of 3.52, and a standard deviation of 0.54. These numbers indicate that the distribution data from the digitalization, productivity, and value-added can explain the entire data well [60].

4.1 Ordinary Least Square Test

At this stage, there are three series of tests: linearity, endogeneity, and multicollinearity tests. The linearity test is to see the linear relationship between the independent variable and the dependent variable. A construct of the independent variable is said to have a linear relationship with a construct of the dependent variable if it has a P-value of $QE > 0.05$ [60]. Figure 1 will show the SEM-PLS result of data analysis.

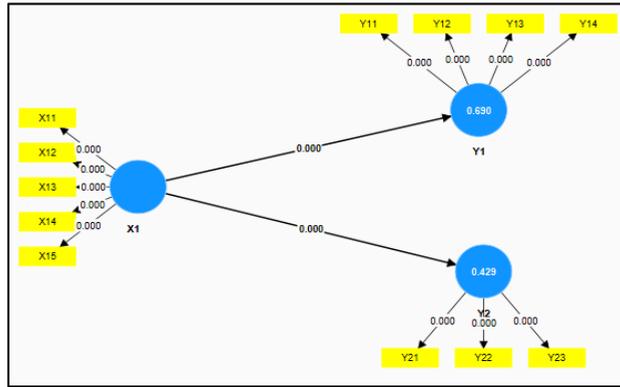


Fig. 1. SEM PLS Result

For better understanding about the result, see Table 3. Based on Table 3, it can be seen that the P-value of QE digitalization to productivity is 0.857. Likewise, the P-value of QE digitalization) to value-added is 0.992. This shows that there is a linear relationship between variables.

Table 3. Liniarity Test

	<i>Original sample (O)</i>	<i>Sample mean (M)</i>	<i>STDEV</i>	<i>T statistics (O/STDEV)</i>	<i>P values</i>
DG → PRO	0.820	0.819	0.042	19.711	0.000
DG → VA	0.658	0.706	0.086	7.665	0.000
QE (DG) → PRO	-0.010	-0.008	0.053	0.180	0.857
QE (DG) → VA	0.002	0.158	0.221	0.010	0.992

Source: Research Data

Endogeneity occurs when there is a reciprocal relationship between the independent and dependent variables or when a latent variable influences both variables. If this occurs, it becomes difficult to accurately determine the causal relationship. The relationship of variables free from the endogeneity issue when the P-value of GC (Gaussian Copula) should be > 0.05 [60]. Table 4 and Table 5 shows the results of the endogeneity test.

Table 4. Endogeneity Result DG → PRO

	<i>Original sample (O)</i>	<i>Sample mean (M)</i>	<i>STDEV</i>	<i>T statistics (O/STDEV)</i>	<i>P values</i>
DG → PRO	0.617	0.588	0.177	3.482	0.001
DG →VA	0.655	0.653	0.073	8.942	0.000
GC (DG) → PRO	0.156	0.176	0.111	1.409	0.159

Source: Research Data

Table 5. Endogeneity Result DG → VA

	<i>Original sample (O)</i>	<i>Sample mean (M)</i>	<i>STDEV</i>	<i>T statistics (O/STDEV)</i>	<i>P values</i>
DG → PRO	0.831	0.828	0.038	21.618	0.000
DG → VA	0.443	0.365	0.283	1.565	0.118
GC DG → VA	0.156	0.208	0.162	0.959	0.337

Source: Research Data

Table 4 and Table 5 show that the GC P-value of DG→PRO is 0.159 and the GC P-value of DG →VA is 0.337. These results show that there are no endogeneity problems, which means that the independent variables in the model are not correlated with the error term. That ensures that the estimates produced are unbiased and consistent. In other words, the model can accurately reflect the causal relationship between the independent and dependent variables. Last but not least, we did not do a multicollinearity test before the structural model of the hypothesis test because that test is to determine that each independent variable is not strongly correlated, since in this paper there is just one independent variable.

4.2 Outer Model

An outer model test is used in Partial Least Squares analysis to assess the reliability and validity of the measurement model before analyzing the inner model. The outer model defines the relationships between observed variables and their underlying latent variables. The indicator is valid if it has an outer loading value > 0.7 [60]. Table 6 shows the results of the outer loading measurement.

Table 6. Outer Loading Result

Variable	Indicator	Outer Loading
DG	X1.1	0.855
	X1.2	0.862
	X1.3	0.907
	X1.4	0.902
	X1.5	0.825
PRO	Y1.1	0.879
	Y1.2	0.932
	Y1.3	0.941
	Y1.4	0.882
VA	Y2.1	0.810
	Y2.2	0.874
	Y2.3	0.908

Source: Research Data

Table 6 shows that all indicators have an outer loading value of more than 0.7. This means all indicators have met the requirements for the outer loading test. Results of the outer model were further used for convergent validity tests through the Average Variance Extracted (AVE). AVE measures the amount of variance captured by the construct compared to measurement error [60]. The results of the AVE measurement are described in the following table.

Table 7. Average Variance Extracted Result

Variable	AVE
DG	0.758
PRO	0.827
VA	0.748

Source: Research Data

Table 7 shows that AVE of DG, PRO, and VA > 0,5 so it can be concluded these three variables are valid. After convergent validity is confirmed, we do a discriminant validity test to ensure that a construct is distinct and truly measures what it's supposed to measure. Discriminant validity helps confirm that each construct in a model is unique and that there isn't too much similarity between them, which is essential for accurate, interpretable results.

The discriminant validity test consists of two types of calculations. First, the fornell-larcker criterion test is carried out. In the fornell-larcker criterion, the root of AVE must be greater than the correlation between variables [60].

Table 8. Fornell-Larcker Test Result

	DG	PRO	VA
DG	0.871		
PRO	0.831	0.909	
VA	0.655	0.601	0.865

Source: Research Data

The digitalization variable (DG) has a root of 0.871, where the value is more correlated when compared to productivity and value-added. This result shows that the discriminant validity of the digitalization variable is met. Likewise with other variables that show similar things. Where, in the productivity variable the AVE root is 0.909 and the value-added is 0.865. Furthermore, discriminant validity can be seen from the heterotrait-monotrait ratio value. A variable is said to be valid if the heterotrait-monotrait ratio value is <0.9 [60]. Table 9 will show the heterotrait-monotrait ratio result.

Table 9. Heterotrait-Monotrait Ratio Result

	DG	PRO	VA
DG			
PRO	0.895		
VA	0.744	0.683	

Source: Research Data

The last step of the outer model test is the reliability test to ensure the consistency and stability of a measurement instrument over time. A reliability test helps to confirm that the instrument consistently measures a construct without too much random error, ensuring dependable and repeatable results. An indicator is said to be able to measure a construct if it has a Cronbach's alpha value > 0.7 and composite reliability > 0.7 [60]. The results of the reliability test are described in the following Table 10.

Table 10. Cronbach's Alpha dan Composite Reliability

	<i>Cronbach's alpha</i>	<i>Composite reliability</i>	<i>Composite reliability</i>
DG	0.92	0.921	0.940
PRO	0.93	0.931	0.950
VA	0.83	0.835	0.899

Source: Research Data

Table 10 shows that all measurement variables meet the reliability test requirements. All variables have a Cronbach's alpha score > 0.7 and a composite reliability score > 0.7. From the results, it can be concluded that this research model is reliable and can be used in further testing.

4.3 Inner Model

In the inner model test, there are four series of tests were carried out, namely R-square, the goodness of fit, F-square, and direct effect. The following are the results of the inner model testing carried out. The R-Square value explains the variance of each endogenous target variable with a measurement standard of around 0.75 considered strong, around 0.50 is considered moderate, and below 0.25 indicates a weak level of variance [60]. The following are the results of the R-Square calculation using SmartPLS.

Table 11. R-Square Calculation

	<i>R-square</i>	Ref
PRO	0.690	Strong
VA	0.429	Moderate

Source: Research Data

Based on the table above, the R-squared value of the productivity is 0.690. This means that the variability of the productivity construct can be explained by the variability of the digitalization construct by 69%, while the rest is explained by other variables outside the study. R-Square value of the value-added is 0.429. This shows that the variability of the added value construct that can be explained by digitalization is 42.9%, while the rest is explained by variables outside the study.

The goodness of fit is a test of the model as a whole. The GoF index can be seen in the SRMR value. If the SRMR value is <0.10, then the model used is classified as fit [60]. Table 12 will show the result of the goodness of fit test that said SRMR value is 0.069, where this value is less than 0.10. This indicates that the model used in this study is classified as fit.

Table 12. Result Goodness of Fit Test

	<i>Saturated model</i>	<i>Estimated model</i>
SRMR	0.067	0.069
d ULS	0.347	0.367
d G	0.297	0.298
Chi-square	273.842	274.500
NFI	0.842	0.842

Source: Research Data

The F-square value shows the magnitude of the influence of exogenous variables on endogenous variables. If the F-square value is 0.02, it is categorized as weak; the F-square value of 0.15 is categorized as medium; the F-square value of 0.35 is categorized as strong [60]. Table 13 shows the result of the F-square test that the F-square value of digitalization on productivity is 2.226 and the F-square of digitalization on value-added is 0.752. This means that the influence of digitalization on productivity and value-added can be categorized as a strong influence.

Table 13. Result F-Square Test

	PRO	VA
DG	2.226	0.752

Source: Research Data

Last but not least test is a direct effect test that is carried out by looking at the path value. Stated that there is a significant influence between variables if the p-value is <0.05 by [60]. Table 14 shows the result of the direct effect test.

Table 14. Result Direct Effect Test

	<i>Original sample (O)</i>	<i>Sample mean (M)</i>	<i>Standard deviation (STDEV)</i>	<i>T statistics (O/STDEV)</i>	<i>P values</i>
DG→PRO	0.831	0.828	0.038	21.618	0.000
DG→VA	0.655	0.653	0.073	8.942	0.000

Source: Research Data

Based on Table 14 above, can be explained that the p-value of digitalization on productivity is less than 0.05 and so and digitalization on value-added. Where the p-value of digitalization on productivity is 0.000 and the p-value of digitalization on added value is 0.000. Therefore, from the tests that have been carried out, it can be concluded that there is sufficient evidence to say that digitalization increases the productivity and value-added of SMEs, which supports our hypothesis.

5. Conclusion and Implication

This study concludes that digitalization significantly enhances the productivity and value-added of SMEs. These findings align with the Innovation Diffusion Theory by [27], which emphasizes that adopting innovation improves efficiency and effectiveness. The evidence from 156 SMEs in the Bangka Belitung demonstrates that digitalization optimizes business operations, streamlines processes, and increases the ability to generate value. Furthermore, the results also support recent research [22], [38], [48]–[52], [62] that highlighting the transformative potential of digital tools in improving SME competitiveness and sustainability, particularly in regions with unique challenges like Bangka Belitung.

From an empirical perspective, the study underscores the practical benefits of digitalization for SMEs. For instance, tools such as e-commerce platforms, digital payment systems, and automated processes enable SMEs to reduce operational costs, expand market access, and improve product and service quality. This suggests that SMEs prioritizing digitalization are better positioned to overcome resource constraints and adapt to rapidly changing market demands. These findings emphasize the need for SME managers to proactively adopt and integrate digital technologies into their operations, leveraging these tools to foster long-term growth and innovation.

Policy implications derived from this research highlight the necessity of government and institutional support in accelerating SME digital transformation. Policymakers should consider providing financial incentives, such as grants or tax relief, for SMEs investing in digital tools. Additionally, training programs to improve digital literacy among SME owners and employees are vital. Future research could explore the longitudinal impact of digitalization on SMEs across different industries and geographic settings, investigate barriers to digital adoption, and examine how emerging technologies like AI and blockchain further contribute to SME growth and value creation.

Thank you LPPM Universitas Bangka Belitung for funding this research through the PDTU 2024 scheme.

6. References

- [1] M. Nuranindita, “Peran Dan Manfaat Marketplace Dan Digital Payment Dalam Meningkatkan Pemberdayaan Umkm Di Provinsi Bangka-Belitung,” *Indones. Treas. Rev. J. Perbendaharaan Keuang. Negara dan Kebijakan. Publik*, vol. 8, no. 1, hal. 17–31, 2023, doi: 10.33105/itrev.v8i1.590.
- [2] E. Widiati, L. Levyda, dan K. Ratnasari, “Optimalisasi Media Sosial Instagram Dalam Aktivitas Bisnis Bagi Umkm Di Bangka Belitung,” *J. Ind. Kreat. dan Kewirausahaan*, vol. 4, no. 2, hal. 84–90, 2021, doi: 10.36441/kewirausahaan.v4i2.628.
- [3] K. Ratnasari dan L. Levyda, “Pengaruh Orientasi Kewirausahaan terhadap Kinerja Perusahaan: Studi Kasus UMKM Pendukung Wisata Kuliner di Provinsi Kepulauan Bangka Belitung,” *JMK (Jurnal Manaj. dan Kewirausahaan)*, vol. 6, no. 2, hal. 1, 2021, doi: 10.32503/jmk.v6i2.1267.
- [4] T. Tambunan, “SME Development in Indonesia: Do Economic Growth and Government Supports Matter?,” *SSRN Electron. J.*, hal. 1–19, 2011, doi: 10.2139/ssrn.1218922.
- [5] D. H. Karadag, “The Role of SMEs and Entrepreneurship on Economic Growth in Emerging Economies within the Post-Crisis Era: an Analysis from Turkey,” *J. Small*

- Bus. Entrep. Dev.*, vol. 4, no. 1, hal. 22–31, 2016, doi: 10.15640/jsbed.v4n1a3.
- [6] M. Tribe, F. Nixon, dan A. Sumner, “Economic growth and structural change,” *Econ. Dev. Stud.*, no. July, hal. 58–78, 2020, doi: 10.4324/9780203847077-11.
- [7] N. Van Song *et al.*, “SME financing role in developing business environment and economic growth: empirical evidences from technical SMEs in Vietnam,” *Environ. Sci. Pollut. Res.*, vol. 29, no. 35, hal. 53540–53552, 2022, doi: 10.1007/s11356-022-19528-w.
- [8] Y. Goto dan S. Wilbur, “Unfinished business: Zombie firms among SME in Japan’s lost decades,” *Japan World Econ.*, vol. 49, no. December 2017, hal. 105–112, 2019, doi: 10.1016/j.japwor.2018.09.007.
- [9] S. Faiez dan R. Vijayendra, “Research & Policy Briefs From the World Bank Malaysia Hub,” *World Bank Glob. Knowl. Res. Hub*, 2019.
- [10] R. Ulewicz dan R. Kuçeba, “Identification of problems of implementation of Lean concept in the SME sector,” *Eng. Manag. Prod. Serv.*, vol. 8, no. 1, hal. 19–25, 2016, doi: 10.1515/emj-2016-0002.
- [11] L. Këri dan A. Jupe, “(Open Access) Implementing IFRS for SME - a Challenge for Albania,” vol. 17, no. 4, hal. 203–210, 2020.
- [12] R. Rudiantoro dan S. V. Siregar, “Kualitas Laporan Keuangan Umkm Serta Prospek Implementasi Sak Etap,” *J. Akunt. dan Keuang. Indones.*, vol. 9, no. 1, hal. 1–21, 2012, doi: 10.21002/jaki.2012.01.
- [13] M. Q. Ridwan, “ANALISIS PENGHITUNGAN HARGA POKOK PRODUKSI (Studi Kasus Pada UMKM HUNAY Kabupaten Probolinggo),” *J. Ilm. Mhs. FEB UB*, hal. 17, 2017.
- [14] D. Smallbone dan F. Welter, “The Role of Government in SME Development in Transition Economies,” *Int. Small Bus. J.*, vol. 19, no. 4, hal. 63–77, 2001, doi: 10.1177/0266242601194004.
- [15] S. Doh dan B. Kim, “Government support for SME innovations in the regional industries: The case of government financial support program in South Korea,” *Res. Policy*, vol. 43, no. 9, hal. 1557–1569, 2014, doi: 10.1016/j.respol.2014.05.001.
- [16] S. Park, I. H. Lee, dan J. E. Kim, “Government support and small- and medium-sized enterprise (SME) performance: the moderating effects of diagnostic and support services,” *Asian Bus. Manag.*, vol. 19, no. 2, hal. 213–238, 2020, doi: 10.1057/s41291-019-00061-7.
- [17] S. Noya, S. M. Yufra TANE0, M. Melany, dan E. Astridya SETIYATI, “The Role of Local Government in Improving Resilience and Performance of Small and Medium-Sized Enterprises in Indonesia*,” *Etsa Astridya SETIYATI / J. Asian Financ.*, vol. 9, no. 3, hal. 245–0256, 2022, doi: 10.13106/jafeb.2022.vol9.no3.0245.
- [18] W. Hartanti, “Peran Pemerintah Kelurahan Dalam Pengembangan Umkm,” *Indones. J. Strateg. Manag.*, vol. 4, no. 1, 2021, doi: 10.25134/ijsm.v4i1.3952.
- [19] T. G. Putra, “Peran Pemerintah Daerah Dan Partisipasi Pelaku Usaha Dalam Pengembangan UMKM Manik-Manik Kaca di Kabupaten Jombang,” *J. Kebijak. dan Manaj. Publik*, vol. 3, no. April, hal. 1–10, 2015.

- [20] W. Irawan dan R. S. Wardhani, "Economic Entity Concept, Penata Keuangan dan Aplikasi Lamikro Era Industri 4.0 (UMKM Provinsi Kepulauan Bangka Belitung)," *J. Akunt.*, 2021, doi: 10.28932/jam.v13i1.3001.
- [21] J. Straková, M. Talíř, dan J. Váchal, "Opportunities and Threats of Digital Transformation of Business Models in Smes," *Econ. Sociol.*, vol. 15, no. 3, hal. 159–171, 2022, doi: 10.14254/2071-789X.2022/15-3/9.
- [22] E. Prem, "A digital transformation business model for innovation," *ISPIM Innov. Summit*, no. December 2015, hal. 1–11, 2015.
- [23] I. Harianton, Heri Setiawan, dan Agus Surjana Saefudin, "Development of Manufacturing System in the Industrial Revolution 4.0 from Concept to Industrial World," *J. Teknol. dan Rekayasa Manufaktur*, vol. 2, no. 1, 2020, doi: 10.48182/jtrm.v2i1.15.
- [24] H. Aghazadeh, F. Zandi, H. Amoozad Mahdiraji, dan R. Sadraei, "Digital transformation and SME internationalisation: unravelling the moderated-mediation role of digital capabilities, digital resilience and digital maturity," *J. Enterp. Inf. Manag.*, 2023, doi: 10.1108/JEIM-02-2023-0092.
- [25] Fachrurazi, A. Y. Rukmana, Supriyanto, Syamsulbahri, dan Iskandar, "Revolusi Bisnis di Era Digital: Strategi dan Dampak Transformasi Proses Teknologi terhadap Keunggulan Kompetitif dan Pertumbuhan Organisasi," *J. Bisnis dan Manaj. West Sci.*, vol. 2, no. 03, hal. 297–305, 2023, doi: 10.58812/jbmws.v2i03.563.
- [26] L. Li, F. Su, W. Zhang, dan J. Y. Mao, "Digital transformation by SME entrepreneurs: A capability perspective," *Inf. Syst. J.*, vol. 28, no. 6, hal. 1129–1157, 2018, doi: 10.1111/isj.12153.
- [27] E. M. Rogers, A. Singhal, dan M. M. Quinlan, "Diffusion of innovations," in *An Integrated Approach to Communication Theory and Research, Third Edition*, 2019. doi: 10.4324/97802037110753-35.
- [28] M. Hasan, A. Dzakiyyah, D. A. Kumalasari, N. Safira, dan S. N. Aini, "Transformasi Digital UMKM Sektor Kuliner Di Kelurahan Jatinegara, Jakarta Timur," *J. Bisnis dan Kewirausahaan*, vol. 17, no. 2, hal. 135–150, 2021, doi: 10.31940/jbk.v17i2.2529.
- [29] Machin, Muhammad Reza Aulia, Joni Hendra, Elvina Safitri, dan A. Bawono, "Keberlanjutan UMKM di Jawa Barat di Tinjau Dari New-era Business: Transformasi Digital, Dividen Digital, dan Kewirausahaan," *J. Bisnisman Ris. Bisnis dan Manaj.*, vol. 5, no. 1, hal. 01–15, 2023, doi: 10.52005/bisnisman.v5i1.130.
- [30] N. M. Widnyani, N. L. P. S. Astitiani, dan B. C. L. Putri, "Penerapan Transformasi Digital Pada Ukm Selama Pandemi Covid-19 Di Kota Denpasar," *J. Ilm. Manaj. dan Bisnis*, vol. 6, no. 1, hal. 79–87, 2021, doi: 10.38043/jimb.v6i1.3093.
- [31] I. Farhani dan H. Chaniago, "Faktor Penentu Transformasi Digital UMKM: Bukti dari Indonesia," *Pros. 12th Ind. Res. Work. Natl. Semin.*, hal. 1010–1015, 2021.
- [32] S. Alam, W. P. Ramadhani, dan P. Patmaniar, "Transformasi Digital UMKM Di Indonesia Selama Pandemi," *J. Soc. Soc.*, vol. 3, no. 2, hal. 140–156, 2023, doi: 10.54065/jss.3.2.2023.344.

- [33] S. Pranata, “Literasi Digital Dorong Akselerasi Transformasi Digital Pelaku UMKM.” 2021.
- [34] G. Marc, “Professional MBA Entrepreneurship & Innovation Digitalization in SME: A Framework to Get From Strategy to Action,” 2018.
- [35] W. Reim, P. Yli-Viitala, J. Arrasvuori, dan V. Parida, “Tackling business model challenges in SME internationalization through digitalization,” *J. Innov. Knowl.*, vol. 7, no. 3, hal. 100199, 2022, doi: 10.1016/j.jik.2022.100199.
- [36] J. Kádárová, L. Lachvajderová, dan D. Sukopová, “Impact of Digitalization on SME Performance of the EU27: Panel Data Analysis,” *Sustain.*, vol. 15, no. 13, 2023, doi: 10.3390/su15139973.
- [37] R. Viswanathan dan A. Telukdarie, “A systems dynamics approach to SME digitalization,” *Procedia Comput. Sci.*, vol. 180, no. 2019, hal. 816–824, 2021, doi: 10.1016/j.procs.2021.01.331.
- [38] M. Alfarizi dan R. Kamila Hanum, “MENINGKATKAN TRANSFORMASI DIGITAL DAN KEBERLANJUTAN PADA UMKM KULINER HALAL INDONESIA: STUDI PEMODELAN KINERJA,” *J. Relig. Policy*, vol. 2, no. 2, 2023, doi: 10.31330/repo.v2i2.30.
- [39] Y. Zanaria, “Pengaruh Pemahaman Fintech Dan Inklusi Keuangan Terhadap Produktivitas UMKM Di Kota Bandar Lampung,” *4th Febenefecium Bus. Econ. Conf. Util. Mod. Technol.*, no. 4, 2021.
- [40] E. Budiyanto dan M. Mochklas, *Kinerja Karyawan Ditinjau dari Aspek Gaya Kepemimpinan Budaya Organisasi dan Motivasi Kerja*. 2020.
- [41] R. Capello, “SME Clustering and factor productivity : A milieu production function model SME Clustering and Factor Productivity : A Milieu Production Function Model,” no. June 2015, hal. 37–41, 2007, doi: 10.1080/09654319908720550.
- [42] R. Verma, “Can total factor productivity explain value added growth in services ? ☆,” *J. Dev. Econ.*, vol. 99, no. 1, hal. 163–177, 2012, doi: 10.1016/j.jdeveco.2011.12.003.
- [43] D. Soyres dan A. Gaillard, “Value Added and Productivity Linkages Across Countries,” no. 1266, 2019.
- [44] C. Koedel, K. Mihaly, dan J. E. Rockoff, “Value-added modeling: A review,” *Econ. Educ. Rev.*, vol. 47, hal. 180–195, 2015, doi: 10.1016/j.econedurev.2015.01.006.
- [45] M. Lechner dan J. Smith, “What is the value added by caseworkers?,” *Labour Econ.*, vol. 14, no. 2, hal. 135–151, 2007, doi: 10.1016/j.labeco.2004.12.002.
- [46] H. Hayami, M. Nakamura, dan A. O. Nakamura, “Economic performance and supply chains: The impact of upstream firms’ waste output on downstream firms’ performance in Japan,” *Int. J. Prod. Econ.*, vol. 160, hal. 47–65, 2015, doi: 10.1016/j.ijpe.2014.09.012.
- [47] V. Stich, V. Zeller, J. Hicking, dan A. Kraut, “Measures for a successful digital transformation of SMEs,” *Procedia CIRP*, vol. 93, no. March, hal. 286–291, 2020, doi: 10.1016/j.procir.2020.03.023.

- [48] R. Rupeika-Apoga, L. Bule, dan K. Petrovska, "Digital Transformation of Small and Medium Enterprises: Aspects of Public Support," *J. Risk Financ. Manag.*, vol. 15, no. 2, 2022, doi: 10.3390/jrfm15020045.
- [49] M. Ayyagari, A. Demircuc-Kunt, dan V. Maksimovic, "Small vs. young firms across the world: contribution to employment, job creation, and growth," *World Bank Policy Res. Work. Pap. Ser.*, no. April, hal. 1–57, 2011.
- [50] D. I. Costa Melo, G. A. Queiroz, P. N. Alves Junior, T. B. de Sousa, W. F. Yushimito, dan J. Pereira, "Sustainable digital transformation in small and medium enterprises (SMEs): A review on performance," *Heliyon*, vol. 9, no. 3, hal. e13908, 2023, doi: 10.1016/j.heliyon.2023.e13908.
- [51] N. Omrani, N. Rejeb, A. Maalaoui, M. Dabic, dan S. Kraus, "Drivers of Digital Transformation in SMEs," *IEEE Trans. Eng. Manag.*, vol. 71, hal. 5030–5043, 2024, doi: 10.1109/TEM.2022.3215727.
- [52] C. Pelletier dan L. M. Cloutier, "Conceptualising digital transformation in SMEs: an ecosystemic perspective," *J. Small Bus. Enterp. Dev.*, vol. 26, no. 6–7, hal. 855–876, 2019, doi: 10.1108/JSBED-05-2019-0144.
- [53] R. Bems dan A. K. Kikkawa, "Measuring trade in value added with firm-level data," *J. Int. Econ.*, vol. 129, hal. 103434, 2021, doi: 10.1016/j.jinteco.2021.103434.
- [54] W. Becker dan O. Schmid, "The right digital strategy for your business: an empirical analysis of the design and implementation of digital strategies in SMEs and LSEs," *Bus. Res.*, vol. 13, no. 3, hal. 985–1005, 2020, doi: 10.1007/s40685-020-00124-y.
- [55] M. Bahri, J. St-Pierre, dan O. Sakka, "Economic value added: A useful tool for SME performance management," *Int. J. Product. Perform. Manag.*, vol. 60, no. 6, hal. 603–621, 2011, doi: 10.1108/17410401111150779.
- [56] A. Moeuf, R. Pellerin, S. Lamouri, S. Tamayo-Giraldo, dan R. Barbaray, "The industrial management of SMEs in the era of Industry 4.0," *Int. J. Prod. Res.*, vol. 56, no. 3, hal. 1118–1136, 2018, doi: 10.1080/00207543.2017.1372647.
- [57] M. T. Miah, S. Erdei-Gally, A. Dancs, dan M. Fekete-Farkas, "A Systematic Review of Industry 4.0 Technology on Workforce Employability and Skills: Driving Success Factors and Challenges in South Asia," *Economies*, vol. 12, no. 2, 2024, doi: 10.3390/economies12020035.
- [58] S. Bresciani, K. H. Huarng, A. Malhotra, dan A. Ferraris, "Digital transformation as a springboard for product, process and business model innovation," *J. Bus. Res.*, vol. 128, no. February, hal. 204–210, 2021, doi: 10.1016/j.jbusres.2021.02.003.
- [59] S. Chatterjee dan A. Kumar Kar, "Why do small and medium enterprises use social media marketing and what is the impact: Empirical insights from India," *Int. J. Inf. Manage.*, vol. 53, no. February, hal. 102103, 2020, doi: 10.1016/j.ijinfomgt.2020.102103.
- [60] J. F. Hair, W. C. Black, B. J. Babin, R. E. Anderson, dan R. L. Tatham, *Multivariate data analysis 6th Edition*. 2020.
- [61] I. F. Pramasari dan Y. Hariyati, "Value added and strategy development of galangal-coffee agroindustry," *Int. J. Educ. Res.*, vol. 6, no. 5, hal. 45–56, 2018.

- [62] Z. Li dan T. Yamada, “Political and economic incentives of government in partial privatization,” *J. Corp. Financ.*, vol. 32, hal. 169–189, 2015, doi: 10.1016/j.jcorpfin.2014.04.008.