resource constraints, marketing constraints, competition constraints, and capital constraints. All of them are dummy variables that have a value of 1 if they have the constraint in question and a value of 0 if they do not. Resource constraints can take the form of difficulties in obtaining raw materials, fuel difficulties, limited infrastructure, limited human resources, and so on (Diliana et al. 2020). The marketing constraints for SMEs include small markets or a lack of a formed market; a lack of market information and knowledge; poor marketing, customer care, and strategic skills; and so on (Mashenene and Rumanyika 2014; Ongori and Migiro 2010). Meanwhile, competition constraints include high competition from other businesses that produce the same or substitute products and competition from imported products (Mashenene and Rumanyika 2014).

2.2.2. Data Analyzed

To examine the role of each independent variable in Table 1 as a determinant of internet adoption and as a factor influencing the level of internet usage, this study uses a logit model (for the dependent variable in the form of a dummy variable) that is formulated in Model 1 and ordinary least square (OLS) model (for the dependent variables in the form of level of use) that is formulated in Model 2 as an analytical tool. The model was validated using the robustness technique to get more valuable results. The following is the estimation model:

$$\begin{aligned}\ln\left(\frac{prob_{Internet\,Adoption_i}}{1-prob_{Internet\,Adoption_i}}\right) = {} & \beta_0 + \beta_1 Partnership_i + \beta_2 Association_i + \beta_3 Certificate_i + \\ & \beta_4 Supply\ territory_i + \beta_5 Marketing\ area_i + \beta_6 B2C_i + \beta_7 ResourceC_i + \beta_8 MarketingC_i + \\ & \beta_9 CompetitionC_i + \beta_{10} CapitalC_i + \beta_{11} NonBankC_i + \beta_{12} BankC_i + \beta_{13} BankCreditC_i + \beta_{14} Age_i + \\ & \beta_{15} Education_i + \beta_{16} Size_i + \beta_{17} FirmAge_i + \beta_{18} BusinessEntity_i + \beta_{19} Profit_i + \varepsilon_i\end{aligned} \quad (1)$$

$$\begin{aligned}UsageLevel_i = {} & \beta_0 + \beta_1 Partnership_i + \beta_2 Association_i + \beta_3 Certificate_i + \beta_4 Supply\ territory_i \\ & + \beta_5 Marketing\ area_i + \beta_6 B2C_i + \beta_7 ResourceC_i + \beta_8 MarketingC_i + \beta_9 CompetitionC_i \\ & + \beta_{10} CapitalC_i + \beta_{11} NonBankC_i + \beta_{12} BankC_i + \beta_{13} BankCreditC_i + \beta_{14} Age_i \\ & + \beta_{15} Education_i + \beta_{16} Size_i + \beta_{17} FirmAge_i + \beta_{18} BusinessEntity_i + \beta_{19} Profit_i + \varepsilon_i\end{aligned} \quad (2)$$

3. Results

3.1. Descriptive Analysis

This study used descriptive analysis to provide an explanation to ease the interpretation of further analysis results.

Table 2 demonstrates that the proportion of the MSIs that adopt the Internet is 15.21% and most users are up to the level of buying and selling (commercial transactions), that is 7730 MSIs. Only 57 MSIs use the Internet up to the level of fintech. The apparel business field category has the highest percentage of internet usage, which is 19.59%, but the other two are not far behind, as they still have a percentage of more than 10%.

Table 3 presents that the means value of the partnership is 0.08, which means that about 8% of MSIs have a partnership with other organizations. In the same way, it is obtained that 2.4% of MSIs join business associations. Mostly, MSIs supply and marketing areas are within the district; it concluded from the means value that close to 1 (1.237 and 1.308). Concerning the constraint factor, less than 30% of MSIs faced business constraints, i.e., marketing constraints mean value is 0.294 (29.4%). The credit components have a wide distribution because the standard deviations (i.e., 16.462 for bank credits) are significantly greater than the means values (i.e., 4.104 for bank credits). On average, the entrepreneur's age in MSIs is 46 years (means value 46.482), and their last education is equivalent to junior high school (means value 2.940). Mostly, MSIs' business entity is unincorporated or individual (means value 1.086), and about 5.6% already have product or production process certificates.

Table 2. Descriptive statistics of dependent variables and business field categories.

Variable	Category	Frequency	%
Internet adoption	0	76,560	84.79
	1	13,735	15.21
Internet usage level	0	76,560	84.79
	1	2784	3.08
	2	3164	3.50
	3	7730	8.56
	4	57	0.06
Business field	Food etc.	27,806	30.79
	Use Internet	3034	10.91
	Do not use	24,772	89.08
	Clothing etc.	20,194	22.36
	Use Internet	3957	19.59
	Do not use	16,237	80.41
	Other	42,295	46.84
	Use Internet	6744	15.95
	Do not use	35,551	84.05

Table 3. Descriptive statistics of all variables.

Variables	Obs.	Means	Std. Dev.	Min.	Max.
Digital innovation					
Internet adoption	90,295	0.152	0.359	0	1
Internet usage level	90,295	0.360	0.906	0	4
Business factors					
Partnership	90,295	0.080	0.271	0	1
Association	90,295	0.024	0.153	0	1
Certificate	90,295	0.056	0.229	0	1
Marketing factors					
Supply territory	90,295	1.237	0.533	1	4
Marketing area	90,295	1.308	0.594	1	4
B2C	90,295	0.632	0.482	0	1
Constraint factor					
Resource constraints	90,295	0.272	0.445	0	1
Marketing constraints	90,295	0.294	0.455	0	1
Competition constraints	90,295	0.240	0.427	0	1
Capital constraints	90,295	0.281	0.450	0	1
Credit factor					
Non-bank credits	90,295	3.065	14.261	0	100
Bank credits	90,295	4.104	16.462	0	100
Bank credit constraints	90,295	0.183	0.387	0	1
Entrepreneur factors					
Age	90,295	46.482	11.363	14	99
Last education level	90,295	2.940	1.471	1	8
Firm factors					
Size (number of workers)	90,295	2.241	2044	1	19
Age	90,295	13.362	11.684	0	119
Business entity	90,295	1.086	0.504	1	7
ln profit	90,295	16.704	1.498	−18.633	26.098

3.2. Determinant Test Results

Using a sample size of 90,295 MSIs, this study examines the determinants of digital innovation proxied by internet adoption and the level of internet usage by complexity. Table 4 displays the empirical findings of the logit model for internet adoption as the dependent variable (model 1) and the OLS model for internet usage level as the dependent variable (model 2). Table 4 also shows the tobit model (model 3) for internet usage level

as the dependent variable. The tobit model is used to determine whether the effects of the independent variables are still consistent with the OLS results when the zero value of internet usage level (not using the Internet) is censored but still considered in the testing process.

Table 4. Determinant of digital innovation.

Dependent Var.	Model 1 (Logit)			Model 2 (OLS)		Model 3 (Tobit)	
	Internet Adoption			Usage Level		Usage Level	
Independent Var.	**Coef.**	**Std. Dev**	**Odds R.**	**Coef.**	**Std. Dev**	**Coef.**	**Std. Dev**
Business factors							
Partnership	0.64 *	0.034	1.896	0.22 *	0.013	1.02 *	0.054
Association	0.63 *	0.056	1.873	0.25 *	0.024	1.00 *	0.087
Certificate	0.22 *	0.040	1.241	0.10 *	0.015	0.38 *	0.065
Marketing Factors							
Supply territory	0.33 *	0.018	1.392	0.13 *	0.007	0.54 *	0.029
Marketing Ar.	0.48 *	0.017	1.616	0.18 *	0.007	0.81 *	0.027
B2C	0.49 *	0.025	1.638	0.11 *	0.006	0.82 *	0.040
Constraint Factors							
Resource	0.03	0.024	1.029	0.03 *	0.007	0.07 ***	0.040
Marketing	0.15 *	0.023	1.159	0.06 *	0.006	0.32 *	0.038
Competition	0.24 *	0.024	1.272	0.06 *	0.007	0.41 *	0.039
Capital	0.04 ***	0.024	1.046	0.02 **	0.006	0.09 **	0.040
Credit Factors							
Non-Bank	−0.003 *	0.001	0.997	−0.001 *	0.0002	−0.005 *	0.001
Bank	0.004 *	0.0005	1.004	0.002 *	0.0002	0.008 *	0.001
Bank credit con.	0.16 *	0.027	1.177	0.03 *	0.008	−0.27 *	0.045
Entrepreneur factors							
Age	−0.03 *	0.001	0.971	−0.005 *	0.0003	−0.048 *	0.002
Education	0.38 *	0.007	1.460	0.11 *	0.002	0.64 *	0.011
Firm factors							
Size	0.04 *	0.005	1.042	0.02 *	0.002	0.07 *	0.009
Age	−0.02 *	0.001	0.985	−0.002 *	0.000	−0.025 **	0.002
Business entity	0.07 *	0.018	1.075	0.04 *	0.008	0.04 ***	0.024
Profit	0.26 *	0.009	1.297	0.04 *	0.002	0.44 *	0.019
_cons	−7.82 *	0.157	0.0004	−1.063*	0.036	−13.38 *	0.305
ModelFit test		0.000		0.000		0.000	
Coef. model		0.197		0.153		0.1198	
Total obs.		90,295		90,295		90,295	

Notes: * $p < 0.01$; ** $p < 0.05$; *** $p < 0.1$. The model fit test is the value of Prob (Wald Chi2) for the logistic model, Prob(F-stat) for the OLS model and Prob(LR chi2) for the tobit model. Coef. Models are Pseudo R2 values for logistic and tobit models and Adj R-squared for OLS models.

Model 1 shows that almost all of the independent variables tested are found to significantly influence internet adoption. Almost all variables in business factors, marketing factors, constraint factors, credit factors, entrepreneur factors, and firm factors improve MSIs' likelihood to use the Internet, except for resource constraint, nonbank credits, entrepreneur age, and firm age. The resource constraints variable, members of the constraint factor group, was found to be insignificant in influencing internet adoption by MSIs. The nonbank credits, entrepreneur age, and firm age variables were found to significantly reduce the likelihood of MSIs' Internet adoption. The older the entrepreneur and firm, the less likely they are to adopt the Internet. At a 1% significant level (* $p < 0.01$), the odds of older entrepreneurs embracing the Internet are 0.971 (Odd R. value) times the chances of younger entrepreneurs. The empirical regression equations for the first suggested model (model 1) are as follows:

$$\ln\left(\frac{prob_{InternetAdoption_i}}{1-prob_{InternetAdoption_i}}\right) = -7.82 + 0.64\,Partnership_i + 0.63\,Association_i + 0.22\,Certificate_i + 0.33\,Supply\ territory_i + 0.48\,Marketing\ area_i + 0.49\,B2C_i + 0.15\,MarketingC_i + 0.24\,CompetitionC_i + 0.04\,CapitalC_i - 0.003\,NonBankC_i + 0.004\,BankC_i + 0.16\,BankCreditC_i - 0.03\,Age_i + 0.38\,Education_i + 0.04\,Size_i - 0.02\,FirmAge_i + 0.07\,BusinessEntity_i + 0.26\,Profit_i + \varepsilon_i$$

Model 2 and model 3 examine the determinants of the level of internet usage complexity. In model 2, the outcomes demonstrate that all factors strongly influence the level of internet usage. The results in model 3 are consistent with model 2, except for the bank credit constraint variable. In model 2, bank credit constraint is shown to promote (coef. is positive) an increase in the internet usage complexity, while in model 3 it is shown to deter (coef. is negative) an escalation in the internet usage complexity. Regarding the business factors, MSIs who have partnerships and/or join associations are more likely to use the Internet with higher complexity. The broader MSIs' buying and selling area, the more likely their internet usage is to be more complex, as well as when the MSIs' primary business model is B2C (business to consumer). The test results also suggest that constraint factors, credit factors, entrepreneur factors, and firm factors tend to drive an increase in the level of internet usage, except for the indicators of nonbank credit, the age of the entrepreneur, and the age of the firm. These three factors greatly reduced internet usage complexity. The empirical regression equations for the second suggested model (model 2) are as follows:

$$\begin{aligned} UsageLevel_i = {} & -1.063 + 0.22\,Partnership_i + 0.25\,Association_i + 0.10\,Certificate_i \\ & +0.13\,Supply\ territory_i + 0.18\,Marketing\ area_i + 0.11\,B2C_i + 0.03\,ResourceC_i \\ & +0.06\,MarketingC_i + 0.06\,CompetitionC_i + 0.02\,CapitalC_i - 0.001\,NonBankC_i \\ & +0.002\,BankC_i + 0.03\,BankCreditC_i - 0.005\,Age_i + 0.11\,Education_i + 0.02\,Size_i \\ & -0.002\,FirmAge_i + 0.04\,BusinessEntity_i + 0.04\,Profit_i + \varepsilon_i \end{aligned} \quad (3)$$

For more in-depth analysis, this study also looks at whether different industries behave differently in the adoption of the Internet, and the results are shown in Table 5. The samples were divided into three business field categories–the food and related industries, the clothing and allied industries, and wood industry and others–since the food industry, wood industry, and clothing industry are the three categories that make up the highest share in our samples. Consistent with the overall sample, our results show that the determinant of internet adoption for the three business field categories is not much different. Different results are only shown on the variables of capital constraints, business entity, and resource constraints. At this level of testing, the results show that capital constraints insignificantly (coef. value, not marked with an asterisk) affect internet adoption in all categories. In the food and clothing industry category, the higher the level of business entity, the lower the chance of adopting the Internet, but at a much lower significance level (10% or *** $p < 0.1$) compared to the overall samples test. Whereas in the wood and other industry groups, MSIs with resource constraints are less likely (coef. is negative) to adopt the Internet.

Table 5. Determinant of digital innovation by business field group.

Dependent Var.:	**Internet**								
Business Field:	**Food etc.**			**Clothing etc.**			**Wood etc.**		
Independent Var.	**Coef.**	**Std. dv.**	**Odds**	**Coef.**	**Std. dv.**	**Odds**	**Coef.**	**Std. dv.**	**Odds**
Business factors									
Partnership	0.67 *	0.069	1.957	0.35 *	0.064	1.425	0.80 *	0.050	2.222
Association	0.53 *	0.102	1.700	0.97 *	0.126	2.644	0.67 *	0.080	1.958
Certificate	0.46 *	0.062	1.592	0.17 ***	0.088	1.180	0.23 *	0.067	1.260

Table 5. *Cont.*

Dependent Var.:	**Internet**								
Business Field:	**Food etc.**			**Clothing etc.**			**Wood etc.**		
Independent Var.	**Coef.**	**Std. dv.**	**Odds**	**Coef.**	**Std. dv.**	**Odds**	**Coef.**	**Std. dv.**	**Odds**
Marketing Factors									
Supply teritory	0.16 *	0.045	1.168	0.18 *	0.033	1.195	0.42*	0.025	1.529
Marketing area	0.71 *	0.042	2.035	0.34 *	0.032	1.409	0.44 *	0.024	1.548
B2C	0.51 *	0.051	1.663	0.73 *	0.050	2.074	0.38 *	0.036	1.458
Constraint Factors									
Resource	0.21 *	0.048	1.237	0.23 *	0.050	1.254	−0.14 *	0.035	0.866
Marketing	0.23 *	0.046	1.255	0.21 *	0.046	1.230	0.09 *	0.033	1.094
Competition	0.09 ***	0.048	1.098	0.23 *	0.046	1.258	0.32 *	0.034	1.380
Capital	0.08	0.050	1.086	−0.02	0.046	0.984	0.01	0.035	1.014
Credit Factors									
Non-Bank	−0.005 *	0.002	0.995	0.001	0.001	1.001	−0.004 *	0.001	0.996
Bank	0.002 **	0.001	1.002	0.01 *	0.001	1.008	0.004 *	0.001	1.004
Bank constraints.	0.06	0.056	1.065	0.21 *	0.051	1.228	0.18 *	0.039	1.192
Entrepreneur Factors									
Age	−0.03 *	0.002	0.973	−0.02 *	0.002	0.975	−0.03 *	0.002	0.971
Education	0.33 *	0.013	1.395	0.35 *	0.015	1.419	0.41 *	0.010	1.503
Firm factors									
Size	0.03 *	0.010	1.030	0.06 *	0.011	1.065	0.04 *	0.008	1.037
Age	−0.02 *	0.003	0.976	−0.02 *	0.003	0.979	−0.01 *	0.002	0.986
Business entity	−0.10 ***	0.052	0.905	−0.10 ***	0.054	0.904	0.11 *	0.022	1.119
Profit	0.17 *	0.018	1.189	0.38 *	0.020	1.464	0.26 *	0.015	1.302
_cons	−6.322 *	0.298	0.002	−9.28 *	0.321	0.0001	−8.02 *	0.247	0.0003
Prob(Wald Chi2)		0.000			0.000			0.000	
Pseudo R2		0.1504			0.1920			0.2299	
Total Obs.		27,806			20,194			42,295	

Notes: * $p < 0.01$; ** $p < 0.05$; *** $p < 0.1$.

4. Discussion

The findings of this study demonstrate that business, marketing, constraint, credit, entrepreneur, and firm factors digital innovation in MSIs. The variables that tend to encourage internet adoption and increase internet usage complexity are having business partners, being members of associations, having wider supply and marketing areas, having higher proportions of B2C marketing types, having business constraints (resources, marketing, competition, and capital), higher percentages of credit capital from banks, having bank credit constraints, higher entrepreneur education, larger workforce, higher level of business entity, higher profit, and having product or production process certificates. Variables that are likely to limit internet adoption and minimize the complexity of its use are the older age of entrepreneurs and firms, and a higher share of nonbank credit capital.

The results of this study support several previous studies. Boschma and Weltevreden (2008) also empirically demonstrate that being a member of a trade association improves the likelihood of retail traders using the Internet for their information strategy. Interorganizational relations such as communication, collaboration (partnership), and information sharing have been shown to influence the decision of Malaysian SMEs to adopt e-business in their supply chain (Chong et al. 2009). Trinugroho et al. (2022) and Kannabiran and Dharmalingam (2012) demonstrate that MSMEs facing competitive challenges have better opportunities to implement digital and advanced information technology. Younger ages, both in terms of companies and entrepreneurs, higher revenue, and higher education can increase the opportunities for MSEs to adopt the Internet and digital technology (Trinugroho et al. 2022; Alam 2009). Businesses with a small scale of operation that are typically not legal entities or individuals and have few employees are less likely to adopt advanced IT

(Kannabiran and Dharmalingam 2012). Gigliarano et al. (2017) proved that the number of workers and the scope of the marketing area are positively related to the opportunities for micro businesses to adopt the Internet. Generally, B2C companies produce digital strategies faster than B2B companies (López-López and Giusti 2020). B2C companies without a clear digital strategy continue to use social media significantly, while B2B companies postpone using social media until they develop a clear digital strategy (López-López and Giusti 2020). SMEs encountering marketing issues like lower consumer demand during COVID-19 can clarify consumer needs and boost sales by implementing technology, such as social media and e-commerce (Kumar and Ayedee 2021). The Internet's low investment costs and ease of use can reduce credit constraints such as information asymmetry and trigger various applications that support credit availability (Owusu-Agyei et al. 2020).

However, a number of earlier studies have refuted the findings of this study. Mathews et al. (2018) stated that business partnerships will minimize technology adoption. Trinugroho et al. (2022) demonstrate empirically that MSEs that receive assistance from the government in the form of government-subsidized bank credits typically do not employ digital technology. Meanwhile, the results of this study indicate that the higher the percentage of capital from bank credits, whether they contain subsidies from the government or not, the higher the chances for MSEs to adopt the Internet. Kannabiran and Dharmalingam (2012) established that the lack of financial capability (capital limitations) has a negative impact on the adoption of advanced IT among SMEs. However, on the other hand, many internet-based technologies, such as e-marketing tools, are free and can be utilized by SMEs with financial limitations and marketing constraints (Lin 2021). E-marketing tactics with social media are thought to be more effective and efficient, partly because they are less expensive to deploy (Corral de Zubielqui and Jones 2022; Lin 2021).

This research's results contribute to enriching and supporting the body of knowledge on digital innovation, particularly in terms of research scope that focuses on MSIs, internet adoption, and internet usage activities. It also confirms the RBV paradigm that MSEs' digitalization might be a resource to survive and be sustainable (Bai et al. 2021) and the TAM theory that perceived usefulness is the most significant variable affecting the acceptance of new technology (Lo Presti et al. 2022; Marangunić and Granić 2015). MSIs with business and bank credit constraints, wider supply and marketing areas, and higher proportions of B2C marketing types tend to utilize the Internet and increase its complexity more than MSIs that do not have those criteria. SMEs encountering marketing issues, competitive challenges, and credit constraints have better opportunities to implement digital and advanced information technology to reduce credit constraints, trigger various applications that support credit availability, and boost sales (Trinugroho et al. 2022; Kumar and Ayedee 2021; Owusu-Agyei et al. 2020; Kannabiran and Dharmalingam 2012). Digital innovations have a positive impact on presales activities, after-sales activities, marketing performance, market efficiency, and company competitiveness (Andaregie and Astatkie 2022; Kraft et al. 2022).

The results suggest that to encourage MSIs' digital innovation, the government should support and facilitate MSI's partnerships with other institutions and membership in business associations. It also suggests that easing bank credit and increasing MSI entrepreneurs' knowledge and comprehension of digital technology can encourage MSIs to increase their digital innovation. According to the Indonesian Central Bureau of Statistics data, organizations that collaborate with Indonesian MSIs include private businesses, local governments, government-owned firms, banks, and foundations (Diliana et al. 2020). In terms of proportion, the largest partnerships are with private companies at 36.25%. Collaborations with the government are only about 5.56%, partnerships with government-owned businesses are 3.23%, and ties with banks are 2.49% (Diliana et al. 2020). Alliances and partnerships provide access to complementary knowledge and abilities, both in technical and marketing fields, and appear to be one of the most important success elements of innovation processes (Chiaromonte 2006). Partnerships with organizations willing to fund firms and support start-ups should be encouraged to promote innovation (Fombang and Adjasi 2018).

5. Conclusions and Recommendations

This study aims to determine the ability of the components of business factors, marketing factors, constraint factors, credit factors, entrepreneur factors, and MSIs' firm factors as determinants of digital innovation proxied by internet adoption and improvement of internet usage complexity. The results suggest that these factors are significant and consistently affect digital innovation, and mostly its influence is as an encouragement.

The findings of this study contribute to enriching and supporting the body of knowledge on digital innovation, particularly in terms of research scope that focuses on MSIs, internet adoption, internet usage activities, and various business field categories, which are quite different from earlier studies. This study also supports RBV and TAM paradigms about digital innovations. This research can be used by the government for consideration regarding policies on how to encourage digital innovation by MSIs, such as whether the government should enhance MSIs' partnerships and association membership, increase ease of access to bank loans, and expand the availability of internet-based technology training. Specifically, MSIs can also use this research as a reference when they are about to make decisions about internet adoption or digital innovation, such as whether utilizing internet-based technology can be a solution to business constraints they faced.

The current study offers insights into the determinants of digital innovation by MSIs and employs a sufficiently large sample from all regions of Indonesia, it has its own limitations. This study solely looks at the factors that influence digital innovation and does not look at the impact of digital innovation itself. Future studies might look into the influence of digital innovation on business performance. Furthermore, the current study investigated the predictor of digital innovation in micro and small-scale industries. Therefore, it is interesting to explore digital innovation in medium- to large-scale industries. Previous studies have the importance of human capital (Latifah et al. 2022), business strategies (Farida and Setiawan 2022), and female leadership (Latifah et al. 2021), therefore, it is suggested future studies consider the importance of human capital, business strategy, and female leadership.

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References

Alam, Syed Shah. 2009. Adoption of Internet in Malaysian SMEs. *Journal of Small Business and Enterprise Development* 16: 240–55. [CrossRef]

Andaregie, Adino, and Tessema Astatkie. 2022. Determinants of Technology Adoption by Micro and Small Enterprises (MSEs) in Awi Zone, Northwest Ethiopia. *African Journal of Science, Technology, Innovation and Development* 14: 997–1006. [CrossRef]

Azemi, Yllka, Wilson Ozuem, Ria Wiid, and Ana Hobson. 2022. Luxury Fashion Brand Customers' Perceptions of Mobile Marketing: Evidence of Multiple Communications and Marketing Channels. *Journal of Retailing and Consumer Services* 66: 102944. [CrossRef]

Bahagia, M. Qodarian, Ardi Sukamto, Fransiska Bonita Diliana, Janiar Ningrum, and Indah Noor Safrida. 2022. *Profil Industri Mikro dan Kecil 2020*; Jakarta: Badan Pusat Statistik.

Bai, Chunguang, Matthew Quayson, and Joseph Sarkis. 2021. COVID-19 Pandemic Digitization Lessons for Sustainable Development of Micro-and Small- Enterprises. *Sustainable Production and Consumption* 27: 1989–2001. [CrossRef]
Battisti, Martina, and Martin Perry. 2015. Small Enterprise Affiliations to Business Associations and the Collective Action Problem Revisited. *Small Business Economics* 44: 559–76. [CrossRef]
Boschma, Ron A., and Jesse W. J. Weltevreden. 2008. An Evolutionary Perspective on Internet Adoption by Retailers in the Netherlands. *Environment and Planning A* 40: 2222–37. [CrossRef]
Brodny, Jarosław, and Magdalena Tutak. 2022. Digitalization of Small and Medium-Sized Enterprises and Economic Growth: Evidence for the EU-27 Countries. *Journal of Open Innovation: Technology, Market, and Complexity* 8: 67. [CrossRef]
Chiaromonte, Ferdinando. 2006. Open Innovation through Alliances and Partnership: Theory and Practice. *International Journal of Technology Management* 33: 111–14.
Chong, Alain Yee Loong, Keng Boon Ooi, Binshan Lin, and Shu Yi Tang. 2009. Influence of Interorganizational Relationships on SMEs' e-Business Adoption. *Internet Research* 19: 313–31. [CrossRef]
Corral de Zubielqui, Graciela, and Janice Jones. 2022. How and When Does Internal and External Social Media Use for Marketing Impact B2B SME Performance? *Journal of Business & Industrial Marketing*. *ahead-of-print*. [CrossRef]
Costa, Eric, António Lucas Soares, and Jorge Pinho de Sousa. 2017. Institutional Networks for Supporting the Internationalisation of SMEs: The Case of Industrial Business Associations. *Journal of Business and Industrial Marketing* 32: 1182–202. [CrossRef]
Cueto, Lavinia Javier, April Faith Deleon Frisnedi, Reynaldo Baculio Collera, Kenneth Ian Talosig Batac, and Casper Boongaling Agaton. 2022. Digital Innovations in MSMEs during Economic Disruptions: Experiences and Challenges of Young Entrepreneurs. *Administrative Sciences* 12: 8. [CrossRef]
Davis, Fred D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly: Management Information Systems* 13: 319–39. [CrossRef]
Del Aguila-Obra, Ana R., and Antonio Padilla-Meléndez. 2006. Organizational factors affecting Internet technology adoption. *Internet Research* 16: 94–110. [CrossRef]
Diliana, Fransiska Bonita, Yani Diyani Rafei, Indah Noor Safrida, and Iman Jihad Fadillah. 2020. *Profil Industri Mikro dan Kecil 2019*; Jakarta: Badan Pusat Statistik.
Ejemeyovwi, Jeremiah O., Evans S. Osabuohien, Olawale D. Johnson, and Ebenezer I. K. Bowale. 2019. Internet Usage, Innovation and Human Development Nexus in Africa: The Case of ECOWAS. *Journal of Economic Structures* 8: 15. [CrossRef]
Falentina, Anna T., Budy P. Resosudarmo, Danang Darmawan, and Eny Sulistyaningrum. 2021. Digitalisation and the Performance of Micro and Small Enterprises in Yogyakarta, Indonesia. *Bulletin of Indonesian Economic Studies* 57: 343–69. [CrossRef]
Farida, Ida, and Doddy Setiawan. 2022. Business Strategies and Competitive Advantage: The Role of Performance and Innovation. *Journal of Open Innovation: Technology, Market, and Complexity* 8: 163. [CrossRef]
Fombang, Mcc Powell Sali, and Charles Komla Adjasi. 2018. Access to Finance and Firm Innovation. *Journal of Financial Economic Policy* 10: 73–94. [CrossRef]
Forman, Chris, and Nicolas van Zeebroeck. 2019. Digital Technology Adoption and Knowledge Flows within Firms: Can the Internet Overcome Geographic and Technological Distance? *Research Policy* 48: 103697. [CrossRef]
Fraccastoro, Sara, Mika Gabrielsson, and Ellen Bolman Pullins. 2021. The Integrated Use of Social Media, Digital, and Traditional Communication Tools in the B2B Sales Process of International SMEs. *International Business Review* 30: 101776. [CrossRef]
Gaglio, Cyrielle, Erika Kraemer-Mbula, and Edward Lorenz. 2022. The Effects of Digital Transformation on Innovation and Productivity: Firm-Level Evidence of South African Manufacturing Micro and Small Enterprises. *Technological Forecasting and Social Change* 182: 121785. [CrossRef]
Gigliarano, Chiara, Gian Luca Gregori, Silvio Cardinali, and Federica Pascucci. 2017. Internet Adoption and Usage: Evidence from Italian Micro Enterprises. *International Journal of Entrepreneurship and Small Business* 30: 259–80. [CrossRef]
Hanafizadeh, Payam, Mehdi Behboudi, Fahimeh Ahadi, and Fatemeh Ghaderi Varkani. 2012. Internet Advertising Adoption: A Structural Equation Model for Iranian SMEs. *Internet Research* 22: 499–526. [CrossRef]
Hossain, Md Imran, Md Shah Azam, and Mohammed Quaddus. 2021. Small firm entry to e-marketplace for market expansion and internationalization: A theoretical perspective. *Journal of International Entrepreneurship* 19: 560–90. [CrossRef]
Hukal, Philipp, and Ola Henfridsson. 2017. Digital innovation—A definition and integrated perspective. In *The Routledge Companion to Management Information Systems*. Edited by Robert Galliers and Mari-Klara Stein. London: Routledge, pp. 360–69. [CrossRef]
Jahanmir, Sara F., and Joana Cavadas. 2018. Factors Affecting Late Adoption of Digital Innovations. *Journal of Business Research* 88: 337–43. [CrossRef]
Jean, Ruey Jer, and Daekwan Kim. 2020. Internet and SMEs' Internationalization: The Role of Platform and Website. *Journal of International Management* 26: 100690. [CrossRef]
Kannabiran, Ganesan, and P. Dharmalingam. 2012. Enablers and inhibitors of advanced information technologies adoption by SMEs: An empirical study of auto ancillaries in India. *Journal of Enterprise Information Management* 25: 186–209. [CrossRef]
Kapoor, Rashmeet, and Kush Kapoor. 2021. The Transition from Traditional to Digital Marketing: A Study of the Evolution of e-Marketing in the Indian Hotel Industry. *Worldwide Hospitality and Tourism Themes* 13: 199–213. [CrossRef]
Kimuli, Saadat Nakyejwe Lubowa, Kasimu Sendawula, and Shakilah Nagujja. 2021. Digital Technologies in Micro and Small Enterprise: Evidence from Uganda's Informal Sector during the COVID-19 Pandemic. *World Journal of Science, Technology and Sustainable Development* 18: 93–108. [CrossRef]

Kolbe, Diana, Haydeé Calderón, and Marta Frasquet. 2021. Multichannel Integration through Innovation Capability in Manufacturing SMEs and Its Impact on Performance. *Journal of Business and Industrial Marketing* 37: 115–27. [CrossRef]
Kraft, Corin, Johan P. Lindeque, and Marc K. Peter. 2022. The Digital Transformation of Swiss Small and Medium-Sized Enterprises: Insights from Digital Tool Adoption. *Journal of Strategy and Management* 15: 468–94. [CrossRef]
Kumar, Anuj, and Nishu Ayedee. 2021. Technology Adoption: A Solution for SMEs To Overcome Problems During COVID-19. *Academy of Marketing Studies Journal* 25: 1–16. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3745814 (accessed on 19 March 2023).
Kumar, Vimal, Pratima Verma, Ankesh Mittal, Juan Alfredo Tuesta Panduro, Sumanjeet Singh, Minakshi Paliwal, and Nagendra Kumar Sharma. 2022. Adoption of ICTs as an Emergent Business Strategy during and Following COVID-19 Crisis: Evidence from Indian MSMEs. *Benchmarking* 25: 186–209. [CrossRef]
Latifah, Lyna, Doddy Setiawan, Y. Anni Aryani, and Rahmawati Rahmawati. 2021. Business strategy—MSMEs' performance relationship: Innovation and accounting information system as mediators. *Journal of Small Business and Enterprise Development* 28: 1–21. [CrossRef]
Latifah, Lyna, Doddy Setiawan, Y. Anni Aryani, Isfenti Sadalia, and Mohammad Nur Rianto Al Arif. 2022. Human Capital and Open Innovation: Do Social Media Networking and Knowledge Sharing Matter? *Journal of Open Innovation: Technology, Market, and Complexity* 8: 116. [CrossRef]
Lin, Chiu Ching. 2021. Investigating Complimentary E-Marketing Strategy for Small-and Medium-Sized Enterprises at Growth Stage in Taiwan. *Information* 12: 380. [CrossRef]
Lo Presti, Letizia, Giulio Maggiore, Vittoria Marino, and Riccardo Resciniti. 2022. Mobile instant messaging apps as an opportunity for a conversational approach to marketing: A segmentation study. *Journal of Business and Industrial Marketing* 37: 1432–48. [CrossRef]
López-López, David, and Giovanni Giusti. 2020. Comparing Digital Strategies and Social Media Usage in B2B and B2C Industries in Spain. *Journal of Business-to-Business Marketing* 27: 175–86. [CrossRef]
Marangunić, Nikola, and Andrina Granić. 2015. Technology Acceptance Model: A Literature Review from 1986 to 2013. *Universal Access in the Information Society* 14: 81–95. [CrossRef]
Mashenene, Robert, and Joel Rumanyika. 2014. Business Constraints and Potential Growth of Small and Medium Enterprises in Tanzania: A Review. *European Journal of Business and Management* 6: 72–80.
Mathews, Shane W., Masahiro Maruyama, Yuka Sakurai, Ralf Bebenroth, Edwina Luck, Hsiu Li Chen, and Edward Franco. 2018. Internet Resources and Capabilities: Japanese SME Risk-Taking, Industry and Performance. *Asia Pacific Business Review* 24: 675–92. [CrossRef]
Morten Bach Jensen. 2006. Characteristics of B2B Adoption and Planning of Online Marketing Communications. *Journal of Targeting, Measurement and Analysis for Marketing* 14: 357–68.
Ongori, Henry, and Stephen O. Migiro. 2010. Information and Communication Technologies Adoption in SMEs: Literature Review. *Journal of Chinese Entrepreneurship* 2: 93–104. [CrossRef]
Owusu-Agyei, Samuel, Godwin Okafor, Aruoriwo Marian Chijoke-Mgbame, Paschal Ohalehi, and Fakhrul Hasan. 2020. Internet Adoption and Financial Development in Sub-Saharan Africa. *Technological Forecasting and Social Change* 161: 120293. [CrossRef]
Panayiotou, Nikolaos A., and Petros K. Katimertzoglou. 2015. Micro Firms Internet Adoption Patterns: The Case of the Greek Jewellery Industry. *Journal of Enterprise Information Management* 28: 508–30. [CrossRef]
Rahayu, Rita, and John Day. 2015. Determinant Factors of E-Commerce Adoption by SMEs in Developing Country: Evidence from Indonesia. *Procedia—Social and Behavioral Sciences* 195: 142–50. [CrossRef]
Ramdani, Boumediene, Siddhartha Raja, and Marina Kayumova. 2022. Digital Innovation in SMEs: A Systematic Review, Synthesis and Research Agenda. *Information Technology for Development* 28: 56–80. [CrossRef]
Ren, Ting, Xinguo Yu, Xuanye Li, and Peng Lv. 2022. Political Connections, Internet Use, and Firm Innovation. *Computers in Human Behavior Reports* 7: 100211. [CrossRef]
Riquelme, Hernan. 2002. Commercial Internet Adoption in China: Comparing the Experience of Small, Medium and Large Businesses. *Internet Research* 12: 276–86. [CrossRef]
Simmons, Geoffrey J., Mark G. Durkin, Pauric McGowan, and Gillian A. Armstrong. 2007. Determinants of Internet Adoption by SME Agri-Food Companies. *Journal of Small Business and Enterprise Development* 14: 620–40. [CrossRef]
Sutarsih, Tri, Desy Apreziyanti, Heny Wulandari, and Atika Nashirah Hasyyanti. 2021. *Statistik Telekomunikasi Indonesia 2020*; Jakarta: Badan Pusat Statistik.
Sutarsih, Tri, Vera Citra Wulandari, Rima Untari, Adam Luthfi Kusumatrisna, and Atika Nashirah Hasyyati. 2022. *Statistik Telekomunikasi Indonesia 2021*; Jakarta: Badan Pusat Statistik.
Tambunan, Tulus T. H. 2020. Evidence on the use of internet for businesses by MSEs in a Developing Country. The Indonesian case. *Anais Da Academia Brasileira de Ciencias* 92: e20180555. [CrossRef]
Tan, Khong Sin, Siong Choy Chong, Binshan Lin, and Uchenna Cyril Eze. 2010. Internet-based ICT adoption: Demographic versus benefits, barriers, and adoption intention. *Journal of Enterprise Information Management* 34: 27–55. [CrossRef]
Tarantilis, Christos D., Chris T. Kiranoudis, and N. D. Theodorakopoulos. 2008. A Web-Based ERP System for Business Services and Supply Chain Management: Application to Real-World Process Scheduling. *European Journal of Operational Research* 187: 1310–26. [CrossRef]

Tiwary, Nishant Kumar, Rishi Kant Kumar, Shagun Sarraf, Prashant Kumar, and Nripendra P. Rana. 2021. Impact Assessment of Social Media Usage in B2B Marketing: A Review of the Literature and a Way Forward. *Journal of Business Research* 131: 121–39. [CrossRef]

Trinugroho, Irwan, Putra Pamungkas, Jamal Wiwoho, Sylviana Maya Damayanti, and Teddie Pramono. 2022. Adoption of Digital Technologies for Micro and Small Business in Indonesia. *Finance Research Letters* 45: 102156. [CrossRef]

Zhang, Lingjun, and Emre Erturk. 2022. Potential Lessons from Chinese Businesses and Platforms for Online Networking and Marketing: An Exploratory Study. *Social Sciences & Humanities Open* 6: 100274. [CrossRef]