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The impact of e-commerce platform usage on the economic benefits of SMEs in Indonesia during the pandemic

Muftia Ariani Lesmana

University of Gadjah Mada, Bulaksumur, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281, Indonesia
e-mail: muftiahariani@mail.ugm.ac.id

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ABSTRACT

This study examines how the effectiveness of e-commerce platforms influenced the economic benefits of SMEs in Indonesia during the pandemic. This study investigates whether the pandemic, coupled with a higher intensity of e-commerce usage than usual, contributed to economic gains for SMEs. This study proposes a new model developed from Tran (2021) by incorporating additional variables such as perceived benefits, perceived supply chain, perceived organizational resources, e-service quality, and external pressure, while also examining the impact of PEEP on economic benefits and the digital transformation process, especially during the pandemic. The researchers conducted an online survey using Google Forms, targeting SME entrepreneurs who use e-commerce platforms to conduct business. A total of 270 responses were obtained. Hypothesis testing was performed using Partial Least Squares (PLS) analysis with Smart PLS 4.0. The results indicate that pandemic fear during online sales positively moderates the relationship between PEEP and economic benefits, and similarly moderates the relationships between perceived benefits, perceived supply chain, perceived organizational resources, e-service quality, and external pressure and economic benefits.

Keywords: Digital Transformation, SMEs, Perceived Effectiveness of E-Commerce Platform, Perception of E-Commerce Platform Usage, Pandemic Fear.

1. INTRODUCTION

The use of e-commerce is one of the impacts of the digitalization era, which demands that society adapt and grow alongside it. Organizations that can adapt to digital changes are believed to gain many advantages, especially during the pandemic. In today's rapidly evolving digital era, those who can survive are individuals and operations that embrace technology (Prasetyo et al., 2021). During the pandemic, many MSMEs faced challenges; however, many also benefited from utilizing e-commerce. The recent increase in online sales has been driven by both new and existing customers, suggesting that online platforms can help organizations survive and adapt during pandemics (Hwang et al., 2020).

One of the driving factors of digital change is the transformation of business practices through the Internet economy, e-commerce and social media. The Internet provides a platform for millions of daily online transactions and communications that contribute significantly to the individual economy (Putra & Santoso, 2021). The digital transformation undertaken by MSMEs adds significant value to their operations. According to Mandviwalla (2021), digital transformation (DT) is widely adopted in various businesses and has the capacity to generate value. The economic impact of COVID-19 has been severe globally, particularly in Indonesia. As a country where internet usage has exceeded 70% of the total population (APJII, 2023), the number of MSMEs joining e-commerce increased by 6.5 million from May 2020 to June 2021 (Akbar, 2021).

However, e-commerce adoption among MSMEs remains low. Therefore, it is crucial for MSMEs to undergo digital transformation. The International Labour Organization (ILO) conducted a survey to examine the impact of the COVID-19 pandemic on 571 MSMEs in Indonesia. The survey, conducted between April 6 and 24, 2020, revealed that 70% of MSMEs had halted production due to COVID-19. Meanwhile, the Minister of Cooperatives and SMEs stated that the pandemic affected most MSME operations and profitability. In contrast, the use of e-commerce during the COVID-19 period offered opportunities that made operations easier for MSMEs and had the potential to boost the country's annual economic growth by 2% (OECD, 2021). According to TDS researcher Ai Mulyani, to survive and grow during the pandemic, most MSMEs (82%) sought to optimize their online sales activities through their outlets on e-commerce platforms and through marketplaces on social media (Liputan6, 2021).

Saputra (2020) indicated that, based on data from reviews of an e-commerce application on the Play Store accessed on October 19, 2019, only 21% of the last 100 reviewers gave 5-star ratings, while 58% gave 1- or 2-star ratings. These findings suggest that customer purchase intention for e-commerce platform X was relatively low, mainly due to several issues identified from the negative reviews, such as app-related problems, lack of trust, poor e-service quality, reduced promotions, and high prices. This highlights the importance of MSME actors paying attention to the presentation of their accounts when using e-commerce platforms for selling and marketing activities, particularly regarding service quality, especially for MSMEs that rely solely on e-commerce platforms for operations.

Building on Tran's (2021) research, this study focuses on the extent to which the effectiveness of e-commerce platforms influences the economic benefits for MSMEs in Indonesia during the pandemic. This study explores whether the pandemic, coupled with higher-than-usual e-commerce usage, provides economic gains for MSMEs. Digital transformation occurs when MSME actors utilize e-commerce platforms, resulting in a shift in their perception that e-commerce activities are more effective than conventional methods.

This study examines the growing effectiveness of e-commerce during the pandemic, where consumers have benefited significantly from using these platforms. The question is whether MSMEs can translate these benefits into economic gains for their businesses. COVID-19 has disrupted and reshaped the business landscape, forcing managers to operate supply chains online due to reduced direct contact with customers (Tran, 2021). The researcher believes that COVID-19 has driven many companies to undergo digital transformation due to the evolving consumer demands. This trend is not limited to large corporations; MSMEs have also been significantly impacted, especially in Indonesia, where MSMEs dominate the business sector and contribute more to the national income than other types of companies. The pandemic has, for example, accelerated the shift of consumers toward online purchasing, requiring

managers to innovate and find alternative supply methods that foster engagement between companies and consumers (Tran, 2021).

The adoption of e-commerce by MSMEs has been extensively examined in recent studies, highlighting key technological, organizational, and environmental determinants (Aswar & Ermawati, 2021). However, most recent studies have not thoroughly examined the direct relationship between e-commerce adoption and MSME economic benefits, particularly in the context of the COVID-19 pandemic (Purba et al., 2021; Hanoum et al., 2025). Tran (2021) emphasizes the need to explore e-commerce operational models from the perspective of companies and managers rather than solely from the consumer viewpoint. The acceleration of digital transformation is driven by changes in business practices based on the Internet, e-commerce, and social media (Prasetyo et al., 2021), which provide significant opportunities for MSMEs. While several recent investigations demonstrate that e-business and digital innovations significantly enhance both financial and non-financial performance among SMEs (Purba et al., 2021; Mangifera et al., 2022), there remains a gap in the literature regarding the interplay of variables such as perceived e-commerce platform effectiveness (PEEP), perceived benefits, supply chain capabilities, organizational resources, e-service quality, and external pressure in driving economic gains for MSMEs—especially amid disruptive contexts such as pandemics. Building on these insights, this study seeks to fill this gap by empirically evaluating these constructs in the Indonesian MSME landscape. Recent research has highlighted the lack of technological roadmaps and supporting ecosystems for digital transformation as major obstacles (Nambisan et al., 2020). This study aims to fill this research gap and contribute both theoretically and practically to the development of MSMEs in the digital era.

Based on the identified research gap, this study intends to provide empirical evidence that the use of e-commerce platforms by MSME actors can deliver economic benefits during the pandemic period. Moreover, it seeks to demonstrate that perceived effectiveness, perceived benefits, perceived supply chain, perceived organizational resources, e-service quality, and external pressures after e-commerce adoption significantly influence MSME economic gains in Indonesia. Furthermore, this study aims to show that the use of e-commerce during the pandemic encouraged MSMEs to engage in more intensive digital transformation, enabling them to adapt and enhance their competitiveness in the digital era.

2. LITERATURE REVIEW

2.1 Digital Transformation Process of MSMEs

Digital transformation helps micro, small, and medium enterprises (MSMEs) enhance their productivity and competitiveness, particularly during the pandemic. Key factors include digital awareness, workforce competence, technical and financial support, and communication infrastructure (Bank Indonesia, 2020; Prasetyo et al., 2021).

2.2 Perceived Effectiveness of E-Commerce Platforms (PEEP)

PEEP refers to the perception that e-commerce platforms safeguard online transactions from risk (Tran, 2020). Effectiveness is measured through data security, privacy protection, and transaction reliability, which in turn drive the economic benefits of MSMEs.

2.3 Perceived Benefits

Perceived benefits represent the belief in the added value of e-commerce in terms of business efficiency, opportunities, and compatibility with existing processes (Raimo et al., 2023; Purwanto et al., 2020).

2.4 Perceived Supply Chain

A supply chain is defined as a network of organizations connected by the flow of products, services, finances, and information from the source to the customer. In the digital era, supply chain integration and resilience are critical for business continuity (Ivanov, 2020; Wamba & Queiroz et al., 2020).

2.5 Perceived Organizational Resources

Technological, financial, and human resources determine the success of MSMEs' e-commerce adoption. IT infrastructure, capital, and skilled human resources are the key drivers of innovation (Papadopoulos et al., 2020; Kraus et al., 2021).

2.6 E-Service Quality

E-service quality is measured by website design, reliability, responsiveness, and trustworthiness. Recent studies have highlighted that digital service quality directly affects customer satisfaction and firm performance (Santoso & Erdaka, 2021; Aljumah et al., 2022).

2.7 External Pressure

Pressure from trading partners and competition influences e-commerce adoption. Partner requirements and the threat of losing customers push MSMEs toward digital transformation (Marcucci et al., 2021; Kraus et al., 2022).

2.8 Economic Benefit

E-commerce increases MSMEs' revenue, efficiency, competitiveness, and innovation (OECD, 2021; Najib et al., 2021).

2.9 Pandemic Fear

The COVID-19 pandemic has altered shopping behavior, pushing consumers toward online purchases because of the fear of infection (Tran, 2021). This has accelerated the e-commerce adoption by MSMEs.

2.10. Hypothesis Development

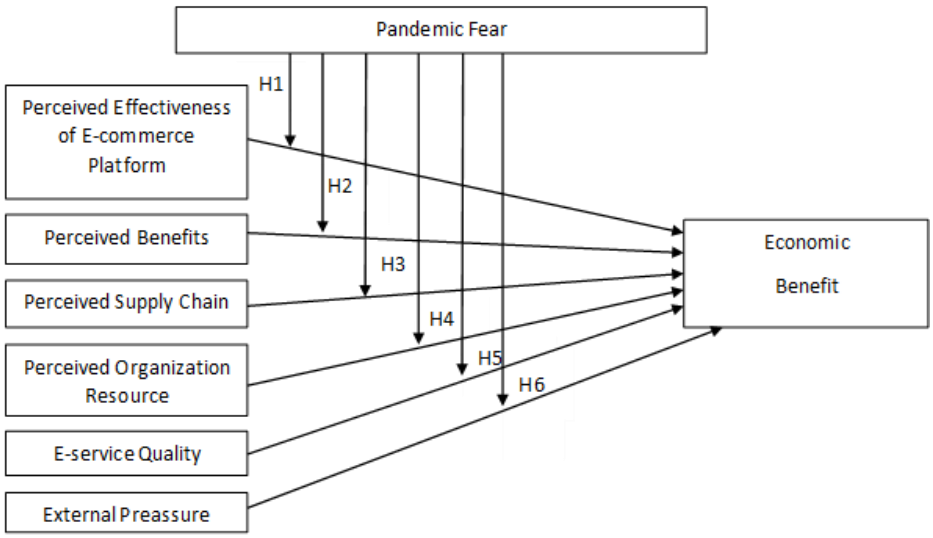

Figure 1. Conceptual Framework

Figure 1 illustrates the conceptual framework underpinning the development of the hypotheses in this study. When using e-commerce, many online customers feel unsafe due to security concerns, which is a critical issue for online shoppers (Zhang et al., 2021). Several recent studies have claimed that mobile payments are more secure than traditional payment methods, especially with the advancement of fintech technologies (Ali, 2021). The pandemic significantly affected the performance in terms of revenue, profit, cash flow, and employment. Connecting MSMEs with markets and buyers through technology should be prioritized, as the rapid adoption of e-commerce plays a crucial role in sustaining business operations and growth during disruptive periods. Empirical evidence shows that e-commerce significantly contributes to regional economic growth by enhancing market reach and business resilience (Khusnul Khotimah, 2021). Furthermore, determinants of e-commerce implementation deeply influence entrepreneurial development among MSMEs in Indonesia amid the COVID-19 pandemic (Iman & Pasaribu, 2022). Studies have also revealed that technological, organizational, and environmental factors moderate the impact of e-commerce adoption on SME performance and competitive advantage (Sutrisno et al., 2024). This approach can help address the challenges faced by MSMEs during the pandemic.

H1: *Pandemic fear in online sales positively moderates the relationship between PEEP and economic benefits.*

Recent findings highlight that perceived benefits significantly influence SME e-commerce gains (Lim et al., 2021; Nguyen et al., 2022). The most frequently reported advantages of e-commerce adoption in the literature are improved relationships with external entities and the ability to retain customers (Alraja et al., 2022). Pandemic fear, which restricts MSME operators from running offline operations, along with the perceived benefits of e-commerce, is expected to contribute to MSME economic gains.

H2: *Pandemic fear in online sales positively moderates the relationship between perceived benefits and economic benefits.*

Studies have also shown that higher coordination levels between suppliers and e-commerce systems increase retailers' online sales (Zhao et al., 2021). Regarding the operational aspects of e-commerce platforms, logistics capability remains one of the most relevant aspects of firm performance, particularly during and after the pandemic (Shaharudin et al., 2022). This indicates that perceived supply chain benefits within e-commerce platforms can improve MSME productivity, performance, and profit.

H3: *Pandemic fear in online sales positively moderates the relationship between perceived supply chain and economic benefits.*

The importance of organizational resources in the adoption of digital technologies has been well recognized in recent research. The availability of organizational resources, including technology, financial/business resources, and human capital, directly influences MSME readiness for digital transformation (Papadopoulos et al., 2020; Kraus et al., 2022). For SMEs, organizational resources provide opportunities for business process improvement through technology adoption and business growth (Najib et al., 2021).

H4: *Pandemic fear in online sales positively moderates the relationship between perceived organizational resources and economic benefits.*

Low customer satisfaction leads to reluctance to use services in the future (Valtokina, 2020). This means that high-quality e-commerce services are believed to yield economic benefits for MSMEs in the form of customer loyalty and repeat purchases, ultimately increasing their profits. Recent studies have confirmed that the adoption of online technologies assists MSMEs in managing their businesses and improving e-service quality (Santoso & Erdaka, 2021). In implementing e-commerce during the current pandemic, MSMEs must innovate and improve their service quality to drive digital transformation.

H5: *Pandemic fear of online sales positively moderates the relationship between e-service quality and economic benefits.*

There is considerable pressure to adopt e-commerce platforms to enhance SME competitiveness and survival (Kraus et al., 2022). By adopting e-commerce platforms, organizations can benefit from lower material costs, greater operational efficiency, and more accurate data collection (Najib et al., 2021). Recent literature has also identified economic benefits in terms of economic growth, increased productivity, improved competitiveness, and innovation (Nguyen et al., 2022).

H6: *Pandemic fear in online sales positively moderates the relationship between external pressure and economic benefits.*

2.11 Operational Variable

Although the conceptual framework has been presented visually, this study also provides a detailed operationalization of variables to clarify how theoretical concepts were translated into measurable indicators. Each construct is defined, along with its indicators, measurement sources, and scale references. This operationalization ensures that readers and reviewers can clearly trace the measurement process and replicate the study. To achieve this, the operational definitions of the variables were developed based on the relevant literature and adapted to the research context of MSMEs during the COVID-19 pandemic. The operationalization covers all main constructs, their measurable indicators and the scale of measurement. This detailed mapping allows for consistency in data collection and strengthens the validity of the study findings.

Table 1. Operational Variable

Construct	Indicator	Scale	Source
Perceived Effectiveness of E-Commerce Platforms (PEEP)	Data security, privacy protection, transaction reliability	Likert 1–5	Adapted from Tran (2020)
Perceived Benefits	Business efficiency, opportunities, compatibility with processes	Likert 1–5	Purwanto et al. (2020)
Perceived Supply Chain	Integration, resilience, information flow	Likert 1–5	Ivanov (2020)
Perceived Organizational Resources	IT infrastructure, financial resources, human resource skills	Likert 1–5	Papadopoulos et al. (2020)
E-Service Quality	Website design, reliability, responsiveness, trustworthiness, personalization	Likert 1–5	Santoso & Erdaka (2021)
External Pressure	Partner requirements, customer demand, market competition	Likert 1–5	Kraus et al. (2022)
Economic Benefit	Revenue, efficiency, competitiveness, innovation	Likert 1–5	Najib et al. (2021)
Pandemic Fear	Online purchase motivation due to fear of infection	Likert 1–5	Tran (2021)

The operationalization table above serves as the foundation for designing the research instrument, ensuring that each construct is measured consistently and systematically. By aligning the variables with validated indicators from prior studies, this research minimizes measurement errors and enhances reliability. Furthermore, this approach allows for greater comparability with existing studies, thereby strengthening the contribution of this study to both theory and practice.

3. RESEARCH METHOD

This study employs a quantitative approach with a causal-associative design through a survey method to examine the relationships among variables using primary data from MSMEs in Indonesia, particularly those affected by COVID-19 and who meet specific criteria. The sample size was determined using the Slovin formula with an error tolerance of 5%, resulting in a minimum of 270 respondents being required. The Slovin formula was chosen because the exact population size of MSMEs affected by the pandemic is large and heterogeneous, making it difficult to conduct a full enumeration of the population. To ensure representation, purposive sampling was applied with inclusion criteria such as MSMEs that had

adopted e-commerce during the pandemic, thus allowing for more relevant and accurate responses across various categories of businesses.

Data were collected using a structured closed-ended questionnaire with a five-point Likert scale (1–5). To enhance methodological rigor, the questionnaire underwent content validity checks through expert judgment, while construct validity and reliability were tested using convergent validity, discriminant validity, and composite reliability analyses in SmartPLS. Potential biases, such as non-response bias and common method bias, were minimized by ensuring the anonymity of respondents and randomizing the question order. Analysis was conducted using the Structural Equation Modeling (SEM) technique based on Partial Least Squares (PLS) with SmartPLS 3. The choice of PLS-SEM over covariance-based SEM (CB-SEM) is justified because this study focuses on prediction and theory development rather than theory confirmation. Moreover, PLS-SEM is more suitable for complex models with multiple constructs and second-order factors, and it performs better with relatively small to medium sample sizes, such as in this study. This approach enabled the evaluation of the measurement model (outer model), structural model (inner model), and hypothesis testing, thereby confirming the relationships among latent variables with reflective indicators and higher-order constructs.

4. RESULT AND DISCUSSION

The research findings were obtained from 270 respondents (15% of the total population of 1,800 MSMEs) located in Sumatra, Java, and parts of Kalimantan and Sulawesi. Data collection was conducted over four weeks in October 2022 via Google Forms, which were distributed through Instagram and email. The population source was obtained from the Bank Indonesia website and regional news outlets. Respondent profiles included geographical and demographic data (gender, age) as well as the e-commerce platforms used, while business names were kept confidential (Table 2).

Table 2. Respondent Characteristics

Gender	Frequency	%
Male	101	37.2%
Female	169	62.8%
Age		
Under 30	170	62.8%
30 to 40	78	29.6%
Up to 40	22	7.6%
E-commerce Platform		
Shopee	183	67.7%
Tokopedia	37	13.5%
Blibli	12	4.5%
Bukalapak	19	7.2%
Lazada	7	2.7%
Pomelo	4	1.8%
JD.ID	5	2.2%
Ralali	3	0.4%
Total Respondent	**270**	**100%**

The respondent profile indicates that MSME operators are predominantly female, possibly due to a high interest in the fashion sector as a source of livelihood for women. Most respondents were under 30, reflecting strong entrepreneurial interest among the younger generation. Shopee emerged as the most widely used e-commerce platform, indicating that it is the primary choice and offers the greatest business opportunities for MSME.

4.1 Statistic Descriptive

Descriptive statistics were used to provide a general overview of the research object and serve as an initial reference for understanding the problem under investigation. The data are presented in Table 3.

Tabel 3. Statistic Descriptive Result

Research Variable	N	Min	Max	Mean	Std. Dev
PEEP	270	2,00	5,00	3,8750	,6295
Perceived Benefits	270	2,00	5,00	3,8790	,6845
Perceived Supply Chain	270	2,40	5,00	3,9881	,4652
Perceived Organizational Resources	270	2,33	5,00	4,1198	,5581
E-service Quality	270	2,33	5,00	3,9815	,6460
External Preassure	270	2,00	5,00	3,9901	,6368
Pandemic Fear	270	3,00	5,00	4,2049	,5019
Economic Benefit	270	1,00	5,00	3,8009	,8236
Valid N (listwise)	270				

Based on the descriptive statistics results in Table 3, all research variables show a maximum value of 5.000 and a minimum value of 2.000, with a total of 270 observations. The PEEP variable has a mean score of 3.8750, Perceived Benefits 3.8790, Perceived Supply Chain 3.9881, Perceived Organizational Resources 4.9881, E-Service Quality 3.9815, External Pressure 3.9901, Pandemic Fear 4.2049, and Economic Benefit, which was also measured from 270 observations. These results provide an initial overview of the respondents' response tendencies for each variable measured in this study.

4.2 Evaluation of the Outer Model

4.2.1 Convergent Validity Test

The convergent validity test was conducted using outer loading (loading factor) values. An indicator is considered to have good convergent validity if its outer loading value exceeds 0.70. Table 4 presents the outer loading values for each indicator of the variables examined in this study.

Table 4. Outer Loading

	EB	PF	PEEP	PB	PSC	POR	EQ	EP
EB1	0,85							
EB2	0,93							
EB3	0,88							
EB4	0,75							
PF1		0,76						
PF2		0,91						
PF3		0,9						
PEEP1			0,81					
PEEP2			0,85					
PEEP3			0,83					
PEEP4			0,87					
PB1				0,86				
PB2				0,9				
PB3				0,84				
PSC1					0,72			
PSC2					0,86			
PSC3					0,75			
PSC4					0,75			

PSC5					0,77			
POR1						0,82		
POR2						0,85		
POR3						0,85		
EQ1							0,90	
EQ2							0,93	
EQ3							0,9	
EP1								0,84
EP2								0,85
EP3								0,88

Based on Table 4, all variable indicators have outer loading values greater than 0.70, indicating that all indicators are valid and suitable for use in this study. Therefore, they can be used for further analysis.

4.2.2 Discriminant Validity Test

The discriminant validity test was conducted using cross-loading values. Discriminant validity is considered satisfactory when the loading value of each indicator on its corresponding construct is higher than its loading on other constructs. Table 5 displays the cross-loading values for each variable indicator used in this study.

Table 5. Cross loading Value

	EB	**PF**	**PEEP**	**PB**	**PSC**	**POR**	**EQ**	**EB**
EB1	0,85	0,39	0,54	0,51	0,48	0,4	0,6	0,56
EB2	0,93	0,37	0,58	0,6	0,36	0,37	0,68	0,64
EB3	0,88	0,36	0,62	0,56	0,45	0,47	0,74	0,61
EB4	0,75	0,29	0,52	0,57	0,3	0,25	0,54	0,6
PF1	0,19	0,76	0,07	0,13	0,02	0,05	0,11	0,13
PF2	0,38	0,91	0,21	0,22	0,15	0,2	0,26	0,21
PF3	0,43	0,9	0,19	0,18	0,15	0,29	0,3	0,23
PEEP1	0,48	0,09	0,81	0,43	0,48	0,41	0,49	0,52
PEEP2	0,55	0,11	0,85	0,48	0,51	0,39	0,49	0,54
PEEP3	0,58	0,25	0,83	0,48	0,48	0,46	0,49	0,45
PEEP4	0,61	0,2	0,87	0,51	0,48	0,44	0,52	0,55
PB1	0,54	0,19	0,48	0,86	0,32	0,32	0,54	0,52
PB2	0,56	0,18	0,5	0,9	0,4	0,28	0,53	0,57
PB3	0,6	0,18	0,5	0,84	0,36	0,32	0,56	0,58
PSC1	0,29	0,1	0,34	0,27	0,72	0,23	0,34	0,4
PSC2	0,4	0,15	0,45	0,33	0,86	0,36	0,4	0,42
PSC3	0,36	0,09	0,43	0,3	0,75	0,29	0,34	0,37
PSC4	0,33	0,14	0,45	0,36	0,75	0,28	0,26	0,36
PSC5	0,41	0,08	0,55	0,34	0,77	0,43	0,39	0,45
POR1	0,36	0,18	0,44	0,24	0,35	0,82	0,34	0,36
POR2	0,37	0,22	0,42	0,29	0,35	0,85	0,37	0,36
POR3	0,38	0,2	0,41	0,36	0,36	0,35	0,84	0,58
EQ1	0,58	0,26	0,43	0,51	0,48	0,34	0,86	0,62
EQ2	0,67	0,27	0,5	0,6	0,36	0,47	0,88	0,68

EQ3	0,68	0,21	0,59	0,56	0,45	0,4	0,64	0,9
EP1	0,64	0,25	0,57	0,57	0,3	0,45	0,69	0,94
EP2	0,66	0,21	0,57	0,13	0,02	0,39	0,68	0,9
EP3	0,58	0,26	0,43	0,22	0,15	0,39	0,84	0,58

Based on Table 5, it can be observed that each indicator in the study variables has the highest cross-loading value on the construct it measures compared to its loadings on other constructs. This indicates that the indicators used in this study achieved good discriminant validity. In addition to the cross-loading values, discriminant validity can also be assessed using the Average Variance Extracted (AVE). Table 5 presents the AVE values for each construct.

Table 6. Average Variance Extracted (AVE) Result

Constructs	AVE
External Preassure	0,73
E-Service Quality	0,83
Economic Benefits	0,72
Pandemic Fear	0,73
PEEP	0,7
Perceived Benefits	0,75
Perceived Supply Chain	0,59
Perceived Organizational Resources	0,7

In Table 6, the Average Variance Extracted (AVE) value must exceed 0.50 for the model to be considered acceptable. Based on the data presented, all variables in this study had AVE values greater than 0.50. Therefore, it can be concluded that each variable in this study demonstrated good discriminant validity.

4.2.3 Composite Reliability Test

Data with a Composite Reliability value greater than 0.70 are considered to have high reliability.

Table 7. Composite Reliability

Constructs	Composite Reliability
External Preassure	0,893616
E-Service Quality	0,937626
Economic Benefits	0,914837
Pandemic Fear	0,894121
PEEP	0,905354
Perceived Benefits	0,900259
Perceived Supply Chain	0,880439
Perceived Organizational Resources	0,878102

Based on Table 7, the Composite Reliability values for all research variables are greater than 0.70, indicating that each variable meets the reliability criterion.

Table 8. Cronbach's Alpha

Constructs	Cronbachs Alpha

External Preassure	0,821848
E-Service Quality	0,900033
Economic Benefits	0,874249
Pandemic Fear	0,832715
PEEP	0,860965
Perceived Benefits	0,833666
Perceived Supply Chain	0,830292
Perceived Organizational Resources	0,791666

A variable is considered reliable if it has a Cronbach's alpha value greater than 0.70. Based on the data, all variables in this study had Cronbach's alpha values above 0.70, indicating that each variable demonstrated a high level of reliability (Table 8).

4.3 Structural Model Evaluation

Structural Equation Modeling (SEM) was explained through a comprehensive evaluation of the model, which included assessing the structural equation values and evaluating the coefficient of determination (R^2).

4.3.1. Collinearity Statistic Test

Table 9. Collinearity Statistic (VIF)

	VIF
EP1	1.815
EP2	1.766
EP3	2.007
EQ1	2.69
EQ2	3.681
EQ3	2.66
KE1	2.436
KE2	3.772
KE3	2.696
KE4	1.724
KP1	1.89
KP2	2.545
KP3	1.854
PEEP1	2.066
PEEP2	2.251
PEEP3	1.928
PEEP4	2.295
PM1	2.174
PM2	2.508
PM3	1.654
PSC1	1.719
PSC2	2.322
PSC3	1.636
PSC4	1.713
PSC5	1.692
PSDO1	1.559
PSDO2	1.77
PSDO3	1.73

In the collinearity assessment, a Variance Inflation Factor (VIF) value of 5 or higher indicated the presence of multicollinearity among the indicators. Based on the results presented in the table above, all indicators fell within the acceptable range, indicating no multicollinearity issues in the model (Table 9).

4.4 Overall Model

Partial least squares (PLS) analysis consists of an outer model, which links variables to their indicators, and an inner model, which links relationships among variables. This study employs three outer models and two inner models, with loading factor values and t-values used to measure the significance of the relationships among variables.

4.4.1 Structural Equation

The inner model in this study explains the causal relationships among the variables as follows:

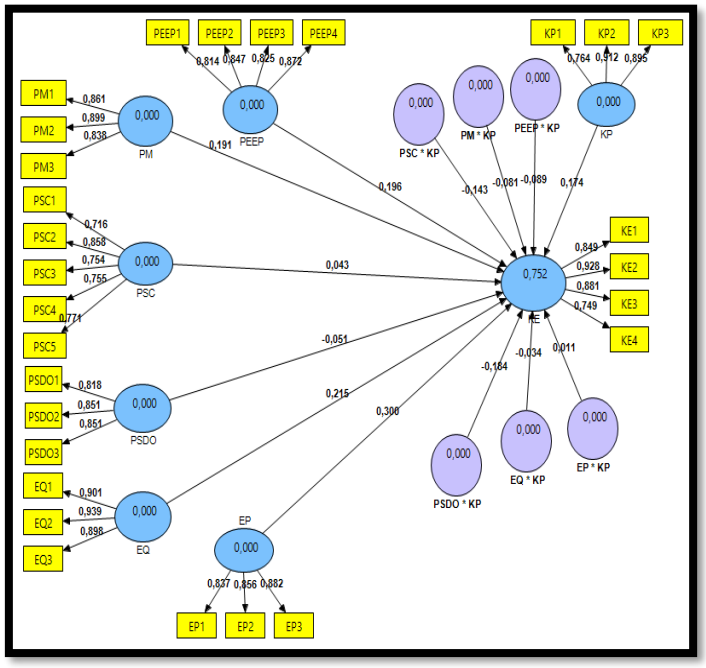

Figure 2. Outer and Inner Research Model

4.4.2 Path Coefficient Test

The path coefficient measures the strength of the influence of independent variables on dependent variables, whereas the R-squared value indicates the extent to which other variables affect the endogenous variables.

Table 10. Path Coefficient Result

No.	Constructs	Coefficient
1	Pandemic Fear	0,174327
2	PEEP	0,195815
3	Perceived Benefits	0,190601

No.	Constructs	Coefficient
4	Perceived Supply Chain	0,043386
5	Perceived Organizational Resources	-0,051092
6	E-Service Quality	0,299901
7	External Preassure	0,215446

Based on these results, the basic structural equation model of this study can be formulated as follows:

$$Y = 0,174327Z + 0,195815X_1 + 0,190601X_2 + 0,043386X_3 - 0,051092X_4 + 0,299901X_5 + 0,215446\,X_6$$

The test results indicate that the greatest influence on economic benefits comes from E-service Quality (29.9%), followed by External Pressure (21.4%), PEEP (19.5%), Perceived Benefits (19%), and Pandemic Fear (17.4%), in that order. The lowest influence was from Perceived Supply Chain (4.3%) and Perceived Organizational Resources (-5.1%). Positive values indicate a strengthening effect, whereas negative values indicate a weakening effect.

4.4.3 Coefficient of Determination (R^2)

The coefficient of determination (R-squared) measures the predictive accuracy of the structural model, with values ranging from 0 to 1; the closer the value is to 1, the higher the model's predictive accuracy (Hair, 2021). The data analysis yielded the following R-squared values (Table 11):

Table 11. Hasil R-Square

	R Square
Economic Benefits	0,752399

The R-squared value of the research model was 0.752, indicating that 75.2% of the Attitudinal Loyalty variable was explained by RLSQ and OLSQ, while the remaining 24.8% was influenced by other factors. The Q-Square value was used to assess the goodness of fit of the model, where higher values indicated a better fit between the model and data.

Q-Square
= 1 – [(1 – $R^2$1) x (1 – $R^2$2)]
= 1 – [(1- 0,752) x (1 - 1,504)]
= 1 – 0,124992
= 0.875

The Q-Square value of 0.875 indicates that the model can explain 87.5% of the data variance, while the remaining 12.5% is influenced by factors outside the model. This result demonstrates that the model has a good goodness of fit.

4.4.4 Hypothesis Testing

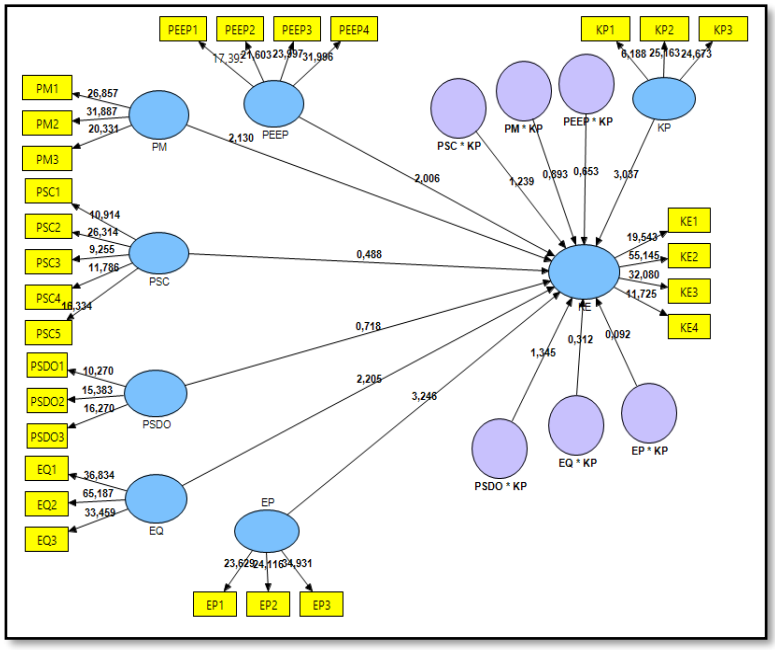

Figure 3. Bootstrapping Result

Based on the data analysis conducted (Figure 3), the results can be used to address the hypotheses of this study. Hypothesis testing in this study was carried out by examining the T-statistics values (Table 12).

Table 12. T-Statistic and P-Values

Hypotheses	Explanation	T Statistics (|O/STERR|)	P- Values
H1	PEEP -> Economic Benefits	2,006465	0.000**
H2	Perceived Benefits -> Economic Benefits	2,129756	0.001*
H3	Perceived *Supply Chain* -> Economic Benefits	0,487510	0.284
H4	Perceived Organizational Resources -> Economic Benefits	0,718462	0.316
H5	External Pressure -> Economic Benefits	3,246332	0.000**
H6	E-service Quality -> Economic Benefits	2,205439	0.000**
Moderation	Pandemic Fear -> Economic Benefits	3,036552	0.000**

Based on Table 12, of the six variables tested without the moderating variable, four hypotheses showed a positive effect on economic benefits with T-statistics values greater than 1.64, while Perceived Supply Chain and Perceived Organizational Resources were not significant, as their T-statistics were below 1.64. However, the results indicate that Pandemic Fear moderates the relationship between all independent variables and economic benefits, with a T-statistic of 3.03, meaning that all hypotheses are supported, according to Al-Fraihat et al. 's(2020) criteria.

4.5. Discussion

Based on the statistical test results, four independent variables—PEEP (T = 2.00), Perceived Benefits (T = 2.12), E-Service Quality (T = 2.20), and External Pressure (T = 3.24)—have a significant positive effect on economic benefits, as their T-statistics are all greater than 1.64. Meanwhile, Perceived Supply Chain (T = 0.48) and Perceived Organizational Resources (T = 0.71) were not significant when tested without moderation. However, Pandemic Fear has been shown to moderate the relationship

between all independent variables and economic benefits, with a moderation t-statistic of 3.03, indicating that all hypotheses in this study are supported (Al-Fraihat et al., 2020).

These findings align with recent studies showing that the implementation of e-commerce can expand market reach and provide opportunities for customization according to consumer needs, thereby enhancing profitability (Dwivedi et al., 2021; Marcucci et al., 2021). Recent evidence also highlights that a high perceived benefit encourages individuals or business actors to adopt new technologies, including e-commerce, which improves efficiency and performance (Soto-Acosta, 2020; Akpan et al., 2022). Although perceptions of supply chain and organizational resources were not significant without moderation, recent evidence supports their critical role during disruptive periods. For instance, a systematic literature review highlights that building supply chain resilience, particularly via proactive strategies and digital support, has been vital for SMEs in facing COVID-19-related disruptions (Mishra & Singh, 2023). Similarly, studies indicate that supply chain resilience reactive strategies, such as agility and operational flexibility, are crucial for food industry SMEs to withstand supply chain shocks during the pandemic (Ali, Suleiman, Khalid, Tan, & Tseng, 2021).

Previous studies have further supported these results, indicating that high-quality e-commerce services can enhance customer loyalty and encourage repeat purchases (Molinillo et al., 2021; Al-Kumaim et al., 2021). In addition, external pressures, such as market competition and consumer demand, force SMEs to adapt through digital innovation (Akpan et al., 2020; Papadopoulos et al., 2022), ultimately reducing costs, increasing efficiency, and boosting profits. Thus, the combination of internal factors, such as perceived benefits and service quality, with external factors, such as market pressure—moderated by pandemic fear—proves effective in enhancing the economic performance of SMEs, consistent with recent research findings (Rahmawati et al., 2021).

5. CONCLUSION

Based on the research findings, Pandemic Fear during online sales has been shown to positively moderate the relationship between PEEP, perceived benefits, perceived supply chain, perceived organizational resources, e-service quality, and external pressure on economic benefits. This indicates that under pandemic conditions, fear encourages SMEs to maximize the use of e-commerce to achieve economic gains. From these findings, several managerial implications can be drawn: SMEs are advised to enhance the management of organizational resources, even if it requires additional costs, as this can yield significant benefits during a pandemic; strengthen the supply chain or logistics for e-commerce sales, which is still relatively weak; and promote technology adoption and knowledge sharing among SMEs to optimize digital transformation.

This study has limitations, including a relatively small sample size compared to the total SME population, limited geographic coverage, and lack of representation across all e-commerce platforms, meaning that the results are more heavily influenced by certain platforms. Therefore, future research should expand the sample size and distribution across various regions of Indonesia, compare different e-commerce platforms to identify the most effective service quality and economic benefits, and examine additional variables and other driving factors that may more comprehensively affect e-commerce usage and digital transformation.

Ethical Approval

Ethical approval was not required for this study design.

Informed Consent Statement

Informed consent was not obtained for this study.

Author Contributions

Muftiah Ariani was responsible for the conceptualization, research design, data collection, analysis, interpretation of results, drafting, and finalization of the manuscript. The author has read and approved the final version of the manuscript and serves as the corresponding author of this study.

Disclosure Statement
The authors declare no potential conflicts of interest.

Data Availability Statement
The data presented in this study are available upon request from the corresponding author for privacy reasons.

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Muftia Ariani Lesmana
Muftia Ariani Lesmana is a researcher at the University of Gadjah Mada specializing in digital transformation, e-commerce, and small and medium enterprise (SME) development. Her work focuses on the intersection of technology adoption and economic resilience, particularly examining how e-commerce platforms contribute to SME performance in times of disruption, such as during the COVID-19 pandemic. She has applied quantitative approaches, including PLS-SEM, to explore digital platforms' effectiveness, supply chain integration, and organizational resources in shaping SMEs' economic benefits.

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