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DIVERSE E-COMMERCE BUSINESS MODELS IN INDONESIA: A CLUSTER ANALYSIS FROM THE NATIONAL E-COMMERCE SURVEY

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Abstract

Background: The extent of digital transformation among Indonesian businesses is varied, highlighting the need for an in-depth examination of the characteristics of e-commerce.
Purpose: The purpose of this study is to examine the diversity of Indonesian e-commerce business models.
Design/methodology/approach: The microdata set from the 2023 e-commerce survey was officially obtained from BPS-Statistics Indonesia. This study focuses on wholesale and retail trade and motor vehicle repair (Category G). After data cleaning, our analysis included 11,345 businesses. Cluster analysis categorized e-commerce into distinct business models based on business profiles, innovative activities, and performance. Additionally, one-way ANOVA was employed to reveal significant diversity among these Indonesian e-commerce models.
Findings/results: Five distinct business models were identified, each characterized by unique features. Business Model 1 includes business to customer (B2C) sellers with substantial offline revenue. Business Model 2 encompasses small-scale B2C sellers who focus on direct sales and also achieve significant offline revenue. Business Model 3 involves micro e-commerce sellers engaged in both B2C and business to business (B2B) transactions using traditional payment methods. Business model 4 consists of small B2B and B2C sellers with limited digital integration. Business Model 5 features marketplace-driven micro e-commerce sellers employing a hybrid approach.
Conclusion: Our examination of Indonesian e-commerce business models revealed distinct clusters, each with varying roles, customer types, payment methods, internet usage, and revenue sources, highlighting significant variability in e-commerce strategies.
Originality/value (State of the art): The originality of this study lies in its analysis of diverse Indonesian e-commerce business models to identify distinct types based on key characteristics.

Keywords: business models, B2B seller, B2C seller, cluster analysis, e-commerce

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INTRODUCTION

In the past decade, e-commerce has garnered significant attention from both practitioners and researchers (Priambodo et al. 2022). In Indonesia, the sector is experiencing rapid growth as online shopping becomes increasingly popular for its efficiency and convenience (Unggara et al. 2021). This growth has fundamentally transformed business practices, altering how companies interact with customers and suppliers (Rahayu and Day, 2015). Furthermore, there is now a greater emphasis on services, information, and intelligence rather than just physical goods (Rayport and Jaworski, 2001), signifying the emergence of the information era in the new economy (Rahayu and Day, 2015). E-commerce has become a vital component that enhances traditional sales channels, offering competitive advantages essential for thriving in a dynamic environment (Priambodo et al. 2022). The advancement of internet technology has revolutionized business practices, facilitating transactions through e-commerce platforms and social media, thereby overcoming barriers of distance and time and significantly improving the efficiency and accessibility of commercial activities (Sari, 2020).

E-commerce has a significant impact on the performance of the electronic trade industry (Jahanshahi et al. 2012) and the performance of small and medium-sized enterprises (Alzahrani, 2019). E-commerce has a significantly positive impact on the performance of the microfood and small non-food industries, enhancing market access while boosting revenue and profitability for these sectors (Silaban et al. 2024). Consequently, through e-commerce platforms and online purchasing, the fourth industrial revolution in technology has established a new market (Fakhrurrazi et al. 2022). Factors such as price, seller type, and the duration of a seller's membership on digital platforms influence average monthly sales (Unggara et al. 2021). Use of the Internet to sell goods or services varies across countries (OECD, 2011). E-commerce is experiencing gradual growth in Indonesia (Dhiranty et al. 2017 and Sihotang et al. 2021) in accordance with the development of internet users in Indonesia (Dhiranty et al. 2017). In the retail sector, the industry was already undergoing transformation due to the emergence of e-commerce and digital technologies (Wijaya and Hidayati, 2024). However, digital transformation among Indonesian businesses varies, necessitating a detailed exploration of e-commerce characteristics. Effectively advancing participation and leveraging digital technology will likely require diverse approaches.

We examined the diversity of Indonesian e-commerce by characterizing business profiles and activities, including roles, customer types, payment methods, internet usage, and revenue sources. This analysis, set within the framework of enhanced business performance, offers a targeted and accelerated pathway to improving outcomes in e-commerce. Success within each aspect of the business model creates motivation for innovation adoption in ecommerce (Asikin et al. 2024). Definition of e-commerce refers to the 2009 OECD (OECD, 2011) which is: "An e-commerce transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations. To be included are orders made over the web, extranet or electronic data interchange. The type is defined by the method of placing the order. To be excluded are orders made by telephone calls, facsimile or manually typed e-mail."

METHODS

BPS-Statistics Indonesia conducted the 2023 e-commerce survey across 34 provinces and 302 regencies/cities, involving a sample size of 4,252 census blocks and 31,753 businesses. The survey consists of four sections: business profiles and activities, worker characteristics, income and expenditure characteristics, and the impact of the Covid-19 pandemic. Data regarding profiles and characteristics refer to conditions in 2022, while the section on the pandemic's impact addresses the year 2023 (BPS-Statistics Indonesia, 2023).

This study focuses specifically on one of the nine categories of e-commerce businesses in Indonesia: wholesale and retail trade, and repair and maintenance of motor vehicles (Category G). This choice is justified by the observation that, in 2022, e-commerce businesses classified under Category G represented a larger proportion than other business categories, making up 37.82 percent or 11,699 businesses (BPS-Statistics Indonesia, 2023). The microdata set from

the 2023 e-commerce survey was officially requested and obtained from BPS-Statistics Indonesia. After the data cleaning process, our analyses included 11,345 businesses under Category G. Comprehensive details about each variable are available in the report on e-commerce statistics for 2022/2023 (BPS-Statistics Indonesia, 2023), including concepts, definitions, and the survey questionnaire. A brief description of the selected variables in our analysis is presented in Table 1.

Table 1. Description of the variables and units of measurement

Name of variable	Description	Type of variable
Business profile and activities		
Employee	Number of paid and unpaid employee	Continuous
Role of e-commerce business	Tyoe of role: Seller, reseller, and dropshipper	Categorical
Sales channel	Type of sales channels: Website, email, instant message, social media, marketplace/digital platforms	Categorical
Customers	The of customers: end customer, agent/other business	Categorical
Financial statement	Ownership of financial statement	Binomial
Payment method	Frequently used payment methods: cash payment/Cash on Delivery, Bank transfer payment, Card payment, and e-wallets	Categorical
Shipping method	Frequently used shipping methods: direct delivery to the buyer by the seller; direct delivery to the buyer using delivery services (e.g., Pos, TIKI, GoSend); in-store pickup or collection from designated pickup points; download from websites, applications, software, email, or other sources	Categorical
Export	Conducting online sales transactions for export	Binomial
Import	Conducting import	Binomial
Constraint	Primary constraints: Lack of capital, shortage of skilled labor; limited internet access; fraud in the buying and selling process; insufficient demand for goods or services; limited delivery services	Categorical
Training and resource for information technology in business		
Training	Receiving training on the use of information technology	Binomial
Training provider	Institution providing training on use of information technology: government, private	Categorical
Training level	Level of training on the use of information technology: basic, skilled, expert	Categorical
Mobile phone	Ownership of mobile phone for business	Categorical
Internet usage	Purpose of internet usage: ordering or purchasing raw materials, financial management of the company, human resource management, access to capital, internal company communication, customer management, marketing, payments using electronic systems, delivery	Categorical
Characteristics of responsible person/business owner		
Gender	Gender: male, female	Categorical
Age	Age	Categorical
Education	Highest level of education completed: High school, associate degree, bachelor,s degree, master's/doctoral degree	Categorical
Business performance		
Revenue	Average monthly revenue in per cent	Continuous
Impact of the COVID-19 to business revenue	The impact of the COVID-19 pandemic to business revenue via the Internet in 2023 compared to 2022: increased, remained the same, decreased	Categorical
Impact of the COVID-19 to transaction volume	The impact of the COVID-19 pandemic to transaction volume via the Internet in 2023 compared to 2022: increased, remained the same, decreased	Categorical
Impact of the COVID-19 to distribution	The impact of the COVID-19 pandemic to distribution of goods/services via the Internet in 2023 compared to 2022: increased, remained the same, decreased	Categorical

Exploring the diversity of Indonesian e-commerce required grouping business profiles and activities, training and resources for information technology in business, characteristics of responsible persons/business owners, and performance of businesses. Therefore, Hierarchical Cluster Analysis (HCA) was widely utilized for this purpose (Asikin et al. 2024), including in studies involving categorical and binomial data, as demonstrated by Makate et al. (2018) and Priegnitz et al. (2019). HCA was performed using the Centroid method. HCA aimed to partition data into several clusters of e-commerce businesses, grouping data with similar characteristics together. The dataset used for the HCA was presented in Tables 1. This approach was a clustering technique that created hierarchical structures, resembling a tree diagram. The results of the classification were presented as a dendrogram. The hierarchical method employed in this study was agglomerative, which involved various techniques for cluster formation (Situmorang et al. 2023). Specifically, average linkage clustering was used, where distances were calculated based on the average distance between clusters (Situmorang et al. 2023). Cluster validation employed ANOVA, which provided satisfactory F-test results, enabling the rejection of the null hypothesis that there were no differences between clusters (Asikin et al. 2024).

RESULTS

Diversity analysis of Indonesian e-commerce

The results of HCA are presented in Table 2. The optimal number of clusters was determined by analyzing the alignment of distance coefficients and the changes in these coefficients across cluster stages, identifying the most significant jump in the differences between distance coefficients. This notable change was observed between stages 11,339 and 11,340. By subtracting the number of stages from the total number of observations, the result indicated that 5 clusters were appropriate.

E-commerce characterisation from clusters

The five clusters identified, reflecting the diversity of Indonesian e-commerce, were detailed in Tables 3-6. ANOVA results indicated that all variables within each cluster differed significantly. However, the characteristics of business performance related to the impact of the COVID-19 pandemic did not differ between clusters. Moreover, the five clusters were profiled and named according to their specific characteristics. The classification of these clusters as business models was due to their innovative behaviors in e-commerce activities, specifically in value architecture and financing mechanisms (Asikin et al. 2020). This classification offered valuable insights into the various business approaches within the Indonesian e-commerce sector.

Table 2. Agglomeration schedule for the hierarchical cluster analysis

Stage	Cluster Combined		Next Stage
	Cluster 1	Cluster 2	
1	10034	11694	53
2	1631	11666	1660
3	9293	11620	1401
4	6696	11579	668
5	11059	11556	26
…	…	…	…
11337	84	9414	11342
11338	28	5193	11340
11339	16	11300	11342
11340	1	28	11341
11341	1	6	11343
11342	16	84	11343
11343	1	16	11344
11344	1	245	0

Table 3. Characteristics of Indonesian E-commerce: Business profile and activities (n=11345)

Characteristics	Total		Cluster 1 (n=7481; 67.37%)		Cluster 2 (n=2459; 22.14%)		Cluster 3 (n=1165; 10.49%)		Cluster 4 (n=235; 2.12%)		Cluster 5 (n=5; 0.05%)		p-value
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	
The year e-commerce began													
< 2020	5300	46.72	3367	45.01	1215	49.41	582	49.96	132	56.17	4	80.00	
2020-2021	4099	36.13	2782	37.19	868	35.30	378	32.45	70	29.79	1	20.00	0,000
2022	1946	17.15	1332	17.81	376	15.29	205	17.60	33	14.04	0	0.00	
Number of paid employees													
1-4 peoples	10086	88.90	6517	87.11	2396	97.44	977	83.86	191	81.28	5	100.00	
5-19 peoples	1087	9.58	844	11.28	61	2.48	150	12.88	32	13.62	0	0.00	0.000
20-99 peoples	160	1.41	112	1.50	2	0.08	34	2.92	12	5.11	0	0.00	
>= 100 peoples	12	0.11	8	0.11	0	0.00	4	0.34	0	0.00	0	0.00	
Number of unpaid employees													
1-4 peoples	5278	46.52	3587	47.95	982	39.93	608	52.19	99	42.13	2	40.00	0.000
5-19 peoples	34	0.30	27	0.36	3	0.12	4	0.34	0	0.00	0	0.00	
Number of employees													
1-4 peoples	9689	85.40	6228	83.25	2362	96.06	910	78.11	184	78.30	5	100.00	
5-19 peoples	1480	13.05	1130	15.10	95	3.86	216	18.54	39	16.60	0	0.00	0.000
20-99 peoples	164	1.45	115	1.54	2	0.08	35	3.00	12	5.11	0	0.00	
>= 100 peoples	12	0.11	8	0.11	0	0.00	4	0.34	0	0.00	0	0.00	
The Role of e-commerce businesses													
Seller	8381	73.87	5988	80.04	1481	60.23	767	65.84	143	60.85	2	40.00	
Reseller	2559	22.56	1319	17.63	831	33.79	334	28.67	72	30.64	3	60.00	0.000
Dropshipper	405	3.57	174	2.33	147	5.98	64	5.49	20	8.51	0	0.00	
Sales channels													
Website	237	2.09	178	2.38	21	0.85	31	2.66	7	2.98	0	0.00	
Email	690	6.08	469	6.27	116	4.72	87	7.47	17	7.23	1	20.00	
Instant message	10856	95.69	7092	94.80	2393	97.32	1136	97.51	231	98.30	4	80.00	0.000
Social media	7185	63.33	4424	59.14	2005	81.54	645	55.36	108	45.96	3	60.00	
Marketplace/digital platforms	1501	13.23	1196	15.99	129	5.25	159	13.65	12	5.11	5	100.00	
Types of customers													
End consumer only	7717	68.02	5880	78.60	1837	74.71	0	0.00	0	0.00	0	0.00	
Agent/other business only	177	1.56	0	0.00	0	0.00	97	8.33	78	33.19	2	40.00	0.000
Both end consumers and agent	3451	30.42	1601	21.40	622	25.29	1068	91.67	157	66.81	3	60.00	
Ownership of financial statement	2890	25.47	2147	28.70	304	12.36	370	31.76	67	28.51	2	40.00	
Frequently used payment methods													
Cash Payment (Cash on Delivery)	9500	83.74	6591	88.10	1870	76.05	919	78.88	120	51.06	0	0.00	
Bank Transfer Payment	1680	14.81	780	10.43	562	22.85	219	18.80	114	48.51	5	100.00	0.000
Card Payment	68	0.60	44	0.59	11	0.45	12	1.03	1	0.43	0	0.00	
E-Wallets	97	0.86	66	0.88	16	0.65	15	1.29	0	0.00	0	0.00	
Frequently used shipping methods													
Direct delivery to the buyer by the seller	6255	55.13	3770	50.39	1642	66.78	677	58.11	165	70.21	1	20.00	
Direct delivery to the buyer using delivery services	1074	9.47	578	7.73	336	13.66	122	10.47	34	14.47	4	80.00	
In-store pickup or collection from designated pickup points	3992	35.19	3113	41.61	478	19.44	365	31.33	36	15.32	0	0.00	0.000
Download from websites. applications. software. email. etc.	24	0.21	20	0.27	3	0.12	1	0.09	0	0.00	0	0.00	
Conducting online sales transactions for export	79	0.70	29	0.39	21	0.85	17	1.46	11	4.68	1	20.00	
Conducting import	75	0.66	40	0.53	21	0.85	12	1.03	2	0.85	0	0.00	

Table 4. Characteristics of Indonesian E-commerce: Training and resource for information technology in business (n=11345)

Characteristics	Total		Cluster 1 (n=7481; 67.37%)		Cluster 2 (n=2459; 22.14%)		Cluster 3 (n=1165; 10.49%)		Cluster 4 (n=235; 2.12%)		Cluster 5 (n=5; 0.05%)		p-value
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	
Receiving training on the use of IT	457	4.03	272	3.64	122	4.96	44	3.78	18	7.66	1	20.00	0.000
Institution providing training on use of information technology													
Government	108	0.95	63	0.84	34	1.38	8	0.69	3	1.28	0	0.00	
Private	335	2.95	202	2.70	83	3.38	34	2.92	15	6.38	1	20.00	0.000
Both government and private	14	0.12	7	0.09	5	0.20	2	0.17	0	0.00	0	0.00	
Level of training on the use of information technology													
Basic	335	2.95	198	2.65	90	3.66	34	2.92	13	5.53	0	0.00	
Skilled	154	1.36	92	1.23	37	1.50	16	1.37	9	3.83	0	0.00	0.000
Expert	53	0.47	33	0.44	11	0.45	7	0.60	1	0.43	1	20.00	
Ownership of mobile phone for business	10239	90.25	6725	89.89	2253	91.62	1037	89.01	219	93.19	5	100.00	0.000
Purpose of internet usage													
Ordering or purchasing raw materials	771	6.80	549	7.34	92	3.74	113	9.70	17	7.23	0	0.00	
Financial management of the company	14	0.12	12	0.16	0	0.00	1	0.09	1	0.43	0	0.00	
Human resource management	6	0.05	6	0.08	0	0.00	0	0.00	0	0.00	0	0.00	
Access to capital	9	0.08	6	0.08	1	0.04	2	0.17	0	0.00	0	0.00	0.000
Internal company communication	681	6.00	498	6.66	95	3.86	79	6.78	9	3.83	0	0.00	
Customer management	441	3.89	325	4.34	53	2.16	52	4.46	11	4.68	0	0.00	
Marketing	1227	10.82	810	10.83	305	12.40	98	8.41	14	5.96	0	0.00	
Payments using electronic systems	21	0.19	19	0.25	1	0.04	0	0.00	1	0.43	0	0.00	
Delivery	35	0.31	24	0.32	8	0.33	3	0.26	0	0.00	0	0.00	

Table 5. Characteristics of Indonesian E-commerce: Characteristics of responsible person/business owner (n=11345)

Characteristics	Total		Cluster 1 (n=7481; 67.37%)		Cluster 2 (n=2459; 22.14%)		Cluster 3 (n=1165; 10.49%)		Cluster 4 (n=235; 2.12%)		Cluster 5 (n=5; 0.05%)		p-value
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	
Gender (Male)	5431	47.87	4016	53.68	570	23.18	703	60.34	139	59.15	3	60.00	0.000
Age													
<25 years old	679	5.99	345	4.61	278	11.31	49	4.21	7	2.98	0	0.00	
25-34 years old	3380	29.79	2074	27.72	989	40.22	254	21.80	59	25.11	4	80.00	
35-44 years old	3873	34.14	2593	34.66	764	31.07	433	37.17	82	34.89	1	20.00	0.000
45-54 years old	2301	20.28	1642	21.95	304	12.36	286	24.55	69	29.36	0	0.00	
>54 years old	1112	9.80	827	11.05	124	5.04	143	12.27	18	7.66	0	0.00	
Highest level of education completed													
High school/equivalent or below	7965	70.21	5326	71.19	1637	66.57	840	72.10	159	67.66	3	60.00	
Associate degree I/II/III	653	5.76	401	5.36	156	6.34	82	7.04	13	5.53	1	20.00	0.000
Bachelor's degree (Diploma IV/S1)	2586	22.79	1661	22.20	635	25.82	229	19.66	60	25.53	1	20.00	
Master's/Doctoral degree (S2/S3)	141	1.24	93	1.24	31	1.26	14	1.20	3	1.28	0	0.00	

Table 6. Characteristics of Indonesian E-commerce: Business performance (n=11345)

Characteristics	Total		Cluster 1 (n=7481; 67.37%)		Cluster 2 (n=2459; 22.14%)		Cluster 3 (n=1165; 10.49%)		Cluster 4 (n=235; 2.12%)		Cluster 5 (n=5; 0.05%)		p-value
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	
Average monthly revenue													
Offline sales		57		70.15		15.46		64.68		15.58		0.00	0.000
Marketplace/digital platforms		4		4.56		0.66		4.47		0.62		98.00	
Other than marketplace/digital platforms		40		25.29		83.89		30.85		83.80		2.00	
The Impact of the COVID-19 Pandemic on the sale of goods/services via the internet in 2023 compared to 2022													
- Business revenue													
Increased	2349	20.71	1479	19.77	543	22.08	266	22.83	60	25.53	1	20.00	
Remained the same	5682	50.08	3886	51.94	1163	47.30	537	46.09	95	40.43	1	20.00	0.906
Decreased	3314	29.21	2116	28.28	753	30.62	362	31.07	80	34.04	3	60.00	
- Transaction volume													
Increased	2285	20.14	1431	19.13	540	21.96	258	22.15	55	23.40	1	20.00	
Remained the same	5812	51.23	3976	53.15	1179	47.95	554	47.55	102	43.40	1	20.00	0.874
Decreased	3248	28.63	2074	27.72	740	30.09	353	30.30	78	33.19	3	60.00	
- Distribution of goods/services													
Increased	1994	17.58	1256	16.79	462	18.79	224	19.23	51	21.70	1	20.00	
Remained the same	6670	58.79	4527	60.51	1379	56.08	642	55.11	121	51.49	1	20.00	0.810
Decreased	2681	23.63	1698	22.70	618	25.13	299	25.67	63	26.81	3	60.00	

Table 3 presents the business profile and activities. The business profile includes details such as when the e-commerce business began commercially, the number of employees (both paid and unpaid), and the role of e-commerce. Business activities encompass export and import operations, sales channels, shipping methods, customer types, and payment methods. Thus, these elements provide a comprehensive overview of the business's operations and strategies.

Table 4 provides an overview of training and resources related to information technology in business. It details participation in training programs offered by both government and private entities. The training is categorized into three levels: basic, skilled, and expert. Additionally, the table presents data on mobile phone ownership and internet usage for business purposes. This comprehensive analysis highlights the importance of technology in enhancing business operations.

Table 5 outlines the characteristics of business owners or responsible persons, including gender, age, and level of education. The data indicate that the majority of business owners are male, and most are between the ages of 25 and 44. However, the level of education is predominantly high school or equivalent or below. These characteristics suggest that while the business ownership landscape is youthful and male-dominated, there may be opportunities to enhance educational attainment among business leaders.

Table 6 presents business performance data, including average monthly revenue and the impact of the COVID-19 pandemic on internet sales of goods and services in 2023 compared to 2022. The data show that average revenue is primarily generated through offline sales, with marketplaces contributing only a small portion. The impact of the COVID-19 pandemic on businesses varied significantly. These findings highlight the continued dominance of offline sales channels and the diverse effects of the pandemic on different businesses.

Overview of Indonesian E-comerce

E-commerce in Indonesia was predominantly small-scale, with 85.40% of businesses employing between one and four people. The majority of e-commerce businesses acted as sellers (73.87%), followed by resellers (22.56%). Sales channels mainly utilized instant messaging and social media, while only about 13% used marketplaces or digital platforms. Traditional

shipping methods were prevalent, with 55.13% relying on direct delivery to customers by buyers and 35.19% using in-store pickup or designated pickup points. Direct delivery to the buyer using delivery services was relatively low, at around 9.47%. Despite its small scale, 0.7% of e-commerce businesses engaged in online sales for export. The Internet was primarily used for marketing (10%), followed by ordering or purchasing raw materials (6.80%) and internal company communication (6%). Payments using electronic systems were minimal, at only about 0.19%.

Cluster 1: B2C seller with high offline revenue

In this largest cluster, the majority of businesses (45.01 percent) began their commercial operations before 2020, though this proportion was smaller compared to other clusters and the sample average. Furthermore, the majority of businesses (87.11 percent) employed between one and four employees, while only 1.61 percent had more than 20 employees. Notably, 47.95 percent of businesses in this cluster utilized between one and four unpaid workers. Over 80 percent of the businesses were sellers, making this cluster the largest concentration of sellers and the lowest concentration of resellers and dropshippers compared to others. This cluster also made extensive use of online marketplaces (15.99 percent) as a sales channel, surpassing all other clusters in this regard. Most customers in this cluster were end consumers (Business to Customer (B2C)), accounting for 78.60 percent. Additionally, cash payments (cash on delivery) were the most frequently used payment method (88.10 percent) in this cluster compared to others. Furthermore, members of this cluster primarily used the internet for marketing, followed by ordering or purchasing raw materials. Monthly revenue was predominantly generated through offline sales, accounting for approximately 70.15 percent of the total.

Cluster 2: Small-scale B2C sellers with direct sales and high offline revenue

Representing 22.14 percent of the sample, most businesses in this cluster commenced their commercial activities before 2020. However, this proportion was the second smallest compared to other clusters. Moreover, over 97.44 percent of businesses employed between one and four workers, making this cluster the largest concentration of small-scale enterprises. In terms of business roles, 60.23 percent were sellers and 33.79 percent functioned as resellers. The primary sales channels for these businesses were instant messaging and social media. Most customers (74.71 percent) in this cluster were end consumers (B2C). The predominant payment method was cash on delivery, followed by bank transfers. A majority of businesses (66.78 percent) delivered goods and services directly to buyers. Members primarily used the internet for marketing. Monthly revenue was mainly generated outside of marketplace/digital platforms, accounting for approximately 83.89 percent of the total.

Cluster 3: Micro e-commerce B2C and B2B sellers with traditional payment models

This cluster consisted of members where 49.69% of e-commerce businesses began commercial activities before 2020. The number of employees in this cluster was predominantly between one and four workers, accounting for 83.86% of the total. Additionally, this cluster had the largest proportion of unpaid workers, approximately 52.19%. Nearly all members (97.51%) used instant messaging platforms such as WhatsApp, Line, and Telegram as sales channels, followed by social media platforms like Facebook and Instagram. The role of e-commerce businesses was primarily that of sellers, making up 65.84%. A significant majority of the members (91.67%) served both end consumers (B2C) and agents/other businesses (B2B). Cash payments, particularly cash on delivery, were the most commonly used payment methods. These businesses delivered goods or services directly to the buyer or through in-store pickup or designated pickup points. Members used the internet for ordering or purchasing raw materials and for marketing, accounting for 9.7% and 8.41%, respectively. Monthly revenue was primarily generated from offline sales, which constituted 64.68% of the total.

Cluster 4: Traditional small B2B and B2C sellers with limited digital integration

This cluster represented the second smallest segment, making up 2.12% of the entire sample. A significant portion of the businesses (56.17%) initiated their operations before 2020, which was the second-highest percentage among the clusters and above the average for the sample. Moreover, the majority of these businesses (81.28%) had between one and four employees, while 13.62% had workforces ranging from 5 to 19 employees. Interestingly, 42.13% of the

businesses employed one to four unpaid workers. More than 60.85% of these businesses functioned as sellers, with resellers comprising 30.64%. Their main sales channels were instant messaging services (98.30%) and social media platforms (45.96%). Most customers in this cluster (66.81%) were a mix of end consumers and agents, representing a combination of Business to Consumer (B2C) and Business to Business (B2B) customers. Payment methods were primarily cash or cash on delivery (51.06%), with e-wallets contributing just 0.43%. The majority of businesses (70.21%) delivered goods and services directly to buyers, making this cluster the largest in this aspect. Internet usage for business purposes was relatively low compared to other clusters. The majority of monthly revenue, approximately 83.80%, was generated outside of marketplaces or digital platforms, which was similar to Cluster 2.

Cluster 5: Marketplace-driven micro e-commerce hybrid sellers

This cluster constituted the smallest segment, comprising just 0.05% of the total sample. A large majority of businesses (80%) began operations before 2020, the highest percentage among all clusters. All businesses in this group had between one and four employees, and 60% employed one to four unpaid workers. The roles within these e-commerce businesses were divided between sellers (40%) and resellers (60%). Their primary sales channels were instant messaging services and social media platforms, each utilized by 60% of businesses. Customers were either agents or a mix of end consumers and agents, with no businesses serving only end customers. All transactions were conducted via bank transfer. Most businesses (80%) used delivery services to transport goods to buyers. On average, 98% of their monthly revenue was generated through marketplaces or digital platforms.

Alignment to business models of Indonesian E-commerce

We examined the variety of business models in Indonesian e-commerce across the wholesale and retail trade sectors by analyzing clusters that differed in role and customer type, payment methods, internet usage purposes, and revenue sources. Cluster 1 had the highest concentration of sellers, primarily targeting end consumers, and relied heavily on cash payments, with offline sales accounting for the majority of monthly revenue. Cluster 2 was characterized by its large concentration of small-scale businesses, with the vast majority employing between one and four workers and focusing on direct sales to end consumers. Unlike Cluster 1, this group primarily used instant messaging and social media as sales channels and generated most of its revenue from offline sources, with a strong preference for cash on delivery payments. Cluster 3 employed a high proportion of unpaid workers while relying on instant messaging and social media for sales. Unlike the first two clusters, these businesses served both end consumers and agents, and their revenue was mainly derived from offline sales, with cash on delivery as the predominant payment method. Cluster 4 was notable for its minimal use of digital platforms for sales and marketing. Unlike other clusters, it showed a mix of customers, including agents, with most revenue generated outside of marketplaces, indicating a reliance on traditional business methods. Finally, Cluster 5, as the smallest cluster, differed from other clusters by relying almost entirely on marketplaces and digital platforms for revenue, using bank transfers for all transactions, and having no businesses serving only end consumers.

These findings aligned with previous research showing that e-commerce significantly impacted the performance of the electronic trade industry and small and medium-sized enterprises. E-commerce enhanced market access, revenue, and profitability for sectors such as microfood and small non-food industries (Jahanshahi et al. 2012; Alzahrani 2019; Silaban et al. 2024). This evolution, driven by the fourth industrial revolution, reshaped the retail sector and created new markets (Fakhrurrazi et al. 2022; Wijaya and Hidayati 2024), with factors like seller type and digital platform membership duration influencing sales (Unggara et al. 2021).

Policy Implications

The government should enhance digital infrastructure and support for businesses reliant on online platforms while providing resources to help small-scale sellers optimize social media and instant messaging. Targeted support could assist offline-focused businesses in adopting modern e-commerce practices.

CONCLUSIONS AND RECOMENDATIONS

Conclusions

In our examination of Indonesian e-commerce business models within the wholesale and retail trade sectors. We identified distinct clusters based on roles, customer types, payment methods, internet usage, and revenue sources. Cluster 1 exhibits the highest concentration of sellers focused on end consumers, relying predominantly on cash payments and offline sales for revenue. In contrast, Cluster 5 distinguishes itself by its almost exclusive dependence on digital platforms and marketplaces for revenue, utilizing bank transfers for transactions and serving a customer base that does not include end consumers exclusively. Thus, highlighting significant variability in e-commerce strategies across the clusters.

Recommendations

Future studies could analyze the determinants of e-commerce performance within different clusters.

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