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Clustering of MSME Development in Lhokseumawe City after Covid 19 Vaccination

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Absract: Clustering is developing the MSME economy that emphasizes cooperation among the various elements . MSMEs' geographical concentration is to link to their ability to synergize. Suppliers of goods, service providers, and business actors are all involved. After the Covid 19 vaccination, develop the economy by managing MSMEs and providing solutions. Clustering can be used to show the region's potential, MSMEs' profiles, regional products, regional opportunities, and qualified businesses that can be developed. Based on testing using the elbow method with SSE, the data clustering process for MSMEs in Lhokseumawe City is 4 with cluster income, namely sound, sufficient, and less, less than optimal (sum of square error). The number of clusters used is four, with the starting point chosen randomly. Cluster 0, which has 20 members; cluster 1, which has three items of data; cluster 2, which has one item of data; and cluster 3, which has six items of data, are the results of grouping into four groups.

Keywords: Cluster, UMKM, Economy, Lhokseumawe, Potential.

1. INTRODUCTION

The spirit of helping the community solve problems with a market approach can be applied to increase the economic productivity of social entrepreneurship. The owners of capital are at the heart of social entrepreneurship, but ideas emerge to solve problems, allowing anyone to contribute to MSMEs. Clustering is a method of developing the MSME economy that emphasizes cooperation among the various elements that make it up. As a cluster carriage, the core business unit is used. Geographical concentration of MSMEs that collaborate, including goods and service providers, as well as business actors (Supriyanto et al., 2017). Clustering relies on two key elements: interconnected changes and proximity to one another. Utilize local resources to create world-class, regionally distinct products

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(Supriyanto et al., 2017). The association of MSMEs can assist the Lhokseumawe City government in developing marketing strategies and maximizing the potential of MSMEs.

MSME businesses will be grouped into several clusters using clustering based on the similarity of MSME characteristics (Dhuhita, 2015) They are growing the economy by managing MSMEs and providing solutions following the Covid 19 vaccination. Determine information on the location of potential MSMEs development, as well as consumer demographics and potential. Clustering can reveal a region's potential, the profile of MSMEs, and regional products and prospects, as well as potential new businesses.

Based on the above problems, the clustering of MSMEs using the K-Means method can cluster the potential of social entrepreneurship in economic development. Clustering is done by identifying the location of MSMEs, asset management, and the type of business being developed. In clustering MSMEs, they can pay attention to the relationship between the potential of community economic resources, types of companies, capital and products developed so that the Lhokseumawe City government can see the potential of social entrepreneurship to improve the community's economy in tackling unemployment Clustering Cluster is a grouping of the same business sector in an area. The cluster concept emphasizes the cooperation between the elements involved, including the core business acting as the main carriage in the development of clustering. Clustering is a systematic approach to developing the potential of MSMEs, requiring a gradual and continuous approach. Consequences are carried out by means of commodities being managed consistently, at least having a comparative advantage. Having quality resources and adequate supporting facilities and infrastructure (Supriyanto et al, 2017).

The MSME clustering approach is interconnected, due to togetherness and complementarity. The proximity of producing a product in a cluster will initially trigger competition. Furthermore, it encourages specialization and quality improvement and creates better innovation. The development of MSME leading commodities is an effective strategy in developing the economy of Lhokseumawe City. The role of partners is needed, starting from large companies and stakeholders, such as the community and local government. Leading commodities can create a regional branding in marketing products, thereby increasing the community's economy. In empowering and increasing the potential for the economy, not all MSMEs are potential and there are still many MSMEs that face difficulties and obstacles to develop properly. So it is necessary to cluster MSMEs so that the potential among existing MSMEs can support each other, so that MSMEs can develop and people's incomes will increase. With the clustering of potential and identified MSME criteria and can be developed. So that the long term it can be developed to strengthen competitiveness and strengthen the regional economy.

The strategy of determining the location of the MSME business is important because mistakes and business placements are very influential in determining marketing strategies. Errors in the provision of goods and services greatly affect the information obtained by related parties, especially consumers. In accordance with Law Number 20 of 2008 concerning Micro, Small and Medium Enterprises (MSMEs), the definition of MSMEs (Rouza, E et al, 2021) is: 1. Micro Enterprises are productive businesses owned by individuals and/or individual business entities that meet the criteria for Micro Enterprises as regulated in the Law. 2.

Small Business is a productive economic business that stands alone, which is carried out by individuals or business entities that are not subsidiaries or branches of companies that

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are owned, controlled, or become part either directly or indirectly of medium or large businesses that meet Small Business criteria as referred to in the Act. 3. Medium Enterprises are productive economic businesses that stand alone, which are carried out by individuals or business entities that are not subsidiaries or branches of companies that are owned, controlled, or become part of either directly or indirectly with Small Businesses or large businesses with total assets. net or annual sales proceeds as regulated in this Law. 4. Criteria for MSMEs Based on wealth and sales proceeds, according to Law Number 20 of 2008 article 6, the criteria for Micro, Small, and Medium Enterprises are as follows: Table 1 Criteria for MSMEs Based on Assets and Turnover

Smes	**Chatracyrtistic**	
	Aset	**Omset**
Micro business Small business Medium Enterprise	Maks Rp 50 Juta	Maks Rp 300 Juta
Micro business Small business Medium Enterprise	> Rp 50 Juta – Rp 500 Juta	Rp 300 Juta – 2,5 Milyar
Micro business Small business Medium Enterprise	Rp 500 Juta – Rp 10 Milyar	> Rp 50 Milyar

K-Means Clustering

Clustering is a non-hierarchical grouping to group objects, and the distance of each object to the centre of the group is minimum (Aditya et al., 2017). The K-Mean algorithm is distance-based by dividing the data into several clusters. Work on numeric attributes, and group objects by attribute into divisors k. The object attribute format is a space vector line (Apriyanti et al., 2015**).**

$$V = \sum_{i=1}^{k} \sum_{j \in Si} |x_j - \mu_i|^2 \cdots\cdots\cdots\cdots\cdots\cdots (1)$$

Normalization of data is calculated with a relatively far away number, for example, the distance between 20,000,000 and 500,000,000. In this study, researchers used the normalization formula with the equation:

$$usaha = \frac{nilai\ aset/omset}{100.000.000} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

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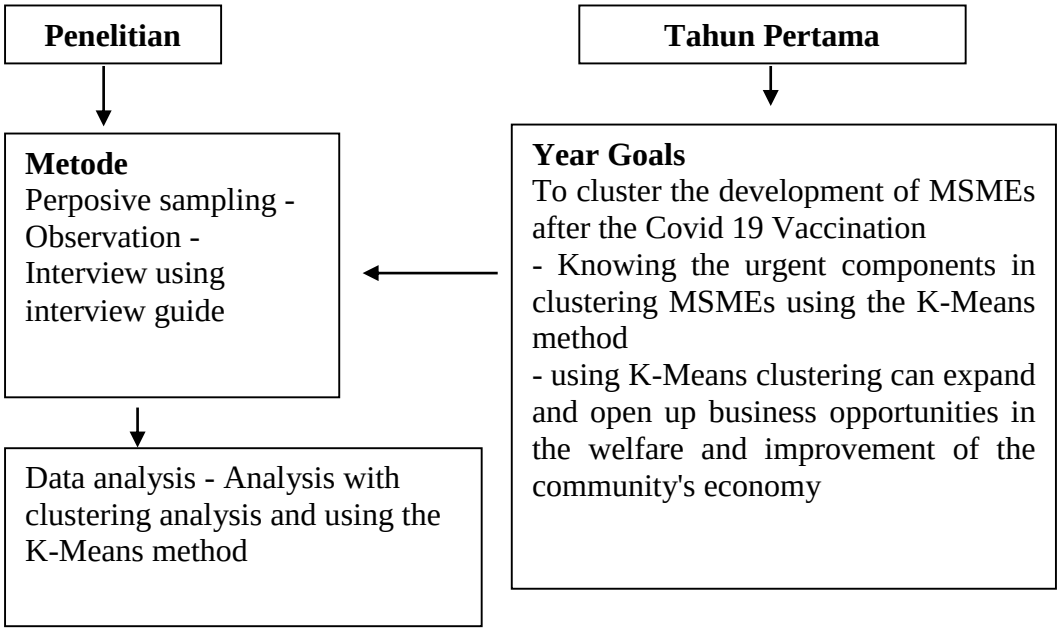

Research sites

The research was conducted in Lhokseumawe City.

Observed parameters

The data used are secondary data, namely the number of SMEs in each sub-district I Lhokseumawe City. Quantitative data were obtained from the Department of Cooperatives and Micro, Small and Medium Enterprises of Lhokseumawe City. The dataset used is Lhokseumawe City UMKM data in 2021 by having attributes, namely assets and business turnover as the main attributes and name, address and type of business as supporting features.

Models used

Research design

The research design is a comprehensive plan of research covering the halls carried out by researchers starting from making hypotheses and their operational implications to final analysis. The data is then concluded and given suggestions. The research design is declared suitable, if the research problem and research plan are used to obtain empirical evidence regarding the relationship in the situation.

Data collection technique

1. Problem Identification
2. The problem identified is grouping MSMEs in each District of Lhokseumawe City
3. Literature Study
4. Literature study is carried out to complete basic knowledge and theories derived from books, journals, and internet media.
5. Data Collection

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6. The data used is data on the number of MSMEs in each Lhokseumawe City District obtained from the Cooperatives and Micro, Small and Medium Enterprises Office of Lhokseumawe City and questionnaire data.
7. Preprocessing
8. Grouping the types of MSME businesses, industrial centres, products and assets

Data analysis

They analyzed this study with an analytical design in determining the strategy for developing MSMEs in Lhokseumawe City. Generate data clusters of SMEs in Lhokseumawe City using the K-Means method. There are 4 clusters formed, namely in the sound, good, less and significantly fewer categories, based on the business performance of MSMEs. The analysis is carried out to provide a choice of business development recommendations in the form of education, training, and capital that will be given to MSME actors by the Lhokseumawe Cooperative and MSME Service. Furthermore, verification and validation are carried out on the analysis model results to determine the MSME development strategy that has been designed.

2. RESULTS AND DISCUSSION

Data Cleaning

Data Cleaning is the process of removing incomplete and inconsistent data. On as many as 165 rows of data, a cleaning process was carried out on data that had empty and conflicting values by eliminating or deleting data to not interfere with the operation of K-means clustering.

Tabel 2 Dataset. UMKM after Cleaning Process

								Form 2
NO	description		**adress**		**Type of business**	**Labbor (ORG)**	**ASSET (Rp.000)**	**OMZET (Rp.000)**
			village	**District**				
1	*2*		*7*	*8*	*9*	*10*	*11*	*12*
I	**Trade of Sector**							
1	1	Ricky Persada Dinamika	Keude Aceh	Banda Sakti	Supplier	3	196.000	2.352.000
2	2	Mitra Persada	Keude Aceh	Banda Sakti	Supplier & Ekspor-Impor	3	200.000	2.400.000
3	3	New Season	Hagu Teungoh	Banda Sakti	Supplier	3	200.000	2.400.000
4	4	Nanta Castle	Tumpok Teungoh	Banda Sakti	Supplier	3	200.000	2.400.000
5	5	Kanaday	Uteun Bayi	Banda	Supplier	4	200.000	2.400.000

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		a Company		Sakti	& Ekspor-Impor			
6	6	IT Computer	Kampung Jawa Baru	Banda Sakti	Pengecer & Supplier	4	300.000	3.600.000
7	7	Dara Citra Beutari	Simpang Empat	Banda Sakti	Supplier	3	200.000	2.400.000
8	8	Laplace	Mon Geudong	Banda Sakti	Supplier	3	200.000	2.400.000
9	9	Tawakal Utama	Keude aceh	Banda Sakti	Supplier	3	500.000	6.000.000
10	10	Harun Jaya	Pusong Baru	Banda Sakti	Supplier	3	250.000	3.000.000
11	11	Sonar Begroting	Simpang Empat	Banda Sakti	Supplier	3	180.000	2.160.000
12	12	IT Computer	Kampung Jawa Lama	Banda Sakti	Pengecer	2	300.000	3.600.000
13	13	Citra Lamrantoagung	Tumpok Teungoh	Banda Sakti	Supplier	3	200.000	2.400.000
14	14	Karya Mandiri	Simpang Empat	Banda Sakti	Supplier	3	75.800	909.600
15	15	Sinar Vision	Kota Lhokseumawe	Banda Sakti	Supplier	3	450.000	5.400.000
16	16	Wisma Kuta Karang	Lancang Garam	Banda Sakti	Supplier	3	200.000	2.400.000
17	17	Trio Putra Karya	Pusong Lama	Banda Sakti	Supplier	3	200.000	2.400.000
18	18	Kiprah Multi Sarana	Kampung Jawa Lama	Banda Sakti	Supplier	3	106.000	1.272.000
19	19	Kharisma Bumi Nusantara	Tumpok Teungoh	Banda Sakti	Supplier	5	5.000.000	60.000.000
20	20	Nusa Bakti Bangsa	Tumpok Teungoh	Banda Sakti	Supplier	3	2.000.000	24.000.000

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21	21	Kana Family	Hagu Selatan	Banda Sakti	Supplier	3	1.600.040	19.200.480
22	22	Rianty Sejahtera Utama	Simpang Empat	Banda Sakti	Supplier	3	2.000.000	24.000.000
23	23	Toko Eka Jaya	Kota Lhokseumawe	Banda Sakti	Pengecer	2	110.000	1.320.000
24	24	Cell Line	Kota Lhokseumawe	Banda Sakti	Pengecer	2	100.000	1.200.000
25	25	SARI	Lancang Garam	Banda Sakti	Pengecer	2	70.000	840.000
26	26	UNIX	Kota Lhokseumawe	Banda Sakti	Pengecer	2	200.000	2.400.000
27	27	Mie Baka	Kampung Jawa Baru	Banda Sakti	Pengecer	2	51.000	612.000
28	28	Tb Taylor	Kota Lhokseumawe	Banda Sakti	Pengecer	2	100.000	1.200.000
29	29	UD. Pratama	Pusong Baru	Banda Sakti	Pengecer	2	100.000	1.200.000
30	30	Toko Pc Com	Kota Lhokseumawe	Banda Sakti	Pengecer	2	250.000	3.000.000
31	31	Asia Mon 688	Kota Lhokseumawe	Banda Sakti	Pengecer	2	110.000	1.320.000
32	32	UD. Soflya	Tumpok Teungoh	Banda Sakti	Pengecer	2	100.000	1.200.000
33	33	Toko Eiger	Simpang Empat	Banda Sakti	Pengecer	2	55.000	660.000
34	34	Arih Ersada	Hagu Barat Laut	Banda Sakti	Pengecer	2	51.000	612.000
35	35	Loris	Kota Lhokseumawe	Banda Sakti	Pengecer	2	55.000	660.000
36	36	Oik Tiara	Kota Lhokseumawe	Banda Sakti	Pengecer	2	75.000	900.000
37	37	Wong Solo	Lancang Garam	Banda Sakti	Pengecer	2	51.000	612.000

Source: Data Collection

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Cluster Testing with Elbow Method

Determining the number of clusters of 10 is appropriate or cannot be done by testing the elbow method. This test compares the results of the number of collections ten times. Tests were carried out to compare the number of clusters by calculating the Sum of Square Error (SSE). This test uses 165 data. Formula *Sum of Square Error:*

$$SSE = \sum_{K=1}^{K} \sum_{x_i} \|x_i - c_k\|^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Tabel 3 Result SSE

No	Hasil SSE	result
Cluster 0	5775193897533443.0	Good
Cluster 1	1674908072552084.5	Enought
Cluster 2	560155264540484.4	Less
Cluster 3	135961732467920.9	Fewer
Cluster 4	53502165393030.17	
Cluster 5	36105645219030.17	
Cluster 6	21893072016259.273	
Custer 7	11981164147131.69	
Custer 8	7593087208172.497	

Source: Data Processing

The test found that the elbow method with SSE, which has the most significant difference in decreasing SSE (Sum of Square Error) and forming elbows, is a cluster of 4. Thus it can be concluded from the test results above that the clustering process of MSME data in Lhokseumawe City is 4 with cluster income is suitable, sufficient, and less, less than optimal based on testing on the elbow method with SSE (sum of square error).

SSE (*sum of square error).*

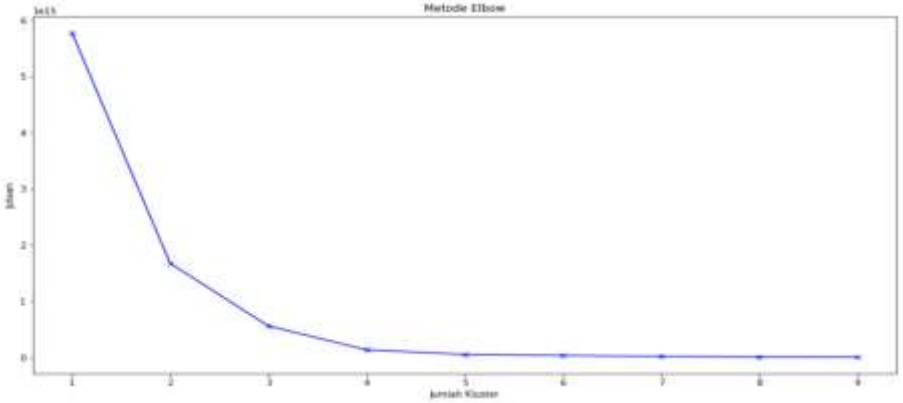

Figure 1 Grafict sum of square error

Plastering Process

The clustering process with the K-Means algorithm is carried out to obtain clusters from the Lhokseumawe City MSME dataset as many as four groups, namely suitable, sufficient and less, significantly less based on business performance in the form of assets annual income

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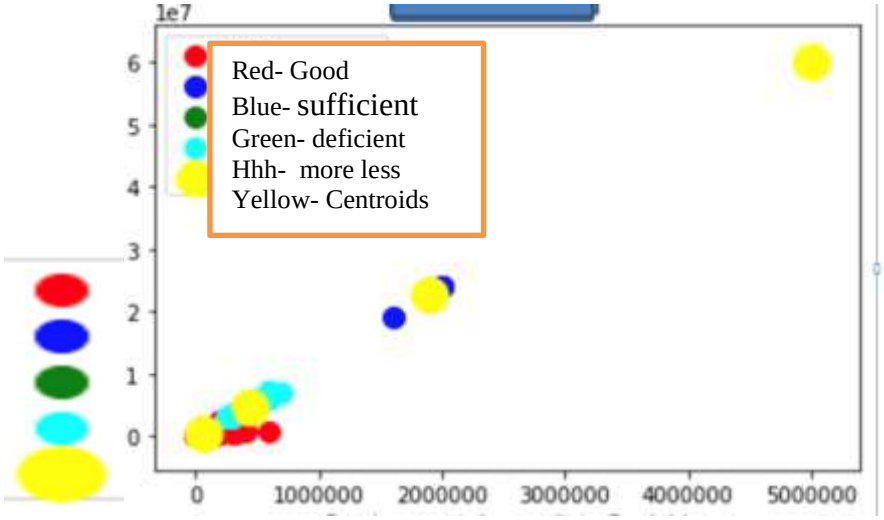

Figure 2. MSME Clustering Results with K-Means

Table 4 Clustering Results

No	Cluster	Business Name	Asset	Omset
1	0	Ricky Persada Dinamika	196.000	2,352,000
2	0	Mitra Persada	200.000	2,400,000
3	0	New Season	200.000	2,400,000
4	0	Nanta Castle	200.000	2,400,000
5	0	Kanadaya Company	200.000	2,400,000
6	3	IT Computer	300.000	3,600,000
7	0	Dara Citra Beutari	200.000	2,400,000
8	0	Laplace	200.000	2,400,000
9	3	Tawakal Utama	500.000	6,000,000
10	3	Harun Jaya	250.000	3,000,000
11	0	Sonar Begroting	180.000	2,160,000
12	3	IT Computer	300.000	3,600,000
13	0	Citra Lamranto agung	200.000	2,400,000
14	0	Karya Mandiri	75.800	909,6
15	3	Sinar Vision	450.000	5,400,000
16	0	Wisma Kuta Karang	200.000	2,400,000
17	0	Trio Putra Karya	200.000	2,400,000
18	0	Kiprah Multi Sarana	106.000	1,272,000
19	2	Kharisma Bumi Nusantara	5,000,000	60,000,000
20	1	Nusa Bakti Bangsa	2,000,000	24,000,000
21	1	Kana Family	1,600,040	19,200,480
22	1	Rianty Sejahtera Utama	2,000,000	24,000,000
23	0	Toko Eka Jaya	110	1,320,000
24	0	Cell Line	100	1,200,000

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25	0	SARI	70	840
26	0	UNIX	200	2,400,000
27	0	Mie Baka	51	612
28	0	Tb Taylor	100	1,200,000
29	0	UD. Pratama	100	1,200,000
30	3	Toko Pc Com	250	3,000,000

Source: Data Processing

3. CONCLUSION

K-Means classification of MSMEs in Lhokseumawe City has been successfully designed and implemented in a computer program. A new K-Means can identify and classify MSMEs in Lhokseumawe City.Based on the asset value and the annual turnover. And this is doable based on their skill. The following findings K-Means using a computer program necessitates using a standard device for all UMKM at Lhokseumawe. Even though there are still many obstacles, both at the level of human resources and the expert abilities of entrepreneurs, the situation is far from ideal. The importance of government and technology-based scientist intervention is expected to benefit various groups in the Lhokseumawe city area. It is hoped that they will master the technology, allowing their business to expand into new markets.

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