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ANALYSIS AND DESIGN OF MSME PERFORMANCE MEASUREMENT SYSTEMS BASED ON GEOGRAPHIC INFORMATION SYSTEMS

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Abstract

MSMEs are a pillar of the nation's economy (Ishak Effendi, 2005). With the contribution of MSMEs provided by GDP growing by 5% throughout 2019 and the contribution of MSMEs in 2020 reaching approximately 65% (BPS, 2019; 2020). The government needs to be supported by research on the performance of national MSMEs which are considered to require an integrated financial data processing information system with a spatial data information system throughout the Republic of Indonesia. Based on research conducted by the LLP-KUKM research section in 2021, 6 out of 10 people agreed and 3 out of 10 other people strongly agreed if the administrative process for MSMEs was carried out offline it would take time. Meanwhile, in the next survey, 5 out of 10 people agreed and 2 out of 10 people strongly agreed if they got an information system to measure the performance of MSMEs. This research was conducted with the aim of designing and building a platform using the DEA (Data Envelopment Analysis) method, measuring the performance and effectiveness of national MSMEs in each province and category throughout Indonesia and continued by measuring the performance of the geographic information system website using the webqual 4.0 method. The geographic information system website for measuring MSME performance in the MSME/user domain was built with the msme-research.com link, while the manager/administrator domain was built with the msme-research/dashboard link. It was concluded that the geographic information system was built and successfully sampled MSME data by spreading links/links in the MSME domain and obtained a sample of 292 MSME data, where the most provinces were obtained from West Java province, namely 95 MSMEs, the highest MSME performance by province was West Nusa Tenggara with the average performance value is 89.02%, the best performance by category is furniture with a performance value of 79.91%. Meanwhile, the measurement of the performance of the information system website which is filled out by 292 correspondents/MSMEs is with a value of 3.704 (which is in the interval between 3 and 4) which means good. Based on the results of usability testing, 75% of respondents stated that they quite understand the names of the fields used, and carry out the process of adding, deleting and editing data. It is recommended that the next development is to use only 2 financial data parameters with the consideration that if there are 14 parameters that must be submitted, MSMEs will feel bored with the filling process.

Keyword: **MSME's Geographical Information Systems, MSME, DEA (Data Envelopment Analysis), MSME finance, MSME Performance**

INTRODUCTION

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MSMEs are a pillar of the nation's economy, where based on a literature study conducted on an article written by Effendi Ishak in 2005 entitled "The Role of Information for the Progress of MSMEs". Sovereignty of the People", then in general MSMEs in the nation's economy has a role: (1) as the main actor in economic activity, (2) provider of largest employment opportunities, (3) important players in economic development local and community empowerment, (4) creating new markets and sources of innovation, and (5) its contribution to the balance of payments.

Contributions from MSMEs given by the GDP of the MSME sector is expected to grow by 5 percent throughout 2019 and the contribution of MSMEs this year has reached approx 65 percent (BPS, 2019;2020).

In its implementation, the government needs to be supported by performance research of national MSMEs that are considered to need a financial data processing information system integrated with the spatial data information system throughout the Republic of Indonesia.

Research conducted by the business research section of the business division LLP-KUKM Smesco Indonesia in March 2020 conducted interviews with 10 administrators working at LLP-KUKM shows a poll on the first question which is "Is administration"

SMEs that you do offline take time?" that 6 out of 10 people agree and 3 out of 10 people strongly agree with the process the administration of MSMEs if done offline will take time. Thing It also encourages the digitization process for MSMEs in the registration process. While in question number 7, namely "Do you feel the need for a system?" information to conclude the performance value of each MSME?" where 5 out of 10 people agree and 2 out of 10 people strongly agree if get an information system to measure the performance of SMEs.

Meanwhile, technological developments also continue to experience significant progress affect the use of information technology by the public, including SMEs in everyday life. According to Suyatno (2000) that to continue In order to increase the competitiveness of MSMEs, it is necessary to increase the ability technology and innovative creative power. With the various developments of information system applications mentioned, above, then this research has a purpose and focuses on analysis and the design of geographic information systems in measuring the performance of SMEs integrated national spatial data system where in the previous era there were still using manual methods that are prone to errors in data submission, data changes, to search for data when needed.

The formulation of the problem of this research is where after conducting research by conducting interviews with administrator staff LLP-KUKM, it can cause problems such as time consuming and human error. Another issue raised including the unavailability of an information system that accommodates a variety of data based on geographic information systems that can assist in measurement performance and effectiveness of a category of MSMEs throughout Indonesia in the region certain categories. So the questions raised in the research this is "How and what kind of analysis and design of information systems based on geographic information systems in measuring MSME performance with certain categories and certain regions?".

LITERATURE REVIEW

MSME stands for Micro, Small, and Medium Enterprises. MSMEs are regulated in Law Number 20 of 2008 concerning MSMEs (Micro small and Medium Enterprises). Where is the quote from the Law This is the definition of Micro, Small and Medium Enterprises Medium. In Law No. 20 of 2008 concerning MSMEs as well explained about the criteria for the MSMEs. Where are each criteria MSMEs have a level of assets and turnover that has been determined by law the law. (Ministry of Cooperatives and SMEs 2008).

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User experience is how the user experience in interact using products or services (Creative Business Jakarta. 2013). Geographic information system is an information system that is used to enter, store, recall, process, analyze, and generate geo-referenced data or geospatial data, to support decisions in land use planning and management (Wahyudi, 2008).

The design of a database consists of three main phases, namely

conceptual database design (Conceptual Database Design), design logical database design, and physical database design (physical database design) (Connolly, 2010).

The web design is developed by Rapid Application Development The software development system developed by James Martin, where the stages include (Kendall, K.E & Kendall, J.E, 2003):

1. The phase of determining the conditions At this stage, the purpose and requirements of the information are determined. Namely by analyzing the needs of the problem for the manufacture of web-based ordering application, determine the purpose of the application, then determine the conditions needed to make the application.

2. Design phase

At this stage, the planning of the processes that will occur is carried out. in system and interface design. In process design DFD tools are used to facilitate researchers in designing application to be made.

3. Construction phase

At this stage, coding is carried out on the designs has been defined. Researchers use PHP for language programming and Joomla for templates. Apache web server as platform to run the application, then use MySQL as a database.

4. Implementation phase

At this stage, the system is tested. By doing testing all features and sub-programs on this geographic information system against all malfunctions.
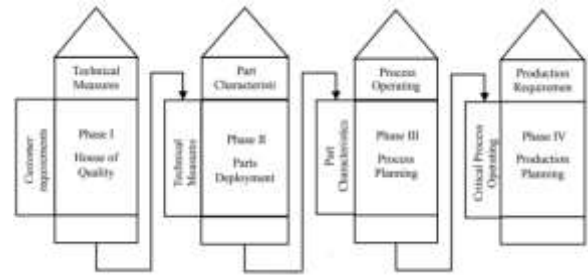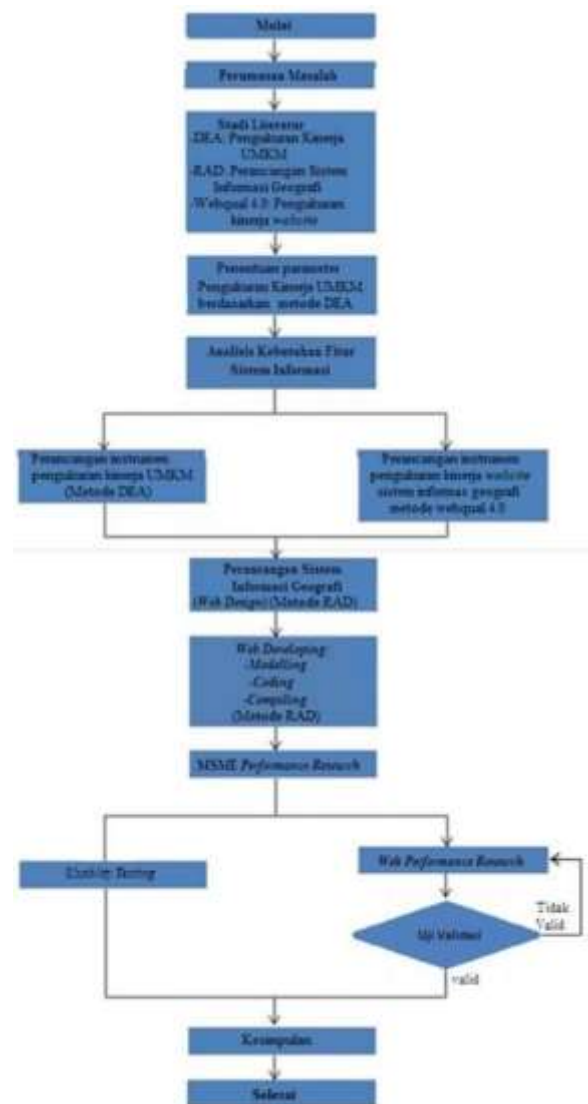

Figure 1 Four-phase QFD

RESEARCH METHODOLOGY

Figure 2 Research flow diagram

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The method used to measure the performance of MSMEs prioritizes efficiency on expenditure and effectiveness on income with completeness the parameters of the MSME performance measurement instruments include:

 a. Planned operating capital
 b. Actual operating capital
 c. Planned total capital
 d. Actual total capital
 e. Planned salary of worker
 f. Actual salary of workers
 g. Planned transportation costs
 h. Actual cost of transportation
 i. Planned monthly turnover
 j. Actual monthly turnover
 k. Planned monthly profit
 l. Actual monthly profit
 m. Planned total assets
 n. Actual total assets

The next step is to design a geographic information system website, using the RAD (Rapid Application Development) method in accordance with the need for MSME performance measurement features where the parameters are adjusted with Data Envelopment Analysis (DEA) parameters. Furthermore, the website performance measurement is carried out. Measurement of geographic information system website performance as an instrument of MSME performance using the webqual 4.0 method. Parameters that used to measure the performance of geographic information system measurement websites MSME performance using the webqual 4.0 method, among others:

a. The usability quality component, where there are 6 questions:

1. Does the DEA site (msme-research.com) have a good appearance interesting?
2. Is the DEA site (msme-research.com) easy to learn?
3. Is the DEA site (msme-research.com) easy to obtain information needed?
4. Does the DEA site (msme-research.com) have an information layout on the monitor screen clearly?
5. Does the DEA site (msme-research.com) provide all the function and capabilities as needed?
6. Does the DEA site (msme-research.com) provide experience which is good for users?

b. The information quality component, where there are 5 questions:

1. Does the DEA website (msme-research.com) provide information that is accurate?
2. Does the DEA website (msme-research.com) provide information that is can be trusted?
3. Does the DEA website (msme-research.com) provide information that is on time when needed?
4. Does the DEA website (msme-research.com) provide information that is easy to understand?
5. Does the DEA site (msme-research.com) provide information with a complete level of detail?

c. The interaction quality component, where there are 5 questions:

1. Does the DEA site (msme-research.com) safeguard personal information?
2. Does the DEA site (msme-research.com) have a good reputation?
3. Does the DEA site (msme-research.com) provide security for users when delivering information?
4. Does the DEA site (msme-research.com) provide confidence for the user that the information is true?
5. Does the DEA site (msme-research.com) provide convenience in terms of analytical calculations?

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Figure 3 Rapid Application Development Model

The stages of developing a performance measurement geographic information system MSMEs in the process model above are as follows:

1. Business modeling (business model) business model for the product being developed is designed in terms of information flow and information distribution between various business channels. A complete business analysis is performed for find important information for business, how that information can be obtained, how and when the information is processed and what it is factors that drive the successful flow of information.

2. Data modeling (data modeling) information collected in the phase
   business modeling is reviewed and analyzed to form a set of data objects vital to business. The attributes of all data sets are identified and defined.

3. Process modeling (process modeling) set of data objects defined in the modeling phase the data is converted to define the flow of information business required to achieve a specific business objective according to the model business. Process model for any changes or enhancements to the object set data is defined in this phase. Process

description for adding, delete, retrieve or modify the given data object.

4. Application generation (application generalization) The actual system is built and coding is done using an automation tool for transform process and data models into true prototypes.

5. Testing and overall testing time turnover is reduced in the model RAD because the prototype is tested independently during each iteration. However, data flows and interfaces between all components must be tested periodically thorough with complete testing coverage. Because most programming components have been tested so that it reduces the risk of problems main.
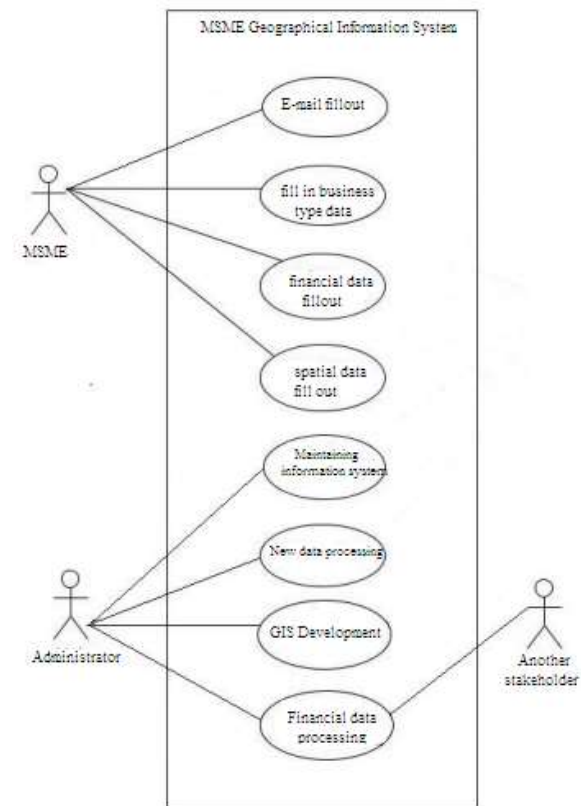
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Figure 4 MSME performance use case diagram

RESULT AND DISCUSSION

The geographic information system for measuring MSME performance is designed to

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meet the needs of the national MSME research information system and provide information on the specifications of MSMEs in certain fields in certain areas. As raw data in business decisions and finding the right partner for Businesses another. This information system web programming is built by doing the following:

coding PHP 7.3.4 programming language, SQL 5.7 database configuration, and using the Appwork bootstrap template. So that the information system can be accessed by link **http://msme-research.com** on browsing software such as internet explorer, opera, mozilla firefox and google chrome (on system operating windows computers and smartphones with android operating system).

This information system is designed as a web-based information system (web based) so that it is easier to use by many users, where web-based use does not require installation on the operating system. So that the use of this information system only requires access hardware and internet network in connectivity in the system hardware operations.

Where there are several parameters that must be filled in which are marked with a red pointer in the header for filling in the data, these parameters include:

a. E-mail, it is a parameter that becomes the main MSME entity where each MSME has one specific email so that other MSME owners cannot enter the same email. So that data communication between one MSME owner and another is also not wrong.

b. MSME category
It is the main parameter that becomes the raw data in conducting MSME research with certain business fields, so that the conclusions that can be drawn in a MSME research can be distinguished from one MSME sector to another MSME sector.

c. Business details.
A parameter that functions to describe the currently running MSME field, so that researchers get an explanation of MSMEs that submit data to this geographic information system.

Figure 5 Screenshot of the user's hardware while accessing a sub-program input data for MSME owners using a smartphone

Figure 6 Screenshot of the user's hardware while accessing
capital and expenditure data input sub-program using a smartphone

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Some of the parameters involved in collecting data on turnover, profit and addition of assets include:

a. Planned monthly turnover

This is the expected business turnover of the MSMEs involved in this data collection, where the total turnover of the business for one month is predicted and after that it can be input into this geographic information system.

b. Actual monthly turnover

This is the business turnover that actually occurs in these SMEs, where all the turnover that has been calculated for one month is totaled and the results of the sum can be entered in this geographic information system.

c. Planned monthly profit

This is the business profit that is expected from the MSME, after conducting a business calculation simulation for a month.

d. Real monthly profit

It is a business profit that actually occurs in these MSMEs, where MSMEs can carry out business calculations so that the profit value generated can be input through this geographic information system.

e. Planned overall assets

It is a parameter involved in measuring planned MSME assets rather than the results of their business activities, so that the results of these business activities have an impact on the progress of the MSMEs themselves. Business assets obtained can be in the form of land, buildings, work tools, production equipment, transportation equipment and others.

f. Actual total assets

It is an MSME data collection parameter to measure MSME assets that occur which will be compared with the assets planned by the MSME. Business assets obtained can be in the form of land, buildings, work tools, production equipment, transportation equipment and others.
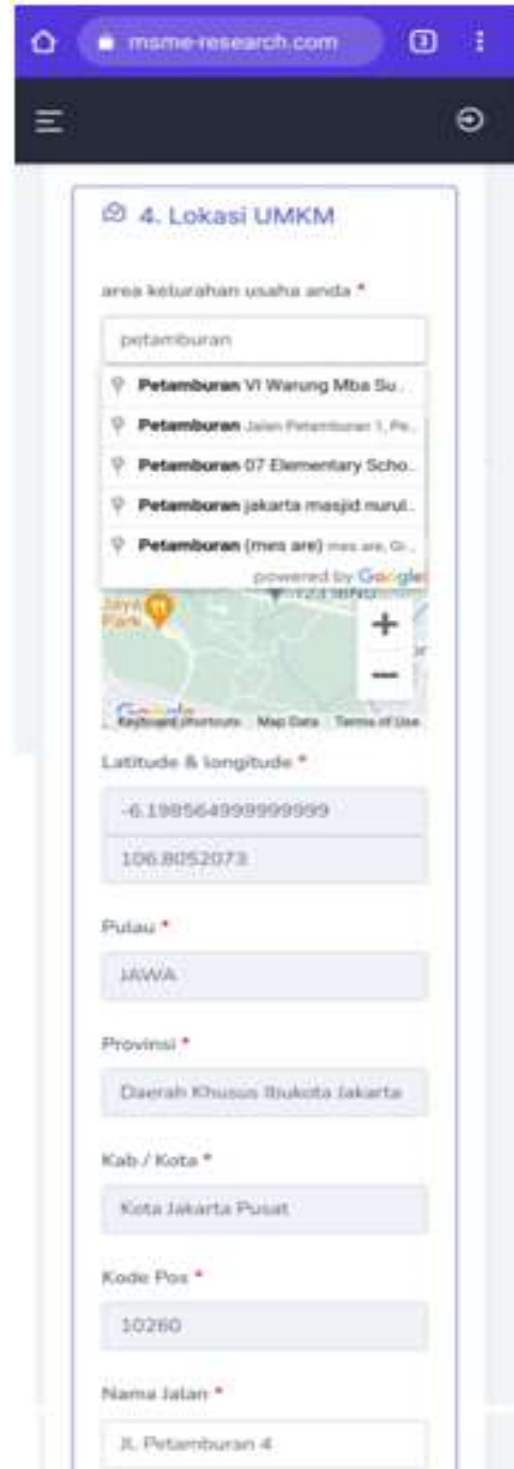
Figure 7 Screenshot of the user's hardware when accessing the MSME location address data input sub-program using a smart phone

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Berdasarkan dari data Usaha yang anda input menghasilkan informasi sebagai Berikut :

USAHA ANDA BERADA DI

DIPULAU	:	JAWA
PROVINSI	:	DKI JAKARTA
KABUPATEN / KOTA	:	KOTA ADM. JAKARTA PUSAT
NILAI KINERJA UMKM		100%

Mengalami PENINGKATAN efisiensi kinerja dengan PENINGKATAN sebesar di seluruh INDONESIA

Tidak Mengalami PENINGKATAN / PENURUNAN efisiensi kinerja, nilai efisiensi di wilayah PROVINSI

Tidak Mengalami PENINGKATAN / PENURUNAN efisiensi kinerja, nilai efisiensi di wilayah KABUPATEN / KOTA

Figure 8 Screenshot of the user's hardware from the calculation and analysis of MSME performance according to the category and province by using a smartphone

The next step is to take data about the quality of the MSME performance measurement web based on Geographic Information Systems with the parameters that have been discussed in chapter 3.

GIS

Maps Indonesia Submisi UMKM

Maps Indonesia Nilai Efisiensi UMKM

Figure 9 GIS map display of performance, efficiency and submission measurement results MSMEs throughout Indonesia are the domain of users/MSMEs on smart phone devices

The next activity is to measure the amount of data that comes in through the submission of geographic information systems to measure the performance of SMEs.

Figure 10 Graph of the dynamics of the number of data submissions in geographic information systems based on June 6, 2022 to July 31, 2022

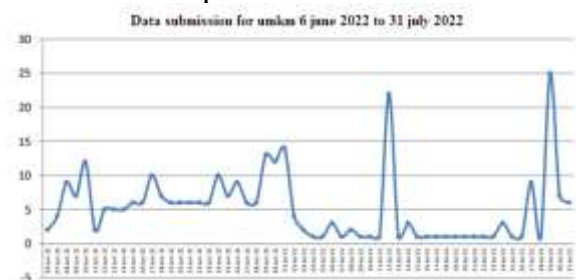Next is the division of categories filled by UMKM based on the category in LLP-KUKM Smesco Indonesia. Based on 292 data successfully submitted by SMEs there are 8 categories and in accordance with 34 provinces of domicile of MSMEs operating.

Table 1 Number of MSMEs by category

Category	Number of Submission
Clothes and batik	98
Handycraft	6
Food and drink	137
Jewelry and accessories	5
Furniture	25
Bag and shoe	21
Weaving and songket	0
Spa	0
Total	292

Table 3 Number of MSMEs by province

No	Category	Number of submission
1	West Java	95
2	Central Java	37
3	East Java	32
4	Banten	31
5	Special Religion of the capital Jakarta	30
6	Lampung	9
7	North Sumatera	9
8	Aceh	8
9	Bali	7
10	South Sulawesi	5
11	South Kalimantan	3
12	Riau Islands	3
13	South Sumatera	3
14	Bengkulu	2
15	Special Region of Yogyakarta	2
16	West Kalimantan	2
17	Bangka Belitung Island	2
18	West Nusa Tenggara	2
19	Riau	2
20	North Sulawesi	2
21	West Sumatera	2
22	Gorontalo	1
23	East Kalimantan	1
24	North Kalimantan	1
25	Central Sulawesi	1
26	Maluku	0
27	Papua	0
28	West Sulawesi	0
29	Southeast Sulawesi	0
30	North Maluku	0
31	East Nusa Tenggara	0
32	Jambi	0
33	West Papua	0
34	Central Kalimantan	0
	Total	292

Table 4 Value of performance by category

Category	Number of submission	Value of performance
Furniture	25	79,9055432
Handycraft	6	79,0203658
Foods and drinks	137	76,8640744
Cloths and batik	98	75,2735855
Bags and Shoes	21	71,1460555
Jewelry and Accessories	5	70,1957628
Weaving and songket	0	0
Spa	0	0

The calculation of MSME performance in the province has a specific purpose for determine the performance of MSMEs in certain provinces throughout Indonesia. As an instrument for measuring the performance of MSMEs in every region in Indonesia, as one of the instruments used by the authorizing party SMEs policy

Table 5 MSME performance measurement based on province

No	Provinsi	Number of submission	Value of Performanc	Grade
1	West Nusa Tenggara	2	89,02001693	B
2	East Kalimantan	1	88,4481066	B
3	Central Sulawesi	1	83,50983652	B
4	West Kalimantan	2	82,74341967	B
5	South Kalimantan	3	82,48196341	B
6	West Sumatera	2	82,4150403	B
7	Bangka Belitung Islands	2	81,5162497	B
8	Aceh	8	80,48413852	B
9	North Sulawesi	2	79,30651701	C
10	Bengkulu	2	78,95592091	C
11	Special Religion of Capital Jakarta	30	78,75819136	C
12	East Java	32	78,5005534	C
13	Bali	7	78,37370251	C
14	North Kalimantan	1	78,24914186	C
15	North Sumatera	9	77,37967611	C
16	West Java	95	75,49333574	C
17	Central Java	37	74,64218013	C
18	Banten	31	73,9529302	C
19	Riau Islands	3	73,23765172	C
20	Special Religion of Yogyakarta	2	72,81194255	C
21	Lampung	9	71,72175935	C
22	South Sulawesi	5	69,97027033	D
23	Riau	2	68,44470261	D
24	South Sumatera	3	63,58277057	D
25	Gorontalo	1	60,26932484	D
26	Jambi	0	0	0
27	Central Kalimantan	0	0	0
28	Maluku	0	0	0
29	North Maluku	0	0	0
30	East Nusa Tenggara	0	0	0
31	Papua	0	0	0
32	West Papua	0	0	0
33	West Sulawesi	0	0	0
34	South East Sulawesi	0	0	0

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Measurement of the geographic information system website aims to measuring the quality of geographic information systems to the public. which method used in measuring the quality of the website is to use webqual 4.0 method. Assessment using the webqual 4.0 method is a session input data that must be filled in by the user after submitting MSME data, address and MSME finance.

Table 6 An example of an assessment MSME performance measurement webqual 4.0 method

No	MSME	Date	Use Quality						Information Quality					Service Information					Total	Average Score
			1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5		
1	MSME A	06/06/2022	2	3	5	2	3	5	3	3	5	3	2	5	5	5	4	5	60	3.75
2	MSME B	06/06/2022	3	3	5	3	4	4	4	3	4	5	5	4	3	4	5	3	62	3.875
3	MSME C	07/06/2022	2	3	3	3	3	3	3	4	4	2	4	3	2	4	4	3	50	3.125
4	MSME D	07/06/2022	2	5	3	2	3	3	3	5	4	4	4	2	5	3	3	4	55	3.4375
5	MSME E	07/06/2022	3	3	3	3	5	2	5	4	2	3	5	3	5	3	4	2	55	3.4375
6	MSME F	07/06/2022	5	3	4	5	3	5	5	5	5	3	5	4	4	5	3	5	69	4.3125
7	MSME G	08/06/2022	3	2	5	4	5	5	3	3	3	3	5	5	2	3	3	5	57	3.5625
8	MSME H	08/06/2022	5	5	3	3	5	3	5	4	5	3	5	2	4	5	3	5	65	4.0625
9	MSME I	08/06/2022	3	4	4	3	3	5	5	2	5	3	3	3	3	2	4	2	54	3.375
10	MSME J	08/06/2022	5	4	3	4	5	3	5	3	2	4	5	3	4	3	5	2	58	3.625
11	MSME K	08/06/2022	3	2	3	4	5	4	3	3	3	4	4	2	3	2	2	3	50	3.125
12	MSME L	08/06/2022	4	3	2	3	2	5	3	3	3	3	3	2	2	5	5	5	53	3.3125
13	MSME M	08/06/2022	3	2	2	2	3	2	5	5	4	5	3	3	4	3	3	3	52	3.25
14	MSME N	08/06/2022	3	2	3	2	3	5	4	2	5	5	3	3	5	2	2	3	52	3.25
15	MSME O	08/06/2022	4	3	5	5	3	4	4	2	3	2	5	5	4	2	5	5	59	3.6875
16	MSME P	09/06/2022	3	2	4	2	3	4	3	5	3	3	2	2	4	4	5	3	52	3.25
17	MSME Q	09/06/2022	4	3	5	5	3	5	3	3	3	3	3	5	4	3	3	3	54	3.375
18	MSME R	09/06/2022	5	3	4	4	4	3	2	3	2	3	5	4	4	3	5	5	58	3.625
19	MSME S	09/06/2022	4	5	3	5	5	4	4	4	3	5	4	3	5	3	3	4	64	4
20	MSME T	09/06/2022	4	5	4	3	5	4	3	5	4	4	4	5	5	4	3	5	69	4.3125

Table 7 Average score of 16 questions webqual 4.0 all average scores are above 3.5

Question	Average Score
Question 1	3,726027397
Question 2	3,691780822
Question 3	3,705479452
Question 4	3,660958904
Question 5	3,746575342
Question 6	3,787671233
Question 7	3,784246575
Question 8	3,756849315
Question 9	3,698630137
Question 10	3,636986301
Question 11	3,72260274
Question 12	3,578767123
Question 13	3,77739726
Question 14	3,657534247
Question 15	3,650684932
Question 16	3,684931507

CONCLUSION

Based on the results of the analysis, design and implementation of geographic information systems website-based MSME performance measurement with the link msme-research.com. Then, got the conclusions drawn are as follows:

1. The geographic information system is built with the user feature of presenting an online form fill in MSME spatial data and 14 MSME financial data parameters at 34 provinces throughout Indonesia along with an online system website performance measurement form geographic information itself. Where is the development of geographic information systems the MSME performance measurement is uploaded and outlined on the website with link http://msme-research.com and the geographic information system is built by having a manager/administrator feature domain built with features management of financial data and spatial data along with the export of data uploaded to server by access www.msmeresearch.com/dashboard.

2. The amount of data that has been successfully submitted by the user/UMKM with the time range from June 6, 2022 to July 31, 2022 is 292 data. By the number of MSMEs the highest based on the food and beverage category, as well as the number of MSME submissions by province is West Java with the number of SMEs 95 data. Amount MSME submission based on 137 data categories. The highest performance by province is the province of West Nusa Tenggara with an average performance value of 89.02%, and the highest performance by category is furniture with an average performance value 79.90%.

3. Measurement of performance and quality of geographic information system performance measurement MSMEs with a value of 1 to 5 which is filled by a total of

292 participants is with a value the average is 3.704 (in the range between 3 and 4) which means good. Based on analysis and calculations using the usability testing method then 75% respondents stated that they quite understand the field names used, and perform the process of adding, deleting and editing data on the website geographic information system for measuring MSME performance.

Suggestion

It contains suggestions given on geographic information systems website-based MSME performance measurement (msme-research.com) by explaining managerial implications on the process of system development. This geographic information is in the interest of MSME research.

Managerial Implications

MSME managers, especially the central government and local governments, can be selecting and measuring MSMEs with certain performance in certain areas so that research activities on MSME actors can run more efficiently. Managerial implications in this study include:

1. Analysis and design of geographic information systems in the next development where the application of the DEA (Data Envelopment Analysis) method concerns analysis MSME performance, it is hoped that it is no longer necessary to involve capital variables operations, workers' salaries, transportation costs, turnover, profit and assets. Due to review of the journal Permata sari, M. F., & Setyawan, A. A. (2019) regarding measurement MSME performance with the DEA method only involves one variable, namely capital whole. System development is intended to shorten sampling data on SMEs, intended to eliminate boredom when MSMEs fill in financial data if only one variable.

2. Analysis and design of the next geographic information system is expected designing and developing dashboards for each UMKM where MSMEs can participate in further research and monitor activities the MSME managing government and the development of MSME performance as a whole.

3. Further analysis is needed on this geographic information system from the side administrator there is a malfunction of writing the characters "@" and "." in the email column, which can result in an error when synchronizing data because email is the main entity in the database though.

4. Consideration of all elements of society and government where the importance of integration all MSME management information systems to run on a single platform, so that the MSME information system platform only goes through one website intended so that there is no dilemma for SMEs in choosing the current information system participate.

5. Continuous development process in accordance with the demands of needs MSME data research.

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