Design and Analysis of Database Clustering System of Micro, Small and Medium Enterprises (MSME) in Bantul Regency

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Abstract Information system support is really important for the existence of MSME in economic competition today. The implementation of information system for MSME is expected to develop the competitiveness through the added value for products and services. One of the examples of the utilization of information system implemented for MSME is the geographical information system which informs the location and the potential MSME. In order to present the information of the potential of MSME optimally in the geographical information system, analysis and design should be made as complete as possible. In this research, the geographic-based information system is developed for the MSME businessmen in Bantul. The system design is started by building a database. The purpose of this research is to design a database that is designed to avoid duplication of data and simplify the storage process and when displaying data. The process of geographical information system database of MSME is detailed into tables. The database process of the MSMES geographic Information system is detailed into tables. By being detailed into some of these tables the duplication can be avoided. Table designed between MSMES table that stores SME master data such as latitude and longitude position, MSME detail table, video, gallery, Medkom and tables that store the location of the area, such as sub-district table, Village table, Dusun table and Clustered tables from MSMES. The implementation of database design is developed into geographical information system using PHP language and utilizing google map to display the geographical position of MSME businessmen. The next application development can be developed based on Android.

1. Introduction
The current era of disruption must be faced by an adaptation process, especially for business people. In the disruption era, the use of information technology becomes an important factor to attract the customers. The disruption era facilitates the customers and procedures. Facilitating the customers and procedures during the transaction becomes a challenge that must be faced by business people.

MSME is one of economic agents should be improved and be ready to face the disruption era. The development of Information and Communication Technology (ICT) gives new opportunity which overcomes some of the MSME problems. Although they are not the main problems, the opportunity is really huge and based on the field condition, meaning that the MSME has not fully adopted the Information and Communication Technology compared to other big companies. The ICT can be utilized for doing promotion, introducing the location/centres of MSME in a location, and obtaining other advantages such as dialogue, discussion, and online consultation with the customers, so the customers can be involved proactively and interactively in designing, developing, marketing, and marketing product.
According to the Indonesian Constitution No.20 of 2008 concerning Micro, Small, and Medium Enterprise (MSME), it is said that the criteria of Micro Enterprise is having net worth of at most Rp50,000,000, excluding land and building of business premises; or having annual sales of at most Rp300,000,000.00 (three hundred million rupiahs). The criteria of small-scale enterprise is having net worth of more than Rp50,000,000 - Rp500,000,000 (five hundred million rupiahs) excluding land and building for business; or having annual sales of more than Rp300,000,000 - Rp2,500,000,000. Meanwhile, the criteria of medium enterprise is having net worth of more than Rp500,000,000 - Rp10,000,000,000, excluding land and buildings of business premises; or having annual sales of more than Rp2,500,000,000 - Rp50,000,000,000 (fifty billion rupiahs).

Specifically in the Special Region of Yogyakarta, Small Micro Industry production growth in the second quarter of 2016 compared to the first quarter of 2016 experienced positive growth, which amounted up to 4.03%. The growth in the second quarter of 2016 was in line with the growth rate of the production of small micro industries at the national level, which experienced positive growth of 5.74%.

Some related studies on the use of ICT for MSME businessmen have been conducted by researchers with different hypotheses in each research. The problems of MSME in utilizing ICT are not only problems in Indonesia, but also other countries. The research conducted by Olise to Peel SMES in Nigeria [2]. In Nigeria, MSME businessmen have not fully used ICT; MSME businessmen are recommended to use ICT and must arrange policies to facilitate the implementation of ICT. This facility is really essential due to its high potential in developing performance of MSME growth; MSME owners should try to develop their productivity and competitiveness; to develop the productivity and competitiveness, SME owners should invest in ICT as well as its components since it has been proven that ICT influences organization performance significantly.

Based on the research conducted by Valdez-Juárez [3], it is apparent that ICT implementation in SMES carries a competitive advantage. It is shown that the implementation of ICT in MSME brings competitive advantage. The analysis result of the knowledge management helps MSME businessmen to understand the condition where MSME might be more effective in developing innovation and performance. One of the important findings of this research focuses on the positive correlation between strategy and policy of innovation management in MSME through the knowledge (ICT). The research conducted is limited to the use of ICT for MSME, and has not examined the specific application used to track the location of MSME.

A paper written by Rulhudana, [4] focuses on the pattern of empowerment or the use of ICT hardware and software in the business management process of MSME which forms two main patterns, namely the technology is able to give advantages (usefulness) and easy to use. It is seen in MSME Buana Property which utilizes/empowers ICT during the process of business management using ICT. This research more focuses on the use of ICT to empower an MSME and has not discussed the use of ICT for promotion and distribution process.

The optimal use of ICT does not only support the administration but also marketing process. Therefore, the users except those involved in MSME are able to know the potential managed by MSME. The research conducted by Susanto [5] examines the system development method used for marketing, selling, and payment process.

Setiawan in this research [6], it is discussed about business process in batik industry. In batik processing, the process covers not only the process of making batik, but also several other processes that can be carried out by implementing technology innovation, such as the research and model design, administrative process, inventory control process, marketing process, communication process, and integration with other external parties. Although the processes have not implemented technology maximally, especially Information and Communication Technology (ICT), the Laweyan Community has started to use ICT in its business processes even though its penetration is still very low; out of 60 (sixty) businessmen becoming the members of the Laweyan community, only 10% have implemented ICT in their business activities.
2. Research Methodology
The development of information system is started by designing database. The purpose of designing database is to obtain information containing the users’ needs specifically and its implementation. Database is a set of data which is interconnected one another, and certain software is used to manipulate it. Database is one of the important components in information system since it contains data which provides information for the users.

The Description of diagram of research flow on figure 1

![Diagram of Research Flow](image)

Figure 1. Diagram of Research Flow

Generally, diagram of research flow is:

2.1 Need Identification
- Conducting a survey, especially on what information will be presented. The information must be adjusted to the wishes of the user (MSME).
- Identifying MSME in Bantul
- Clustering MSME
- Mapping the position of latitude and longitude of the location of MSME

2.2 System Analysis
- Doing primary data inventory through interview and questionnaires. Interview and questionnaires is conducted with MSME staff, especially in Bantul.

2.3 System Design
- System design, proposing logical problem solving.
- Design detail, conducting system design of problem solving in detail.

2.4 Database Design
- Designing database structure used to store the data of MSME
- Evaluating database design to avoid data duplication
2.5 Information System Coding
Program coding is the translation step of system design made in the form of commands understood by computer. Programing language of PHP, HTML, CSS, and Jquery is used to create software in We category. Database uses MySQL.

2.6 Program Testing
Program testing is the testing step of system which has been successfully translated in listing program. In this step, all processes of input and output are tested, so the possible error and bug can be immediately known and the reparation on program coding can be performed. Trial is carried out locally on computer.

2.7 Implementation
The implementation of program is a step in which the developer team implements software, that has been created and tested, and provides training to the users. When conducting training, it is important to make sure that the community can use without any difficulties.

3. Result and Discussion
3.1. Clustering ICT-based MSME
Clustering ICT-based MSME which is developed is the process of classifying MSME based on some classifications, such as clustering based on location, types of business of MSME businessmen, types of commodity, and Standard Classification of Indonesian Business Field. Types of MSME are included in the classification of micro, small, and medium enterprise. Detail of clustering process is as follow:

a. Clustering based on area is differentiated by MSME area. The area will be detailed from district, sub-district, village, and RT/RW. Clustering based on area is expected to ease the process of searching of MSME businessmen in an area.

b. Clustering based on the types of business is classified based on the capital or expense of MSME, such as micro, small, and medium enterprise. The clustering process aims to ease the data collection of the expenses of MSME in certain area or all areas in Bantul.

c. Clustering based on the types of commodity of MSME, such as food business like meatball, soto, chicken noodles, clothing business, convection business, or others.

d. Clustering based on Standard Classification of Indonesian Business Field [7].

3.2. Identification of Users’ Need
Database design process is started by identifying the users’ need and purpose of the application which is developed. To make the process of designing database is in accordance with the need, and to keep the database design away from data duplication, all needed data are classified. According to the purposes of the application which is developed, such as clustering MSME based on either location or types of MSME and illustration of database system should represent the whole illustration of the system. Database design is classified into the main data and supporting data. The main data is a master file of which data growth is static, such as data related to the location in urban to rural areas. Supporting data is data from MSME, and the data is dynamic and grows. MSME data becomes one of the data used in clustering process.

3.3. Database Implementation
Database implementation process is carried out through normalization process. The purpose of normalization process is to eliminate and to reduce data redundancy and to make sure data dependency, as well as data stored in the right table. During normalization process, all tables designed is analyzed whether the table contains deviations, especially in the process of adding data, removing data, and editing data.

Normalization process obtains table that has been avoided from:

3.3.1 INSERT Anomaly: a situation in which it is not possible to include several types of data directly to the table before putting the main file. One of the examples of analysis process is adding data of MSME businessmen on the table of SME should be conducted first. If the data of MSME
businessmen has already existed in the MSME tables, the process of adding data related to MSME can be done on the supporting tables. The process of adding data directly to the tables, such as produk_ukm table and galeri-foto table cannot be carried out if the data of MSME businessmen have not included on SME table.

3.3.2 DELETE Anomaly: Deletion of unexpected data is only done on certain tables, while the same data in other tables is not deleted, meaning that the data that should not be deleted may unintentionally be deleted or data that should have been deleted is not deleted. The analysis process carried out includes the deletion of MSME data which cannot be immediately deleted in MSME tables, deletion can be done if UMKM data deleted in the produk_ukm table and galeri-foto table has been deleted first.

3.3.3 UPDATE Anomaly: this is a situation where changed values cause database inconsistencies; data that is changed is not as ordered or desired. The analysis process carried out includes changes in data which can only be done on general fields. Changes to the field that becomes the primary key cannot be made; data changes are made to the table according to the desired data changes.

The results of the database design and after implementing analysis using mysql there are some table-making processes, namely:

- Making Regency table:

```sql
CREATE TABLE `alamat_kabupaten` (  `kabupaten_id` int(11) NOT NULL AUTO_INCREMENT,  `kabupaten_nama` varchar(100) DEFAULT '',  `kabupaten_latitude` varchar(200) DEFAULT NULL,  `kabupaten_longitude` varchar(200) DEFAULT NULL,  `date_created` datetime DEFAULT current_timestamp() ON UPDATE current_timestamp(),  `date_updated` datetime DEFAULT NULL,  `user_created` int(11) DEFAULT NULL,  `user_updated` int(11) DEFAULT NULL,  PRIMARY KEY (`kabupaten_id`) ) ENGINE=MyISAM AUTO_INCREMENT=10 DEFAULT CHARSET=latin1 ROW_FORMAT=DYNAMIC;
```

- Making UMKM table

```sql
CREATE TABLE `alamat_ukm` (  `alamat_ukm_id` int(11) NOT NULL AUTO_INCREMENT,  `ukm_id` int(11) NOT NULL,  `kabupaten_id` int(11) NOT NULL,  `kecamatan_id` int(11) NOT NULL,  `kelurahan_id` int(11) NOT NULL,  `dusun_id` int(11) NOT NULL,  `rw_id` int(11) DEFAULT NULL,  `rt_id` int(11) DEFAULT NULL,  `alamat_detail` varchar(200) NOT NULL,  `alamat_jenis` varchar(10) DEFAULT 'cabang',  `alamat_latitude` varchar(200) DEFAULT NULL,  `alamat_longitude` varchar(200) DEFAULT NULL,  `date_created` datetime DEFAULT current_timestamp() ON UPDATE current_timestamp(),  `date_updated` datetime DEFAULT NULL,  `user_created` int(11) DEFAULT NULL,  `user_updated` int(11) DEFAULT NULL,  PRIMARY KEY (`alamat_ukm_id`) USING BTREE ) ENGINE=MyISAM AUTO_INCREMENT=15 DEFAULT CHARSET=latin1;
```

3.4. Relations between Tables

Relations between tables become the main key in the implementation of database. In programming, the needed information during the process of displaying data is the result of query of interrelated tables. Figure 4 is the result of relation between tables in the database. The relation will connect all existing tables. The main relation is done by relating alamat_kabupaten table, alamat_kecamatan table,
alat kelurahan table, RW table, and RT table. The relation aims to display the location of MSME. Meanwhile, other relations connect UKM table to other supporting tables for MSME, such as produk ukm table and galeri-foto table.

![Diagram of MSME database tables relationship](image)

**Figure 2.** Relationship between MSME database tables

Database design consisting of some small tables aims to avoid duplication during the process of storing data. Although the data is stored in the tables, the process of creating information does not become a problem. By using query, the process of displaying information can be done easily. Some of the results of query are as follow:

- **Displaying information of the location of MSME**

  ```sql
  SELECT `alamat_ukm_id`, `ukm_nama_usaha`, `kabupaten_nama`, `kecamatan_nama`, `kelurahan_nama`, 
  `dusun_nama`, `rw_nama`, `rt_nama`, `alamat_detail`, `alamat_jenis`, `alamat_latitude`,  
  `alamat_longitude` 
  FROM `alamat_ukm` 
  JOIN `ukm` ON `ukm`.ukm_id = `alamat_ukm`.ukm_id  
  JOIN `alamat_kabupaten` ON `alamat_kabupaten`.kabupaten_id = `alamat_ukm`.kabupaten_id  
  JOIN `alamat_kecamatan` ON `alamat_kecamatan`.kecamatan_id = `alamat_ukm`.kecamatan_id  
  JOIN `alamat_kelurahan` ON `alamat_kelurahan`.kelurahan_id = `alamat_ukm`.kelurahan_id  
  JOIN `alamat_dusun` ON `alamat_dusun`.dusun_id = `alamat_ukm`.dusun_id  
  LEFT JOIN `alamat_rw` ON `alamat_rw`.rw_id = `alamat_ukm`.rw_id  
  LEFT JOIN `alamat_rt` ON `alamat_rt`.rt_id = `alamat_ukm`.rt_id
  ```

- **Displaying potential of MSME**

  ```sql
  SELECT `ukm`.ukm_id, `ukm`.ukm_nama_usaha, `ukm`.ukm_foto, `ukm`.ukm_deskripsi,  
  `alamat_ukm`.alamat_detail, `alamat_ukm`.alamat_latitude, `alamat_ukm`.alamat_longitude,  
  `jenis_industri_nama`, `t_user_nama`, `t_user_foto`
  ```
FROM `ukm`
LEFT JOIN `t_user` ON `t_user`.'t_user_id' = `ukm`.'t_user_id`
LEFT JOIN `komoditi` ON `komoditi`.'komoditi_id' = `ukm`.'ukm_komoditi_id`
LEFT JOIN `jenis_industri` ON `jenis_industri`.'jenis_industri_id' = `komoditi`.'jenis_industri_id'
LEFT JOIN `klasifikasi` ON `klasifikasi`.'klasifikasi_id' = `ukm`.'klasifikasi_id'
LEFT JOIN `kblui` ON `kblui`.'kblui_id' = `ukm`.'ukm_kblui'
LEFT JOIN `alamat_ukm` ON `alamat_ukm`.'alamat_ukm_id' = `ukm`.'ukm_id'
WHERE
`ukm`.'ukm_id' = `ukm_id`

3.5. Analysis of database constraints
Another important analysis in database management is data integrity or constraints in database. Database constraints are basically the limitation of values which are allowed to be included in a field in a table. By implementing the limitation in a table, only data that matches these limitations can be put in the table. The main function of constraints in a table is to ensure the consistency and integrity of data included in a table. The result of the analysis is:

mysql> ALTER TABLE alamat_ukm ADD FOREIGN KEY (kabupaten_id) REFERENCES alamat_kabupaten (kabupaten_id) ON UPDATE CASCADE ON DELETE CASCADE;

These restrictions aim to maintain data consistency when deleting data. With this limitation, if deletion is carried out on district data, all data in the address table will be deleted, especially the same data.

Compliment:

mysql> SELECT kabupaten_id, kabupaten_nama from alamat_kabupaten ORDER BY kabupaten_id DESC LIMIT 2;

| kabupaten_id | kabupaten_nama |
|--------------|----------------|
| 13           | klaten         |
| 8            | Kota Yogyakarta|

2 rows in set (0.69 sec)

mysql> select alamat_ukm_id, kabupaten_id, kecamatan_id from alamat_ukm order by alamat_ukm_id desc limit 2;

| alamat_ukm_id | kabupaten_id | kecamatan_id |
|---------------|--------------|--------------|
| 20            | 13           | NULL         |
| 14            | 8            | 22           |

2 rows in set (0.18 sec)

mysql> DELETE FROM alamat_kabupaten WHERE kabupaten_id = '13';
Query OK, 1 row affected (1.55 sec)

mysql> SELECT kabupaten_id, kabupaten_nama from alamat_kabupaten ORDER BY kabupaten_id DESC LIMIT 2;

| kabupaten_id | kabupaten_nama |
|--------------|----------------|
| 8            | Kota Yogyakarta|
| 7            | Gunung Kidul   |

2 rows in set (0.19 sec)

mysql> select alamat_ukm_id, kabupaten_id, kecamatan_id from alamat_ukm order by alamat_ukm_id desc limit 2;

| alamat_ukm_id | kabupaten_id | kecamatan_id |
|---------------|--------------|--------------|
| 14            | 8            | 22           |
| 12            | 6            | 18           |

2 rows in set (0.19 sec)
4. CONCLUSION
The results of database design need to be done to examine the tables that have been designed whether they have been avoided from the problems during the process of adding, deleting, and editing data. Limitations in a database must be defined in database design. With this restriction, it is certainly influential in making information system. In this study, the database design has been analyzed, so all boundaries have been defined in the database implementation. Database implementation using MYSQL and all restrictions like setting data deletion conditions can only be done if all data in the relation table has been deleted. The process of deleting data from one of the MSMEs in alamat_ukm, table, then the MSME data in the galeri_ukm table and foto_ukm table must be deleted first. After the data in the galeri_ukm table and foto_ukm table is deleted, the deletion process of the desired UMKM data can only be deleted in the parent table (alamat_ukm table).

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