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Community information systems for agriculture with analytical features

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ABSTRACT: Indonesian farmers and agriculture face various obstacles in every stage of production from finding good seeds, inefficient production, and well into post-production which are marketing and selling. Among the common obstacles that farmers have in the last stage is the lack of access to market information, the price in particular, and the lack of financial power to bring and sell their produce to the nearest market which ultimately leads many farmers unable to resist when the middlemen, with their financial strength, offering to buy most or all of their agricultural produce even with price lower than the market price. This paper proposes a community information system with analytical features which offers farmers a platform to promote and offer their produce to end consumers or wholesalers directly with reasonable and competitive price. Equipped with OLAP view, the system enables users to compare the price of commodities in the markets both from official data released by the government agency and those posted by farmers or wholesalers. The system also opens up the way for transport companies or any individuals who offer goods transport service to share their service and prices which will benefit both sellers/producers and consumers. With this system farmers and other stakeholders in agriculture get comprehensive information which help them make action for their best interests.

Keywords: Community Information Systems, OLAP, Farmers, Agriculture

1. INTRODUCTION

Indonesian farmers face various obstacles in every stage of production from finding good seeds, inefficient production, and well into post-production which are marketing and selling. Among the common obstacles that farmers have in the last stage is the lack of access to market information [1], the price in particular, and the lack of financial power to bring and sell their produce to the nearest market which ultimately leads many farmers unable to resist when the middlemen, with their financial strength, offering to buy most or all of their agricultural produce even with price lower than the market price.

In the meantime, nowadays, social media has become an integral part of life of everyone's life disregard of where they live, whether they are in urban area or in the rural areas, and what they do, whether they work as managers, farmers or those who become housewives [2].

There has been many attempts to use ICT to solve issues in the agriculture [3], [4] and social problem especially poverty [5] but none has tried to propose a special purpose system for agriculture which gives users capabilities to analyze data.

This paper proposes a community information system [6], [7], [8], [9] with analytical features [10] which offers farmers a social media platform to post and offer their produce to end consumers or wholesalers directly with reasonable and competitive price. Equipped with OLAP view, the system enables users to compare the price of commodities in the markets both from official data released by the government agency and those posted by farmers or wholesalers. The word cloud on the other

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hand gives the users the ability to interactively see what terms are frequently used by all users in their posting or comments. The system also opens up the way for companies or any individuals who provide goods transport service to share their services and respected prices which will benefit both sellers/producers and consumers.

This paper is organized as follows: in Section 1 (Introduction) we introduce the background of the research; in Section 2 (Method) we explain the methodology which we use in this research; in Section 3 (Result and Discussion) we present the result and discuss the advantages and the potential for future improvements; finally, in Section 4 we conclude our research.

2. METHOD

The system developed in this research has several features that use data mining [14] and OLAP technology,

2.1 Feature of Comment Analysis

2.1.1 Model development

The processes to be carried out in the development of the model is to collect data related to agriculture, preprocess the data followed by TF-IDF weighting, and then finally visualize the weighted results. Flowchart of the development process of this model can be seen in Figure 1.

Fig.1 Stages of Development of Comments Analysis Model

In this research the preprocessing stage is done in the RStudio tools with the package library text mining support (tm) installed in it. Some required preprocessing stages are available in the functions contained in this package library, while other preprocessing stages must be assembled by themselves. The processes contained in this preprocessing step are case folding, cleansing, stop-word removal, and whitespace striping.

If the level of accuracy obtained is considered good enough, then the model can be used well to classify new data records that have never been trained or tested before. In other words the built model is ready to be implemented into the system.

2.2 Visualize comment analysis results

The first process that will be passed is to collect data from official websites related to agriculture, then preprocess of all data that has been collected. The following step is calculating the weighting of TF-IDF (term frequency-inverse document frequency). Then the last process is to visualize the result of the weighting.

The result of the process of weighting the term frequency (TF) will be visualized into the form of word cloud, which will be packaged into a part of a web-based application with the aim that the results of the analysis can be visualized by attracting and facilitate users in understanding the output generated by the system has been built. Stages of visualization will be compiled with scripts PHP, HTML, CSS, and JavaScript.

2.3 Features of external data acquisition

Data acquisition system can be defined as a system that functions to retrieve, collect and prepare data, to process it to produce the desired data. Selected types and methods generally aim to simplify every step taken in the whole process. So before creating a system that can acquire a data required a process to build and find a good acquisition model.

The next process that will be done in the development model is the collection of data related to agriculture in this case the data will be retrieved from official government agency www.siskaperbapo.com. After preprocessing, the data is stored in the database and visualized on the

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web. Here's a web display design that already contains data acquisition features.

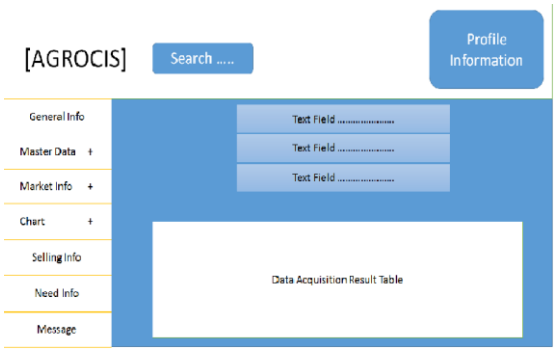

Fig.2 Interface Design of External Data Acquisition Features

2.4 OLAP View Features

This feature displays agriculture data collected in multidimensional view using features provided by OLAP engine by Mondrian.

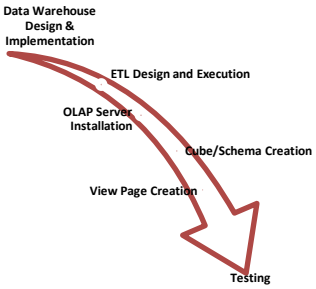

Fig.3 Interface Design of External Data Acquisition Features

The analysis module to be built should provide data analysis capabilities easily and flexibly, viewing data from multiple perspectives and can be easily operated by users who are primarily knowledge workers and decision makers. For the purposes of such a transactional or transactional system Point of Sales (POS) database is designed to serve transactions in the most effective manner known as Online Transaction Processing (OLTP). For the purpose of a system that can analyze data easily and flexibly then the database is designed with different concept that is Data Warehouse which implements Multidimensional Modeling concept to be able to serve query optimally known as Online Analytical Processing (OLAP).

2.4.1 Data Warehouse Design and Implementation

The first step is to design the data warehouse and implement it. The multidimensional model used in data warehouse design is Star Schema. While the data source used is data related to consumer prices and producer prices obtained from http://siskaperbapo.com. In the design of the star schema taken as measures in the fact table are consumer price today (price), consumer price yesterday (price_yesterday), and price difference (price_diff).

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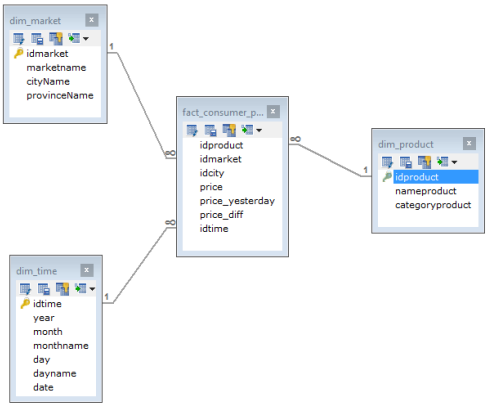

Fig 4. Star Schema – Consumer Price

While the 3 dimension tables used are market dimensions showing the name and location (city and province) of the market, the product dimension that describes the product name and category, as well as the time dimension that shows the time in the hierarchy form of the year, month, date and complete date. Month names and day names are also used to enrich the analysis that allows easier analysis of data by month names and day names.

2.4.2 ETL Design and Execution

Raw data collected from Siskaperbapo needs to be included in the designed data warehouse. This process is commonly known as ETL (Extract, Transform, and Load).

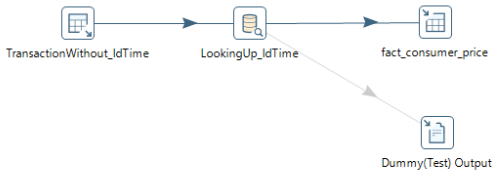

Fig 5. ETL Transformation in Pentaho Data Integration

3. RESULT AND DISCUSSION

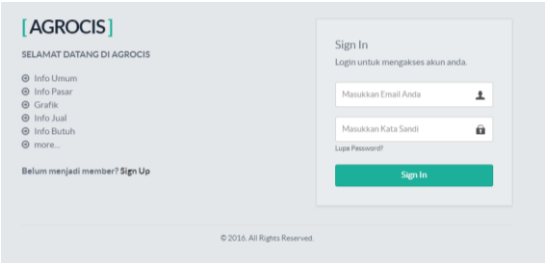

Fig 6. Sign In Page

After the first page (Fig. 6), the user will go to the main page that has a choice of various menus on the left column. Explanation of the main features of the application as follows:

3.1 Feature of Comment Analysis

This comment analysis feature uses text mining technique implemented using R language. All comments are analyzed, viewed every word and counted its appearance. The results of the analysis are visualized using word cloud. This feature is found in the general info menu as shown in figure 4.

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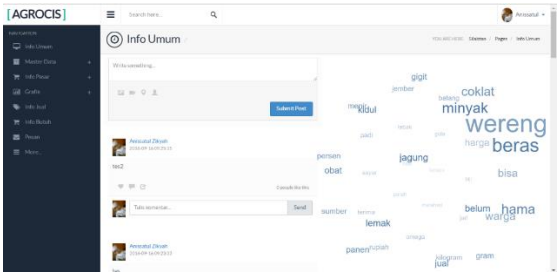

Fig 7. Public/General Page and Word Cloud

3.2 Features Of External Data Acquisition

The external data acquisition feature utilizes CURL techniques that are implemented by using PHP. The results of the acquisition will be displayed in graphical form as shown in figure 5.

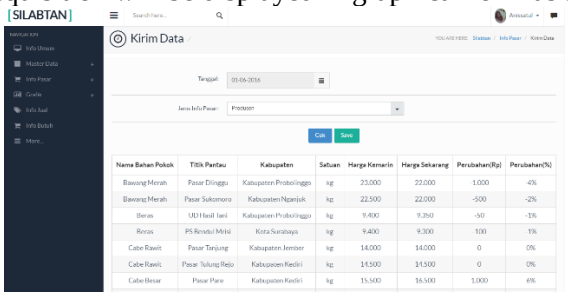

Fig.8. External Data Acquisition

3.3 OLAP View

In figure 9, an OLAP view of consumer commodity price is presented. Using this analysis page, users can easily view data from different perspective and gain knowledge necessary to make decision for their businesses.

Fig 9. Sign In Page

4. CONCLUSION

The system takes a different form of information systems in general because it adopts various aspects of social media technology that is currently growing. The system succeeded in implementing data acquisition and visualized using chart. The system successfully implements the analytic feature in the form of text mining processing and visualized to the word cloud and also presents data analysis using OLAP View.

5. ACKNOWLEDGEMENTS

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