



Functional Database in Gateway-based Price Service System

Basis Data Fungsional dalam Sistem Pelayanan Harga Berbasis Gateway

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ABSTRAK

Informasi harga produk menjadi salah satu hal yang sering diresahkan masyarakat karena informasi mengenai harga produk sering berbeda dikalangan penjual. Padahal pemerintah telah melakukan keterbukaan informasi berupa standar harga pokok sebuah produk. Sesungguhnya standar harga produk dari pemerintah tersebut bertujuan untuk mengurangi perbedaan harga di kalangan penjual. Namun keterbukaan informasi dari pemerintah terkait standar harga produk di pasaran yang *up to date* masih melalui media internet. Media internet tidak dapat sepenuhnya diakses oleh semua masyarakat, khususnya masyarakat desa yang masih memiliki kawasan wilayah terpencil seperti Desa Gadungan Kab. Kediri. Penelitian ini dilakukan sebagai alternatif teknologi untuk memfasilitasi keterbukaan informasi harga produk. Metode yang digunakan dalam penelitian ini adalah *action research*. Penelitian ini menggunakan layanan teknologi *gateway service* dengan fungsional *database* PostgreSQL. Hasil penelitian berdasarkan pengujian *usability testing* diketahui bahwa rata-rata *score* adalah 88,3%. Hasil pengujian aplikasi didapatkan dari tingkat efektivitas aplikasi pada kisaran 89%, tingkat efektivitas aplikasi pada kisaran 90% dan pada kepuasan aplikasi pada kisaran 86%. Penggunaan aplikasi diharapkan dapat membantu masyarakat dalam mendapatkan informasi harga lebih variatif sehingga mencapai persaingan harga sempurna dengan teknologi informasi menggunakan metode *gateway service*.

ABSTRACT

Information on product prices is one of the things that is often disturbed by society because information about product prices is frequently different among sellers. Whereas the government has made information disclosure in the form of a standard price of a product that aims to reduce price differences among sellers. However, the disclosure of information from the government regarding the standard up-to-market price of products on the market is still through the internet. Not all people can fully access the internet, especially rural communities in remote areas such as Gadungan village in Kediri regency. This research was conducted as an alternative technology to facilitate information disclosure of product prices. The method used in this study is *action research*. In this research phase, researchers used the *gateway service* technology service with a functional PostgreSQL database. The results on usability testing showed that the average score was 88.3%. Application testing results obtained from the application effectiveness level in the range of 89%, the application effectiveness level in the range of 90% and on application satisfaction in the range of 86%. The use of the application is expected to help the public in getting more varied pricing information to achieve perfect price competition.

1. Introduction

Currently, information has become a basic important necessity in the life of society. Information can be obtained by traditional means and by utilizing technological progress. Information can be obtained through

face-to-face meetings with other individuals (face-to-face) or it can be through various means/media available so it is not to require individuals to meet directly. Obtaining information is a human right, therefore, public information disclosure is one of the characteristics of a democratic state that upholds the sovereignty of the people to realize good state administration, as stipulated in constitution number 14 of 2008 on Public Information Disclosure (Republik Indonesia, 2008; Zulaikha & Paribrata, 2017).

The definition of Public Information based on UU KIP is information generated, stored, managed, transmitted, and received by a public body relating to state and other public agencies and other information relating to the public interest (Republik Indonesia, 2008) □. Information can be delivered by various media both social media and print media so that the community has many alternatives that can be selected. The ability of a government to manage information and produce quality public information becomes one of the factors that make the government become advanced in the field of community welfare (Rijati et al., 2015).

Disclosure of information can affect many things, one of them in the field of economy is market price competition (Wiratraman, Muhtaj, & Kasim, 2015) □. The market has the power of demand and supply that can move freely. Price competition is a reflection of the wishes of producers and consumers where demand reflects consumer desires, while supply reflects the wishes of producers or sellers. In perfect competition, it is necessary to know the number of buyers and sellers. The number of buyers and the number of sellers can affect the market price. Perfect competition is the ideal market structure, because this market system will ensure the efficient production of goods or services. Thus, it can be defined that Perfect Competition Market is a market or industry structure where there are many sellers and buyers, and any seller or buyer cannot affect the situation in the market.

Gadungan Village is a reasonably wide village with an area of 624,225 ha located in Puncu District of Kediri. Topographically, Gadungan village is a lowland (not a beach) to the north of Mount Kelud. This village has of sandy soil, and it is a rainfed agricultural land due to the absence of technical irrigation. In general, soil fertility is in the medium category. Gadungan Village has a variety of staple products and superior products that can compete. The products in the village of Gadungan should be published further.

People generally know the products that they want to get, but information about prices often varies among sellers. In this case, the government has a standard benchmark about the cost of a product. Government price benchmarks are already able to reduce the price difference from the seller, but it is undeniable the difference will still always exist with factors such as territory, transportation, and stock limitations.

In the era of information disclosure, the Government can apply information disclosure of up-to-date market prices through media such as digital media with internet technology. Many villager cannot thoroughly enjoy the internet media technology, especially villagers who live in remote areas like the village area of Gadungan (Sucipto & Karaman, 2015) □. Technology that can reach the information market price disclosure in poverty village is through technology gateway service namely SMS media (short message service) (Thierry & Priyambodo, 2017) □. Implementation of technology using SMS has been done by some central government, such as the trade ministry that can be accessed on page ews.kemendag.go.id and also on page infoharga.bappebti.go.id. Products implementation by the central government can only help a little regarding the difference in prices in the Gadungan Village due to uneven technological factors that are not equally distributed, and the prices that are still on a national scale.

The things that will be done to provide solutions to the difference in product prices in poverty villages is by applying the concept of sharing price information products using information technology through the media website and gateway service with SMS media. The system to be designed will involve several stakeholders namely government, verified traders and villagers. The stakeholders will contribute information on the market price, so that the public will obtain not a single price, but there is three pricing information from the government, verified traders and the public.

2. Literature Review

2.1. Information Technology

Information technology (IT) is a generic term for any technology that helps humans create, transform, store and disseminate information (Raymond Mcleod & Schell., 2007). IT combines high-speed computing and communications for data, voice, and video. Information technology includes all things related to the process, use as a tool, information management, and manipulation of information. Therefore Information Technology has a broad definition, namely all kinds of activities related to processing, management, manipulation, and transfer of information between media (Raymond Mcleod & Schell., 2007).

SMS Gateway is an application system used to send and receive SMS for the benefit of a broadcast via computer and computerized system. Gammu is a service provided to build SMS-based gateway applications. SMS gateway application with gammu is free. Gammu as an application will work when the gammu command is executed in the shell environment, and its commands are included according to function ("Gammu," n.d.). Whereas as a daemon, gammu is marked by executing the smsd command on the shell. In principle how the gammu work is connecting the modem/phone with PC. SMS received on the modem/mobile will be taken by gammu to be moved into a pre-arranged database.

2.2. Previous Researchs

Another study that discussed the use of SMS gateways, one of which was carried out by Matin Aziz Saputra and Bambang Setiawan in 2014 under the title "Customer Relationship Management for Blood Donor Management." The study discusses the application of 3 CRM cycles, namely acquisition, enhancement, and retention. The SMS gateway feature support the implementation of the CRM system. The results of using information gateway SMS can be spread quickly to donors (Saputra & Setiawan, 2014).

Andi Adriansyah and Kasmad Ariansyah researched in 2011 with the title "Short Message Service Application (SMS) and Email as Data Communication Media in Temperature Monitoring Systems." The study discusses monitoring and recording temperature changes in near real-time (NRT) and sending reports automatically via email and SMS by using the SMS gateway with MySQL database storage. The results of this research are, by using the SMS gateway data extraction function, storage to the database, and sending reports in the form of SMS and Email works well (Adriansyah & Ariansyah, 2011).

Another study conducted by Ann Kurth et al. in 2013 with the title of Information and Communication Technology to the Criminal Justice Revenue Link to HIV Care in the Community. This study discusses the use of text messages to develop innovative and effective approaches to support HIV treatment and retention in care among HIV-positive people involved in the criminal justice system. The results of the research are to evaluate and summarize the implications for the knowledge base in the built system (mHealth).

2.3. Research Conducted Today

The current research is titled Functional Database in Gateway-based Price Service System (Functional Database in Gateway-based Price Service System). This study is not the first time regarding SMS gateway, it been done, both domestically and abroad, especially about the use of SMS gateways. This research is based on the zoning area which only allows the dissemination of information through an SMS-based system. The technique used is a functional database as a link between several user levels. To find out the stages of the study can be seen in the next section.

3. Method

Action research is a study that focuses directly on social action. Action research is both qualitative and quantitative research, and it is a way of doing problems at the same time. Based on the problems that have been formulated in this study the researchers used Action Research research methodology (Ernest, 2014).

Action research can be implemented in various research fields. In the field of information systems application, action research methods are used (Kock, Avison, & Malaurent, 2017a). The studies summarized in an article that discusses specific issues explain that action research models can be used for information systems research. The method is used as an alternative solution to the right problem (Kock, Avison, & Malaurent, 2017b). □ The question that has been revisited in the field of Information Systems is a method that can be used in the context of information infrastructure. (Boulus-Rødje, 2014; Eden & Ackermann, 2018).



Figure 1. Action Research

The stages of the action research method, the main explanation is as follows:

1. Plan

At this stage, the researcher understands that the underlying problem is then followed by preparing an appropriate action plan to solve the existing problems, at this stage the application development takes into account the needs of stakeholders.

2. Act

At this stage, the researcher implements an action plan in the hope of solving the problem. This stage, data is collected for the needs of developing applications.

3. Observe

The researcher identifies the main problems that exist to make the application design. Application design is made in the system architecture. System architecture design can produce an analysis of application hardware and software requirements. All stages of observation are based on data obtained from stakeholders that are directly related or not directly related to application development.

4. Reflect

At this stage, the researcher evaluated the results of the implementation. This stage can see how the user acceptance of the application from usability testing.

4. Result and Discussion

4.1. Plan

This research was conducted with an action research methodology. The initial stage is to do the Plan. Plan stage is done by direct observation of the field and resuting existing problem that is the spread of price information that still has differences between the village area. Problems that have been obtained, submitted to the local village government. The researchers provide solutions to the problems and benefits by designing a system. The system that will be applied to solve the problem is the gateway service system using SMS media. SMS is selected because it is appropriate to apply in the village area.

4.2. Act

The second stage is Act. This step is done by collecting data. The data consist of government data, verified merchant data, and village community data. Data retrieval is done gradually. Initial stages of data retrieval are in the form of sample data for application testing. The data taken are the data of the staple. Government data taken are in the form of xls file. Data from merchants are in the form of data write. Traders are selected based on suggestions of criteria from village government. Traders come from grocery traders and market traders. Data from the community are in the form of direct input to the application. Data inputted via SMS media. Socialization of information to the public regarding the use of price applications was through village information boards, village websites, and RT and RW(Neighbourhood) authorities.

4.3. Observe

The third stage is Observe. This stage determines the application development planning of the gateway service using SMS media. The first stage of planning is to create a system architecture design. System architecture design is made based on observe stage. Architectural design is shown in figure 2.

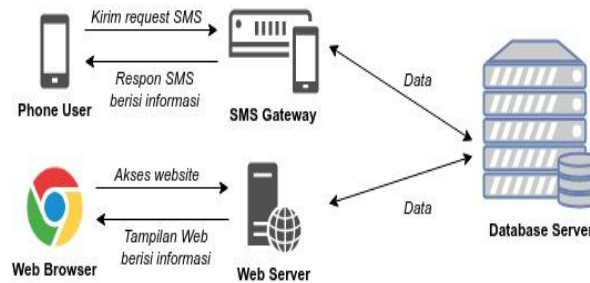


Figure 2. Gateway Service System

Architecture in figure 2 consists of two Cloud servers. First is the database server. The database server is a leased server from a third party. Data security is a priority because it avoids frequent downtime servers caused by unstable power flows. Cloud server provider comes from IIX (Indonesia Internet eXchange). The database used is PostgreSQL. PostgreSQL selection is based on database reliability.

The second server is the web server. The web server is a local computer located in the village hall. Web server uses GNU / Linux Ubuntu operating system server 14.10. This operating system is installed into a virtual operating system using VirtualBox application. The use of VirtualBox aims to facilitate the maintenance of applications. Maintenance is easier because the village only needs to back up the main file from the gateway service system to the external hard drive. If there is a problem with the local computer, the user can simply restore the application to the new computer by using the copy command.

Gateway service used in this application is gammu. Gammu is an open source application. Gammu can run without any front-end application and only with database media. Gammu acts as one of the SMS gateway modules in this application that connects the database with a web-based programming language. The gammu application will be linked to a local web server that is connected to the database from the cloud server. Application access consists of two lines. The first line is access for application operators via web-based applications and the second line is community access via SMS. Application operator records the cost of the government, while the price information of the merchants and the community through SMS

The second stage of planning is to determine the material requirements. Needs of materials used is according to the needs in figure 2. Materials needed are described in table 1.

Table 1. Material needs Gateway Service

No	Material	Information
1	Database Server	Cloud server VCPU 2Ghz Ram 2GB
2	Websserver	Local PC Core2duo CPU 2GHZ Ram 2GB
3	Modem	Modem GSM/GPRS, Dual Band 900/1800 Mhz Fully type-approved
4	Phone Number	GSM Friendly Number

Table 1 describes the architectural details contained in Figure 2. There are 4 staples in the manufacture of gateway service applications with SMS media. Server hardware specification in table 1 is the requirement of this application. The needs in table 1 are reversed to village observations and capabilities in various areas such as financial capacity and application stability. The use of modem and gsm SIM is chosen because of the more affordable cost of SMS API service providers. GSM SIM card is used so its nominal will be easy to remember (friendly).

The third stage of planning is to determine the programming language. The programming languages used are the PL / pgsq and PHP languages. The selection of PL / pgsq programming languages is used for the application of functions within the PostgreSQL database (Sucipto, Suhartanto, & Firliana, 2015)□□. Processing functions by the PL / pgsq programming language can process data faster than through PHP-based languages (Sucipto, 2017)□□. The auto reply function of the application system is placed in the database. Visual access is through web programming. The selection of web programming is intended to application operator. Database operators can process SMS data such as adding staple data, merchant registration, merchant key data filters, and basic data on community reports.

Script code data processing informed to the community is located on the price table. Script table prices as follows:

```
create table harga(
kode_h serial primary key,
kode_b char(15) references barang(kode_b),
harga int,
id_harga char(2) default 'M',
aktif_harga default 'N',
time timestamp default now());
```

The price table script filters input from three sources: government, verified merchants and the public at large. The governing entity is *id_harga* and *aktif_harga*. System gateway service line can be seen in figure 3.

The flowchart of the system in Figure 3 shows the stages of the process in providing information reception services and information delivery. At the stage of receiving information, the public can find out product price information with the keyword sms "info." At the stage of delivering product information, the public can submit information with the keyword "price." In the flowchart flow in Figure 3 the reply service from SMS is limited to 10 SMS.

When the keyword is wrong there will be a reply from the system. The following message is delivered when the message with the keyword is incorrect "**Maaf, anda salah** (Sorry you are wrong) **Format, type INFO <space> KONTENT or HARGA <space> CONTENT**".

Figure 3 flows can run with triggers created on the database. Here is the script code trigger auto_reply used:

```
create trigger auto_reply
after insert on inbox
```

for each row
execute procedure auto_reply ();

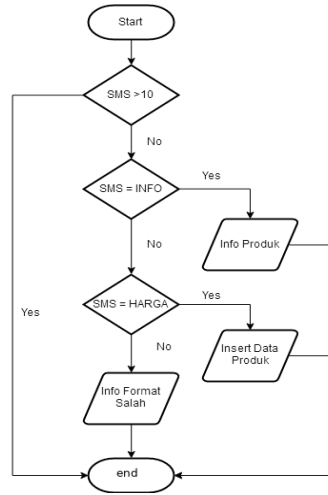


Figure 3. Flowchart Gateway Service

Trigger auto_reply script runs when a message arrives on your gammu inbox table. Trigger auto_reply executes auto_reply function created based on flow table in figure 3. Test function and trigger is to insert in inbox table. The following test code insert data pricing information and input price insert:

```

insert into inbox ('text','udh','textdecoded','recipientid') values ('','harga 01 m 1000','');
insert into inbox ('text','udh','textdecoded','recipientid') values ('','info ketela','');
    
```

the key words to know the price is *info*(information) and to add goods is *harga*(price). *harga* are followed by some item codes that can be viewed on the village website as well as information by the village apparatus.

4.4. Reflect

The fourth stage is to reflect namely implementation and application testing. Stages of implementation are done by connecting the database server and web server with the application of web-based applications. The application is built using PHP and uses the adminLTE template. Here is the front end display for the operators of the gateway service system:

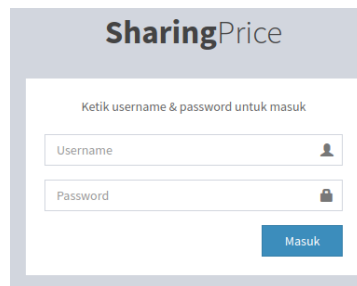


Figure 4. Application Login

Figure 4 is an application login page used by the village administration to manage the application system. This page is only for village government. While for sharing the price of the community and traders can

only use SMS. Figure 5 is a list of user managers of the application. Managers can add operators to manage those system apps.

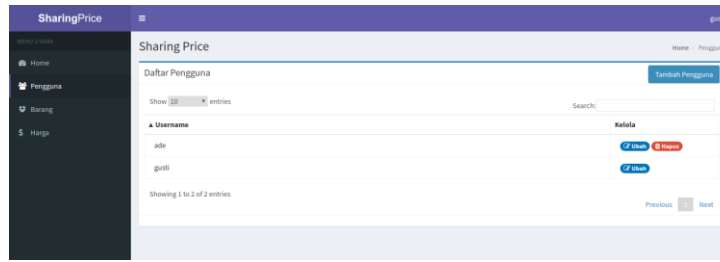


Figure 5. Users List

The application operators are the village apparatus or employee assigned by the village head. Only operators can access information over the web. Web access is only available for operators according to the observation step at the beginning of the search.

Figure 6 is a list of items that can be known their information sharing price. List of products not included in the system can not be known their information sharing price. The price list will also be published on the website to facilitate product information. Figure 6 is a sharing of prices from communities, traders, and village governments. Prices that are shared with the community and traders will be filtered by the village government to avoid unclear pricing information or avoid price spam so that people get the best information.

Kode Harga	Nama Barang	Sumber Data	Aktif ?	Harga (Rp)	Kelola
131313	Minyak Goreng	Pemerintah Desa	✓	14800	Ubah Hapus
1498006439	Beras	Pedagang	✓	9500	Ubah Hapus
149800593	Telur	Masyarakat	✓	17000	Ubah Hapus
1499309534	Telur	Masyarakat	✗	18250	Ubah Hapus
149918438	Cabe	Masyarakat	✓	21500	Ubah Hapus
149918949	Jagung	Pedagang	✓	4000	Ubah Hapus
149915248	Cabe	Pedagang	✗	15000	Ubah Hapus
149920772	Cabe	Pedagang	✗	15000	Ubah Hapus
149921252	Cabe	Pedagang	✗	15000	Ubah Hapus

Figure 6. SMS List of Goods' Cost

Figure 7 is an application report graph. The graph consists of the average price of the stakeholders. This chart report can help the government in controlling prices in the village area. The results obtained after testing the built-in prototype functionality show that all functions work well because the built prototype meets functional and user requirements.

Stage to determine satisfaction with the application is built using usability testing. At this stage, the testing of the price information system application is done using the SMS gateway. Testing is based on the running of the system in accordance with its function, namely service delivery and receipt of prices of basic needs. The success of delivery and acceptance services were related to the functional database that was previously created. The functional database is created in PL / PostgreSQL language by using device requirements in table 1.



Figure 7. Chart of Staples Price Conclusion

Usability testing of the system is built to use test for the level of effectiveness, efficiency, and satisfaction (Rubin, J., & Chisnell, 2008). After analyzing the usability test results, the usability score of the built prototype was 88.3%. Summary of usability test results is shown in Figure 8.

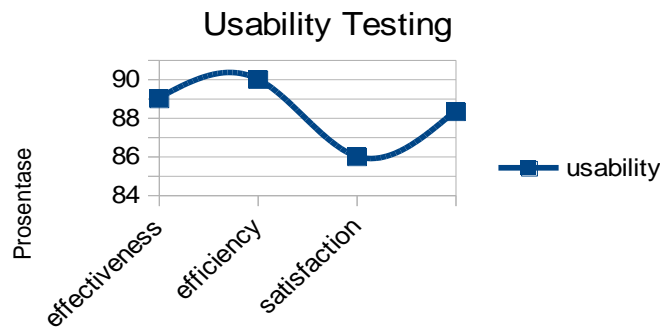


Figure 8. Usability Testing

This test is intended to ensure that the performance of the application in accordance with the planning. The application effectiveness rate is in the range of 89%, the application efficiency level is in the range of 90% and the rate of application satisfaction is in the range of 86%.

Several factors that influence the test results are local and cloud servers that are used are still in the middle level. The middle level is known from services provided by cloud computing providers. Another influence is derived from the quality of the modem, the modem used is a single type so that the quality of reception and delivery of messages is still delayed. (Warsito et al., 2017).

5. Conclusion

Based on the discussion, analysis and testing of this study provide good results seen from the test with an average score of 88.3%. Application testing results obtained from the application effectiveness level in the range of 89%, the application effectiveness level in the range of 90% and on application satisfaction in the range of 86%.

The use of the application is expected to help the public in getting more varied price information to achieve perfect price competition with information technology using the gateway service method. Application

development can be done in line with the development of internet access technology infrastructure in fake villages. The development of good internet infrastructure can be used for the transformation of SMS technology towards social media chat API technology so that it saves the cost of SMS transactions.

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