Journal of Social Research

P-ISSN: 2827-9832
E-ISSN: 2828-335x
http://ijsr.internationaljournallabs.com/index.php/ijsr

MANAGEMENT INFORMATION SYSTEM FOR TELECOMMUNICATION TOWER FEE PAYMENT AT THE DEPARTMENT OF COMMUNICATION AND INFORMATICS OF MEMPAWAH REGENCY

Devi Rizki Dwi Ananda[1*], Rahadian Kurniawan[2]
Universitas Islam Indonesia, Yogyakarta, Indonesia
19523098 @students.uii.ac.id, rahadiankurniawan@uii.ac.id

ABSTRACT

The development of telecommunications technology, such as BTS towers, has provided significant benefits to society. However, the Communication and Information Office (DISKOMINFO) of Mempawah District still faces challenges in managing telecommunications tower data using separate Microsoft Excel files. This causes the data retrieval process to be slow, hinders data changes, and increases the risk of errors. In order to address this problem, the Information Technology Division of DISKOMINFO Mempawah District has developed a web-based management information system to monitor and expedite the calculation of fees and the issuance of SKRD (Tower Utilization Permit). The waterfall development method was chosen to ensure a clear understanding of the system requirements before starting development, and to ensure that each phase is completed before moving on to the next phase. It is expected that the developed telecommunications tower fee payment system will support DISKOMINFO in ensuring timely fee payments, which are crucial for the development of the telecommunications industry and the overall economy.

Keywords: Department of Communication and Informatics of Mempawah Regency, Management Information System, Telecommunication Technology, Waterfall.

INTRODUCTION

Technological developments in the field of telecommunications, including BTS towers (Base Transceiver Station), have brought significant changes in people's daily lives. BTS towers are a very important component in cellular telecommunications infrastructure. BTS tower is a device that is responsible for sending and receiving radio signals in cellular networks into a message or data (Kominfo, 2019). The main function of BTS towers is as a signal amplifier and as a place to connect cellular telecommunications operator networks with subscribers (Ismail et al., 2015).

The Communication and Information Agency (DISKOMINFO) is one of the government agencies that has the responsibility to take care of BTS towers. One of the tasks of DISKOMINFO Mempawah Regency is to manage BTS towers and related tasks such as data collection and printing of SKRD (Regional Retribution Decree) (Ghalib et al., 2017). However, currently DISKOMINFO Mempawah Regency still manages telecommunication tower data using Microsoft Excel which is divided into several separate files. This causes the data search process to be slow and time-consuming if the data is needed at any time. Using Microsoft Excel as a fragmentary data management tool can also result in difficulties in combining and verifying data consistently. In addition, if there are changes or updates to the data, it needs to be done manually on each file, which increases the risk of errors and takes a long time. The process of calculating retribution and printing SKRD, especially SKRD in Mempawah

Regency, has also become hampered. Therefore, DISKOMINFO Mempawah Regency must ensure that the telecommunication tower levy can be arranged and paid in a timely manner. Timely payment of the levy is important so that there are no obstacles that can disrupt the development of the telecommunications industry and the economy as a whole.

One of the efforts made by the Informatics Application Division of DISKOMINFO Mempawah Regency to ensure a good levy calculation process and print SKRD is by developing a web-based management information system to handle this. The internship was placed in this division with the aim of developing the Telecommunication Tower Management Information System of Mempawah Regency. Management information systems are chosen because they can increase productivity as well as easy access to the information needed (Suyarti et al., 2023). This system will be used by DISKOMINFO Mempawah Regency to monitor the process of levy calculation and SKRD printing, so as to minimize errors and speed up the process carried out. There are similar studies that discuss the management of telecommunication towers as follows:

At (Suganda et al., 2019) ,6,7] The three studies have similarities in the management of telecommunication tower data through the application of information systems, monitoring, and communication facilities used to improve the efficiency and effectiveness of data management.

In the study [8,9,10,11] there are similarities in the application of Geographic Information Systems (GIS) in managing telecommunication tower data. All of these studies have the same focus, namely on managing tower data and using GIS as a tool to visualize and manipulate that data. The data input process includes information about the tower and its owner, which is then used to organize and manage the data more efficiently. In addition, the three studies also pay special attention to efficiency and effectiveness in data management, as well as related parties in tower data management.

This research is different from previous research because it uses the waterfall method in system development. This research has a specific focus, namely recording and calculating telecommunication tower retribution in DISKOMINFO Mempawah Regency. In addition to adopting several pre-existing features, this research also developed several new features such as provider management, office, village, subdistrict, cellplan zone, tower, location, payment, and user. This research emphasizes more on levy data management and the use of systems to manage tower data in detail.

METHOD

A. Data Collection

1. Interview

The interview was conducted to gain direct understanding from DISKOMINFO regarding the telecommunication tower management information system development project. The goal is to obtain information about the needs, challenges, and expectations of the system to be developed. Through this interview, it is expected to identify more specifically the needs that must be met by the system.

2. Observation

Based on observations, there is a need to develop a system capable of managing telecommunication towers in Mempawah Regency. These findings indicate that the current data collection process faces several obstacles so that improvements are needed

through the addition of features in the system that can support data management and levy calculations.

3. **Document Review**

The document review was carried out by analyzing the documents that had been provided by the DISKOMINFO Mempawah Regency. The results of the study include the levy calculation formula used and the output expected by the agency.

B. Application Development

In this system, system development is carried out using the waterfall method. The stages of the waterfall method can be seen as shown in Figure 1.

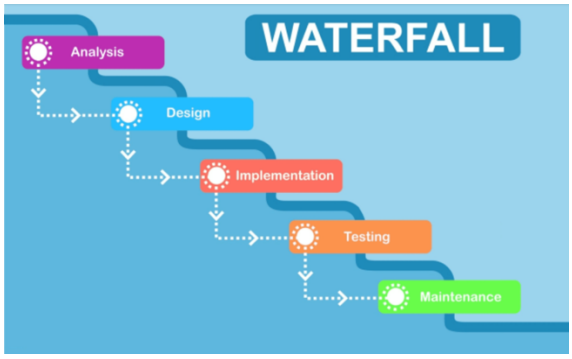


Figure 1 Stages of the Waterfall Method
Source: [12]

The following is an explanation of Figure 1:

a. Needs Analysis is used as a process of analyzing data related to the needs of the system to be developed.
b. System Design is used to analyze the information that has been collected during the Requirements Analysis stage, with the aim of designing the overall software architecture
c. Implementations are used to build systems using specific programming languages.
d. Testing is the stage where all programs that have been developed will be tested.
e. Maintenance is the last stage in the waterfall method that involves fixing bugs, improving performance, adding new features, and adjusting the system according to user needs.

According to research conducted by [13] the advantages of the waterfall method are that it is easy to understand and implement, and allows the creation of structured plans.

RESULTS AND DISCUSSION

This development is carried out by completing one phase in each stage process. In each phase, the results or outputs from the previous phase will flow and be used as input in the next phase. The stages carried out are as follows:

A. Needs Analysis

At this stage, there are several analyses carried out such as: input analysis, process analysis, output analysis, and interface analysis.

1. Input Analysis

Input analysis is used to understand data and information needed as input in software development.

Table 1 Input Analysis of Software Development Needs.

No	Actor	Function
1.	Admin	a. Manage *User* Data : No, Id, Username, Password, Nickname, and *Role*. b. Manage Data Provider: No and Provider Name. c. Manage *Office* Data: No, Company Name and Address. d. Manage Village Data: No, District and Location. e. Manage District Data: No, Regency and Subdistrict. f. Manage Cell Plan Zone Data: No, Longitude, Latitude and Status. g. Manage Tower Data: No, Company Name, Height, Tower Type and Status. h. Manage Location Data : No, Provider, Company Name, District, Address, Longitude, and Latitude. i. Manage Payment Data: No, Provider, Company Name, Usage Level, Distance, Type, Levy Value, Status and Address.
2.	*User*	a. View Provider Data b. View *Office* Data c. View Village Data d. View subdistrict data e. View Cell Plan Zone Data f. View Tower Data g. View Location Data h. View payment data

2. Process Analysis

Process analysis is used to help ensure that software development is done in a structured and systematic manner. The process analysis obtained for software development is as follows:

a. Manage User Data Process
b. Manage Data Provider Process
c. Manage Office Data Process
d. Village Data Management Process
e. District Data Management Process
f. Cell Plan Zone Data Management Process
g. Manage Tower Data Process
h. Process Manage Location Data
i. Manage Payment Data Process
j. View Data Provider Process
k. View Office Data Process
l. Process View District Data
m. Village Data View Process
n. Process View Cell Plan Zone Data
o. View Data Tower Process
p. View Location Data Process
q. Process View Payment Data

3. Output Analysis

Output analysis is used to ensure that the software provides results that are in accordance with the input provided by the user. The analysis of software output obtained is as follows:

a. User Information
b. Provider Information
c. Office Information
d. Village Information

e. District Information
f. Zone Cell Plan Information
g. Tower Information
h. Spot Information
i. Payment Information

4. Interface Analysis

Interface Analysis is used to ensure the user interface is as needed based on the user's needs in interacting with the system. The interface required by the software is as follows:

a. Manage Provider interface
b. Manage Office interface
c. Manage Village interface
d. Manage Subdistricts interface
e. Manage Cell Plan Zone interface
f. Manage Tower interface
g. Manage Location interface
h. Manage Payments interface
i. Manage User Interface

B. System Design

The first step is to design a use case diagram. This diagram is used to identify and visualize the needs of systems and actors. The use case diagram is as shown in Figure 2.

Figure 2 Use Case.

The following is an explanation related to Figure 2:

Table 2. Use Case Explained

Use case	Process	Actor	Information
Manage User Data	Add User Data	Admin	Add new user data including: no, id, username, password, nickname, and *role*.
	Edit Data User		Change or update user data.
	Delete User Data		Remove user information from the system.
	View User Data		View information about system users.
Manage *Data Provider*	Add Data Provider	Admin	Adding provider data includes: no and provider name.
	Edit Data Provider		Change or update your data provider.
	Delete Data Provider		Remove provider information from the system.
	View Data Provider		View information about providers available on the system.
Manage *Office* Data	Add *Office* Data	Admin	Add *office* data including: no, company name and address.

	Edit Data *Office*		Change or update data o*ffice*.
	Clear *Office* Data		Delete information o*ffice* from the system.
	See *Office* Data		View information about *office* available on the system.
Manage Village Data	Add Village Data	Admin	Add village data including: no, sub-district and location.
	Edit Data Desa		Change or update village data.
	Delete Village Data		Removed the village information from the system.
	View Village Data		View information about villages available on the system.
Manage District Data	Add District Data	Admin	Adding sub-district data includes: no, regency and kecamatan.
	Edit District Data		Change or update subdistrict data.
	Delete District Data		Remove subdistrict information from the system.
	View District Data		View information about sub-districts available on the system.
Manage *Cell Plan* Zone Data	Add *Zone Cell Plan* Data	Admin	Add *zona cell plan* data including: no, longitude, latitude and status.
	Edit Data *Zona Cell Plan*		Change or update cell plan zone data.
	Delete *Cell Plan Zone* Data		Remove cell plan zone information from the system.
	View *Cell Plan Zone* Data		View information about cell plan zones available on the system.
Manage Tower Data	Add Data Tower	Admin	Adding tower data includes: no, company name, height, type of type and status.
	Edit Data Tower		Change or update the data tower.
	Delete Tower Data		Remove tower information from the system.
	View Data Tower		View information about towers available on the system.
Manage Location Data	Add Location Data	Admin	Add location data including: no, provider, company name, sub-district, address, longitude, and latitude.
	Edit Location Data		Change or update location data.
	Clear Location Data		Remove location information from the system.
	View Location Data		View information about available locations on the system.
Manage Payment Data	Add Payment Data	Admin	Add payment data including: no, provider, company name, usage level, distance, type, levy value, status and address.
	Edit Payment Data		Change or update your payment data.
	Clear Payment Data		Remove payment information from the system.
	View Payment Data		View information about payments available in the system.
View Data Provider	View provider data.	User	The system provides information about available providers.
See *Office* Data	View *office* data.	User	The system provides information about available offices.
View Village Data	View village data.	User	The system provides information regarding available villages.
View District Data	View subdistrict data.	User	The system provides information about the sub-districts available in the system.
View *Cell Plan Zone* Data	View cell plan zone data.	User	The system provides available cell plan zone information.
View Data Tower	View tower data.	User	The system provides information about available towers.
View Location Data	View location data.	User	The system provides information regarding available locations.
View Payment Data	View payment data.	User	The system provides information regarding available payments.

The next step performed in the design phase is to create a database table. The results of the database table that has been created can be seen as shown in Figure 3.

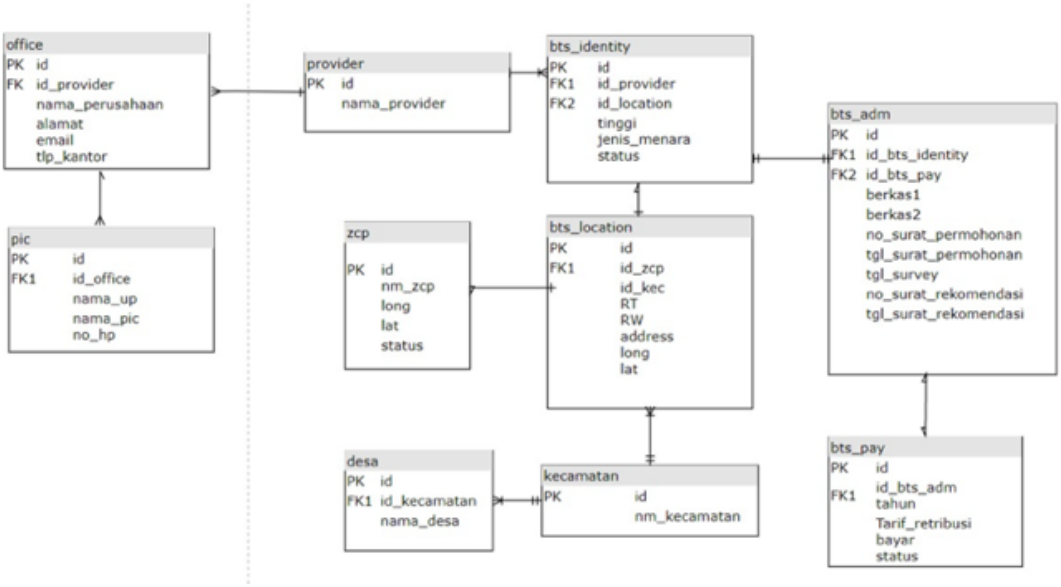


Figure 3. Relationship Table

C. Implementation

After the interface design has been completed, the next step is implementation. The first display that appears on this application is the login page. On the login page, users can enter the username and password that have been created previously to enter the system. If the verification process is successful, then the user can access the system. The application login page can be seen as shown in Figure 4.

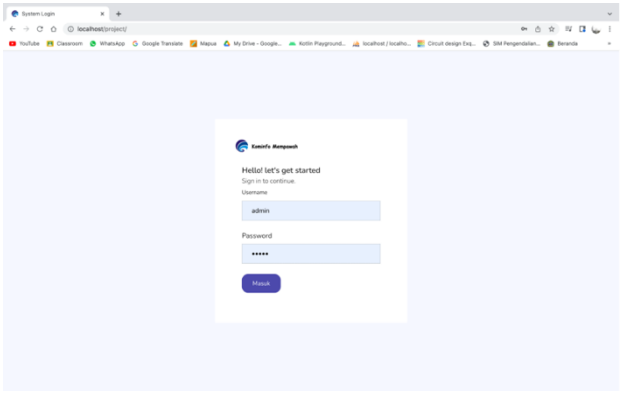


Figure 4. Login Page

After the user successfully logs in as an admin or user, the next page that will be displayed is the dashboard page. The dashboard page displays the amount of income, users, providers, and sub-districts according to the data previously entered along with a map of Mempawah Regency. On this page there are several menus provided, namely the data provider menu, office, subdistrict, village, cell plan zone, picture, tower, location, payment and logout. The admin dashboard page view can be seen as shown in Figure 5.

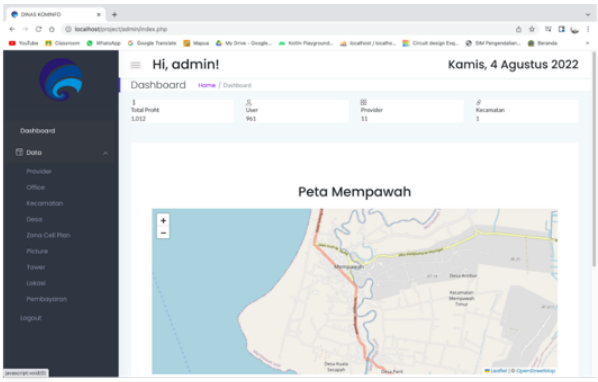


Figure 5. Dashboard Page

If the user selects the provider page, then the provider page display can be seen as Figure 6. This page contains information about the list of providers operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.

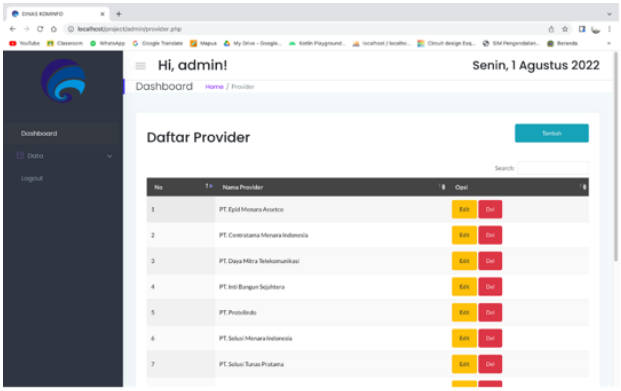


Figure 6. Provider Page

If the user selects the office page, then the office page view can be seen as shown in Figure 7. This page contains information about the list of offices operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.

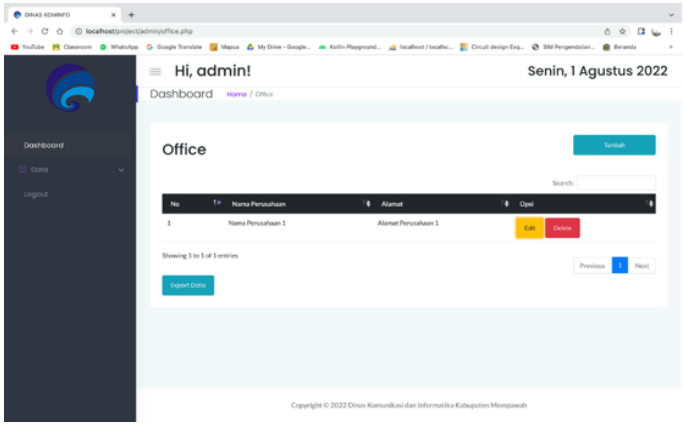


Figure 7. Office page

If the user selects the village page, then the village page display can be seen as shown in Figure 8 This page contains information about the list of villages operating in Mempawah

Regency along with the available features. These features include: add, search, edit, del and export data.

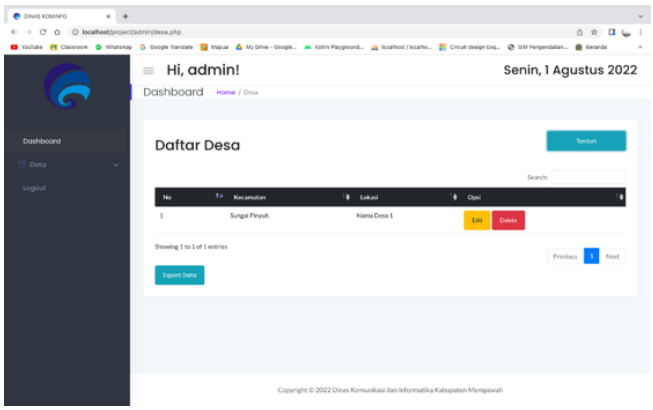


Figure 8. Village Page

If the user selects the sub-district page, then the sub-district page display can be seen as shown in Figure 9. This page contains information about the list of sub-districts operating in Mempawah Regency and the available features. These features include: add, search, edit, del and export data.

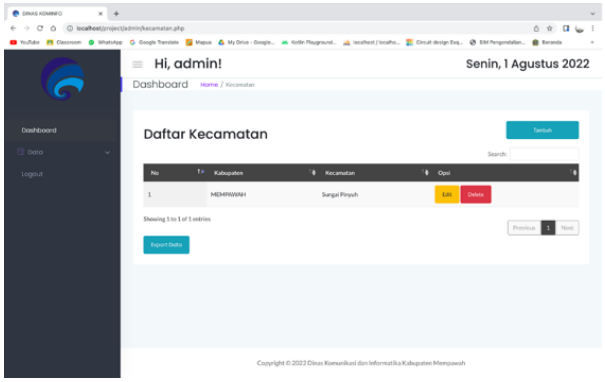


Figure 9. District Page

If the user selects the Zone Cell Plan page, then the Zone Cell Plan page view can be seen as shown in Figure 10. This page contains information about the list of Cell Plan Zones operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.

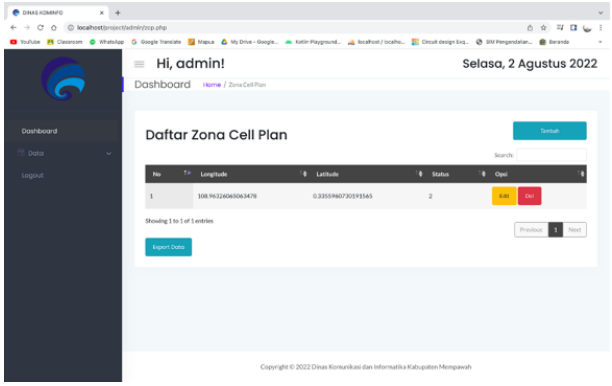
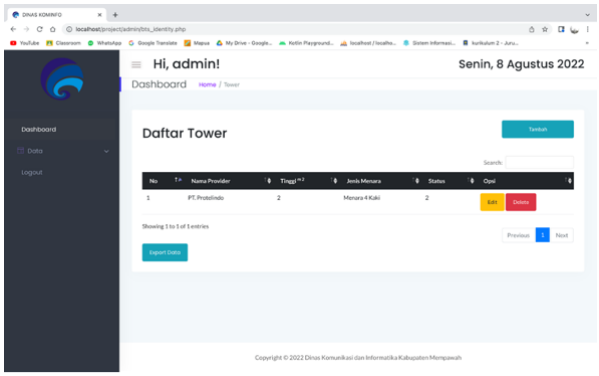


Figure 10. Cell Plan Zone Page

If the user selects the tower page, then the tower page display can be seen as shown in Figure 11. This page contains information about the list of towers operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.



Picture 11 Tower Page

If the user selects the location page, then the location page display can be seen as shown in Figure 12. This page contains information about the list of locations operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.

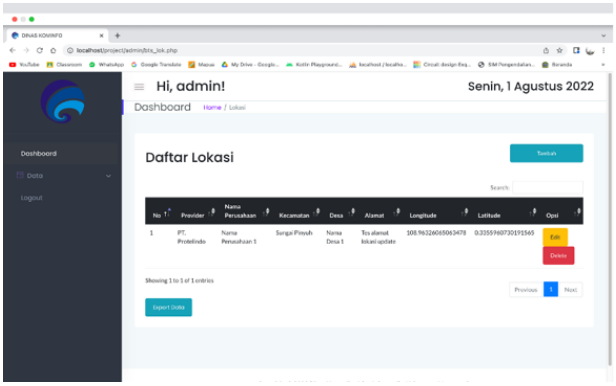


Figure 12. Location Page

If the user selects the payment page, then the payment page display can be seen as shown in Figure 13. This page contains information about the list of payments operating in Mempawah Regency along with the available features. These features include: add, search, edit, del and export data.

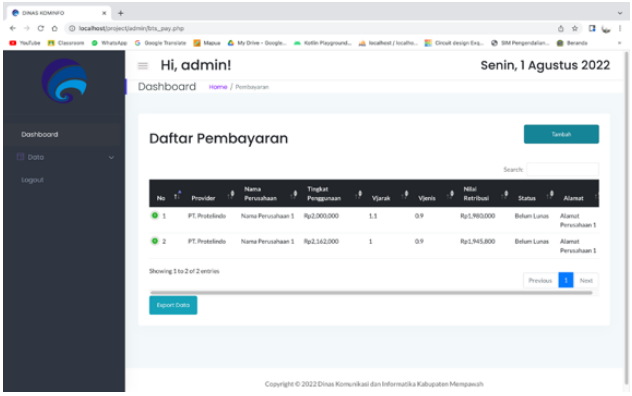


Figure 13. Payment Page

Discussion

The test was conducted using a questionnaire filled out by three respondents from DISKOMINFO Mempawah Regency. The questionnaire consists of ten questions that are used to test the system being evaluated. In the test, the Likert scale method was used with seven score scoring weights. Details on grading weights based on the Likert scale can be seen in Table 3.

Weight	Likert scale	Interval
1	Very Disagree	14.18% < ≤ score 26.47%
2	Disagree	26.47% < ≤ score 38.76%
3	Simply Disagree	38.76% < ≤ score 51.04%
4	Neutral	51.04% < ≤ score 63.33%
5	Simply Agree	63.33% < ≤ score 75.51%
6	Agree	75.51% < ≤ score 87.76%
7	Very Agree	87.76% < ≤ score 100.00%

In this test, four categories were evaluated, namely usefulness, ease of use, ease of learning, and satisfaction. Each category is calculated based on the results of the questionnaire that has been filled out by respondents. Here are the test results based on each category: The first category is Usefulness, this category is used to measure the level of usability of the system that has been developed. The results obtained can be seen in Table 4.

Table 4. Usefulness

No.	Statement	Shoes						
		1	2	3	4	5	6	7
1.	This system is useful						2	1
2.	This system helps to be more productive						2	1
3.	The system performs as expected						2	1
	Sum	0	0	0	0	0	6	3
	Number of Scores	0	0	0	0	0	36	21
	Σskor	57						
	Present (%)	90%						

The number of scores is the result of combining the scores for each statement that has been done which is then multiplied by the weight of the score based on the Likert scale. The maximum score that can be achieved is the result of multiplying the maximum score on the Likert scale by the number of statements, which is 7 x 3 = 21. The expected number of scores is the result of multiplying the maximum score by the number of respondents, so 21 x 3 = 63. To calculate the percentage of data usefulness eligibility based on Table 4, the following formula is used:

∑shoes = (Total x Score1) + (Total x Score2) + (Total x Score3) + (Total x Score4) + (Total x Score5) + (Total x Score6) + (Total x Score7)

∑shoes = (0x1) + (0x2) + (0x3) + (0x4) + (0x5) + (6x6) + (3x7)

∑shoes = 57

Percentage Value = $\%\frac{Total\ Skor}{skoryangdiharapkan}\ X\ 100$

Percentage Value = $\frac{57}{63}\ X\ 100\%$

Value Percentage = 90 %

The second category is Easy to Use, this category is used to measure the level of ease of use of the system that has been developed. The results obtained can be seen in Table 5.

Table 5. Easy to Use

No.	Statement	Shoes						
		1	2	3	4	5	6	7
1.	Easy to use system						1	2
2.	The system is user-friendly						1	2
	Sum	0	0	0	0	0	2	4
	Number of Scores	0	0	0	0	0	12	28
	Σskor	40						
	Present (%)	95%						

The number of scores is the result of combining the scores for each statement that has been done which is then multiplied by the weight of the score based on the Likert scale. The maximum score that can be achieved is the result of multiplying the maximum score on the Likert scale by the number of statements, which is 7 x 2 = 14. The expected number of scores is the result of multiplying the maximum score by the number of respondents, so 14 x 3 = 42. To calculate the percentage of eligibility of easy to use data based on Table 4, the following formula is used:

∑score = (Total x Score1) + (Total x Score2) + (Total x Score3) + (Sum x Score4) + (Total x Score5) + (Total x Score6) + (Total x Score7)

∑shoes = (0x1) + (0x2) + (0x3) + (0x4) + (0x5) + (2x6) + (4x7)

∑shoes = 40

Percentage Value = $\%\frac{Total\ Skor}{skoryangdiharapkan}\ X\ 100$

Pepercentage Value = $\frac{40}{42}\ X\ 100\%$

Value Percentage = 95 %

The third category is Easy of Learning, this category is used to measure the level of ease of learning the use of the system that has been developed. The results obtained can be seen in Table 6.

Table 6. Easy of Learning

No.	Statement	Shoes						
		1	2	3	4	5	6	7
1.	Learn how the system works quickly						1	2
2.	The system is easy to remember how to use it						2	1
	Sum	0	0	0	0	0	3	3
	Number of Scores	0	0	0	0	0	18	21
	Σskor	39						
	Present (%)	92.8%						

The number of scores is the result of combining the scores for each statement that has been done which is then multiplied by the weight of the score based on the Likert scale. The

maximum score that can be achieved is the result of multiplying the maximum score on the Likert scale by the number of statements, which is 7 x 2 = 14. The expected number of scores is the result of multiplying the maximum score by the number of respondents, so 14 x 3 = 42. To calculate the percentage of eligibility of easy to use data based on Table 4, the following formula is used:

∑score = (Total x Score1) + (Total x Score2) + (Total x Score3) + (Total x Score4) + (Total x Score5) + (Total x Score6) + (Total x Score7)

∑shoes = (0x1) + (0x2) + (0x3) + (0x4) + (0x5) + (3x6) + (3x7)

∑shoes = 39

Percentage Value = $\%\frac{Total\ Skor}{skoryangdiharapkan}\ X\ 100$

Percentage Value = $\frac{39}{42}\ X\ 100\%$

Value Percentage = 92.8%

Category four is Satisfaction, this category is used to measure the level of satisfaction with the use of the system that has been developed. The results obtained can be seen in Table 7.

Table 7. Satisfaction

No.	Toyounyaan	Shoes						
		1	2	3	4	5	6	7
1.	This system is satisfactory?						2	1
2.	This system needs to be owned?						2	1
3.	The system works as expected?						2	1
	Sum	0	0	0	0	0	6	3
	Number of Scores	0	0	0	0	0	36	21
	Σskor	57						
	Present (%)	90%						

The number of scores is the result of combining the scores for each statement that has been done which is then multiplied by the weight of the score based on the Likert scale. The maximum score that can be achieved is the result of multiplying the maximum score on the Likert scale by the number of statements, which is 7 x 3 = 21. The expected number of scores is the result of multiplying the maximum score by the number of respondents, so 21 x 3 = 63. To calculate the percentage of eligibility of easy to use data based on Table 4, the following formula is used:

∑score = (Total x Score1) + (Total x Score2) + (Total x Score3) + (Total x Score4) + (Total x Score5) + (Total x Score6) + (Total x Score7)

∑shoes = (0x1) + (0x2) + (0x3) + (0x4) + (0x5) + (6x6) + (3x7)

∑shoes = 57

Persentase Value = $\%\frac{Total\ Skor}{skoryangdiharapkan}\ X\ 100$

Persentase Value = $\frac{57}{63}\ X\ 100\%$

Value Percentage = 90%

Table 7. Test Results

Usefulness	Easy of Use	Easy of Learning	Satisfaction	Average
90%	95%	92.8%	90%	91.95%

Based on the test results that have been obtained from all categories, it is known that the system test results get 91.95% results. The value is obtained from the average calculation of each category.

CONCLUSION

Based on the results of the tests conducted, it can be concluded that users consider this system very useful in managing telecommunication tower data. This can be known from the results of tests involving various categories. In the usefulness category, this system obtained a score of 90%, indicating that this system provides significant benefits in managing telecommunication tower data. In this context, the system plays a role in assisting DISOMINFO in managing telecommunication towers in Mempawah Regency.

In addition, users also find this system easy to use, with an ease of use level of up to 95%. They also agree that the system is easy of learning, with a score of 92.8%. The user satisfaction rate reaches 90%, indicating that the user is satisfied with the use of the system. The average score of all categories tested was 91.95%. The results of this test show that this system is running as expected. Although the system built has achieved good results, test respondents gave input that it is necessary to add infographic elements to make information easier to understand. In addition, it is expected that this system will be more dynamic and avoid errors in data collection.

REFERENCES

Ghalib, M. F., Widayati, S., & Zaenal, Z. (2017). Analisis Sensitivitas Nilai NPV Terhadap Parameter Ekonomi Harga Jual dan Ongkos Penambangan Batuan Diorit, di PT Total Optima Prakarsa, Kecamatan Sui Pinyuh, Kabupaten Mempawah, Provinsi Kalimantan Barat. *Prosiding Teknik Pertambangan*, 536–543.

Ismail, N., Maharoni, M. M., & Lindra, I. (2015). Analisis Perencanaan Pembangunan Bts (Base Transceiver Station) Berdasarkan Faktor Kelengkungan Bumi Dan Daerah Fresnel Di Regional Project Sumatera Bagian Selatan. *Jurnal Istek*, *9*(1).

Kominfo, B. (2019). *Pengertian, macam dan komponen pada tower bts yang sebaiknya anda tahu*.

Suganda, A., Permatasari, R. D., & Panessai, I. Y. (2019). Sistem Informasi Pemantauan Retribusi Pada Menara Telekomunikasi. *International Journal of Education, Science, Technology, and Engineering (IJESTE)*, *2*(2), 97–111.

Suyarti, S., Savitri, P., Haryati, T., Suwandi, S., Sulistyawati, U. S., Kasmaniar, K., Usmia, S., Kuswandi, S., Fithriyana, R., & Rosaria, D. (2023). *Sistem Informasi Manajemen: Suatu Pengantar*.