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Development of an Online Consultation Information Service System at the Directorate General of Mineral and Coal

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ABSTRACT

In the era of digitalisation, public information services are a crucial aspect in supporting transparency and accountability in government agencies. The Directorate General of Mineral and Coal still faces several obstacles in delivering information services, including a limited number of face-to-face service staff and the absence of an efficient feedback system. Therefore, this study aims to develop an online consultation information system to improve service efficiency and flexibility. The system was developed using the RAD software development method, which includes the stages of needs analysis, system design, coding, and testing. The implementation was carried out using the PHP programming language with the CodeIgniter framework and MySQL database. A key feature of the system is real-time queue monitoring for business entities, which represents a novelty compared to previous research. System testing was conducted using black box and User Acceptance Testing (UAT) methods, involving employees and business representatives as end users. The results show that the system functions well according to user needs and is expected to enhance the quality of public information services at the Directorate General of Mineral and Coal.

Keywords: *Online Consultation; Service System; RAD*

INTRODUCTION

In the current era of digitalization, public information services are one of the important aspects in supporting transparency and accountability of public agencies or organizations (Cheng et al., 2025). The public has the right to accurate, fast, and easily accessible information as part of fulfilling the principle of *openness* (Ulumiyah & Gati, 2024). Information disclosure is one of the important elements in evaluating service performance in the public sector and assessing the extent to which public sector implementers are responsible for every decision (Syafar et al., 2022) and the actions taken. Public services themselves are a very vital strategic part in realizing good governance, including the active participation of the community (Robial et al., 2023).

Public services are currently still experiencing several obstacles, such as what happened to the Directorate General of Minerals and Coal, where the information service process has not been maximized and there are limited mechanisms to get objective feedback from the public (Bureaucracy, 2024). In addition, the problem experienced today is the lack of the number of face-to-face service employees at the Directorate General of Minerals and Coal, which only amounts to four employees, so that face-to-face services are limited to only 10 times. With a limited number of employees and evaluators in consulting services regarding coal and minerals, service employees have a busy schedule, so additional consultation hours are required. Another

problem that occurred was the blocking of the *ePNBP* system caused by unpaid PNB receivables through the *ePNBP* application and requests from legal entities such as the prosecutor's office, *innocence* or *KPK* related to the investigation of the Waba IUP. Therefore, it is necessary to have a new system that can be accessed for information services to the public. To answer these problems, innovations that are able to improve information services are needed. One of the innovations that can be applied to overcome problems in public information services is the use of information technology in the form of information systems for online consulting services.

Research by Ramdoni & Herdiansyah (2023) developed a web-based doctor consultation system using the *RAD* method and the *Laravel* framework to simplify the previously manual medical consultation process. As a result, this system is able to speed up patient data services and management. Meanwhile, Ardiansyah & Palasara (2022) designed a web-based monitoring application at BPS Tasikmalaya to overcome delays in data processing and budget allocation, resulting in a system that allows real-time monitoring of work and increased work efficiency. This research was carried out as a solution to the problem of information services at the Directorate General of Minerals and Coal by developing an online consultation system to provide an additional quota for limited face-to-face consultations. The novelty of the research lies in the real-time monitoring feature of queue numbers for business actors. This research is expected to improve information services to the community.

Despite this growing demand, many government institutions still face significant challenges in delivering optimal services. One such case is the Directorate General of Mineral and Coal, which struggles with limited face-to-face service capacity—only four employees available and consultations restricted to 10 sessions—along with bureaucratic hurdles and issues such as system blockages (e.g., *ePNBP*) and legal process disruptions. These operational inefficiencies underline the urgent need for innovative solutions that enhance service delivery and provide effective channels for public engagement.

Several previous studies have proposed the development of online service systems to address similar limitations in other sectors. For instance, Ramdoni & Herdiansyah (2023) developed a web-based medical consultation system using the *RAD* method and *Laravel*, significantly improving patient data access and efficiency. Ardiansyah & Palasara (2022) designed a real-time work monitoring system for BPS Tasikmalaya, solving delays in budget processing. However, these systems did not address real-time queue transparency or administrative overload within resource-constrained government sectors.

This research aims to develop an online consultation system tailored for the Directorate General of Mineral and Coal, with a key innovation—real-time queue monitoring—that distinguishes it from prior solutions. Unlike earlier models that focused solely on process automation or data digitization, this system integrates live consultation tracking to provide greater transparency and service certainty for business actors. The novelty of this system lies in its ability to not only extend consultation access beyond face-to-face limits but also to empower users with timely and accountable service engagement. Through this development, the study fills a crucial research gap in designing public-facing digital services that respond to both administrative constraints and user-centric expectations.

METHOD

The research method used in *the RAD* method. The RAD model is sometimes referred to as the *classic life cycle*, which refers to a systematic and sequential approach to software development (Supiyandi et al., 2022) The stages of this method can be seen in Figure 1 (Ardiansyah & Palasara, 2022)

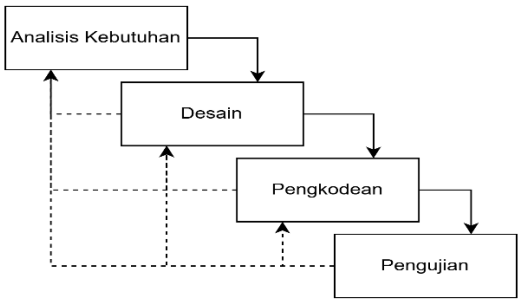

Figure 1. **RAD Method**

Data collection for this study was conducted using a qualitative approach to gain a comprehensive and contextual understanding of the implementation of the online consultation information service system within the Directorate General of Minerals and Coal (Andini et al., 2023). The primary data collection methods included interviews, observations, and documentation (Ardiansyah et al., 2023). Interviews were carried out with service managers and users to explore their needs, experiences, and perceptions regarding the online consultation system. Observations took place within relevant work units to monitor system usage, user interactions, and agency responses. Additionally, documentation was reviewed by examining service guidelines, usage reports, internal records, and technical documents related to the system's development.

Following data collection, a needs analysis was performed to identify both functional and non-functional requirements for the system, such as necessary features and hardware or software specifications (Ardiansyah & Palasara, 2022). Based on this analysis, the system design phase commenced, involving the creation of system structures and user interfaces using the Unified Modeling Language (UML), a standardized software modeling language (Ardhy et al., 2023). This structured approach ensured that the workflow and architecture of the online consultation system were effectively mapped out to meet the identified needs.

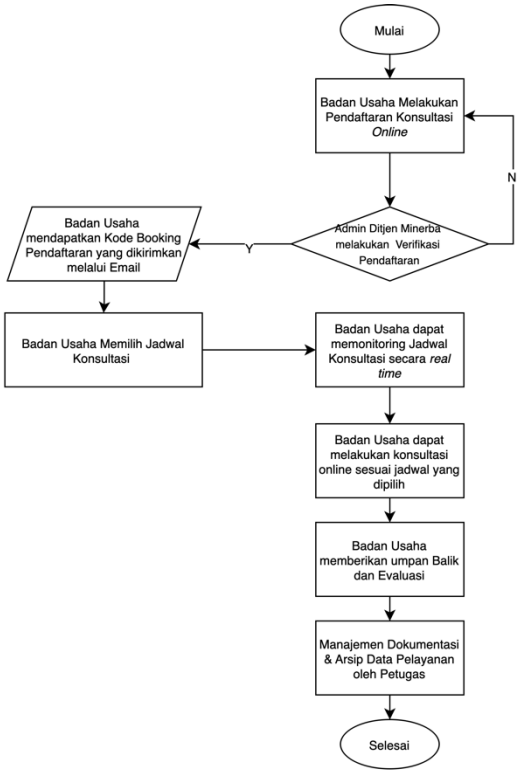

Figure 2. Flowchart System

Based on what is shown in Figure 2 the process begins with business entities registering for consultations online. Once the registration is done, the admin will verify the registration. If the registration has not been verified, the business entity will wait for the verification process first. After the registration is verified, the business entity will get a *booking* code as proof that the registration has been successful. Furthermore, business entities can choose the available consultation schedule and can monitor the queue in *real-time* through the system. If the turn/consultation schedule is close to the specified time, the system will provide a notification. Furthermore, business entities can conduct consultations online, either through *video calls* or chat. After the consultation is completed, the business entity will be asked to provide feedback and evaluation of the services that have been received. And the last stage, documentation management and archival storage of the entire consultation process that has been carried out by officers or employees of the Directorate General of Minerals and Coal for reference and future needs and officers can add notes because of consultation. This process was closed with the completion stage, marking the end of the online consultation service flow.

The UML used is a *use case diagram* which is an abstract representation of the interaction between the system and the actors involved. Then *the activity diagram* describes the functional flow in an information system by clearly showing where the workflow begins, where it ends, the activities that occur during the process, and the order of each of these activities (Ramdany et al., 2024) and *the class diagram* depicts the structure and description of classes, packages, and objects, including the relationships between elements (Farhan & Leman, 2023) The form of system design using a use case diagram can be seen in Figure 3.

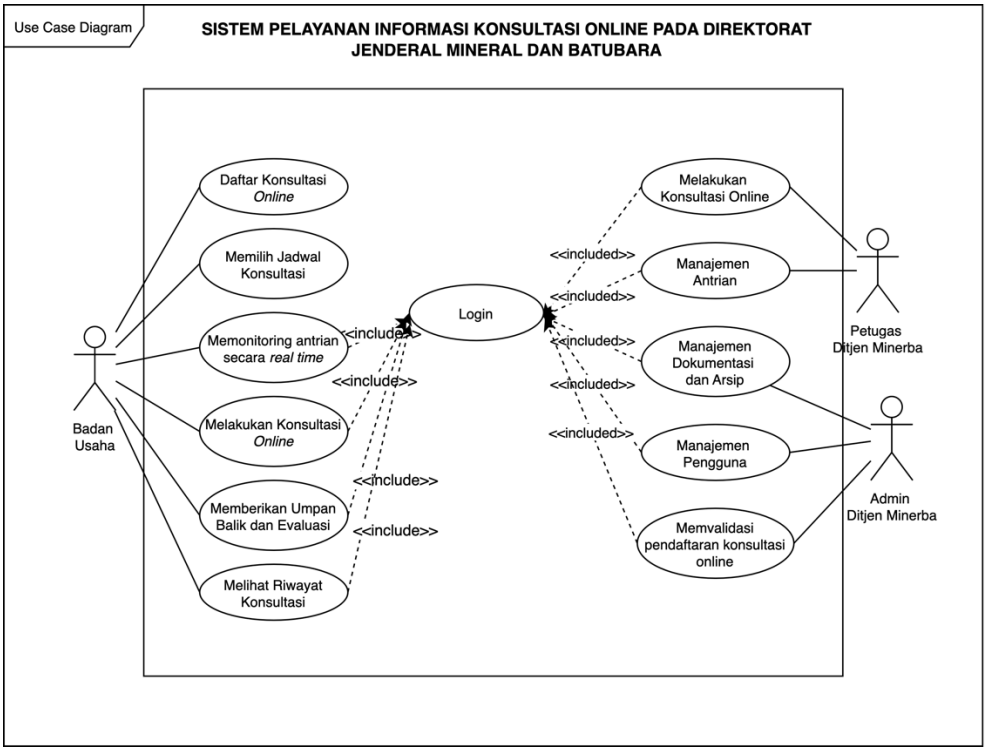

Figure 3. Use Case Diagram

Based on Figure 3 shows that the design of the system users is three types of users, namely business entities that can register for online consultations and choose online consultation schedules without login, and again monitor, schedule, conduct online consultations, provide feedback and evaluation, and view online consultation history after login. Then there are officers from the Director General of Mineral and Mineral Resources who have access to online consultations and queue management after logging in. And finally, there is an admin of the Director General of Mineral and Mineral Resources who has access to documentation management and archives of online consultations, user data management, and validates online consultation registration carried out by business entities, of course, after login.

Meanwhile, the design of the system database developed using UML, namely *class diagrams*, can be seen in **Error! Reference source not found.**, which consists of six main tables, namely User, booking, Type of Consultation, Evaluation, and Archive. The *User Table* has a willing *one to many* with the Booking Table and the Evaluation Table because of each *user.* The Type of Consultation table only has one relationship with the Booking Table, which is *a one-to-many* relationship, because each type of consultation can consist of more than one *booking data*. In addition to having a relationship with the *User Table,* the Booking Table has a *one-to-one relationship* with the Consultation Table because each booking can only do 1 consultation session. Likewise, the relationship between the Consultation Table and the Evaluation Table has a *one-to-one relationship* because each consultation is completed and can provide 1 evaluation data.

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The formula used in the calculation process is indicated by the following equation (Aprilia & Dermawan, 2023)

$$Index\ (\%) = \frac{A}{B\ x\ N} x\ 100\%$$

Information:

A = Total score from respondents

B = Highest score x number of items

N = Number of respondents

The assessment criteria from the results of the percentage of UAT scores based on the weights that have been calculated using equation 2.1 can be seen below (Zahro et al., 2021)

Table 1. **Answer Weights**

Interval	Criteria
20% - 36%	Very Ineligible
37% - 52%	Not Eligible
53% - 68%	Less Eligible
69% - 84%	Eligible
85% - 100%	Highly Eligible

Meanwhile, efficiency analysis is very important in evaluating financial performance, in order to assess whether the available resources have been optimally utilized or not. Effectiveness is an indicator to measure the extent to which an organization has succeeded in achieving its goals. An organization is considered successful if these goals can be achieved effectively. In the context of effectiveness, the focus does not lie on how much costs are spent, but rather on achieving the planned program goals, even if the costs used exceed the specified budget (Rahmawati & Susanto, 2023) In the online consultation service system at the Directorate General of Mineral and Mineral Resources and Mineral Resources, several formulas that can be used for system efficiency and performance analysis include:

Average Consultation Time (t)

The equations used are derived from statistical formulas in the calculation of the mean (Pratikno et al., 2022) as follows.

$$[T = \frac{\sum t_i}{n}]$$

Keterangan:

T = Average consultation time

ti = Consultation time to-(i)

n = Total number of consultations

Service Efficiency (E)

Service efficiency can be calculated using the formula in the following equation (Anggradini, 2024)

$$E = \frac{C_{online}}{C_{total}} \; x \; 100\%$$

Information:
C_{online} = Number of consultations conducted online
C_{total} = Total consultations (*online* + face-to-face)

User Satisfaction Level(s)

The formula for calculating satisfaction levels based on surveys can be seen in the following equation (Rosadi & Takim, 2022)

gan:
C_{online} = Number of consultations conducted online
C_{total} = Total consultations (*online* + face-to-face)

RESULTS AND DISCUSSION

User Acceptance Testing Business Entities

User Acceptance Testing (UAT) was conducted on 10 respondents from representatives of business entities to find out the extent to which the built system can be accepted and used properly by users. This test was carried out using a 5-point Likert scale, ranging from Strongly Agree (5) to Strongly Disagree (1). The questionnaire results data are then processed to obtain the system feasibility index value. The question items and categories of quality aspects used in this test refer to research conducted by (Yakub et al., 2024). The results of the questionnaire are shown in the following table.

Table 1. User *Acceptance Testing Results*

No	Question	Answer					Percentage				
Learnibility		**SS**	**S**	**N**	**TS**	**STS**	**SS**	**S**	**N**	**TS**	**STS**
Q1	Is the system easy to understand?	3	7	0	0	0	30%	70%	0%	0%	0%
Q2	Are the features on the system easy to use?	7	3	0	0	0	70%	30%	0%	0%	0%
Effeciency											
Q3	Is the system easy to use for online consultation service registration?	3	7	0	0	0	30%	70%	0%	0%	0%
Q4	Is the system easy to implement by the public to apply for online consultation services at the Directorate General of Mineral and Mineral Resources?	7	2	1	0	0	70%	20%	10%	0%	0%
Memorability											
Q5	Can the system perform the online consultation registration process properly?	4	6	0	0	0	40%	60%	0%	0%	0%
Q6	Can the system expand public access to apply for online consultation services at the Directorate General of Mineral and Mineral Resources?	8	2	0	0	0	80%	20%	0%	0%	0%
Errors											
Q7	Are the errors that occurred in the system resolved properly?	2	7	1	0	0	20%	70%	10%	0%	0%
Q8	Are the features on the system working properly? Received by email clearly?	9	1	0	0	0	90%	10%	0%	0%	0%

Satisfaction											
Q9	Does the system have an attractive appearance?	4	6	0	0	0	40%	60%	0%	0%	0%
Q10	Is the experience of using this system good?	5	5	0	0	0	50%	50%	0%	0%	0%

Based on the results of the recapitulation of the answers in Table, most of the respondents gave a positive assessment of the system tested. The **Strongly Agree (SS)** and **Agree (S) answer options** dominated in almost all aspects, which reflected that the system was considered quite good in terms of ease of use, clarity of information, and completeness of the consultation process. To determine the level of feasibility of the system quantitatively, the index value was calculated based on the total answer score given by the respondents. Calculations are performed separately for each aspect, and the final results are used to assess the extent to which the system is judged feasible by the user.

Value Processing Per Aspect

After the questionnaire data is collected, the next step is to process the scores for each aspect of the test *User Acceptance Testing (UAT).* This process aims to find out the extent of the feasibility of the system based on user perception. The assessment was carried out using the index formula in equation 2.1 (Aprilia & Dermawan, 2023): The index value is calculated separately for each aspect tested, then compared to the system's eligibility criteria to determine whether or not the system is feasible. Here are the results of the value processing for each aspect:

Learnability

a. Number of questions: 2
b. Maximum number of scores: 5 × 2 × 10 = 100
c. Actual score (A):
   - Q1: (3×5) + (7×4) = 15 + 28 = 43
   - Q2: (7×5) + (3×4) = 35 + 12 = 47
   - Total A = 43 + 47 = 90
d. Calculation: Index = (90 / 100) × 100% = 90.00%

Efficiency

a. Number of questions: 2
b. Maximum number of scores: 5 × 2 × 10 = 100
c. Actual score (A):
   - Q3: (3×5) + (7×4) = 15 + 28 = 43
   - Q4: (7×5) + (2×4) + (1×3) = 35 + 8 + 3 = 46
   - Total A = 43 + 46 = 89
   d. Calculation: Index = (89 / 100) × 100% = 89.00%

Memorability

a. Number of Questions: 2
b. Maximum Total Score: 5 × 2 × 10 = 100
c. Actual Score (A):
   - Q5: (4×5) + (6×4) = 20 + 24 = 44
   - Q6: (8×5) + (2×4) = 40 + 8 = 48
   - Total A = 44 + 48 = 92

d. Calculation: Index = (92 / 100) × 100% = 92.00%

Errors

a. Number of Questions: 2
b. Maximum Total Score: 5 × 2 × 10 = 100

Actual score (A):

- Q7: (2×5) + (7×4) + (1×3) = 10 + 28 + 3 = 41
- Q8: (9×5) + (1×4) = 45 + 4 = 49
- Total A = 41 + 49 = 90

c. Calculation: Index = (90 / 100) × 100% = 90.00%

Satisfaction

a. Number of questions : 2
b. Maximum score : 5 × 2 × 10 = 100
c. Actual Score
   Q9: (4×5) + (6×4) = 20 + 24 = 44
   Q10: (5×5) + (5×4) = 25 + 20 = 45
   Total A = 44 + 45 = 89
d. Calculation : Index = (89 / 100) × 100% = **89.00%**

Overall Recap

Table 2 UAT *Testing Recap*

Aspects	Total Score (A)	B × N	Table of Contents (%)	Category
Learnability	90	100	90.00%	Highly Worth It
Efficiency	89	100	89.00%	Highly Worth It
Memorability	92	100	92.00%	Highly Worth It
Error Handling	90	100	90.00%	Highly Worth It
Satisfaction	89	100	89.00%	Highly Worth It
Total/Average	450	500	90.00%	Highly Worth It

Based on the results of User Acceptance Testing (UAT) processing on 10 respondents from business entities, an index score for the Learnability aspect was obtained of 90%, Efficiency of 89%, Memorability of 92%, Error Handling of 90%, and Satisfaction of 89%. All of these aspects have a value above 80%, so they are included in the Very Feasible category. This category refers to the assessment criteria in Table 2.12 (Prasetya et al., 2022), which states that a value range between 80%–100% is classified as Very Feasible. Thus, the system tested is considered very suitable for use and has been well received by users from business entities.

Efficiency Analysis

Testing of the effectiveness and efficiency of the system is carried out to evaluate the extent of the consulting service system *Online* developed to be able to provide optimal functional benefits. This test uses a simulation approach with engineered data, as the system is not yet fully used by the end user.

The simulation is carried out based on realistic use scenarios that describe conditions in the field. The data used includes the duration of the consultation time, the number of service sessions, the type of consultation (face-to-face/*Online*), as well as user satisfaction scores obtained from the questionnaire simulation. While not actual data, this approach provides an initial overview of the performance of the system being built.

The formula and measurement method used in this test refer to the theoretical foundation that has been described in Chapter 2, namely:

The three main indicators analyzed are as follows:

1. Average Consultation Time

   Used to measure the average duration of consultations from all sessions:

   Data Simulation:

   Total consultation duration (10 sessions): 241 minutes

   Number of consultation sessions (n) = 10

$$T = \frac{241}{10} = 24{,}1 \text{ menit}$$

   Interpretation:

   This value shows that the consultation service time has an average time of 24.1 minutes.

2. Service Efficiency (E)

   Efficiency shows how much this system is able to shift consultations to online media rather than face-to-face.

$$E = \frac{C_{online}}{C_{total}} \, x \, 100\%$$

   Information:

   C_{online} = Number of consultations conducted online

   C_{total} = Total consultations (*online* + face-to-face)

   Simulation:

   Number of online consultations = 36

   Total number of consultations = 40

$$E = \frac{36}{40} \, x \, 100\% = 90\%$$

   An efficiency value of 90% indicates that the system has facilitated online consultations well.

3. User Satisfaction Level(s)

   The level of satisfaction is measured based on the average score of the user's assessment of the system.

$$S = \frac{\sum R_i}{N}$$

Information:

S = Average satisfaction score

Ri = Satisfaction score from respondents to - (i)

N = Total number of respondents

Simulation:
Total score from 10 respondents = 42

$$S = \frac{42}{10} = 4.2$$

On a scale of 1–5, a score of 4.2 indicates that the system is getting a high level of satisfaction from users.

Conclusion of Effectiveness and Efficiency Analysis

Based on the simulation results, the online consultation system showed good performance in three main indicators:

1. Service times are relatively fast, with an average of 24.1 minutes per session.
2. The level of service efficiency is very high, namely 90% of services have been transferred to the online system.
3. The user satisfaction rate is high, with a score of 4.2 out of 5.

Based on the test results, the system can be said to be effective and efficient in supporting the online consultation process within the Directorate General of Mineral and Energy and Mineral Resources, although this test is still simulative. It is recommended to conduct further testing using actual data from end users to obtain more representative and comprehensive results.

CONCLUSION

This research concludes that the development of an online consultation information service system using the RAD method has effectively addressed key limitations of face-to-face consultations at the Directorate General of Mineral and Coal, particularly through the integration of a real-time queue monitoring feature that enhances accessibility, transparency, and service efficiency for business entities. System testing with both black box and User Acceptance Testing (UAT) methods confirms that the platform meets user needs. For future research, it is suggested to integrate automated notification systems, expand consultation features to support document uploads, and implement data analytics for ongoing service improvement. Additionally, conducting long-term monitoring and user feedback analysis is recommended to ensure the system continues to evolve in line with stakeholder needs.

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