

## Web-Based Monitoring Information System for Local Tax Revenue Realization in Temanggung Regency

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### ABSTRACT

**Purpose of the study:** This study aims to design and implement a web-based monitoring information system capable of presenting real-time local tax revenue realization achievement and its percentage of target attainment for each tax type in Temanggung Regency.

**Methodology:** This study employs a descriptive qualitative approach combined with the Waterfall system development method, consisting of requirement analysis, system design, implementation, and testing. The system was built using PHP programming language and MySQL database, designed with Unified Modelling Language (UML), and evaluated through black box testing involving field tax collectors and the revenue treasurer.

**Main Findings:** The developed system successfully displays real-time achievement information for nine types of local taxes. The hotel tax case demonstrated that a new transaction input immediately updated the nominal achievement from IDR 17,100,000 to IDR 26,500,000, with the percentage automatically changing from 9% to 11%. Black box testing confirmed that all core functions, including login, data entry, monitoring, and percentage calculation, operated validly according to specification.

**Novelty/Originality of this study:** Unlike previous systems that covered regional revenue broadly or were restricted to intranet or specific mobile platforms, this study offers a web-based system specifically focused on real-time, transaction-level monitoring of local tax achievement. This provides a practical model for accessible, up-to-date tax monitoring applicable to other regional government institutions.

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## 1. INTRODUCTION

The development of information technology has become a fundamental necessity for organizations and government institutions in supporting fast, accurate, and data-driven decision-making [1], [2]. The utilization of information technology enables data processing to become more efficient and allows information to be presented in real-time to the parties who need it [3], [4]. The availability of accurate and timely information also supports institutions in monitoring operational conditions and evaluating the achievement of predetermined targets. One field that highly depends on the availability of fast and accurate information is regional financial management, particularly in local tax revenue collection, which serves as one of the main sources of Regional Revenue and Expenditure Budget (APBD) [5]. Therefore, the implementation of information technology in local tax revenue management is important to ensure that revenue information can be monitored and utilized effectively.

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Local tax is a mandatory contribution imposed on individuals or entities by the regional government, enforced under statutory law, without direct compensation, and utilized for regional development and governance purposes [6]. Local tax revenue plays an important role in supporting the financial capacity of regional governments and financing various public services and development programs. The optimization of local tax revenue requires accurate information regarding the realization of revenue and the achievement of predetermined targets. The optimization of local tax revenue is a shared responsibility among field tax collectors, revenue treasurers, and policy makers [7]. Consequently, the availability of timely and reliable tax revenue information is essential for supporting coordination, monitoring, evaluation, and policy formulation among these stakeholders.

In Temanggung Regency, the reporting process of local tax revenue achievement has so far been conducted manually through monthly reports prepared by the revenue treasurer [8]. The manual reporting mechanism requires the treasurer to collect, process, and compile revenue data before the information can be distributed to the relevant parties. This condition causes information regarding the realization achievement and the percentage of target attainment for each type of local tax to only be known after the report has been completed, which often exceeds the predetermined timeframe due to the treasurer's daily routine workload [9]. Delays in reporting can reduce the timeliness of information received by field tax collectors and policy makers when monitoring revenue performance. As a result, field tax collectors and policy makers experience delays in obtaining the data required to formulate strategies for achieving local tax revenue targets.

Several previous studies have addressed the development of regional revenue information systems and web-based reporting systems [10]. One study developed an intranet-based warehouse management information system using Data Flow Diagram (DFD) modeling to improve data retrieval efficiency; however, its implementation was limited to a local network (intranet), making it inaccessible from outside the work environment [11]. Another study designed a Regional Original Revenue information system covering all aspects of regional revenue, including taxes and levies, but did not specifically provide real-time monitoring information on the realization achievement of tax revenue by type [12]. Meanwhile, another study developed an Android-based geographic information system for land sales and rentals which, although using UML modeling, was limited in accessibility since it could only be operated on devices running a specific operating system [13]. These studies demonstrate that information systems can improve data management and information accessibility, but their features and implementation contexts still differ from the specific requirements of local tax revenue monitoring.

Based on a review of these previous studies, a research gap was identified, namely the absence of a web-based information system specifically designed to monitor the realization achievement of local tax revenue along with its percentage of target attainment in real-time, accessible anytime and anywhere by both policy makers and field tax collectors. Most of the existing systems are either general in scope, covering all regional revenue, or restricted to specific access platforms. Such limitations make it difficult for stakeholders to obtain focused information regarding the progress of local tax revenue for each tax category. In addition, systems that do not provide real-time achievement information may require stakeholders to wait for periodic reports before evaluating revenue performance. Therefore, a system that integrates local tax realization data with target achievement percentages and provides web-based access is needed to overcome these limitations.

To address this gap, this study proposes a Web-Based Monitoring Information System for Local Tax Revenue Realization, designed using Unified Modelling Language (UML) and implemented through web-based programming [14]. The proposed system is intended to facilitate the recording, processing, monitoring, and presentation of local tax revenue realization data in an integrated manner. The novelty of this research lies in the presentation of local tax revenue realization achievement in real-time, along with the percentage of target attainment for each type of tax, which can be accessed online by all stakeholders without having to wait for the completion of manual report preparation. The system is also designed to provide information that can support continuous monitoring of revenue performance during the fiscal year. The urgency of this research is further reinforced by the fact that delayed information on tax achievement may hinder the formulation of appropriate strategies and billing policies, particularly for large-value transactions occurring after the monthly report has been finalized [15].

Based on the above description, this research aims to design and implement a web-based information system capable of presenting real-time information on local tax revenue realization achievement within one fiscal year period. The system is also designed to display the percentage of achievement for each type of local tax against the predetermined targets. The availability of these features is expected to provide stakeholders with more timely information regarding the development of local tax revenue realization. The system is further expected to support the identification of tax types that have not yet reached their targets and require follow-up actions. With this system, the decision-making process and the formulation of local tax billing strategies in Temanggung Regency can be carried out more quickly, accurately, and based on reliable data.

## 2. RESEARCH METHOD

### 2.1 Research Design

This study employs a descriptive qualitative approach combined with a system development method (Research and Development), since the primary output of this research is a software product rather than a statistical hypothesis test [16]. The system development refers to the Waterfall model, which consists of five sequential stages: requirement analysis, system design, implementation (coding), testing, and maintenance [17], [18]. Each stage is completed before proceeding to the next, ensuring that the resulting system genuinely meets the institution's needs.

### 2.2 Research Subject and Object

The subjects of this study are field tax collectors, the revenue treasurer, and the head of the tax collection division at the Regional Revenue, Financial, and Asset Management Agency (BPPKAD) of Temanggung Regency. These participants serve as the primary users and key sources of information regarding the existing local tax revenue reporting process [19]. The object of the study is the local tax revenue realization reporting system, which covers nine types of local taxes: restaurant tax, hotel tax, parking tax, advertisement tax, groundwater tax, entertainment tax, land and building acquisition duty (BPHTB), street lighting tax (PPJU), and rural and urban land and building tax (PBB-P2) [20].

### 2.3 Data Sources and Data Collection Techniques

The data used in this research consist of primary and secondary data.

- Primary data were obtained directly through observation and interviews with field tax collectors, the revenue treasurer, and the head of the tax collection division to identify the current business process and system requirements.
- Secondary data were obtained from supporting documents, such as annual local tax revenue targets, monthly tax realization reports, and regional/regent regulations related to local tax management.

The data collection techniques used in this research include:



Figure 1. Data collection techniques

- Observation: directly observing the current tax achievement reporting workflow at the related institution.
- Interview: conducted in a structured manner with relevant stakeholders to identify the functional requirements of the system to be developed.
- Literature study: reviewing theories, previous research, and regulations relevant to local tax administration and web-based information systems.

### 2.4 Research Instrument

The research instrument used to evaluate the developed system was a black-box testing checklist. The instrument was designed to verify whether each system function operated according to its predetermined specifications without examining the internal structure of the program code. The testing covered core functions, including user login, tax data entry, revenue monitoring, percentage calculation, and report-related processes. Each function was evaluated by executing a predefined test scenario and comparing the actual system response with the expected result. The black-box testing instrument is presented in Table 1.

Table 1. Black Box Testing Instrument.

| No | Tested Function | Test Scenario | Expected Result |
|----|-----------------|---------------|-----------------|
|----|-----------------|---------------|-----------------|

|   |                        |                                       |                                                           |
|---|------------------------|---------------------------------------|-----------------------------------------------------------|
| 1 | Login                  | Input correct username and password   | User successfully accesses the dashboard page             |
| 2 | Login                  | Input incorrect username and password | System displays a login failure notification              |
| 3 | Tax data entry         | Add new transaction data              | Data is successfully saved and displayed on the dashboard |
| 4 | Revenue monitoring     | Access the dashboard menu             | System displays the current tax realization achievement   |
| 5 | Percentage calculation | Add a new transaction                 | System automatically updates the achievement percentage   |

The testing scenarios in Table 1 cover both successful and unsuccessful user interactions with the main system functions. The scenarios are intended to verify authentication, data processing, revenue monitoring, and automatic percentage calculation. The expected results provide specific criteria for determining whether each tested function operates according to its requirements.

## 2.5 Data Analysis Technique

Data obtained from observation and interviews were analyzed descriptively to identify the current business process, system requirements, and the limitations of the existing manual reporting method. The results of this analysis were then translated into system requirement specifications, which served as the basis for system design using Unified Modelling Language (UML), including use case diagrams, activity diagrams, sequence diagrams, class diagrams, and Entity Relationship Diagrams (ERD) [21].

## 2.6 Research Procedure

The research procedure was carried out through the following stages:



Figure 1. Research Procedure (Waterfall Model)

1. Requirement Analysis : identifying functional and non-functional requirements based on observation and interview results.
2. System Design : designing the system architecture, database structure, and user interface using UML notation.
3. Implementation : translating the design results into program code using the PHP programming language and MySQL database.
4. Testing : evaluating the system using the black box testing method to ensure all functions operate according to specification.
5. Deployment and Maintenance : implementing the system in the actual operational environment and performing continuous maintenance to accommodate future needs.

## 3. RESULTS AND DISCUSSION

### 3.1 System Implementation

Based on the requirement analysis and system design described in the previous section, a web-based monitoring information system for local tax revenue realization was successfully developed [22]. The system was built using the PHP programming language with MySQL as the database management system, consisting of several main modules: user authentication, tax data entry, revenue monitoring dashboard, and achievement reporting [23]. The system covers nine types of local taxes: restaurant tax, hotel tax, parking tax, advertisement

tax, groundwater tax, entertainment tax, land and building acquisition duty (BPHTB), street lighting tax (PPJU), and rural and urban land and building tax (PBB-P2) [24].

### 3.2 Monitoring Dashboard and Achievement Results

The core output of this research is the monitoring dashboard, which presents real-time information on local tax revenue realization achievement without requiring users to wait for a manual monthly report, as identified as the main problem in the existing system. The dashboard automatically calculates and displays the achievement percentage for each tax type based on the ratio between realized revenue and the predetermined annual target. The achievement results for each type of local tax are presented in Figure 2.

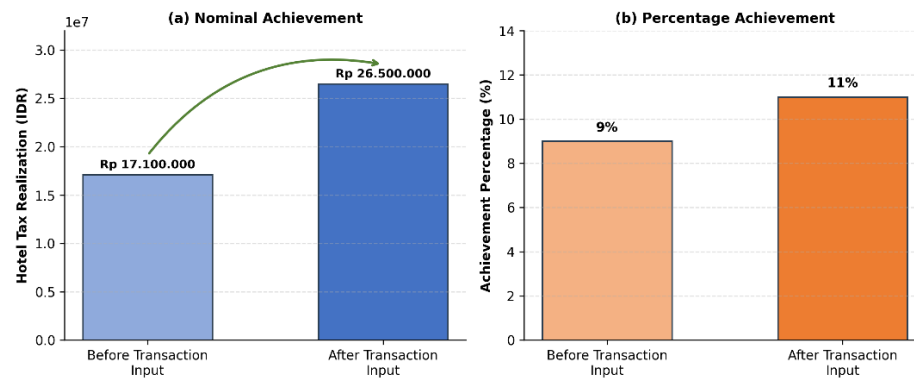


Figure 2. Real-Time Update of Hotel Tax Achievement After New Transaction Input

### 3.3 System Testing Results

System testing was conducted using the black-box testing method based on the testing instrument presented in Table 1 (Section 2.4). The testing focused on the main system functions, including authentication, tax data entry, revenue monitoring, and automatic percentage calculation. Each function was evaluated by executing a predefined test scenario and comparing the observed system response with the expected result. All five tested scenarios produced valid results, indicating that the system functions operated as specified. A summary of the black-box testing results is presented in Table 2.

Table 2. Black Box Testing Results

| No | Tested Function        | Test Scenario                         | Expected Result                                           | Testing Result |
|----|------------------------|---------------------------------------|-----------------------------------------------------------|----------------|
| 1  | Login                  | Input correct username and password   | User successfully accesses the dashboard page             | Valid          |
| 2  | Login                  | Input incorrect username and password | System displays a login failure notification              | Valid          |
| 3  | Tax data entry         | Add new transaction data              | Data is successfully saved and displayed on the dashboard | Valid          |
| 4  | Revenue monitoring     | Access the dashboard menu             | System displays the current tax realization achievement   | Valid          |
| 5  | Percentage calculation | Add a new transaction                 | System automatically updates the achievement percentage   | Valid          |

The results presented in Table 2 show that all five tested functions achieved a valid status. Both successful and unsuccessful login scenarios generated the expected system responses, while tax data entry, revenue monitoring, and percentage calculation operated according to their specified functions. These findings indicate that the main system functions were implemented correctly and operated in accordance with the defined functional specifications.

The results presented in the previous section demonstrate that the developed web-based monitoring information system is capable of presenting local tax revenue realization achievement in real time. As shown through the hotel tax case in Figure 2, the system successfully updated the nominal achievement from IDR 17,100,000 to IDR 26,500,000 immediately after a new transaction was recorded, while the corresponding percentage automatically changed from 9% to 11%. This finding confirms that the system functions exactly as

intended during the design stage, in which every transaction input directly affects the achievement value displayed on the dashboard without requiring manual recalculation. Such automatic updating represents a fundamental shift from the previous condition, in which achievement information could only be known after the treasurer completed the monthly report. The consistency between the designed system requirements and the actual system behavior indicates that the implementation phase using PHP and MySQL was carried out appropriately [25].

In addition to the real-time achievement update, the black box testing results in Table 2 further strengthen the credibility of the developed system. All five tested functions, namely login validation, tax data entry, revenue monitoring, and percentage calculation, produced outcomes that matched the expected results without exception. This indicates that the core functionalities required by field tax collectors and policy makers operate reliably under normal usage scenarios [26]. The successful testing outcomes also suggest that the system is technically ready to be used in an actual operational environment at the related institution [27]. Taken together, the real-time dashboard performance and the valid testing results provide strong evidence that the research objective stated in the Introduction has been achieved.

These findings are in line with the condition previously described in the background, where the absence of a real-time reporting mechanism caused delays in decision-making, particularly for large-value transactions that occurred after the monthly report had been issued. The result obtained in this study directly supports the argument that manual reporting processes are inherently limited in providing timely information for operational and strategic purposes [28]. Furthermore, the ability of the system to automatically recalculate both nominal and percentage values reinforces the initial assumption that automation can significantly reduce the information gap between field data collection and management-level reporting. This is consistent with the general principle in information systems development, where real-time data processing is expected to eliminate delays caused by manual, periodic reporting cycles [29]. Therefore, the results of this study empirically confirm the problem identified at the beginning of the research.

The novelty of this research lies in its specific focus on presenting local tax achievement information in real time, rather than covering regional revenue in a general manner as found in several previous studies. Unlike earlier systems that were limited to intranet access or restricted to a single mobile platform, the system developed in this study is accessible through a web-based platform, allowing broader and more flexible access for both field tax collectors and policy makers [30]. This research also contributes a practical example of how a specific tax component, in this case hotel tax, can be monitored down to the transaction level while simultaneously reflecting its impact on the overall achievement percentage. Such a level of detail has not been explicitly demonstrated in the previous studies discussed in the Introduction. Consequently, this study extends existing knowledge by showing a concrete implementation of real-time, transaction-level tax monitoring within a single integrated web-based dashboard.

From a practical perspective, the implementation of this system offers significant implications for the tax administration process in Temanggung Regency. Policy makers and division heads can now access up-to-date achievement information at any time without depending on the treasurer's monthly reporting schedule, allowing billing strategies to be adjusted more responsively. Field tax collectors also benefit from immediate visibility of their input results, which may increase accountability and accuracy in daily data entry. Moreover, the availability of real-time percentage tracking enables early identification of tax types that are falling behind target, such as the hotel tax example illustrated in this study, so that corrective actions can be planned before the end of the fiscal year. In a broader context, this system may serve as a reference model for other regional government institutions facing similar challenges in monitoring local revenue realization.

Despite these promising results, this study has several limitations that should be acknowledged. First, the system evaluation in this research relies primarily on black box testing, which confirms functional correctness but does not measure user satisfaction, system usability, or long-term performance under high transaction volumes. Second, the illustration of real-time achievement update presented in this study focuses specifically on the hotel tax category, so the generalizability of this behavior to the remaining eight tax types has not been empirically demonstrated within this article. Third, the current system is limited to monitoring local tax revenue only and does not yet integrate other components of regional original revenue, such as levies, fund transfers, or general allocation funds. Fourth, aspects related to data security, system scalability, and integration with existing financial and accounting systems at the institution have not been examined in this research. These limitations indicate the need for further development and more comprehensive testing in future studies to strengthen the applicability of the proposed system.

#### 4. CONCLUSION

This study successfully designed and implemented a web-based monitoring information system for local tax revenue realization in Temanggung Regency, as initially aimed in the Introduction. The system is capable of presenting real-time information on local tax revenue achievement within one fiscal year period, as

well as automatically displaying the percentage of achievement for each type of local tax against its predetermined target. This is evidenced by the hotel tax case presented in the Results and Discussion section, in which the nominal achievement and its corresponding percentage were instantly updated following a new transaction input, without requiring any manual recalculation. Furthermore, the black box testing results confirmed that all core system functions, including login, tax data entry, revenue monitoring, and percentage calculation, operated validly according to their intended specifications. These findings indicate that the research objective has been achieved and that the developed system directly addresses the research gap identified at the beginning of this study, namely the absence of a real-time, web-based monitoring system for local tax revenue realization.

For future development, it is recommended that the system be extended to cover other components of regional original revenue, such as levies, fund transfers, and general or special allocation funds, so that a more comprehensive regional financial monitoring platform can be achieved. Further research is also suggested to integrate the system with existing treasury and accounting information systems within the institution, in order to produce a fully integrated regional financial reporting mechanism. In addition, future studies may consider evaluating the system from the perspective of user satisfaction and usability, as well as testing its performance under a larger volume of transactions, to ensure its reliability for long-term operational use. With these developments, the proposed system is expected to serve not only as a monitoring tool for local tax revenue but also as a foundation for a more integrated regional revenue management system in Temanggung Regency and potentially in other regional government institutions facing similar challenges.

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