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Article

# Designing a Web-Based Online Opinion Polling System (Case Study: Kampar Regency Transportation Agency)

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**A B S T R A C T**

This study aims to design a web-based online polling system for the Kampar Regency Transportation Agency to improve the effectiveness and efficiency of gathering community aspirations. Public opinion is a crucial foundation for policy-making, particularly in supporting the "Smart Transportation System" initiative. The study was conducted using the Prototyping development model, which includes requirement gathering, quick design, and iterative evaluation. Data collection involved literature reviews, obersrvations, and interviews with agency officials to identify challenges such as geographical barriers and decentralized communication channels. The system was designed using Unified Modelling Language (UML), including Use Case, Activity, and Class Diagrams, to provide a structured blueprint for both the user interface and database. The results demonstrate that the transition from convetional to digital methods provides a centralized, transparent, and accessible platform for the public. The significance of this research lies in its contribution to local government digital transformation, ensuring that community feedback is systematically documented and accurately processed. This system serves as a scalable solution for enchancing public participation and supporting data driven policy evaluation in Kampar Regency.

## 1. Introduction

The implementation of public policy, both within government environments and organizations, demands accurate data collection through public opinion polls as a foundation for developing work programs. The Kampar Regency Transportation Agency (Dinas Perhubungan Kabupaten Kampar), aligned with the vision of the Regent of Kampar following the 2024 Asia-Pacific Intelligent Transport System forum, strives to encourage the development of inclusive and accessible land transportation facilities (Dishub, 2024). This policy is part of the transformation of Bangkinang City into a Smart City, which requires the Transportation Agency to balance it with a Smart Transportation System program. In this context, community responses and aspirations become a deterimining variable for the success of such policies.

However, the effectiveness of gathering aspirations in Kampar Regency is currently hindered by geographical conditions and convetional methods (Suryani et al., 2025). Based od 2024 data from the Central Bureau of Statistics (BPS), Kampar Regency covers an area of 11,289.28 $km^2$ with varying topography, ranging from lowlands to the Bukit Barisan mountain range. Current methods for collecting opinios-including official letters, direct audiences, or field surveys are considered inefficient for reaching a populations of 860,379 people spread across a wide area. A major issue is that only aspirations sent via official letters are administratively documented, while data from direct interactions and field surveys tend to go unrecorded in an organized system (Yurisdian, 2025). This complicates the use of data as a basis for sustainable policy evaluation.

The gap between the vast coverage area and weak data documentation requires an information technology based solution. Web based technology offers advantages in reaching users without time and space constraints, while enabling faster and more systematic data processing through integrated databases (Marwa, 2024). Through a digital platform, the community can participate in online polls, resulting in shorter data collection times and higher data accuracy compared to manual methods.

This research aims to design a web based online polling system for the Kampar Regency Transportation Agency as an effort toward the digital transformation of public services. The system is designed to provide a systematic, documented, and transparent medium for aspirations. With this system, it is expected that the process of absorbing community aspirations can run more efficiently to support the principles of information openness and public participation in transportation policy making in Kampar regency.

## 2. Literature Riview

### 2.1 Relevant Research

Research related on online systems has been conducted by Xueyun Ji (Ji, 2011) using UML modeling for analysis and design of a public opinion system with a layered object-based architecture. Simililarly, Namruddin (2013) developed a web-based universal polling software generator to serve as a decision-support instrument.

In Indonesia, the implementation of digital aspiration systems has been adopted by various local government agencies as a manifestation of e-government (Syafarudin & Haris, 2025). The Gorontalo Government, through the Communication and Information Agency, utilizes the Layanan Aspirasi dan Pengaduan Online Rakyat (LAPOR) application (Pakaya et al., 2023). Similar models have been implemented by the Population and Civil Registry Office of Medan City (Silaban, 2023) and Bogor City through the Sistem Informasi Berbagi Aduan dan Saran (SiBadra) (Santoso et al., 2024). Furthermore, the design of a community complaint system at the Palembang City Housing Agency renforces the trend of digitalizing public services (Septiani & Rahayu, 2024). This research focuses on developing a similar tailored to the specific needs of the Kampar Regency Transportation Agency.

### 2.2 Software Development Life Cycle (SDLC)

Structured software development requires a continuous sequence of activities. The Software Development Life Cycle (SDLC) is a general methodology used to ensure systems are built according to user requirements. Based on the theory by Valacich, George, and Hoffer (2009), there are four main stages in the SDLC.

1. Planning stage

This stage focuses on identifying requirements, planning, and developing a system development schedule, which is outlined in a feasibility study proposal. The process concludes a system investigation and

determination of the scope of work, which serves as a crucial foundation for the next stage.

2. Analysis

This stage emphasizes understanding the organization's core business processes to clarify system requirements. By comparing the old and new systems, the team can identify the costs, skills, and technology needed during the project.

3. Design

This stage converts the analysis results into logical system specifications that include input/output displays, reposts, databases, and computational processes. This design is theoretical (not tied to any particular device) and is presented in the form of diagrams or written reports as guidelines for constructing program code.

4. Implementation

This stage not only focuses on writing program code, but also ensures that the code passes testing according to specifications (requirements). After testing, the system goes through an installation process so that it is ready for use by users.

## 2.3 Software Design

Software design serves as a blueprint for the system solution to be developed. This stage includes high-level architecture and detailed designs that describe program algorithms and functionalities using specific programming languages. The detailed of the design are implemented using programming languages such as Java or C++ (O'Regan, 2017). The design process is carried out based on requirement specifications obtained through data collection. According to Budgen (2003), design effectiveness is determined by the balance between requirement details and the designer's in overcoming resource constraints and technical experience. The final output is a program description that serves as a guide for system construction. This can be seen in Figure 1, which illustrates the general software design process.

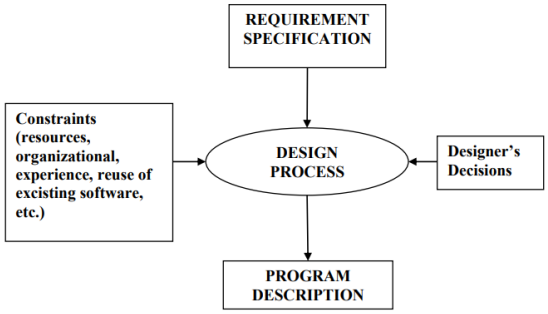



**Fig. 1.** Software Design Process (Budgen, 2003)

## 2.4 Unified Modelling Language (UML)

Unified Modelling Language (UML) acts as a standard modeling language in the information technology industry to visualize system designs. As an analogy, UML is a structural plan document that facilitates communication between developers and stakeholders (Bell, 2003).

UML can be a standard modeling language because it is independent of programming languages. Similarly, the notations used by UML are a language rather than a method, making them easier to understand.

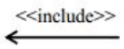
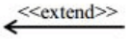
UML uses different diagrams to facilitate the understanding of the software being created. Among these diagrams, there are several standard diagrams that are most frequently used, namely: use case diagrams, class diagrams, sequence diagrams, and activity diagram.

1. Use case Diagram

This diagram documents the system's nature by illustrating functions (use cases), the entities interacting with them (actors), and their relationships (Quatrani, 2003). Actors, represented as stick men, reside outside the system, while use cases, depicted as ellipses containing verbs, represent the activities within the system. Communication lines connect actors and use cases to show their interactions. The notations used refer to the standards by Saiful (2014) as shown in Table 1.

**Table 1.** Symbol Use Case Diagram

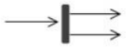
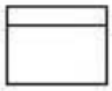
| Symbol | Name | Description |
|---|---|---|
|  | Actor | Specifies the set of roles that users play when interacting with the use case |
|  | Dependency | Dependency is a relationship in which chages to an independent element will |

| | | |
|---|---|---|
| | | affect other elements that depend on it |
|  | Generalization | A relationship in which a child object inherits the data structure and behavior (attributes and methods) of its parent object. |
|   | Include | Specifies that the source use case explicity. |
|   | Extend | Specifies that the target use case exrends the behavior of the source use case at a certain point. |
|  | Association | Connecting one object to another. |
|  | Use Case | A description of a series of system actions that provide tangible and measurable results for an actor. |

2. Activity Diagram

According to Munawar (2005), this diagram is a technique to describe procedural logic, business processnd workflows. While similar to flowchart, its primary advantage is the ability to support parallel processes. The symbol used in the activity diagram follow the standar by Suharni et al. (2003) as presented in Table 2.

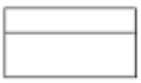
**Table 2.** Symbol Activity Diagram

| | |
|---|---|
|  | Initial<br>Initial of system activity, an activity diagram has an initial status. |
|  | Activity<br>Activities performed by the system, activities usually begin with the verb. |
|  | Decision<br>A branching association where more than one activity is combined into. |
|  | Join |
| | Association of the combinations where more than one activity is more than more. |
|  | Final<br>Final status of system activity, an activity diagram has an final status. |
|  | Swimline<br>Separating the business organization responsible for the activities that occur. |

3. Class Diagram

This diagram provides a static view of the system by displaying classes or packages and their relationships (Sholiq, 2006). It serves as a blueprint for developers to establish the system structure, including attributes and operations, before writing code. A single system may consist of several class diagrams to ensure optimal design. The symbols used in the class diagram refer to the standards by Suryani et al. (2025) as detailed in Table 3.

**Table 3.** Symbol Class Diagram

| Symbol | Name | Description |
|---|---|---|
|  | Generalization | A relationship in which a child object inherits the behavior and data structure of its parent object. |
|  | Nary Association | Efforts to avoid association with more than 2. |
|  | Class | A collection of objects that share the same attributes and operations |
|  | Collaboration | A series of system actions that produce tangible results for an actor |
|  | Realization | Operations that are actually carried out by an object. |
|  | Dependency | A relationship in which changes in an |

| | | |
|---|---|---|
| | | independent element affect the elements that depend on it. |
| | Association | One object connects to another object |

## 3. Research Methodology

This research adopts the Software Development Life Cycle (SDLC) method to ensure a systematic and structured development process. The SDLC approach used in this study of four primary stages: Planning, Analysis, Design, and Implementation. This methodology is chosen fo provide a clear roadmap from indetifying the problem at the Kampar Regency Transportation Agency delivering a functional web-based polling system.

### 3.1 Instruments and Materials

The development of the online polling system requires specific software instruments to ensure system's reliability and accessibility. The software instruments include web development tools and database management systems. The technical specifications of the tools used in research are summarized in Table 4.

**Table 4.** Technical Specifications of Development Tools

| Parameter | Specification |
|---|---|
| Programming Language | PHP, HTML5, Javascript, PHP |
| Framework | Laravel |
| Database Management | MySQL |
| Web Server | Apache |
| Modeling Tool | Unified Modelling Language |

### 3.2 Data Collection and Analysis

The research process was conducted through several stages of data collection and analysis to ensure that the system meets the requirements of the Transportation Agency and the community.

1. Planning

This stage involved identifying the necessary resources, defining the research objectives, and establishing a project timeline. Clear boundaries and scopes were set during this phase to ensure the analysis and subsequent development remained and efficient.

2. Analysis

Data collection was conducted through literature reviews, field ebservations, and interviews with stakeholders at the Kampar Regency Transportation Agency. This stage focused on identifying the core problems related to current conventional polling methods and analyzing user requirements. The result this stage is a set of system specifications (requirements) that align with the goal of creating a "Smart Transportation System".

3. Design

Based on the analisys, the system was designed by creating a conceptual model that includes the process flow, database structure, and user interface (UI). UML diagrams (Use Case, Activity, and Class Diagram) were utilized as the primary design blueprints. Interactive prototypes were developed at this stage to allow for rapid evaluation and refinement of the system's functionality.

4. Implementation

The final stage involved translating the designs into a web-based application using the specified programming tools. This phase did not only focus on coding but also included rigorous testing. During implementation, the system was tested against the initial requrements, and user feedback was collected to ensure all components functioned correctly and met the needs of the Kampar Regency Tranportation Agency.


**Fig. 1** Research Process

## 4. Results and Discussion

### 4.1 Requirements Gathering and Analysis

The development began with an intensive Requirements Gathering and Analysis phase. Key informants, including the Head of Development and Safety at the Kampar Regency Transportation Agency, identified three primary obstacles: decentralized aspiration channels, geographical barriers affecting accessibility for remote residents, and absence of a dedicated digital database for policy evaluation. To provide a structured solution, a PIECES analysis was conducted to compare the conventional system with the proposed web-based system, as shown in Table 5.

**Table 5.** PIECES analysis of the existing and proposed systems

| Analysis | Existing System (Manual) | Proposed System (Web-based) |
|---|---|---|
| **P**erformance | • Requires written documentation reports at the relevant agency<br>• Complete administrative requirements<br>• No need internet to communication | • Can be used anytime and anywhere<br>• Can be done online (complete)<br>• Must access the internet to be able to run system |
| **I**nformation | • Takes a long time to find out the results<br>• Information is not well documented<br>• Data and information are scattered | • Rapid dissemination of information through web publications<br>• Well-organized documentation of information<br>• Centralized and non-distributed data structure |
| **E**conomics | • High operational costs for transportation and office supplies<br>• Physical resource requirements, particulary specialized staff for handling | • Low operational costs, focusing only on intial system investment<br>• Human resource efficiency, requiring only one system administrator |
| **C**ontrol | • Lack of transparency and tracking | • Improved public trust<br>• Accurate data analys |
| **E**fficiency | • Slow manual recapitulation | • Automated process<br>• Traceable status |
| **S**ervice | • Limited by geographical reach | • Broad access<br>• High community participation |

### 4.2 Quick Design

Following the analysis, the Quick Design phase translated these requirements into a system architecture using UML. The system is

designed as a web-based platform with two primary user roles: the General Public and the Admin. The General Public can view news, fill out surveys, and submit feedback without loggin in. meanwhile, the Admin (Agency Staff) has full access to manage surveys, news, and community feedback via a secure login. The system's logical structure and workflows are visualized through the UML diagrams.

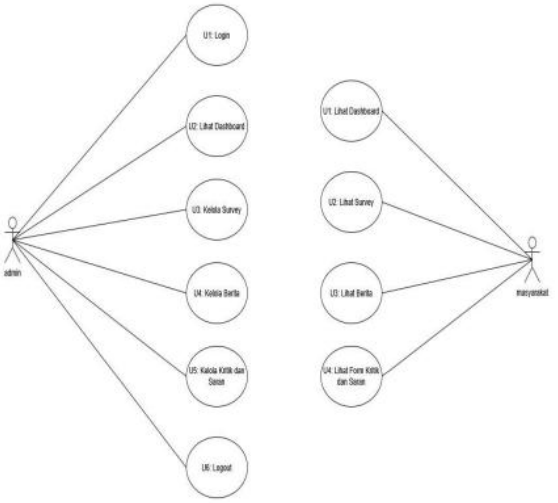



**Fig. 2** Use Case Diagram for Online Polling System

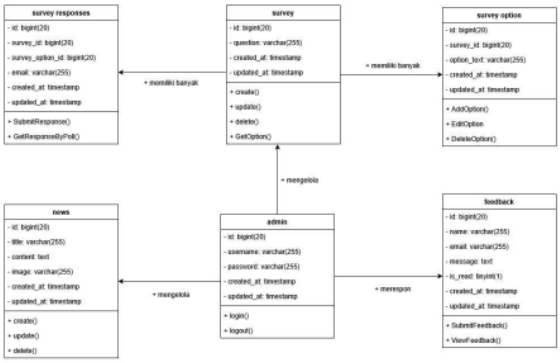



**Fig. 3** Class Diagram for Online Polling System

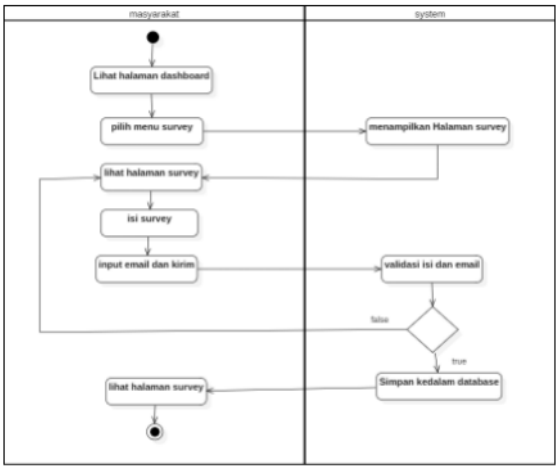



**Fig. 4** Acitivty Diagram Survey for Community

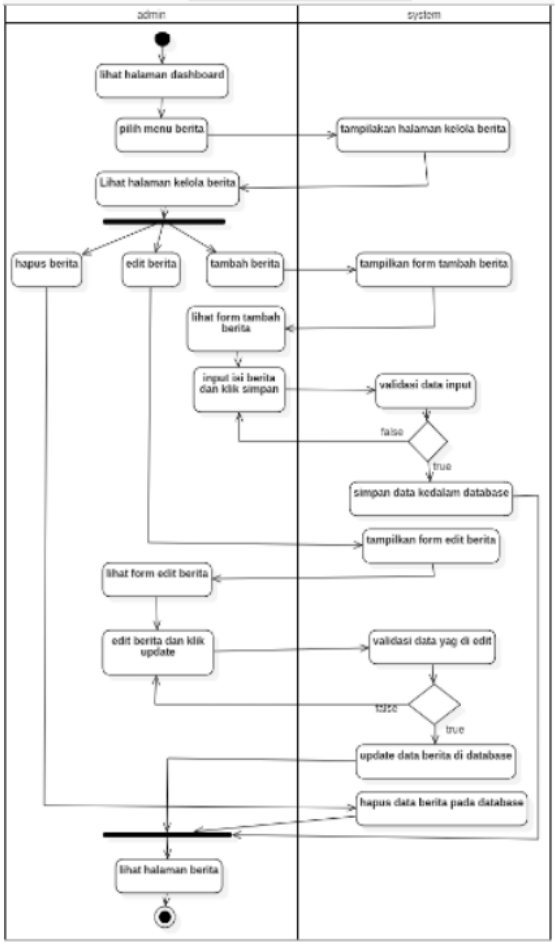



**Fig. 5** Activity Diagram Manage News for Admin

Meanwhile, the interface design is as follows:


**Fig. 6** Community Dashboard Interface Design


**Fig. 7** Community Surveys Display Design


**Fig. 8** Criticism & Community Suggestions Displays Design

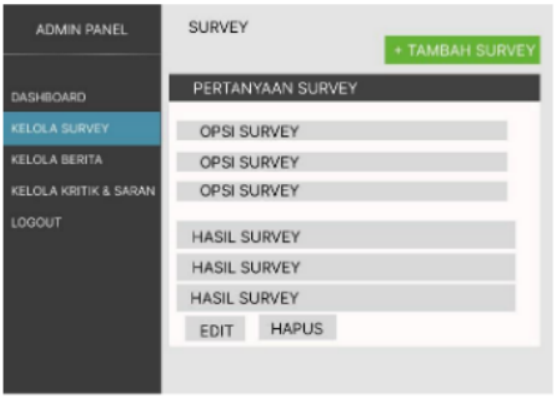



**Fig. 9** Survey Management Display Design Admin

### 4.3 Build Prototype

After Quick Design is approved, the next step is to create a prototype that will be used as a reference for creating programs or applications. Creating this prototype is essential before developing a system in order to have a clearer picture of the future. This prototype is created using the PHP Laravel Framework and MySQL.

### 4.4 User Evaluation

At this stage, the system, which has been developed in prototype form, is presented and tested by the Head of Devlopment and Safety at the Kampar Regency Transportation Agency and the community in order to obtain evaluation results.

### 4.5 Refining Prototype

Improvements were made and the system was developed based on the results obtained from testing conducted with the Head of Development and Safety of the Kampar Regency Transportation Agency and the community.

### 4.6 Implement Product and Maintain

At this final stage, the product will be manufactured on the final prototype, then the system will be tested by the Head of Development and Safety of the Kampar Regency Transportation Agency. Next is the maintenance stage to ensure that the system runs smoothly in accordance its features.

### 4.7 Discussion of Results

The findings indicate that the transition from a manual to a digital aspiration system significantly addresses the communication gap between the government and the community in Kampar Regency. As shown in the PIECES analysis (Figure 2), the web-based system enhances efficiency by automating resources. This aligns with the vision of transforming Bangkinang into a Smart City, where digital platforms serve as the primary bridge for public participation.

The implementation of the Prototyping model allowed for iterative feedback from the Kampar Regency Transportation Agency, ensuring that the system's features, such as the survey and feedback modules, are highly relevant to their policy-making needs. The centralized database established by this system solves the problem of undocumented aspirations mentioned by Yuristian (2025). By providing a transparent and accessible platform, the agency can now monitor public trends and respond to transport issues in real-time. This suggests that digital transformation in local government not only improves administrative speed but also strengthens public trust through better accountability and serveice accessibility.

## 5. Conclusion

This research, a collaboration between the Faculty of Engineering and the Kampar Regency Transportation Agency, has successfully designed a web-based online polling system. Developed using the Prototyping model and

UML modeling (Use Case, Activity, and Class diagram), the system effectively addresses geographical barriers and decentralized communication. The findings show that this digital transformation enchances efficiency and transparency in gathering community aspirations, providing a structured database for policy evaluation. This system supports the "Smart Transportation" initiative and serves as a scalable model for improving public participation and local government accountability.

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