Development of an online system for reporting service problems of state-owned companies

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Abstract. Several state-owned companies in Indonesia provide subscription services for the general public. One of them is the Regional Water Company as a provider of clean water. Handling service problems by the company affect customer satisfaction. This study aims to develop that online system for reporting service problems by following the Rational Unified Process stages, which are limited to the construction stage. The research successfully developed the system, which includes user activation functions, problem maps, as well as reporting and history of problems, and their handling. The system becomes a communication bridge between the company and the customer. Through this system, companies can see the condition of customers displayed in the form of icons and at several points of geographical location on the map. The green icon represents the condition of the customer who is not dealing with the problem, and vice versa is red. The yellow icon represents the condition of the customer whose issue is being handled by the company.

1. Introduction
The rapid population causes solving the problem of lack of clean water becomes essential [1]. In Indonesia, the solution to this problem includes RWC (Regional Water Company), which acts as a provider of clean water services. RWC, as a State-Owned Company, must guarantee the availability of clean water, so that customers do not complain. Research conducted in the district of Sukabumi shows that RWC's response to customer complaints affects customer satisfaction [2]. Research conducted in the city of Padang shows that the process of handling complaints, controlling decisions, ease of submitting complaints, time, and speed of response to problem handling affect customer satisfaction [3]. RWC needs to provide customer support services to handle customer complaints. The service can be run by RWC or an outsourcing company with a strong customer focus to have the motivation to meet customer needs [4].

Customer support services not only need to be effective in meeting user needs but must also be efficient in their implementation. The organization continually strives to provide efficient customer support services [5]. For example, universities achieve efficiency objectives by improving services and providing information using information technology [6] that includes software, hardware, networks, and data [7]. Self-service information access through various information technology platforms affects user satisfaction as information customers [8]. RWC can realize efficient customer support services by following the university's way, which is implementing information technology to increase customer satisfaction. Technology and innovation influence organizational success [9].
Previous research has shown how customers or users report problems to companies or organizations. Among them is by sending a problem report through an information system [10], email, IP-PBX system [11], or by making a ticket in an online reporting system [5]. The system shown by previous research has not yet visualized the customer's location and problem. Visualization can use Google Maps that displays objects (for example, customers) in the form of icons in specific locations [12,13] to indicate the problem [14]. This research aims to develop an online system for reporting problems and to monitor the problem locations with Google Maps. The question is, how can an online system with such specifications be in line with online customer complaint management?

2. Methods

Research stages include a literature survey to identify research gaps and contributions [15], stages of development with the Rational Unified Process to construct an online system [16], and reporting that ends at the publication activity. Stages of inception and elaboration in the development process use Unified Modeling Language techniques. Figure 1 shows the research stages covering its output.

![Figure 1. Research stages.](image)

In black-box testing, researchers will observe the system's reaction to user input activities. Program specifications become a reference in identifying system reaction errors [17]. In usability testing, researchers will measure user satisfaction [18] with questions whose answers cover the following five aspects:

- Learnability (Le): the speed of in using the system;
- Efficiency (Ef): quantity of resources use;
- Memorability (Me): the ability to remember;
- Error (Er): error intensity; and
- Satisfaction (Sa): comfortable level.

This study involved ten customers of RWC in the district of Garut as respondents. Customers will use the system and answer test questions. The customers will answer eight questions related to the overall appearance, application functionality, color selection, use of symbols and images, font selection, information presentation, layout, and navigation. Every aspect of each question item has an answer on the following Likert scale: Strongly Agree (SA), score 4; Agree (A), score 3; Disagree (D), score 2; and Strongly Disagree (SD), score 1. The formula to get the total score for each aspect of each question item is as shown in equation 1.
Total-Score = (SA total * 4) + (A total * 3) + (D total * 2) + (SD total * 1)  \hspace{1cm} (1)

Determination of the level of user satisfaction using the GN (Grand Mean) formula, which divides the total-Score average by the number of the respondent (N) as shown in equation 2.

\[ GM = \frac{\sum Total\ Score}{N} \]  \hspace{1cm} (2)

The conclusion of satisfaction level refers to the following rounding of GM averages: Very Satisfied, score 4; Satisfied, score 3; Neutral, score 2; Dissatisfied, score 1; Very Dissatisfied, score 0.

3. Results and discussion

The research team has conducted interviews with RWC SC (Subscription Relationship) staff in the district of Garut, Indonesia. SC staff explained that the process of reporting service problems by customers to him did not use information technology. Customers come to the RWC office and write their complaints on paper. SC staff recapitulate customer complaints in the general ledger and assign technicians to deal with the problem. The technician reports the results of the handling of the problem to the SC staff. Every once a month or once a year, SC staff makes a problem report for the SC chief.

The interviews showed three reporting activities: customer and technician to SC staff, and SC staff to SC chief. The relationship between the four actors, as shown in figure 2.

Staff enters the coordinates of the customer's home based on the survey results. After the customer successfully activates, a green emoji icon appears on the map at a location that matches the survey results. The icon turns red after the customer reports a service problem. The icon sets yellow after the staff assigns a technician to handle the problem. The icon turns green again after a technician successfully handles the problem. Emotion is an essential factor in communication [19]. The color display of the icon on the problem map, as shown in figure 3.
Customers can report service problems after successfully entering the system using the correct username and password, as shown in Figure 4. Previous research shows that the reporting process by customers ends in a success message. This research provides additional problem map features that indicate the location where customers are dealing with problems.

![Problem map interface](image)

**Figure 3.** Problem map interface.

![Sequence diagram](image)

**Figure 4.** Sequence diagram of reporting problems.

All black-box test scenarios for each activity carried out by the actor have met the expected results. All actors can see all points of problem location on the map. With information transparency, users can create pressure based on data that can trigger faster responses from companies that focus on customers. Companies will not let customers feel dissatisfied and spread their complaints in public space. SC can make general decisions by looking at all the problems that appear on the map.

Ten customers have filled out the questionnaire with answers that reflect their level of satisfaction with the online system. GM is determined for each category and aspect so that the results obtained, as
shown in table 1. Score 4 shows the average condition of customers who are very satisfied with their experience interacting with the online system.

| No | Category                      | Le | Ef | Me | Er | Sa | Avg |
|----|-------------------------------|----|----|----|----|----|-----|
| 1  | Overall Appearance            | 3.9| 3.4| 3.7| 3.9| 3.7| 3.72|
| 2  | Application Functionality     | 3.9| 3.7| 3.6| 4  | 3.9| 3.82|
| 3  | Color Selection               | 3.8| 3.9| 3.7| 4  | 3.7| 3.82|
| 4  | Use of Symbols and Images     | 3.8| 3.9| 3.9| 4  | 3.8| 3.88|
| 5  | Font Selection                | 3.7| 3.8| 3.8| 4  | 3.9| 3.84|
| 6  | Information Presentation      | 3.8| 3.9| 3.8| 4  | 3.8| 3.86|
| 7  | Layout                        | 3.8| 3.7| 3.8| 4  | 3.7| 3.8 |
| 8  | Navigation                    | 3.7| 3.8| 3.8| 4  | 3.8| 3.82|

Avg (Average) Satisfaction Score 3.82
Round Satisfaction Score 4

This study has paid attention to previous research, where this map feature can realize decision control, ease of complaint, and speed of handling problems that affect customer satisfaction [2,3]. This study also reinforces the opinion of previous research, which states that information technology can realize efficiency in improving services and providing information [6]. The online system increases the ease of access to customer service and transparent handling information, where customers can access it anywhere and anytime. All actors can make decisions quickly based on transparent information.

The online system can realize proper online customer complaint management by fulfilling 3T aspects, which include a timeline, transparency, and trust [20]. RWC needs to recruit people for the position of SC actors who can respond to the problem quickly. RWC must ensure that all customers can access this online system to achieve information transparency. SC staff must be kind when dealing with customers who confirm the progress of handling the problem.

4. Conclusion
This research succeeded in building an online system that can increase customer satisfaction. The problem map feature in the online system can realize information transparency that makes SC try to handle problems as quickly as possible so that customers do not submit their complaints in the public space based on that information. The application of this system in online customer complaint management will be successful if RWC places the right people in SC with the ability to respond to problem reports quickly and deal with customers with the right attitude. Future research must integrate communication technology with online systems so that the communication process between customers and SC staff is more efficient. All state-owned companies can use this online system after future research adds company objects to the design model.

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