

Development of a Web-Based Management Information System for Customer Complaints and Feedback

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Abstract: Small distributors often handle customer complaints through instant messaging, where complaint information is produced but not retained. Prior complaint-management systems are reported after the transition, for institutional users or structured datasets, without a measured account of the process they replace. This single-case study at a heavy equipment spare part distributor in Central Jakarta measures that pre-formalisation baseline and derives the system design and its evaluation indicators from it. Observation, WhatsApp history review and interviews with five staff and eight customers were triangulated into a case register with fixed counting rules: from January to March 2026 it held 70 complaints, of which 24 (34.3%) took more than three working days to resolve and 18 (25.7%) had histories administrators could not retrieve. A web-based system was developed through Rapid Application Development and tested with eight black box scenarios derived by equivalence partitioning. All scenarios produced the expected output, and each baseline problem has a corresponding capability at handover. These are functional and process-level results; no post-implementation data were collected and security, boundary, concurrency and volume testing were outside scope, so no improvement in service quality is claimed. The contribution is a measured baseline, a low-cost design traceable from each baseline problem to a tested function, and indicators with baseline values for later evaluation.

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Introduction

Complaints are among the few channels through which an organisation learns where its service has failed ([Kim & Kwak., 2023](#); [Sheth et al., 2023](#)), and resolution speed is a determinant of satisfaction ([Tedja et al., 2024](#); [Aboalghanam et al., 2024](#)). Complaint handling belongs to operational CRM, whose records analytical CRM aggregates into performance indicators; operational and organisational dimensions, not customer-centric intent alone, drive CRM performance ([Martinho et al., 2025](#); [Wang., 2023](#)), and IT affects performance through its organisational embedding ([Ranjan., 2023](#); [Park & Jung., 2025](#)). The organisation studied, a heavy equipment spare part distributor in Central Jakarta, receives complaints through the WhatsApp accounts and telephone lines used for sales, so recording is discretionary and no field records a complaint's state. Latency and loss of traceability are typical of such channels ([Lee & Zhao., 2024](#)), and small firms face cost and complexity barriers to digital customer-service tools ([Szwajca & Rydzewska., 2025](#)), which Indonesian small businesses address through simple, low-cost applications ([Nugroho et al., 2026](#)). Without classification, timing or a shared repository, management cannot see recurring failures, measure resolution performance or retain complaint knowledge.

Existing complaint-management systems address different situations (Table 1).

Table 1 Comparison of previous complaint-management studies with the present study

Study	Setting and users	Main capability	Pre-implementation baseline
Merang et al. (2022)	Water supply; utility customers	Web-based complaint submission and management	Not reported
Arizal et al. (2026)	Higher education; registered users	Login, verification, status updates, monitoring	Not reported
Nasrulloh et al. (2025)	Public complaints	Naive Bayes topic classification after submission	Not reported
Lee & Zhao (2024) ; Kim & Kwak (2023)	Structured complaint or review datasets	Data mining, control charts, importance-performance analysis	Dataset presupposed
Shuja et al. (2023)	Single firm (teaching case)	Move from disintegrated handling to e-complaint system	Not reported as indicators
This study	Spare part distributor; business customers via sales channels	Capture without registration; mandatory category and invoice; administrator-only state changes	Measured: 70 cases, three indicators (Table 2)

Source: Authors' synthesis of the cited studies (2026)

These studies presuppose an institutional user base that can be asked to register or a structured dataset, report the system after the transition rather than a measured baseline before it, and are not set in spare part distribution, where business customers report item mismatch, delivery delay and loss in transit through sales channels. The gap is therefore the absence of a measured account of complaint handling in a small distributor before formalisation, linked to the design decisions and indicators a supporting system must provide. The novelty lies in that link rather than in the software: each measured problem is traced to a requirement, a function, a test and an indicator with a baseline value (Tables 6 and 7). Three design decisions follow from the baseline: capture without registration, so occasional business customers are not deterred; mandatory classification and invoice reference at capture, so complaints can be aggregated without a training corpus; and restriction of every change of state to authenticated administrators.

The research objectives are (1) to establish a measured baseline of the existing process and its managerial consequences, and (2) to evaluate whether the system provides a tested capability for each baseline problem and to define indicators, with baseline values, for later measurement of its effect. The development objective is to build the system through Rapid Application Development (RAD), chosen against alternative methods in Table 3. Effects on resolution performance and service quality are outside the scope of this study and are not claimed.

Research Method

Research Design

The study used a qualitative descriptive design within a single case ([Sandelowski, 2000](#); [Yin, 2018](#)) to establish what the complaint process is, where it breaks down and what a system must provide. Because no complaint records existed, the quantitative baseline was not drawn from a dataset but generated by the researcher as descriptive counts during observation and message-history review, reported as frequencies and percentages without inferential statistics.

Research Setting and Participants

The research ran from January to July 2026; baseline data were collected from January to March and the system was handed over on 30 June 2026. Participants were selected purposively. The five company participants (the owner-manager and four administrative staff with two to six years of service, each with at least six months of complaint handling) are all the personnel who handle complaints, so the company side was covered completely. Eight customers from five companies, each with at least one complaint in the preceding twelve months, were chosen to cover the three complaint types observed (item mismatch, delivery

delay, loss in transit). Adequacy was judged by information power, which is high for a narrow aim, specific first-hand experience and case-specific analysis (Malterud et al., 2016), and by saturation (Guest et al., 2006): interviewing stopped when two consecutive interviews in each group added no new process step, breakdown point or requirement. The quantitative baseline does not depend on the number of interviewees because it covers every case in the window.

Data Collection and Baseline Measurement

Data were collected from three sources and processed in four stages (Figure 1).

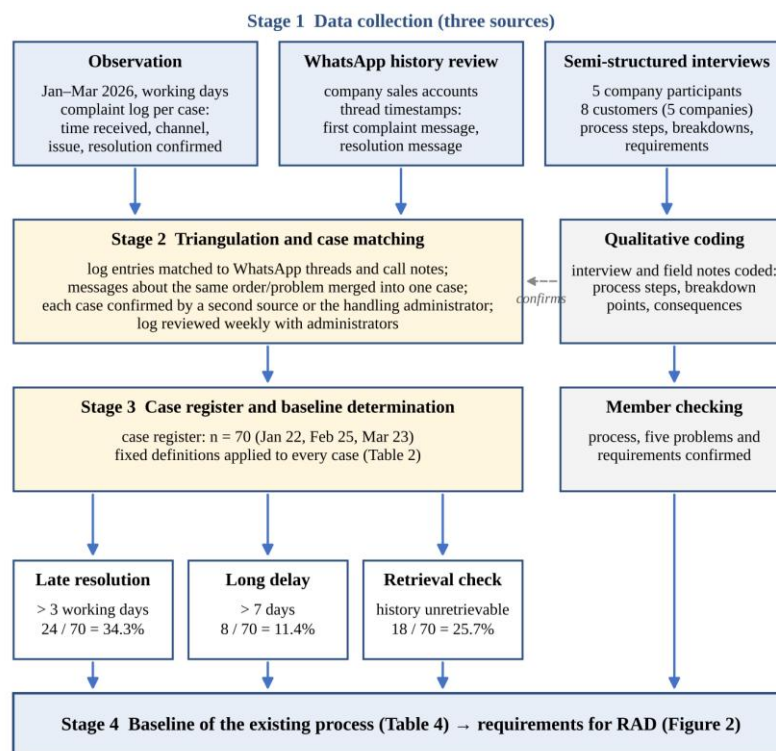


Figure 1 Data collection, triangulation and baseline determination procedure

In Stage 1, the researcher, as a non-participant observer on working days, logged every complaint as it arose (date and time, channel, administrator, customer, invoice reference, problem and, later, confirmed resolution date); complaints outside observed hours were taken from the WhatsApp accounts and administrators' next-day reports. The WhatsApp review extracted the timestamps of the first complaint and resolution messages of each thread, and interviews covered how complaints are received, recorded and closed, where the process fails and what a system should provide.

In Stage 2, each log entry was matched with its WhatsApp thread or, for telephone complaints, the administrator's call note. Messages and calls about the same order and problem were merged into one case, and an entry was retained only if it met the definition in Table 2 and was confirmed by a second source (a message trace or the handling administrator). The log

was reviewed weekly with the administrators, and discrepancies were settled in favour of the timestamped message record. In Stage 3, the fixed definitions in Table 2 were applied to every case in the register. Retrievability was tested at the end of the window by asking the handling administrator to locate each case's complete conversation in any company account; the resolution times of the 18 cases that failed had been recorded in the log while they were open, so all 70 cases contribute to the timing indicators.

Table 2 Derivation of the baseline indicators from the raw data

Indicator	Counting rule	Verification sources	Result (Jan–Mar 2026)
Complaints recorded	One case per customer problem with an order, item or delivery; repeated contacts on the same problem merged	Log matched with WhatsApp thread or call note; weekly review	70 (22, 25, 23 per month)
Late resolution	More than three working days from first contact to confirmed resolution	Log and WhatsApp timestamps	24 of 70 (34.3%)
Long delay	More than seven days from first contact to confirmed resolution	Log and WhatsApp timestamps	8 of 70 (11.4%)
Unretrievable history	Complete conversation not locatable in any company account at window end	Retrieval check by administrators	18 of 70 (25.7%)
Classification and reporting	Any complaint category or report produced	Company records; interviews	None

Source: Authors' case register, January–March 2026

In Stage 4, interview and field notes were coded into process steps, breakdown points and consequences, linked to the case counts that evidence them (Table 4), and confirmed by the participants before design began (Lincoln & Guba., 1985). Because the baseline was recorded by the researcher, its validity rests on definitions fixed before counting, second-source confirmation of every case, weekly review with the administrators and confirmation of the final counts by the owner-manager. As the log depends on a single observer, a telephone complaint neither observed nor reported would be missing, so the counts are a lower bound of complaint volume.

System Development Procedure

The method had to suit four conditions: (C1) undocumented requirements; (C2) non-specialist users who judge needs better against prototypes; (C3) user validation at each stage to keep the system traceable to the baseline; and (C4) one developer and a short window. Table 3 compares RAD with the alternatives used for comparable systems.

Table 3 Comparison of system development methods against the conditions of the case

Method	Fit with conditions C1–C4
Waterfall	Conflicts with C1 and C2: requirements must be fixed in advance and users see the system only at the end
Prototyping	Meets C1 and C2 but lacks defined construction, testing and cutover stages (C3)

Method	Fit with conditions C1–C4
Extreme Programming (Mahardika & Syafrullah, 2026)	Meets C1, but pair programming and an on-site customer are not feasible with one developer and part-time users (C4)
Scrum	Meets C1, but roles and sprint ceremonies are disproportionate to a single-developer project (C4)
Design thinking (Mahardika et al., 2025)	Strong for C1 and C2, but ends at a validated concept and needs another method for construction
RAD (Martin, 1991 ; Anggraeni et al., 2026)	Meets C1–C4: prototype-based user design with defined construction, testing and cutover stages that map onto the research objectives

Source: Authors' analysis (2026)

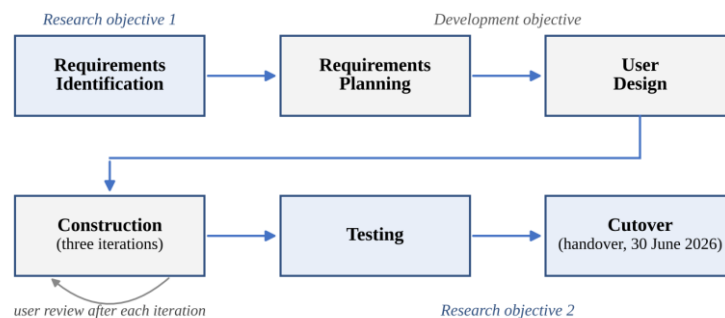


Figure 2 Research stages using the Rapid Application Development method

In Figure 2, Requirements Identification answers the first objective (Table 4); in Requirements Planning each problem became functional requirements confirmed with users; User Design produced a use case diagram, an entity relationship diagram and interface prototypes reviewed with users ([Mubarok et al., 2026](#)); and Construction ran in three iterations, each closed by a user review. Testing and Cutover answer the second objective; the system (PHP, Laravel, MySQL, shared hosting) was handed over on 30 June 2026.

Evaluation Procedure

Functional conformity was assessed by black box testing with equivalence partitioning ([ISO/IEC/IEEE., 2021](#)). The functions under test were the six that create or change a stored record or control access: login, complaint submission, evidence attachment, status update, response and deletion; read-only views were checked through these scenarios' outputs. Each function received a valid partition, and an invalid partition was added where free input is specified to be rejected (login credentials and required form fields), giving six valid and two invalid scenarios (Table 5). A scenario passed only when the actual output, including the message shown and the stored record, matched the expected output. Scenarios were run with test data during cutover.

Results and Discussion

Baseline of the Existing Process

All complaints were received through WhatsApp and telephone, recorded at the discretion of the receiving administrator, and monitored through no mechanism. Table 4 summarises the findings, the baseline evidence derived in Table 2 and their managerial consequences.

Table 4 Observation findings on the existing process and their managerial consequences

No	Observation finding	Baseline evidence (Jan–Mar 2026)	Managerial consequence
1	Complaints received through WhatsApp and telephone, interleaved with sales conversations	70 complaints in three months (22–25 per month)	No central record, so complaint volume cannot be counted and no indicator computed
2	Complaints recorded manually at the discretion of the receiving administrator	No complete written record; coverage unknown	Any derived measure is unreliable
3	Complaint resolution status not held in any system	24 of 70 cases (34.3%) resolved after more than three working days; eight after more than seven days	Workload and backlog invisible to management; customers must contact staff
4	Complaint history retrieved by searching individual chat conversations	18 of 70 histories (25.7%) unretrievable	Knowledge is personal and lost on turnover
5	No complaint classified and no complaint report produced	No categories or reports exist	Frequent failure types cannot be identified, so corrective effort cannot be prioritised

Source: Authors' observation and interviews, January–March 2026

Table 4 describes one condition: the process generates information it does not retain. An unretrievable history is more serious than late resolution because the complaint lies permanently outside management's view, so completeness of capture takes priority over speed of response (Kim & Kwak., 2023; Lee & Zhao., 2024).

System Design

The system has two actors (Figure 3). Customers submit complaints and view their history, status and responses without authenticating; administrators must log in before changing any record. Registration would protect integrity but suppress reporting by less committed customers and bias the indicators.

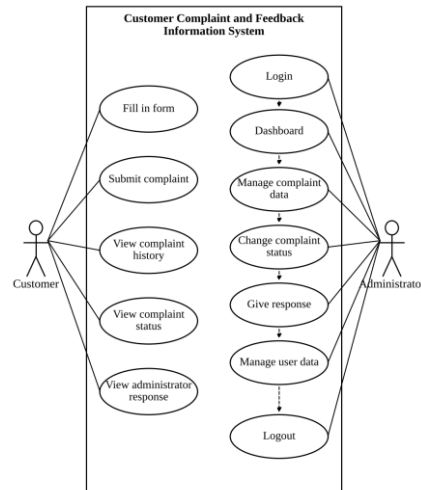


Figure 3 Use case diagram of the customer complaint and feedback management information system

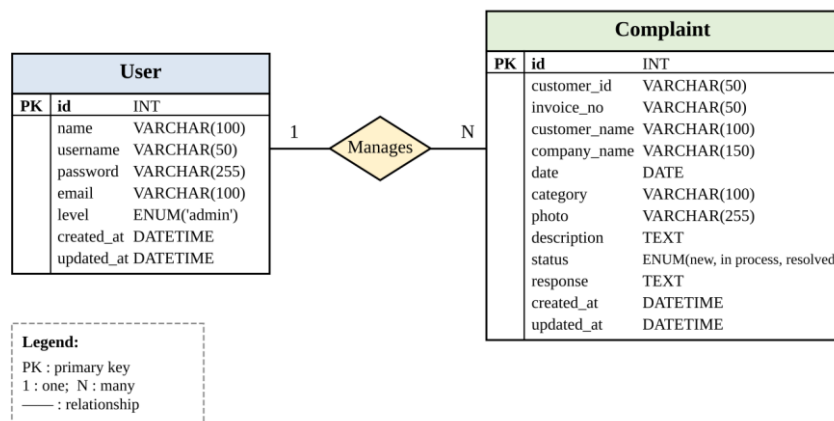


Figure 4 Entity relationship diagram of the complaint and feedback management information system

Figure 4 (attribute names translated from the Indonesian schema) has two entities linked one-to-many: User holds the administrators, and Complaint holds customer and invoice references, category, photo, description, status (new, in process, resolved) and response, so category and resolution latency become computable attributes (Nilashi et al., 2023; Elshaer et al., 2024). Only the latest status and response are kept; a full audit trail requires separate Response and Status History entities, specified as the first extension of the design.

Implementation

The complaint form (Figure 5, in Indonesian for its users) captures customer ID, invoice number, names, date, category (drop-down), evidence file and description, addressing problems 1, 2 and 5 in Table 4. The dashboard (Figure 6) shows total, in-process, resolved and rejected complaints with recent activity, addressing problem 3. It was captured at handover with test data and a single record, so it shows that the aggregation works, not how the dashboard performs under real operating conditions.

Figure 5 Implementation of the customer complaint and feedback form page

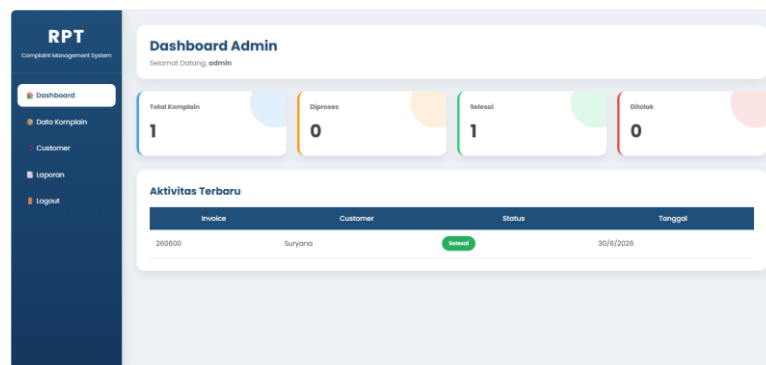


Figure 6 Implementation of the administrator dashboard page (at handover, test data)

Evaluation Results

All eight scenarios produced the expected output, including the two negative cases (scenarios 2 and 4) (Table 5).

Table 5. Test scenarios, success criteria and results of functional conformity testing

No	Function (partition)	Test input	Expected output	Actual output	Result
1	Login (valid)	Registered username, correct password	Dashboard shown; session established	As expected	Pass
2	Login (invalid)	Wrong password; empty fields	Access refused; error message; no session	As expected	Pass
3	Submission (valid)	All required fields valid	Record stored with reference, category, status "new"	As expected	Pass
4	Submission (invalid)	Required fields empty	Rejected; missing field identified; no record	As expected	Pass
5	Attachment (valid)	Image of accepted type	File stored and linked to record	As expected	Pass
6	Status update (valid)	Status selected by administrator	Status updated in customer view	As expected	Pass
7	Response (valid)	Response text by administrator	Response stored; shown in history	As expected	Pass

N o	Function (partition)	Test input	Expected output	Actual output	Result
8	Deletion (valid)	Deletion by administrator	Record removed from database and summaries	As expected	Pass

Source: Authors' testing at handover (2026)

Testing limitations. These results show conformity for representative inputs only. Not tested were boundary values (e.g. field-length and file-size limits), invalid or malicious attachments, security (SQL injection, cross-site scripting, brute-force login, guessing of complaint references), concurrent updates by two administrators, performance at large volumes, and the user-management and logout functions. Robustness, security and performance are therefore not demonstrated, and the tests are not evidence of operational effectiveness.

Table 6 Traceability from baseline problems to functions, tests and capabilities verified at handover

Problem (Table 4)	Implemented function	Test	Capability verified at handover
1 Dispersed channels	Complaint form stored in one database	3, 5	Complaints stored centrally with a reference number
2 Discretionary recording	Required fields; incomplete submission rejected	3, 4	Incomplete complaints cannot be stored
3 Status not held	Status attribute; dashboard; customer status view	6, 7	Status and responses stored and shown to customers
4 History not retrievable	History and response view by reference	3, 7	Complaint and response retrievable by reference
5 No classification or report	Mandatory category and invoice number	3, 4	Every record carries a category and invoice (report menu not tested)
Access control	Administrator login	1, 2	Invalid credentials refused (direct page access not tested)

Source: Authors' analysis (2026)

Every problem in Table 4 has a capability that worked at handover (Table 6), but these are functional and process-level results only: without post-implementation data, faster resolution, fewer lost histories, dashboard use or better service quality are not shown.

Discussion

Three trade-offs qualify the results. First, unauthenticated submission increases coverage but permits false or duplicate submissions, and reference-based retrieval exposes content to anyone who guesses a reference. Invoice number and customer ID allow screening at 22 to 25 complaints a month, but non-guessable retrieval tokens, customer–invoice matching, rate limiting or CAPTCHA, attachment validation and layered hosting protection ([Ratih, Moniroh, & Mahardika., 2025](#)), together with security testing, are prerequisites for operational use.

Second, customers may classify complaints inconsistently, distorting category-based indicators. The category list should be short and plainly defined, administrators should be able

to correct a category while retaining the original, and classification accuracy should be measured; automated text classification ([Nasrulloh et al., 2025](#); [J. Purwanto et al., 2026](#)) and sentiment analysis ([R. Purwanto et al., 2026](#)) could later check customer-selected categories.

Third, the deletion function (scenario 8) is the main integrity weakness: it removes a record permanently and without trace, so a complaint can vanish from the indicators. It should be replaced by soft deletion (record voided with reason, time and administrator and excluded from summaries) with Response and Status History entities so that every change is attributable; until then it should be restricted to the owner-manager.

Managerial Implications and Follow-up Evaluation

The case is consistent with the finding that operational and organisational dimensions drive CRM performance ([Martinho et al., 2025](#); [Wang., 2023](#)): the company was customer-centric in intent but lacked the layer that turns responses into a record. The system supplies the informational precondition for analytical CRM, but its use by management was not observed; whether reporting routines are adopted is an organisational question ([Ranjan., 2023](#)).

Table 7 is an evaluation design, not a result: only the baseline column was measured. A follow-up of at least twelve months of operational use should compare these indicators with the baseline.

Table 7 Evaluation design: follow-up indicators and baseline values (not results of this study)

Indicator	Baseline (Jan–Mar 2026)	Data source after implementation
Resolution within three working days	65.7% (46 of 70)	Status timestamps (needs Status History)
Resolution after more than seven days	11.4% (8 of 70)	Status timestamps (needs Status History)
Retrieval completeness	74.3% (52 of 70)	Retrieval check on a sample of records
Complaint volume per month	22–25 (lower bound)	Complaint records by date
Classification accuracy; backlog	Not measurable	Corrected category; status field
Attributable changes	Not measurable	Audit trail (to be implemented)
Satisfaction; use of reports	Not measured; none	Post-resolution survey; meeting records

Source: Authors' evaluation design (2026)

Conclusions

This study measured the complaint process of a small spare part distributor before formalisation. From January to March 2026 the case register held 70 complaints: 24 (34.3%) took more than three working days to resolve, 18 (25.7%) had unretrievable histories and none was classified, so the principal defect was the absence of a retained record. The system developed through RAD answers each baseline problem with a specific capability, and all eight

black box scenarios produced the expected output. This establishes functional conformity and process-level change at handover, not faster resolution or better service quality, which were not measured; security, boundary, concurrency and volume behaviour remain untested. The study is limited to a single case evaluated at handover. Its contribution is a documented pre-implementation baseline, a low-cost design traceable to it, and indicators with baseline values for judging the system's effect. Future work should add soft deletion and an audit trail, test security and load, and measure the indicators over at least a year of use.

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