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Performance Measurement of the Info BMKG Application Using the Information Technology Infrastructure Library (ITIL) V.4 Framework

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***Abstract*:**

The Meteorology, Climatology, and Geophysics Agency (BMKG) provides information to the public through the Info BMKG mobile application. This app delivers data on earthquakes, early warnings, weather, climate, and other meteorological topics. Observations, interviews, and user reviews from the Google Play Store highlight several issues. These include an unstructured display, inaccurate location information, and delays in earthquake notifications. To address these, the application's performance was evaluated using the ITIL V4 management practices. The assessment collected questionnaire data from internal users, stakeholders, and the public. Analysis showed an average maturity level of 4.56, with the largest gap (0.76) in service desk management. Recommendations for improvement were provided for each management activity. These aim to ensure best practices in the application. With these findings, the Info BMKG app is seen as applying continuous improvement practices based on ITIL V4, supporting IT integration, and enhancing organizational quality, efficiency, and adaptability.

INTRODUCTION

Information Technology (IT) now impacts various sectors and significantly influences organizations. It supports operational activities and business processes in companies and institutions [1]. Effective IT service management is essential. It ensures the sustainability of technology by allowing proper monitoring and efficient operation [2]. The proper function of these services, as seen by users, is a critical factor. The Meteorology, Climatology, and

Geophysics Agency (BMKG), a non-ministerial government body, provides public information through the Info BMKG app. Weather, climate, earthquakes, early warnings, and other BMKG-related issues are accessible through the app [3]. Based on observations and interviews, as well as user feedback in the comment section of the Info BMKG application on the Google Play Store, several issues and complaints have been identified. These include disorganized screen layouts, inconsistent interface placement, and delays in real-time earthquake notifications. These issues raise concerns regarding user experience, perception, and responsiveness of the Info BMKG application's information services.

Currently, the Info BMKG application is used by hundreds of users from various backgrounds. These users include the general public and relevant stakeholders. As dependence on this service continues to increase, continuous efforts are needed to maintain its quality and reliability. An important step is to conduct objective and structured performance measurement of the application. To support this process, organizations may adopt best practice frameworks. One framework is the Information Technology Infrastructure Library (ITIL) Version 4, which is widely used as a reference in the management and improvement of IT services across institutions [4]. Research on measuring the maturity level of IT services has been widely conducted in various institutions. Similar implementations can be found in fertilizer companies [5], small and medium enterprises (SMEs) [6], ticketing services [7], e-ticketing applications [8], and academic administration and e-learning systems [9][10]. Other examples include layanan TI [11][12][13] and government institutions [14]. These studies generally use the ITIL framework as a tool for evaluating maturity levels. ITIL has proven effective in identifying improvement gaps across diverse organizations.

At the operational echelon, IT service maturity assessments have been extensively deployed across diverse sectors, including corporate IT operations [15], asset management [16], e-Government architectures [17, 18], and public service platforms [19, 20]. While prior scholarship has successfully utilized various ITIL domains to address institution-specific challenges—ranging from incident management at PT. Pupuk Sriwidjaja to service quality enhancements for ticketing and e-learning systems like Dyandra Global Edutainment [5], [7], Ferizy [8], and UNITOMO [10]—these studies often remain localized to commercial or educational contexts. Recent investigations into municipal platforms, such as the Tangerang LIVE and MyPertamina applications [14, 19], have further expanded the scope of maturity and gap analyses; however, a critical research gap persists regarding specialized environmental information systems. This study bridges that lacuna by applying the ITIL V4 framework to the Info BMKG Application. By synthesizing maturity level assessments with rigorous gap analysis, this research extends the implementation of ITIL V4 into the high-stakes domain of public weather and meteorological information systems—a sector where service reliability is not merely an operational goal but a matter of public safety.

METHODS

This study begins with data collection through surveys and interviews with Info BMKG application users, using both qualitative and quantitative approaches. Next, the study determines service maturity level and identifies gaps. Then, improvement recommendations are formulated using five key ITIL V4 practices. The implementation of these practices is adapted to the real-time disaster information service qualities of Info BMKG. Specifically, three key adaptation steps are followed: (1) the study purposefully selects high-impact ITIL service domains that match Info BMKG's real-time requirements; (2) ITIL processes are streamlined to fit the application's operational flows for timely information delivery; and (3) evaluation

indicators are recalibrated to reflect the application's emphasis on speed, reliability, and public communication. All adaptations are evaluated within the service management assessment framework presented in Figure 1. This approach ensures that standardized ITIL service domains are contextually tailored to the distinct requirements of meteorological information services.

The resulting conceptual mapping, detailed in Table 1, ensures the assessment reflects meteorological system operations. Specifically, Incident Management addresses disruptions like weather data delivery latency. Service Request Management focuses on the high public demand for precise forecasts. To capture the life-critical nature of the service, Service Level Management emphasizes speed, accuracy, and reliability. Availability and IT Service Continuity Management are combined to measure system resilience in high-stress situations. These include extreme weather events and disasters, where uptime supports public safety and disaster mitigation.

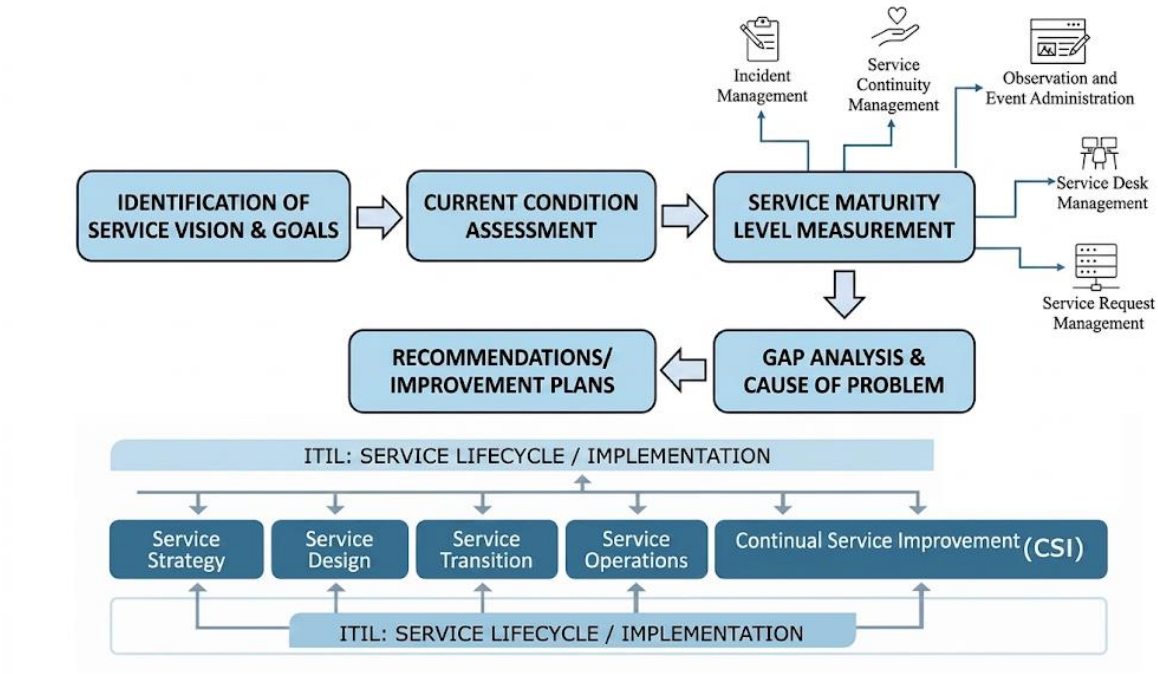

Figure 1. ITIL V4-Based Service Management Assessment Framework

Table 1. Modification of ITIL Indicators into the BMKG Context

ITIL Domain	Standard ITIL Indicator	Modified Indicator (BMKG)
Incident Management	Mean Time to Resolve (MTTR)	Response time to weather information disruptions
Service Request	Request fulfillment time	Response speed for weather data requests
Service Level Management	SLA compliance (%)	Availability level of real-time weather information
Availability Management	System uptime	Application service availability during extreme weather conditions
IT Service Continuity	Recovery time	System resilience during network disruptions/disasters

Identification of Service Vision and Objectives

At this stage, the study first identifies the primary issues in the application, such as access constraints, service disruptions, or mismatches between features and user needs. Using these findings, the direction of evaluation is established. The application's role in supporting the organization's vision and mission is clarified. Service objectives and stakeholders, including critical success factors, are identified. The study defines the scope of measurement, focusing on access reliability, notification speed, usability, and information security. These steps ensure the evaluation process is structured and aligned with user needs and organizational goals.

Assessment

At this stage, a survey uses questionnaires distributed to application users. The aim is to get an objective view of existing service quality. The collected data cover service availability, feature reliability, response speed, usability, and user satisfaction. This data helps map current service conditions. It also identifies areas that meet expectations and those needing improvement. These results provide a valid basis for measuring maturity levels, doing gap analysis, and formulating improvement plans.

Measurement of Service Maturity Level

At this stage, the study evaluates five service management areas of the Info BMKG application: Incident Management, Event Observation and Administration, Service Continuity Management, Service Desk Management, and Service Request Management. Incident Management assesses the handling of disruptions and incident reporting. Event observation and administration include monitoring, issue resolution, and responses from developers and management. Service continuity management evaluates access reliability and performance in meeting user needs. Service desk management is assessed by response speed and ease of user access to operators. Service request management covers handling complaints, service requests, and assessing user needs. The results form the basis for assessing maturity before gap analysis and improvement recommendations.

Gap Analysis and Root Cause Identification

At this stage, the study compares measured service maturity levels with ideal conditions based on IT service management best practices. The goal is to identify gaps between Info BMKG's current services and the expected targets for each domain. The study also analyzes the root causes of these gaps, including technical aspects, policies, procedures, and human resources. These findings form the basis for improvement recommendations and action plans.

Recommendations / Improvement Plan

At this stage, strategic recommendations are made to address identified service gaps. Each recommendation is based on the root cause analysis within the service domains: incident management, event observation and administration, service continuity, service desk, and service request management. All recommendations align with IT service management best practices. This ensures practical implementation and supports continuous improvement of the Info BMKG application services.

Data Collection

Respondents in this study come from three main groups: internal users, stakeholders, and general users of the Info BMKG application. The study uses purposive sampling.

Respondents are chosen based on specific criteria relevant to the research, mainly people with direct experience using or interacting with Info BMKG. The total number of respondents in this study is N. There are 30 internal users (25%), 18 stakeholders (15%), and 72 general users (60%). The sample size is determined using the Slovin formula with a 5% margin of error. This follows the minimum sample size approach for quantitative research.

Data Analysis

The questionnaire data are analyzed using a maturity level assessment based on ITIL V4 management practices. Each item is measured using a Likert scale and mapped to the corresponding maturity level indicator. Each maturity level value is calculated by averaging responses from all respondents. To identify improvement priorities, a gap analysis compares the current and expected maturity levels for each management practice. The results show which areas need improvement to enhance IT service management effectiveness in the Info BMKG application.

RESULTS AND DISCUSSION

Questionnaire Distribution

The ITIL V4 framework was used to adapt the questionnaire to its service management practices. ITIL V4 is a set of best practices for IT service management. These practices were chosen because they suit measuring service management maturity. The questionnaire was then distributed to 100 respondents, including internal BMKG staff, stakeholders, and the general public. Four Heads of Technical Implementation Units (KUPT) validated the questionnaire items. Table 2 lists the items developed from ITIL V4 [2]. Before collecting data, we tested the questionnaire for validity and reliability to ensure each item accurately measured the research variables. Validity testing used the Pearson Product-Moment correlation, which measures the linear correlation between two variables. Reliability testing used Cronbach's Alpha coefficient, which indicates how consistently a set of items measures a concept. The questionnaire was valid since correlation values exceeded the r-table threshold [21] and reliable because Cronbach's Alpha was greater than 0.70.

Maturity Level Assessment Scale

The maturity level assesses how well an organization implements IT management procedures. A higher maturity level means better operation, more efficient IT resource use, and stronger risk mitigation. According to ITIL V4, IT service management maturity levels range from Level 1 (Initial) to Level 5 (Optimizing). These levels reflect progress in IT governance to support organizational goals [8]. During assessment, questionnaire data are used to calculate average scores for each practice and activity. The response percentages for each question then determine the maturity level of each subdomain, according to Levels 1 to 5.

Analysis of Results Using ITIL V4

a. Initial Identification

This study uses the ITIL V4 framework to assess system services for internal BMKG personnel, stakeholders, and the general public through the Info BMKG application. To provide a comprehensive evaluation, it focuses on practices such as Incident Management (handling and resolving service interruptions), Monitoring and Event Management (detecting and responding to system events), Service Continuity Management (ensuring services continue during disruptions), Service Desk Management (managing customer inquiries), and Service

Request Management (handling user requests for services).

Table 2. Questionnaire Instrument

No.	User Questionnaire Instrument
1	Incident Management
	Disruptions occur when using the Info BMKG application.
	Scope of incident management within the Info BMKG application.
	Details related to reported incidents.Monitoring and Event
2	Monitoring and Event Management (Observation and Event Administration)
	Periodic service monitoring.
	Problem resolution within the Info BMKG application.
	Responsiveness of management and developers.
	Guidelines, principles, and fundamental concepts of monitoring and administration.
	Policies and scope are defined within the Info BMKG application.
3	Service Continuity Management
	Long-term and reliable access to the Info BMKG application services.
	Service performance.
	Fulfillment of user needs.
4	Service Desk Management
	Availability of a contact center for complaints.
	Service response time in case of disruptions.
	The effort and responsiveness of the contact center to provide services.
	User access to developers and service operators.
5	Service Request Management
	The Info BMKG application system services are accessible when needed.
	Handling of system complaints and service requests.
	Identification and evaluation of user requirements.

Following data collection and analysis, several issues were identified:

1) Issues Experienced by Internal BMKG
   Problems arise when earthquake-related information is required, as several seismic events are not displayed in the Info BMKG application. Consequently, cross-verification must be conducted with the BMKG earthquake center or local geophysical station (UPT) to validate earthquake information reported by the public.
2) Issues Experienced by Stakeholders
   Stakeholders have reported concerns about early warning systems for severe weather and earthquake alerts. Early warnings for severe weather are not yet part of the Info BMKG application. Instead, local BMKG units send them via WhatsApp groups. This indicates a need to enhance the application to directly incorporate such warnings. Also, earthquake alarms within Info BMKG do not always activate. This highlights the need to improve the timely delivery of seismic information.
3) Issues Experienced by the General Public
   User feedback in the Google Play Store reflects community responses. However, issues remain, including a disorganized interface, improper feature placement, and delays in real-time seismic alerts. These problems relate to user perception, responsiveness, and the overall experience. They may reduce user comfort and understanding when using the application.

b. Questionnaire Analysis

At the questionnaire analysis stage, users of the Info BMKG application—including BMKG personnel, stakeholders, and the general public—answered a structured set of questions. The team compiled 100 responses to calculate maturity level values. The analyzed questionnaire data determined the application's maturity level, using a scale from the ITIL V4 framework. After review, the gap analysis and service maturity evaluation produced findings. These results came from comparing observed and expected (target) maturity level values.

c. Maturity Level

The next step is to calculate the maturity level for Info BMKG application users. This group includes internal BMKG personnel, stakeholders, and the public. Survey responses from 100 respondents are used. The calculation (1) follows ITIL V4 management practices and based on collected questionnaire data [10]. Table 3 presents the maturity level results for Info BMKG users.

$$Maturity\ level = \frac{\sum answers}{\sum questions} \quad (1)$$

All ITIL V4 management practice domains, including Incident Management, Monitoring and Event Management, Service Continuity Management, Service Desk Management, and Service Request Management, have average scores above 4.20 across all respondent groups. The overall average score is 4.56. This indicates that the Info BMKG application services have reached a high maturity level. Analyzing by respondent group, stakeholders, or related institutions gives the highest evaluations in almost all domains, with average scores from 4.72 to 4.92. Internal BMKG respondents assign slightly lower scores, between 4.24 and 4.38. The general public also provides high ratings (4.51–4.58). This shows that public perception of the reliability and quality of services is highly positive. These findings suggest external stakeholders have strong trust in the Info BMKG services. Internal respondents are more critical, reflecting awareness of areas still needing improvement. Service Desk Management (4.24) and Incident Management (4.29) show the lowest internal scores. This suggests that operational support, such as service desk responsiveness and incident handling, still needs improvement to better meet internal expectations and public demands. Figure 2 presents a radar chart showing the maturity levels.

Table 3. Maturity Level of Info BMKG Application Users

No	Management Practice	Maturity Level			Average
		Internal BMKG	Stakeholder/ Related Institutions	General Public	
1	Incident Management	4,29	4,92	4,51	4,57
2	Monitoring and Event Management	4,33	4,86	4,55	4,58
3	Service Continuity Management	4,32	4,82	4,58	4,57
4	Service Desk Management	4,24	4,83	4,53	4,53
5	Service Request Management	4,38	4,72	4,53	4,54
Total Average					4,56

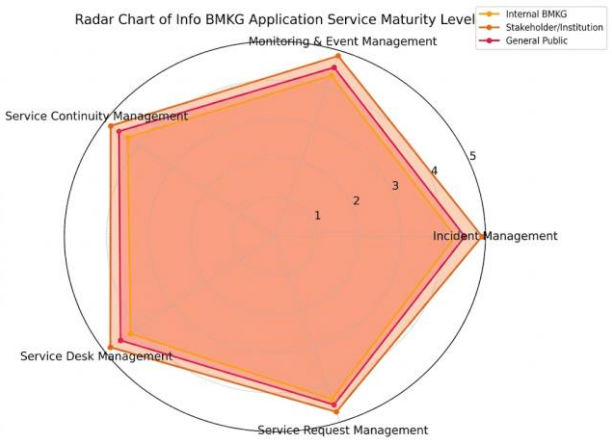

Figure 2. Radar Chart of the Info BMKG Application Service Maturity Level

d. *Gap Analysis*

The previously obtained maturity level findings and assessments are subsequently analyzed to identify service gaps. This is conducted by comparing the expected (target) values with the current condition values in order to determine the magnitude of the gaps. Each user group, internal BMKG, stakeholders, and the general public exhibits different gap values, as presented in Table 4.

The largest gap, 0.76, is seen in Service Desk Management, surveyed by internal BMKG users. The average questionnaire scores, mapped to the ITIL V4 maturity scale [8], place this at Level 1 (Initial). This means service management practices are in early development and are not yet fully documented or standardized. It also shows that BMKG and the team have not established standard service management yet.

Recommendation

Recommendations for Improving Maturity Level and Bridging Service Gaps in the Info BMKG Application Based on the ITIL V4 Framework:

1. Incident management

   BMKG is recommended to continuously enhance the Info BMKG application to ensure prompt and accurate handling of various incidents. Standardized incident management procedures should be consistently implemented, including the handling of user complaints. Rapid response mechanisms and periodic system adjustments will help maintain service reliability and ensure alignment with user needs.

Tabel 4. Gap Analysis of Each User

No	Management Practice	Internal BMKG	Stakeholder/ Related Institutions	General Public
1	Incident management	0.71	0.08	0.49
2	Monitoring and event management	0.67	0.14	0.45
3	Service continuity management	0.68	0.18	0.42
4	Service desk management	0.76	0.17	0.47
5	Service request management	0.62	0.28	0.47

2. Monitoring and event management

BMKG is expected to strengthen procedures and automation in monitoring and managing events within the application. The standardization of event management policies should be consistently maintained to ensure proper implementation in operational contexts. User feedback should also be managed proactively to sustain service quality and user satisfaction over time.

3. Service continuity management

BMKG is advised to continuously monitor, evaluate, and improve services, procedures, and supporting systems related to service continuity. Enhancing the performance of the Info BMKG application should be aligned with the evolving needs of the public, enabling the delivery of more responsive and reliable information services.

4. Service desk management.

The optimization of the service desk function should focus on establishing clear escalation pathways, improving administrative coordination, and enhancing the responsiveness to user complaints. The service desk should function as an effective communication channel between users and application managers, ensuring that all issues are resolved comprehensively and that user satisfaction is improved.

5. Service request management.

BMKG is encouraged to strengthen preventive service management practices by identifying potential issues at an early stage and continuously improving system quality. Regular evaluation of user requests and complaints will support ongoing improvements in the quality of information services in future versions of the application.

CONCLUSIONS AND SUGGESTIONS

The maturity assessment of the Info BMKG application reveals a heterogeneous landscape of service management capabilities across five foundational domains: Incident, Monitoring and Event, Service Continuity, Service Desk, and Service Request Management. While the existence of structured processes indicates an operational baseline capable of supporting core application functions, the study identifies critical systemic vulnerabilities—specifically a lack of procedural standardization, inadequate process documentation, and suboptimal user service functions. Rectifying these deficiencies is not merely an operational necessity but a strategic imperative for fostering a consistent, resilient, and high-performance service management framework. Consequently, this research suggests that future scholarly inquiries should move beyond isolated domain evaluations toward integrated comparative analyses leveraging global standards such as COBIT, CMMI, or ISO/IEC 20000. Expanding the scope to include critical ITIL practices like Change Management is essential for a more comprehensive maturity profile. Furthermore, to bridge the gap between process maturity and service excellence, there is a fundamental need for empirical validation via quantitative metrics—including incident response latency and multi-dimensional user satisfaction indices—coupled with risk-based evaluations of automation sustainability within the Info BMKG ecosystem.

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