

Utilization of Business Intelligence Dashboards for Continual Improvement of It Services and Efficient Workforce Demand Prediction Based on Service Desk Ticket Data

Afandi Chalid Sahuri*, Ahmad Muklason
Institut Teknologi Sepuluh Nopember, Indonesia
Email: hurryacs@gmail.com*

ABSTRACT

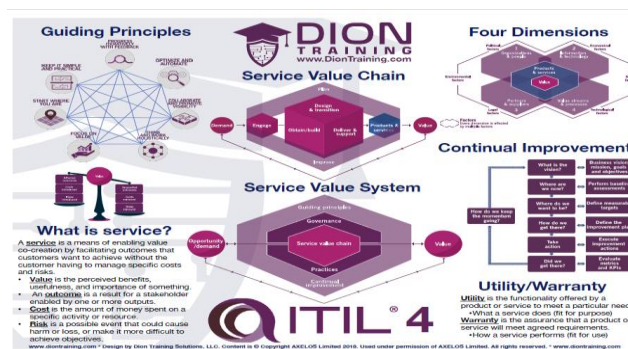
In the digital age, organizations must provide efficient and reliable IT services to ensure business continuity. The implementation of ITIL 4 as a framework for IT service management has become essential in many organizations, including PT XYZ. However, challenges persist in service performance reporting, particularly due to manual, time-consuming processes and the absence of predictive analytics. This research focuses on the design and development of a Business Intelligence (BI) dashboard that integrates ITIL 4 principles to automate reporting, track SLA trends, and predict IT workforce needs. Using historical ticket data, this study employs ARIMA forecasting to predict future ticket volumes and optimize workforce planning. The BI dashboard provides a visual, real-time overview of service performance, ticket status, and SLA compliance, replacing traditional manual processes. Interviews with IT managers from various regions of PT XYZ inform the dashboard's design, ensuring it meets operational and strategic needs. The results indicate that the BI dashboard significantly improves reporting efficiency, enhances SLA monitoring, and supports data-driven decision-making. The integration of descriptive and predictive analytics provides a robust decision-support framework, promoting continual improvement in IT service management. Future research will enhance the system by incorporating external variables and hybrid forecasting models.

Keywords: BI dashboard, ITIL 4, continual improvement, service desk, IT Workforce Forecasting, IT Service Performance, ARIMA.

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INTRODUCTION

In the digital era, business organizations are required to provide fast, reliable, and valuable services to customers (Aithal, 2023; Ansong & Boateng, 2019; Demirel, 2022). Information Technology (IT) plays a strategic role as the operational foundation and driver of organizational transformation. To ensure IT services run efficiently and are user-oriented, many organizations adopt the Information Technology Infrastructure Library (ITIL) framework (AbdelMoneim, 2020; Kangas, 2016; Mera Macías & Aguilar Alonso, 2019). The ITIL 4 framework diagram clarifies how this approach works comprehensively, from Guiding Principles to the Service Value Chain, to help organizations manage and deliver consistently valuable IT services.



Gambar 1. Basic ITIL 4 Diagram training material (www.diontraining.com, s.a.)
Sumber: www.diontraining.com, s.a. (ITIL+4 Study Guide)

Figure 1. From the image above, ITIL 4 is depicted as a single unified system that connects guiding principles, the four dimensions of service, the Service Value System, and the Service Value Chain to generate value for the organization (Sutrisno & Lestari, 2020). Guiding principles such as focusing on value, starting from where you are, working iteratively, and collaborating are the cornerstones of behavior in managing services (Kurniawan & Prabowo, 2021; Setiawan et al., 2021). The four dimensions of service ensure each service is viewed from the aspects of organization and people, information and technology, partners and suppliers, and value streams and processes (Aminah & Rahman, 2021). All of these elements are integrated into the Service Value System that processes demand and opportunities through the Service Value Chain, including plan, engage, design and transition, obtain/build, deliver and support, and improve, which work together to create value (Rizki & Salim, 2020; Setiawan, 2021). ITIL practices and a continuous improvement mindset strengthen this system by ensuring that services are always relevant and provide value through utility and warranty that meet user needs (Suryadi & Yuliana, 2021; Pratama, 2022).

The consistent application of ITIL 4 principles has been the foundation for many global companies in managing complex IT services (Sutrisno & Pramudya, 2021). One of the organizations that has adopted this approach is PT XYZ, a multinational company in the building materials industry, which has implemented ITIL 4 principles in the management of IT services in various countries (Prabowo & Salim, 2020). A centralized service desk system is used to record and monitor tickets that include incidents and service/change requests, with groupings based on issue type, priority (impact and urgency), and Service Level Agreement (SLA) (Kurniawan & Setiawan, 2021; Yusuf & Kurniawan, 2022). This service desk system enables efficient management and resolution of IT-related issues, ensuring that services meet the agreed-upon SLAs (Suryadi, 2020). Additionally, the system plays a critical role in aligning IT service management with business objectives by providing transparency and improving customer satisfaction (Fitriani & Wibowo, 2021).

Although IT service systems are aligned with ITIL 4, there are still challenges in the form of performance reporting processes that are carried out manually through queries and spreadsheets that are time-consuming and at risk of errors, the lack of historical records of performance for long-term trend analysis, and the lack of predictive analytics to support data-driven decision-making. This condition shows the need for a solution that is able to process operational data into strategic information through the development of a Business Intelligence (BI) dashboard that presents real-time and historical ticket data with informative and easy-to-analyze visualizations, while supported by a forecasting approach based on historical data so that the needs of IT support workers can be predicted more accurately, balanced, and efficiently in terms of cost.

Based on this background, this study formulates problems related to how to design an ITIL 4-based BI dashboard that is able to automate IT service reporting, visually display SLA trends, and replace spreadsheet-based manual processes; how to structure the mechanism for storing and presenting ticket historical data to identify workload patterns by domain and region; how to design storytelling-based information flows so that management can understand the operational context and service improvement priorities; how to build an ARIMA forecasting model to project ticket volume as the basis for planning for IT support workforce needs; and

how to integrate descriptive analytics on the BI dashboard with ARIMA-based predictive analytics in one integrated decision support framework.

The purpose of this research is to develop an ITIL 4-based BI dashboard that is able to automate reporting, store historical data, and visually present SLA trends and achievements to support fast and objective performance evaluation, as well as build a storytelling-based analytics mechanism and ARIMA forecasting model to support the planning of IT support workforce needs. This research is expected to provide theoretical benefits in the form of contributions to the development of ITIL 4-based IT Service Management science that is integrated with Business Intelligence and forecasting, as well as practical benefits for PT XYZ in improving reporting efficiency, SLA monitoring, technician performance evaluation, identification of workload patterns across domains and regions, as well as faster, accurate, and data-based managerial decision-making through a unified descriptive–predictive analytics framework.

METHOD

This research was applied research with a quantitative approach that aimed to solve practical problems in the management of IT services at PT XYZ, especially related to service desk performance reporting and planning for IT Support workforce needs. The method used combined the design of an information system in the form of a Business Intelligence (BI) dashboard with a time series forecasting method using the Autoregressive Integrated Moving Average (ARIMA) model. This approach was chosen because it could produce solutions that were not only descriptive in displaying current service conditions but also predictive in projecting future workloads, thus supporting data-driven managerial decision-making and the principle of continuous improvement in ITIL 4.

The population in this study included all IT service ticket data recorded in PT XYZ's service desk system, including incidents, service requests, and change requests that occurred during the organization's operational period. From this population, a research sample was taken in the form of historical data of tickets over the past few years that were considered representative to illustrate workload patterns and IT service trends. In addition, the sample also included survey respondents consisting of IT Managers, Service Delivery Managers, and other related personnel who acted as the main users of the dashboard, with the aim of obtaining an overview of information needs, expectations for the reporting system, and the context of decision-making in the management of IT services.

The data collection technique in this study was carried out through several methods. First, secondary data collection in the form of historical data on IT service tickets from the service desk system, which included information on service categories, priorities, response and completion times, ticket status, and the person in charge of technicians. Second, the collection of SLA data and IT service operational policies that were used as the basis for measuring service performance and compliance. Third, primary data collection through surveys and discussions with potential dashboard users to identify analytics needs, visualisation preferences, and the type of information needed in decision-making. All data obtained then went through a process of validation, cleaning, and transformation so that it was ready to be used in the analysis and dashboard design process.

The data analysis technique was carried out through two main approaches, namely descriptive analysis and predictive analysis. Descriptive analysis was conducted using Business Intelligence dashboards to identify patterns, trends, and distribution of IT service workloads by category, priority, domain, and region, and to evaluate SLA achievement and technician performance. Meanwhile, predictive analysis was carried out using the ARIMA model on the time series data of the number of tickets to project future ticket volumes and estimate the need for IT Support workforce. The forecasting results were then evaluated using accuracy indicators such as Mean Absolute Percentage Error (MAPE), Symmetric Mean Absolute Percentage Error (SMAPE), and Root Mean Square Error (RMSE), so that the best model could be selected as the basis for capacity planning and data-driven managerial decision-making.

RESULTS AND DISCUSSION

Creating a BI Dashboard with the Story Telling Method

1. Demand Analytics

This chapter presents the results and discussion of the stages of demand analysis that have been carried out. At this stage, the author conducted interviews with 6 IT Managers at Company XYZ representing various global operational areas. This interview aims to explore the analytical needs related to IT service performance monitoring, with reference to the indicators listed in the organization's Service Charter. The results of the interviews are the basis for the formulation of information needs and analysis presented in the next section.

1) Interview Results with Head of IT Core Services

The speakers emphasized the importance of data-driven IT service management to ensure compliance with global standards, service quality improvement, and the effectiveness of continuous improvement efforts. They need visibility into the level of adoption of technology standards and processes in different countries so that areas of inconsistency can be immediately identified and followed up through audits and service harmonization.

In addition, comprehensive service quality monitoring is a key focus, including real-time evaluation of SLA performance, identification of user dissatisfaction through satisfaction and feedback data, and understanding the relationship between KPIs and user perception. The information is used to determine improvement priorities and ensure systematic follow-up.

In the aspect of continuous improvement, the resource person needs a tool to evaluate the effectiveness of improvement actions through a comparison of conditions before and after implementation. They also want a KPI review mechanism to stay relevant to the needs and experience of IT service users.

2) Interview Results with East Europe IT Manager

Resource persons need real-time operational data such as ticket status, backlogs, critical SLAs, and complaint patterns to support daily monitoring and evaluation of service desk performance. Consistent and easily accessible data is considered important so that issue detection and operational response can be carried out faster and more accurately. In terms of strategic goals, they want to improve service quality and consistency, balance team workloads, improve user experience, and support capacity forecasting. Decisions taken include prioritizing improvements, identifying overload teams, evaluating agent quality, and estimating future resource needs.

For information needs and operational activities, the resource persons utilize real-time ticket data, historical trends, critical SLAs, workload distribution, service ratings, and forecasting indicators. This information is used in ticket monitoring, service desk performance evaluation, quality audit, problem trend analysis, and automated report preparation that supports continuous decision-making.

3) Interview Results with South Europe IT Manager

Resource persons need dashboards that not only display operational data, but also support increased user satisfaction, adoption of standardized solutions, and strengthened relationships between IT and business. They want to understand the causes of user dissatisfaction, monitor trend issues, and look at differences in satisfaction between regions to be more proactive.

In terms of strategic and decision goals, they want to increase user satisfaction, strengthen the adoption of standard tools, improve IT alignment with the business, and develop knowledge management. Supported decisions include the identification of training and communication needs, the identification of areas of low adoption, and the assessment of IT readiness to support business projects. For information needs and operational tasks, resource persons need data on issue trends, satisfaction levels per country, knowledge base usage, service portal adoption, ticket categorization errors, and BRM interaction history. This information is used for dissatisfaction analysis, training planning, user education, knowledge content curation, and business engagement planning.

4) Interview Results with Northwest Europe IT Manager

Resource persons need dashboards that support ticket backlog and aging control, improved service security, and decision-making related to user satisfaction, system adoption, resource planning, and alignment with the business. This is necessary so that the IT team can monitor operational risks and service quality more effectively.

Strategically, they want to reduce backlogs, strengthen handling of security issues, improve user satisfaction, encourage the adoption of ticketing systems, and support resource planning. Decisions taken include identifying the highest backlog areas, reassigning jobs, prioritizing security tickets, and analyzing the causes of low service satisfaction. In the need for information and operational activities, the resource persons utilized aging and backlog data per category, vulnerability tickets, user feedback, ticket volume trends, and device to user ratio. This information is used for daily monitoring, job redistribution, security prioritization, capacity forecasting, and preparation of business relationship management activities.

5) Interview Results with Africa IT Manager

Resource persons need dashboards that improve the speed of response and ticket completion, while supporting continuous improvement and resource planning. They want visibility into queue times, response times, resolution times, and recurring problem patterns so that service bottlenecks can be identified faster.

In terms of strategic and decision goals, they want to increase the speed of services, strengthen user trust in IT, encourage continuous improvement, and support resource management. Supported decisions include ticket bottleneck identification, service desk performance evaluation, user experience assessment, and workforce needs estimation. For information needs and operational activities, the resource persons used data on response time, completion time, user satisfaction level, recurring issue trends, skill gap indicators, and

workload trends. This information is used in daily SLA monitoring, performance evaluation, root cause analysis, training planning, and resource planning and justification.

6) Interview Results with LATAM IT Manager

Resource persons need a dashboard that supports daily operational monitoring while maintaining infrastructure stability, improving SLA compliance, developing forecasting capabilities, and strengthening IT-business relationships. They want direct visibility into the condition of services and infrastructure so that critical issues can be addressed faster.

Strategically, they want to ensure infrastructure stability, improve service quality and SLA compliance, develop data-pattern-based predictions, and optimize resource capacity. The decisions taken include an assessment of the condition of the infrastructure per site, a major incident analysis, an evaluation of the backlog and SLA, and an assessment of the readiness of the site for the project. In the need for information and operational activities, the resource persons utilized infrastructure health data, critical incident logs, backlog and SLA trends, issue segmentation per region, predictive indicators, resource availability, and business perception metrics. This information is used for real-time monitoring, root cause analysis, action planning, service prediction development, resource capacity planning, and engagement tracking with businesses.

2. Structuring and Grouping

After analyzing the results of interviews from all sources, the author grouped and synthesized findings to identify patterns of needs that have similarities and relationships between regions. The results of this grouping are then further analyzed so that they can be processed systematically in accordance with the storytelling approach, so that information needs can be prepared gradually and contextually, starting from operational monitoring to strategic decision-making. The mapping of the results of the analysis is presented in the following table 1.

Table 1. Table of interview summary results of all interviewees

<i>Strategic Goals (SG)</i>	<i>Decision Goals (DG)</i>	<i>Information Goals (IG)</i>	<i>Operational Tasks (OT)</i>
SG1 Improve service quality & user experience	DG1 Assess service health quickly	IG1 SLA, backlog, aging, critical incidents	OT1 Daily service monitoring
	DG2 Identifying the causes of dissatisfaction	IG2 CSAT, low-rating feedback, KI usage	OT2 Feedback analysis & corrective action
SG2 Balancing workload & improving team performance	DG3 Determining an overloaded team/engineer	IG3 Workload per engineer, ticket hopping	OT3 Redistribution of work & coaching
	DG4 Determining technical training needs	IG4 Recurring issues, slow-resolution patterns	OT4 Training planning
SG3 Process standardization & increase system adoption	DG5 Assessing the maturity of Topdesk use	IG5 Tickets/user/year, portal usage, shadow IT	OT5 User education & process enforcement
	DG6 Identifying category & process errors	IG6 Category patterns, wrong selection analysis	OT6 Harmonization of processes & categories
SG4 Business alignment & strategic communication	DG7 Determining the topic of BRM & escalation	IG7 Open changes, open incidents, feedback trend	OT7 BRM preparation & stakeholder communication

<i>Strategic Goals (SG)</i>	<i>Decision Goals (DG)</i>	<i>Information Goals (IG)</i>	<i>Operational Tasks (OT)</i>
SG5 Predictive operations & early detection	DG8 Identifying cross-border issue patterns	IG8 Issue segmentation (region-country-plant), repeated patterns	OT8 Proactive incident prevention
	DG9 Assessing site readiness for the project	IG9 Infrastructure health, cloud/server/network status	OT9 Site readiness assessment
SG6 Workforce & resource planning jangka panjang	DG10 Determining the needs of the workforce	IG10 Volume trend, user/device ratio, forecasting output	OT10 Resource forecasting & budget justification

Source: Results from Interviews with IT Managers at PT XYZ, 2025

Table 1 presents the results of the grouping of resource person needs that have been analyzed and compiled according to the storytelling flow of IT services. The resource person wanted early visibility into the overall health condition of the service, including SLA indicators, backlogs, aging tickets, and critical incidents, as the foundation for daily service monitoring and early detection of problems.

Furthermore, the speakers emphasized the need for a deeper understanding of user satisfaction and team workload. They want the ability to identify the causes of user dissatisfaction, recognize teams or engineers who are experiencing overload, and understand patterns of recurring problems that impact resolution time. This information is used as the basis for corrective action, job redistribution, and technical training planning.

At the process and system adoption level, the resource persons wanted an evaluation of the maturity of the use of the ticketing system and the consistency of the implementation of standard processes. Data related to portal usage, categorization error patterns, and indications of unofficial practices are considered important to support process standardization efforts and increase system adoption in a sustainable manner.

The resource person also wanted dashboard support in strengthening the alignment between IT and business, especially through determining the topic of business relationship management, preparation for escalation, and communication with stakeholders. In addition, predictive capabilities are seen as important for detecting patterns of issues across regions, assessing site readiness for new projects, and supporting proactive incident prevention.

Finally, the resource persons wanted data support for long-term workforce and resource planning. Information related to service volume trends, user-to-device ratios, and forecasting results is used as the basis for justifying resource and budget needs, as well as closing the storytelling flow from current operational conditions to future planning.

After grouping the interview results from all sources, the author obtained a more structured understanding of the main information needs that need to be provided by the IT service dashboard. From this process, the author can identify information goals that represent the type of information needed to answer the main service problem.

Furthermore, each information goal is analyzed and lowered to the level of insight that you want to display. This process is carried out with a storytelling approach, which is compiling information based on the flow of managerial questions that are commonly asked by IT service managers, starting from understanding the current condition of services, their impact on the

team and users, to determining follow-up actions. The mapping between information goals, storytelling layers, main questions, and insights is presented in the following table 2.

Table 2. Analysis Table of Information Goals, Story Layers and Insights

Information Goals (IG)	Story Layer	Main Questions	Insights Featured
IG1 SLA, backlog, aging, critical incidents	SL 1. Service Health	"How is the service condition today?"	SLA, backlog, aging, critical incidents, vulnerability
IG2 CSAT, low-rating feedback, KI usage	SL 4. Customer Experience	"How do users feel?"	CSAT, low rating, feedback, KI usage
IG3 Workload per engineer, ticket hopping	SL 3. Impact & Workload	"What impact will it have on my team?"	Workload per engineer, ticket hopping, aging per engineer
IG4 Recurring issues, slow-resolution patterns	SL 5. Root Cause Insight	"What is the main cause?"	Recurring issues, wrong category, dependency, infra health
IG5 Tickets/user/year, portal usage, shadow IT	SL 6. Predictive & Action	"What's the next step?"	Forecasting tickets, resource needs, training topics
IG6 Category patterns, wrong selection analysis	SL 5. Root Cause Insight	"What is the main cause?"	Recurring issues, wrong category, dependency, infra health
IG7 Open changes, open incidents, feedback trend	SL 6. Predictive & Action	"What's the next step?"	Forecasting tickets, resource needs, training topics
IG8 Issue segmentation (region-country-plant), repeated patterns	SL 2. Issue Localization	"Where is the problem?"	Region-country-site breakdown, category
IG9 Infrastructure health, cloud/server/network status	SL 5. Root Cause Insight	"What is the main cause?"	Recurring issues, wrong category, dependency, infra health
IG10 Volume trend, user/device ratio, forecasting output	SL 6. Predictive & Action	"What's the next step?"	Forecasting tickets , resource needs , training topics

Source: Analysis by the Author Based on Interviews with IT Managers at PT XYZ, 2025

Table 2 shows how the information needs that have been grouped are translated into a structured IT service storytelling flow. The resource person wants a dashboard that is able to answer managerial questions gradually, starting from understanding the general condition of service to recommendations for actions that can be taken. In the initial layer, the resource person wants visibility into the overall health of the service. Information related to SLAs, backlogs, aging tickets, and critical incidents is used to answer questions about daily service conditions and support operational monitoring activities. Furthermore, the resource person wants an understanding of the user experience and the impact of the service on the team. User satisfaction information, low-value feedback, knowledge base utilization, and per-engineer workloads are seen as important to answer questions related to user perception and internal workload distribution. At the more in-depth analysis stage, the resource person wants the ability to identify the root cause of the service problem. Recurring issue patterns, ticket categorization errors, inter-system dependencies, and infrastructure conditions are used to analyze the root of the problem and localize the issue based on the region or operational location.

Finally, the resource person wants predictive and action-oriented insights. Information related to service volume trends, changes that are still open, infrastructure conditions, and forecasting results are used to determine next steps, such as resource planning, training needs, proactive incident prevention, and strategic decision justification. Thus, this table illustrates the storytelling flow from operational data to insight-based decision-making.

3. Object Analysis

After further grouping and analysis of the interview results, the author identified the need to map information goals into a more operational storytelling flow. Each storytelling layer is analyzed based on the main questions that IT service managers want to answer, the types of insights needed, and the reports used to display those insights. This approach ensures that the results of the analysis do not stop at the classification of information needs, but can be further processed into relevant insights that are ready to be acted upon. The mapping between the storytelling layers, key questions, insights, and reports used is presented in the following table 3.

Table 3. Story Layer, Insight and Report Analysis Table

Story Layer	Main Questions	Insights Featured	Report Name
SL 1. Service Health	What is the condition of the service today?	<i>Aging tickets</i> above the threshold	<i>Tickets w/o activity more than 7 days</i>
		<i>Critical incidents dan vulnerability backlog</i>	<i>Tickets w/o activity more than 7 days</i>
		Number of open tickets and <i>backlog</i>	<i>Waiting for User; Waiting for Approval</i>
		Overall SLA compliance level	<i>Incident Resolution; Request Fulfillment</i>
SL 2. Issue Localization	Where does the problem occur?	Areas with increasing problem trends	<i>Incident by Operator Group; Service Request by operator Group</i>
		Ticket distribution by country	<i>Incident by Operator Group; Service Request by operator Group</i>
		Distribution of tickets per plant/site	<i>Incident by Operator Group; Service Request by operator Group</i>
		Ticket distribution by region	<i>Incident by Operator Group; Service Request by operator Group</i>
		Dominant ticket categories and subcategories	<i>Incident by Operator Group; Service Request by operator Group</i>
SL 3. Impact & Workload	What impact will it have on my team?	<i>Aging tickets per engineer</i>	<i>Aging of ticket</i>
		<i>Ticket hopping</i> between teams or support levels	<i>Ticket Hopping</i>
SL 4. Customer Experience	How do users feel?	Kasus <i>low-rating</i> (1–2 stars)	<i>User Satisfaction</i>
		The main theme of <i>user</i> feedback	<i>User Satisfaction</i>
		CSAT (user satisfaction) trends	<i>User Satisfaction</i>
SL 5. Root Cause Insight	What is the main cause of the problem?	Ticket category selection error	<i>Ticket & Time report - All codes</i>
		<i>Slow-resolution patterns</i>	<i>Incident Resolution; Request Fulfillment</i>
		<i>Recurring issues</i> and recurring patterns	<i>Incident Resolution; Request Fulfillment</i>
SL 6. Predictive & Action	What's next?	<i>Forecasting</i> ticket volume	<i>Forecast Reporting</i>
		Projected IT resource requirements	<i>Forecast Reporting</i>

Source: Analysis by the Author Based on the BI Dashboard Design at PT XYZ, 2025

Table 3 shows how the IT service storytelling flow translates into specific dashboard and report designs. The resource person wants each layer of storytelling to have clear visual and analytical support, so that the dashboard is not only informative, but also supports gradual decision-making.

At the Service Health layer, the resource person wants visibility into the overall service conditions, such as the number of open tickets, backlogs, tickets awaiting user approval, as well as critical incidents and vulnerability issues. These insights are used for daily service monitoring and early detection of SLA violation risks.

In the Issue Localization layer, the resource person wants the ability to localize the issue based on the group operator, country, and region. This information helps identify areas of operations that are experiencing increased issues and supports the focus of corrective actions.

The Impact and Workload layer is focused on understanding the impact of services on teams. The resource person wanted information related to ticket age and the phenomenon of ticket hopping to assess the distribution of workload, assignment efficiency, and potential bottlenecks in the ticket settlement process.

In the Customer Experience layer, the resource person wants to monitor user satisfaction through service ratings, CSAT trends, and low-value feedback. These insights are used to evaluate the quality of service from the user's perspective and form the basis for corrective action.

The Root Cause Insight layer aims to help resource people understand the root cause of service problems. Recurring issue patterns, ticket categorization errors, and linkages between incidents are analyzed to support root cause analysis and process quality improvement.

Finally, in the Predictive and Action layer, the resource person wants forecasting skills to support future decision-making. Insights such as predicted ticket volume and resource requirements are presented as the basis for capacity planning and resource allocation justification. All these layers leverage key data from the Topdesk system, while forecasting is developed using the ARRIMA approach.

4. Data Selection and Preparation

Once the design of the report that supports each storytelling layer is defined, the next stage is to identify the data sources used to generate insights on the IT service dashboard. At this stage, the authors map each type of report to the main data source and the required data details, to ensure information traceability, analysis consistency, and feasibility of implementation. This mapping is the basis for ensuring that the insights displayed on the dashboard are accurate, reproducible, and support data-driven decision-making. Details of the data sources for each report are presented in the following table 4.

Table 4. Report data source table

<i>Report Name</i>	<i>Key Data Sources</i>	<i>Detailed Data Sources</i>
<i>Tickets w/o activity more than 7 days</i>	Topdesk Ticket Tool	Tickets have no activity for more than 7 days
<i>Waiting for User; Waiting for Approval</i>	Topdesk Ticket Tool	Tiket "waiting for user" dan "waiting for approval"
<i>Incident by Operator Group; Service Request by operator Group</i>	Topdesk Ticket Tool	Trend analysis

Report Name	Key Data Sources	Detailed Data Sources
<i>Incident by Operator Group; Service Request by operator Group</i>	<i>Topdesk Ticket Tool</i>	<i>Breakdown/filter per Country</i>
<i>Incident by Operator Group; Service Request by operator Group</i>	<i>Topdesk Ticket Tool</i>	<i>Breakdown/filter per operator category/ticket category</i>
<i>Incident by Operator Group; Service Request by operator Group</i>	<i>Topdesk Ticket Tool</i>	<i>Breakdown/filter per Plant</i>
<i>Incident by Operator Group; Service Request by operator Group</i>	<i>Topdesk Ticket Tool</i>	<i>Breakdown/filter per Region</i>
<i>Aging of ticket</i>	<i>Topdesk Ticket Tool</i>	Number of tickets per completion time group (1-10), (11-30), (31-90), (91-150), (151-200), (>200)
<i>Ticket Hopping</i>	<i>Topdesk Ticket Tool</i>	The number of tickets where the operator's assignment always changes
<i>User Satisfaction</i>	<i>Topdesk Ticket Tool</i>	<i>Rating ticket topdesk</i>
<i>User Satisfaction</i>	<i>Topdesk Ticket Tool</i>	<i>Train Ticket Rating topdesk</i>
<i>User Satisfaction</i>	<i>Topdesk Ticket Tool</i>	<i>Feedback rated ticket topdesk</i>
<i>Ticket & Time report - All codes</i>	<i>Topdesk Ticket Tool</i>	Error analysis of assignment ticket (shift right)
<i>Incident Resolution; Request Fulfillment</i>	<i>Topdesk Ticket Tool</i>	Trend analysis
<i>Incident Resolution; Request Fulfillment</i>	<i>Topdesk Ticket Tool</i>	If the completion of the ticket is outside the completion limit, it will be considered a breach
<i>Forecast Reporting</i>	<i>ARIMA Forecast</i>	Predict the number of future tickets per priority per month
<i>Forecast Reporting</i>	<i>ARIMA Forecast</i>	Predict the number of future tickets per priority per month multiplied by the SLA

Source: Data from the Topdesk System at PT XYZ, 2025

Table 4 shows how the data source of each report. Starting with reports related to tickets without activity for more than seven days as well as waiting for user and waiting for approval status sourced from the Topdesk Ticket Tool system. This data is used to identify tickets that have the potential to stagnate in the settlement process. The insights generated support backlog control and are an early indicator for ticket settlement delays.

Incident distribution and service request data by group operator is processed using information from Topdesk with various levels of breakdown, including country, region, plant, as well as carrier and ticket categories. This distribution analysis is used to identify operational areas that show increasing problem trends, so that management can focus attention and resources on units that need intervention.

The aging of tickets report presents the number of tickets based on the completion time range, which is used to assess the efficiency level of the service process. In addition, the ticket hopping report measures the frequency of ticket assignment shifts between operators. These two insights are used to evaluate the effectiveness of assignment mechanisms, identify potential competency mismatches, and detect bottlenecks in service team workflows.

User satisfaction reports are sourced from ticket rating and feedback data on Topdesk. The insights generated include service ratings, satisfaction trends, and user feedback content.

This analysis is used to understand user perceptions of the quality of IT services and identify the factors that contribute to dissatisfaction, so that corrective actions can be formulated that focus on the user experience.

Incident resolution and service request data are analyzed to see performance trends as well as SLA compliance. Tickets that exceed the settlement deadline are identified as potential SLA violations. This insight serves as the basis for evaluating service performance, monitoring the effectiveness of the service process, and setting improvement priorities.

The forecasting report utilizes historical ticket data processed using the Autoregressive Integrated Moving Average (ARIMA) method. The insights generated are in the form of predicting the number of tickets in the upcoming period based on priorities and a certain time horizon. The results of this forecast are used to support capacity planning, estimation of IT resource needs, and justification for future strategic decision-making.

5. Forecasting Labor Needs

1) Determining the Best Model

Based on the initial analysis of the ITSM ticket time series data, the data pattern shows quite sharp fluctuations between periods without any consistent long-term trends or recurring seasonal patterns. Data variance also tends to be unstable, so a Box–Cox transformation is carried out to increase the homogeneity of variance. The transformation results showed a value of λ close to 1, which indicated that the data was sufficiently stable and feasible for the model identification stage using ACF and PACF analysis. From the results of the ACF and PACF plots, autocorrelation is dominated by low lag, so the autoregressive components and moving averages are estimated to be on a small order.

The model selection process is carried out by testing several combinations of ARIMA parameters and selecting the model with the smallest AICc value. For the overall ITSM data, the best model obtained is ARIMA (1,0,0), which shows a moderate dependence between the ticket value of the current period and the previous period. The results of residual diagnostic tests, including the Ljung–Box test, showed the absence of significant residual autocorrelation, so the model was declared suitable for use for forecasting. With a similar approach, the best model for each group operator was also determined, with different characteristics according to the data patterns of each group, including the presence of differentiation in several regional groups and the emergence of seasonal components in the Regional Service Delivery South EU.

2) Forecast Results

After the best model is obtained for each group operator, the forecasting and accuracy evaluation process is carried out using MAPE, SMAPE, and RMSE metrics. The results of the evaluation showed that there was a variation in performance between operator groups, where the regional service delivery group generally had a better level of accuracy than the central and infra groups. Some group operators, such as the Regional Service Delivery South EU, Cog Central Service Desk, and Regional Northwest EU, show low error values, indicating that their data patterns are relatively stable so that the model can provide more accurate estimates. In contrast, groups such as Regional Service Delivery Africa and Cog Central ITSM have higher error rates due to greater data volatility.

In general, the forecast results show that the ARIMA model tends to produce stable estimates and represents the average workload of the medium term, but is less responsive to monthly extreme spikes. Sharp spikes and declines are treated as temporary shocks, not as

structural trend changes. Therefore, the forecast results are more appropriately used as a baseline for capacity planning and resource allocation, with recommendations for additional operational buffers or analysis on group operators that have high volatility and unstable demand patterns.

6. Data Analysis

1) Analyze Ticket Forecasting Data

Forecasting results using the ARIMA method show that most IT service ticket volumes, both at the domain and regional levels, move in a fluctuating pattern around historical average values. Although some periods show significant spikes, the model does not identify any long-term structural trend changes. Forecast values tend to return to equilibrium levels after a spike, indicating that the spike is a temporary shock, rather than a representation of sustained growth in demand for services.

In the context of dashboard storytelling, these findings form a key storyline that IT service load is systemically stable, but operationally volatile. Therefore, the dashboard needs to direct the user's attention to:

- a. Actual vs Forecast comparison to highlight periods of extreme deviation.
- b. Visualize the baseline forecast as a representation of the normal capacity of the service.
- c. Highlight the spike period as a context for managerial discussions, not as a new trend. This approach helps stakeholders understand the difference between routine fluctuations and anomalies that require specific action.

As a basis for decision-making, ARIMA results are most appropriately used as baseline forecasting in the storytelling dashboard.

2) Analyze the data of the report dashboard to be created

After designing the dashboard structure and determining the type of report based on the storytelling flow, the author then compares the needs of the reports identified from the analysis results with the reports realized in the dashboard implementation. This comparison aims to ensure that the main information needs of the resource persons have been optimally accommodated, as well as to identify needs that have been simplified or combined in the implementation process. The results of the comparison are presented in the following table 5.

Table 5. Tables of Reports to be Created

Report Required	Report made
Waiting for User; Waiting for Approval	Waiting for User Waiting for Approval
Tickets w/o activity more than 7 days	Tickets w/o activities for more than 7 days
Incident Resolution; Request Fulfillment	Incident Resolution Request Fulfillment
User Satisfaction	User Satisfaction
Aging of ticket	Tickets w/o activities for more than 7 days
Ticket Hopping	Ticket & Time report
Ticket & Time report - All codes	Ticket & Time report
Forecast Reporting	Forecast Reporting

Source: Data from BI Dashboard Implementation at PT XYZ, 2025

Table 5 illustrates the mapping between the required reports based on needs analysis and the reports realized in the dashboard. In general, most of the core reports identified, such as waiting for users, tickets with no activity of more than seven days, incident and request resolution, user satisfaction, ticket aging, as well as time-based reports and ticket codes, have been successfully implemented directly.

In some cases, there is a simplification of the report structure without reducing the substance of the information. For example, the waiting for user and waiting for approval reports are separated into two separate reports to increase the clarity of ticket status monitoring. Similarly, the incident resolution and request fulfillment report categories are displayed separately so that the performance evaluation of each service type can be carried out more specifically.

However, there are also needs that have not been explicitly realized, such as ticket hopping reports. This indicates the potential for further development in the next stage to increase the visibility of ticket assignment efficiency. Overall, this table shows that most of the key report needs have been accommodated, while also providing an overview of areas that can be further developed in future dashboard implementations.

7. Organization Visualization and Storytelling Dashboard

1) Report Waiting for User

The Waiting for User dashboard is designed to provide a comprehensive overview of tickets that are on hold pending a response from the user. The focus of this dashboard is to help operations teams identify tickets that have the potential to be hidden backlogs and understand the patterns of delays that occur across different regions, categories, and carrier groups. With this visibility, IT service management can monitor service conditions more proactively and ensure that tickets don't stop for too long without follow-up. The information displayed also supports a routine evaluation of the effectiveness of communication between the IT team and the service users.

In addition to providing an aggregate overview, this dashboard also supports more in-depth data exploration through filtering based on certain attributes such as region, department, category, and priority. Each filter change updates the entire visualization so that the analysis can be focused on specific areas that need attention. With this approach, the dashboard not only functions as a monitoring tool, but also as a means of data storytelling that helps readers understand the root of the problem, determine follow-up priorities, and formulate the right action plan to speed up ticket settlement.

2) Report Waiting for Approval

The Waiting for Approval dashboard was developed to monitor change tickets that are held up at the approval stage and have the potential to become a bottleneck in the IT service process. This dashboard provides visibility into the volume of tickets awaiting approval, their distribution in various regions and approver groups, and the length of time tickets have been in that status. With this information, the Service Delivery team can understand which areas are experiencing the most delays and when tickets start to be held, so that weekly operational discussions can be conducted based on consistent and objective data.

In addition to presenting an overview, this dashboard also allows for a more detailed search of certain approver or group operators who are waiting for the approval process. Weekly historical trends are used to identify patterns of increasing or decreasing backlogs, so that

management can evaluate the effectiveness of the approval process that is running. Thus, this dashboard not only serves as a monitoring tool, but also as a basis for tactical decision-making in improving approval flows and strengthening cross-team coordination.

3) Tickets without Activities for More Than 7 Days

The Tickets without Activities for More Than 7 Days dashboard is designed to identify tickets, changes, and activities that don't update within a certain period, potentially becoming hidden backlogs. This dashboard provides a long-term historical picture of stagnant entities and allows operations teams to understand patterns of inactive ticket accumulation across various organizational units. Thus, the potential for a decrease in service quality due to neglected tickets can be detected early and followed up systematically.

In addition to displaying a summary of the current conditions, this dashboard also supports more in-depth analysis through grouping by operator group, region, and division. Detailed information down to the ticket number level helps the team identify responsible parties and prioritize handling. With this approach, the dashboard acts as a storytelling tool that explains the ticket journey from stagnant conditions to the root of structural problems that cause delays in updates, so that it can be the basis for continuous improvement of service processes.

4) Incident Resolution

The Incident Resolution dashboard was developed to monitor the achievement of incident resolution SLAs based on priority, ranging from P1 to P4. This dashboard provides an overview of weekly and monthly performance, as well as comparing actual results to the baseline SLA that the organization has set. With this visualization, the Service Delivery team can understand incident resolution performance trends, identify periods or categories that experience frequent breaches, and assess the consistency of achieving service targets over the long term.

In addition to displaying performance aggregation, the dashboard also provides access to the details of tickets that have experienced delays in completion. This information allows users to conduct a more in-depth root cause analysis and determine the necessary corrective actions, both in terms of processes, resources, and technical competencies. Thus, this dashboard not only serves as a performance reporting tool, but also as a means of organizational learning to improve the quality of incident handling on an ongoing basis.

5) Request Fulfillment

The Request Fulfillment Dashboard is designed to monitor the performance of request fulfillment and changes that have been implemented, both for standard and non-standard request categories. The differences in the characteristics of these two types of requests require separate monitoring so that SLA achievement can be evaluated more objectively. This dashboard displays monthly trends in request completion performance and compares it to the organization's SLA baseline, so management can understand performance patterns and identify periods that require special attention.

In addition to providing an aggregate overview, this dashboard also supports detailed exploration down to the individual ticket level that caused SLA breaches. With drill-through capabilities, users can drill down into factors that cause delays, such as request categories, locations, or specific group operators. This information is the basis for the operational team to evaluate processes, improve workflows, and strengthen resource capacity so that the quality of request fulfillment services can continue to be improved.

6) User Satisfaction

The User Satisfaction Dashboard was developed to monitor user satisfaction levels as a key indicator of IT service quality. This dashboard displays the average trend of feedback ratings and participation rates over time, so that the team can understand changes in user perception of the services provided. Rating distribution also helps identify whether dissatisfaction is sporadic or concentrated in a specific group of services, so that improvement responses can be directed more on target.

In addition to providing an aggregate picture, this dashboard allows for detailed exploration of feedback down to the group operator level and individual tickets. This information helps teams understand the patterns of positive and negative comments that appear, and associate them with specific types of services, priorities, or locations. With this approach, the dashboard not only serves as a satisfaction monitoring tool, but also as a means of organizational learning to continuously improve the quality-of-service interactions and user experience.

7) Ticket & Time Report

The Ticket & Time Report dashboard is designed to provide a comprehensive overview of the number of tickets handled and the total working time recorded by the operator in each period. This information is used to understand the distribution of workloads, the effectiveness of assignments, and the proportion of time spent on various types of activities, including the consequences of assignment errors such as wrong assignments. With this visibility, the management team can evaluate operational efficiencies and identify areas that need process improvement.

In addition to presenting aggregated data, this dashboard also supports detailed exploration down to the level of time recording reasons and individual tickets. Users can drill down into time usage patterns by group operator, ticket type, or specific time to understand the sources of time waste and optimization opportunities. Thus, this dashboard functions as a tool for analyzing operational performance as well as a basis for planning to improve work processes and increase the productivity of the IT service team.

8) Forecast Reporting

The Forecast Reporting dashboard was developed to display the results of monthly ticket forecasting based on statistical models and compare them with historical actual data. The main purpose of this dashboard is to support capacity planning, resource allocation, and evaluation of long-term trends in IT services. By presenting forecast and actual results side by side, management can understand the pattern of growth or decline in ticket volume and assess the relevance of forecast results to actual operational conditions.

In addition to being a visualization tool for forecasting model results, this dashboard also functions as a means of conceptually evaluating the quality of predictions through comparison of trends and deviations between forecasts and actuals. This information assists operations and management teams in formulating data-driven strategies, such as team capacity adjustments, budget planning, and prioritization of service improvement initiatives. Thus, this dashboard strengthens the data-driven approach in medium- and long-term strategic decision-making.

Analysis and Discussion

To analyze whether the Business Intelligence dashboard studied is in accordance with the needs of the resource persons, the author conducts an evaluation through a survey method. This survey was compiled to capture user perceptions of the functional aspects and quality of the dashboard in supporting IT service monitoring and decision-making activities.

The survey instrument is compiled based on several main indicators, namely clarity of information, ease of use, quality of insight, support for decision-making, and strategic relevance. Each indicator is translated into a statement that directly describes the functions and benefits of the dashboard used by the source. Respondents were asked to give an assessment using a Likert scale of 1 to 5, where higher scores indicate a better level of approval or satisfaction.

The results of this survey are then analyzed to assess the extent to which the dashboard is able to present IT service information clearly, is easy to use, and provides relevant and actionable insights. This analysis is the basis for discussion in the next subchapter, which will relate the results of the respondents' assessment to the purpose of designing the dashboard and the operational and strategic needs of the organization.

Table 6. Survey question list table

Indicator	Questions	Scale
Clarity of Information	The dashboard presents the status of IT services (SLA, backlog, aging) clearly and easily understandable.	1-5
Ease of Use	The dashboard is easy to navigate and allows me to quickly find the information I need.	1-5
Quality Insight	The dashboard helps me quickly identify patterns and problem areas (e.g. problematic categories, problematic countries, recurring issues).	1-5
Decision Making Support	The dashboard helps me determine priority actions (e.g. workload balancing, service improvements, root cause analysis).	1-5
Strategic Relevance	The dashboard supports long-term analytical needs such as forecasting, resource planning, and BRM discussions.	1-5

Source: Results from User Survey on BI Dashboard at PT XYZ, 2025

The following graph is the result of a survey conducted by the author to evaluate the compatibility between the Topdesk system and the designed Business Intelligence dashboard, based on user perception. This survey aims to assess the extent to which the dashboard is able to meet the needs of information, analysis, and decision-making compared to the operational systems used previously. The assessment was given by respondents using the Likert scale, then calculated the mean value and standard deviation to get an idea of the level of perception and consistency of the respondents' answers. Details of the data can be seen in the attachment section.

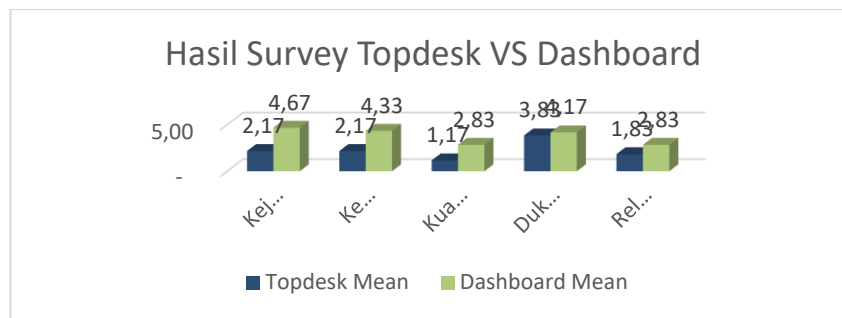


Figure 2. Graph image of the final results of the topdesk report vs dashboard report survey
Source: Results of the User Assessment Survey by the Author (2025)

Figure 2 presents a comparison of respondents' assessment results of five main indicators, namely Clarity of Information, Ease of Use, Quality of Insight, Decision Making Support, and Strategic Relevance, between the Topdesk system and the developed dashboard. Each indicator was assessed based on respondents' individual scores, which were then summarized in mean values and standard deviations.

In general, the results show that the dashboard has a higher average score than Topdesk on all indicators. The Information Clarity and Ease of Use indicators show significant improvements, indicating that dashboards are more effective in presenting IT service information in a concise and easy-to-understand manner. In the Insight Quality and Strategic Relevance indicators, the dashboard also shows a better average score, indicating its ability to help users identify patterns, problem areas, and support long-term analysis. The relatively low standard deviation values in both systems indicate that respondents' perceptions of each indicator are consistent.

Clarity of Information

In the Information Clarity indicator, Topdesk obtained an average score of 2.17, while the dashboard obtained an average score of 4.67. This considerable difference in value shows that respondents consider the dashboard to be much clearer in presenting information related to the status of IT services, such as SLAs, backlogs, and ticket aging.

The low standard deviation values in both systems indicate the consistency of respondents' perceptions. However, the high average value on the dashboard indicates that the information displayed is more concise, structured, and easy to understand than the information display on Topdesk which is operational and detailed. This shows that the dashboard has succeeded in converting operational data into managerial information that is easier for users to consume.

Ease of Use

The Ease of Use indicator shows an average value of 2.17 for Topdesk and 4.33 for the dashboard. These results illustrate that respondents had difficulty navigating Topdesk to get the information they needed quickly, while the dashboard was considered more intuitive and efficient.

Dashboards provide a visual approach and summary of information that allows users to directly focus on key information without having to do a lot of manual steps or searches. Thus, the results of this survey show that dashboards provide a significant improvement in terms of usability compared to operational systems used daily.

Quality Insight

In the Quality Insight indicator, Topdesk obtained an average score of 1.17, while the dashboard obtained a score of 2.83. Although the value of the dashboard is still at the intermediate level, the difference is still significant compared to Topdesk.

This shows that Topdesk provides almost no analytical insights that help users identify patterns, problem areas, or issues that arise repeatedly. Dashboards, although not perfect, have begun to be able to show certain patterns and areas of concern through data aggregation, trend visualization, and category grouping. These results indicate that dashboards have an important role as an analysis tool, not just a recording tool.

Decision Making Support

In the Decision Making Support indicator, Topdesk obtained an average score of 3.83, while the dashboard obtained a score of 4.17. The difference in the value in this indicator is not as large as other indicators, but it still shows the advantages of the dashboard.

These results indicate that Topdesk can still be used as a reference in operational decision-making, especially at the level of detail and execution. However, the dashboard is considered more supportive in determining priority actions because it is able to present a comprehensive picture, such as workload distribution, problem trends, and indications of areas that need immediate attention. In other words, the dashboard equips Topdesk with a broader analytical perspective.

Strategic Relevance

The Strategic Relevance Indicator shows an average score of 1.83 for Topdesk and 2.83 for dashboards. The relatively low values of both systems indicate that the use of data for long-term strategic needs is not fully optimal.

However, the dashboard still shows an improvement compared to Topdesk. This shows that dashboards are starting to be able to support long-term analytical needs such as forecasting, resource planning, and BRM discussions, although there is still room for further development. Topdesk itself is considered less relevant for strategic analysis because it is focused on operational functions and recording daily activities.

CONCLUSION

The ITIL 4-based BI dashboard effectively automates IT service reporting, visualises performance and SLAs, and supports historical data-driven service evaluation and improvement. By integrating BI as descriptive analytics with ARIMA as predictive analytics, it creates a decision support system that aids in capacity planning, resource allocation, and backlog management. Future research should focus on incorporating external variables like customer feedback, operational changes, and market trends to enhance predictive capabilities and provide a comprehensive view of IT service performance. Additionally, developing a hybrid forecasting model combining ARIMA with machine learning could improve prediction accuracy, especially for extreme ticket volume fluctuations. Enhancing the user interface would facilitate engagement from non-technical stakeholders, while ensuring scalability will accommodate growing data volumes and offer customised reporting for different departments or regions. Establishing a continuous feedback loop is essential to identify usability issues and evolving needs, keeping the dashboard relevant and effective.

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