Advancing Public Complaint Management in Malaysia: A Data-Driven Dashboard Solution for SISPAA

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Abstract

The Public Complaints Bureau (PCB) of Malaysia plays a pivotal role in enhancing public service delivery by managing citizen feedback through the Public Complaint Management System (SISPAA). Despite its effectiveness in complaint tracking, SISPAA's limited data visualization capabilities reduce operational efficiency, forcing complaint managers to manually compile and interpret reports—often leading to delays and inaccuracies. This study addresses these limitations by designing and evaluating an interactive dashboard developed in Microsoft Power BI, which integrates directly with SISPAA's complaint database. The dashboard enables real-time monitoring, dynamic filtering, and role-specific visualizations for both complaint handlers and senior leadership. Using the Goal-Question-Metric (GQM) framework, the solution was assessed by end-users, with over 85% reporting improved usability, faster access to insights, and reduced reporting time. These findings underscore the dashboard's potential to enhance transparency, accountability, and decision-making, thereby aligning with Malaysia's digital governance initiatives.

Keywords: *Data Visualization, Dashboard, Operational Efficiency, Public Complaint Management, SISPAA*

1. Introduction

Effective management of public complaints is crucial for improving government accountability and service delivery. In Malaysia, the Public Complaints Bureau (PCB), which was established in 1971 under the Prime Minister's Department, oversees citizen feedback through the Public Complaint Management System (SISPAA). Although SISPAA offers a solid framework for handling complaints, its static reporting tools hinder real-time analysis and decision-making [1]. Current research highlights the significance of data visualization in converting raw data into actionable insights [2]. Dashboards facilitate real-time monitoring, trend analysis, and performance tracking, all of which are vital for enhancing efficiency in the public sector [3]. Nevertheless, the existing system of SISPAA does not possess these functionalities, indicating a need for a user-focused dashboard solution.

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The objectives of this study are to:

i. Identify appropriate data types and visualization methods for SISPAA.
ii. Create an interactive dashboard designed to meet the needs of complaint managers.
iii. Assess the dashboard on usability, functionality, and its effectiveness in enhancing decision-making and operational efficiency.

To meet these objectives, an interactive data visualization dashboard was developed using Microsoft Power BI and connected to complaint data from SISPAA. The dashboard is tailored to different user roles and supports real-time updates and dynamic filtering. This study evaluates its effectiveness using the Goal-Question-Metric (GQM) framework. The following sections present a literature review on digital governance, feedback systems, data visualization, and dashboard design. The methodology outlines the system development and evaluation process, followed by results, discussion, and conclusions that highlight the dashboard's contribution to enhancing public service delivery through data-driven decision-making.

2. Literature Review

Malaysia's digital governance initiatives, outlined in the Digital Economy Blueprint and Public Sector ICT Strategic Plan, emphasize the use of big data analytics and e-government platforms to enhance public service delivery [4]. Despite these national strategies, systems like SISPAA still rely on static reporting tools that limit real-time analysis and strategic response. Feedback systems are critical in identifying service gaps, enhancing operational accountability, and fostering citizen trust [1][5][6][7][8][9]. However, SISPAA's current architecture lacks the analytical capabilities to transform high-volume complaint data into meaningful insights for performance improvement [10].

Data visualization is a proven method to simplify complex datasets and support evidence-based decision-making. Visual tools reveal patterns, reduce cognitive load, and improve communication among stakeholders [2][11][12][14]. Their application in real-time environments, such as during health crises [13], further illustrates their potential. Dashboards, in particular, serve as integrated tools that support trend tracking, performance monitoring, and strategic alignment [3][17][18][19]. Nonetheless, challenges remain. Data quality issues, system integration complexities, and varying user technical skills can undermine dashboard effectiveness [10][20][22]. Ensuring usability, scalability, and data security requires automation, stakeholder-centred design, and cloud-based infrastructure [21][9].

While platforms like Tableau and SAP offer advanced capabilities, Power BI provides a cost-effective and adaptable solution suited to public-sector needs [23][24][25][27]. Existing research has not sufficiently addressed real-time, interactive dashboards in government complaint systems [25][28][29], creating a practical and theoretical gap. This study aims to bridge that gap by developing and

evaluating a Power BI dashboard tailored for SISPAA's operational and strategic requirements.

3. Methodology

This study adopts a structured research methodology to guide the systematic development and evaluation of a data visualization dashboard intended to enhance the Public Complaint Management System (SISPAA). The methodological approach ensures that both practical challenges and theoretical considerations are addressed through rigorous planning, iterative development, and user-centered evaluation. The methodology is divided into several key phases that reflect the flow of the research from identifying problems and user needs to designing the solution and assessing its impact. The next subsection outlines the research framework that structures these phases.

3.1 Research Framework

The research is guided by the Design Science Research (DSR) framework proposed by Venable [31], which is well-suited for creating and evaluating IT-based artifacts in complex, real-world environments. DSR emphasizes the iterative development of solutions that are both practically effective and theoretically grounded. In this study, the DSR framework is applied through three core phases: (i) problem diagnosis and planning, (ii) dashboard design and development, and (iii) post-implementation evaluation. Each phase integrates stakeholder input and feedback loops to ensure continuous refinement. Figure 1 illustrates the research framework used in this study.

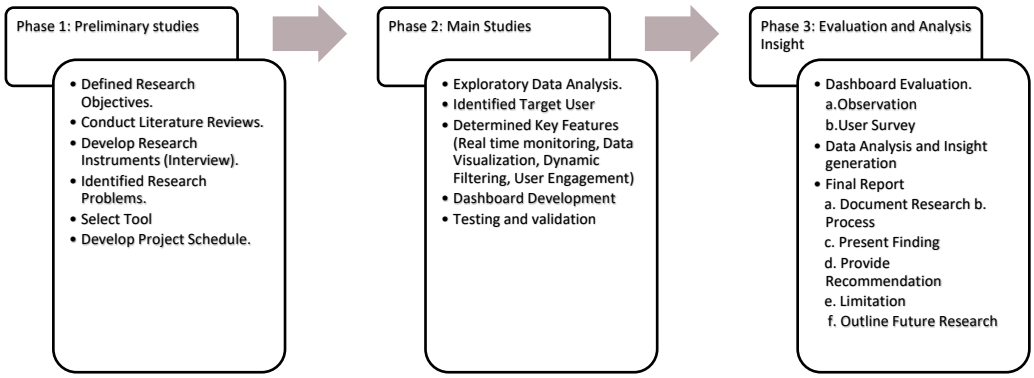

Figure 1: Research Framework

In the initial phase, exploratory interviews were conducted with five complaint managers from the Public Complaints Bureau (PCB) to identify key operational issues, such as delayed reporting, performance monitoring challenges, and limited insight generation from existing tools. These insights informed the functional requirements of the dashboard. Microsoft Power BI was selected for its compatibility with PCB's existing infrastructure, support for both structured and unstructured data, rich visualization capabilities, and ease of use across user groups. A detailed project schedule was prepared to structure the research timeline and activities.

The development phase included exploratory data analysis (EDA) of existing SISPAA records to uncover complaint trends, resolution timelines, and workflow inefficiencies. These findings guided the dashboard design, which followed Shneiderman's information-seeking mantra, "overview first, zoom and filter, then details-on-demand" [32] and incorporated Edward Tufte's principles of clarity and simplicity in data presentation [14]. The resulting dashboard featured real-time updates, interactive visualizations (bar, line, and pie charts), dynamic filters, and drill-down capabilities tailored to the needs of complaint managers and senior decision-makers.

In the evaluation phase, the dashboard was assessed for usability, functionality, and effectiveness using the Goal-Question-Metric (GQM) framework [33]. Structured surveys with a 5-point Likert scale and guided observations were used to collect feedback from PCB users. Quantitative data focused on navigation, clarity, and responsiveness, while qualitative responses captured user experiences and improvement suggestions. Thematic analysis and descriptive statistics were used to interpret the results, enabling comprehensive evaluation and refinement of the dashboard. Key findings were compiled into a final report that documented the development process, user feedback, limitations, and recommendations for future enhancements.

4. Results and Dashboard Development

This section presents the development and evaluation outcomes of the data visualization dashboard integrated into the Public Complaint Management System (SISPAA). The results are based on iterative user engagement, exploratory data analysis, and user-centered design practices. Each stage, from problem identification to system design and deployment was guided by the Design Science Research (DSR) framework to ensure the solution addressed actual workflow inefficiencies faced by complaint managers. The findings highlight key design decisions, visualization strategies, and usability results that demonstrate the dashboard's effectiveness in enhancing transparency, performance monitoring, and decision-making within the public service context.

4.1 User Needs and Data Analysis

To identify operational gaps within the Public Complaints Bureau (PCB), five senior complaint managers were interviewed using a semi-structured protocol. The interviews revealed consistent processes case filtering, assignment, and stakeholder coordination but emphasized inefficiencies due to manual data compilation in Excel. Key performance indicators (KPIs), such as case screening within 3 days (90%), closure within 5 days (90%), and resolution within 15 days (60%), were routinely monitored. However, the SISPAA system lacked visual analytics, unit-level filtering, and automated reporting, leading to time-consuming manual enhancements for presentations. These limitations support broader literature advocating digital transformation and system integration to improve public sector service delivery and responsiveness [21].

To address this, a comprehensive Exploratory Data Analysis (EDA) was conducted on a dataset of 37,738 entries and 21 attributes from January 1 to December 31, 2024. Data cleaning included duplication, null value handling, and date validation. Feature engineering derived key fields such as complaint duration and escalation levels. Aggregation techniques created role-based summaries (e.g., `action_branch`, `assigned_to`) to support operational monitoring. This analytical process aligned with best practices in public sector data governance and enabled insights critical to dashboard functionality.

4.2 Dashboard Architecture and Design

A data visualization solution was developed using Microsoft Power BI, integrating insights from EDA and interview findings. Three role-specific dashboards were created—Executive, Operational, and KPI—each grounded in user-centered design principles and optimized for clarity, real-time data interaction, and strategic relevance [31], [34].

The **Executive Dashboard** as illustrated in Figure 2 was designed for senior leadership, incorporating dynamic filters for branch and date, and interactive visuals including bar charts (resolution status), funnel charts (feedback types), pie charts (complaint sources), and searchable tables. These features support macro-to-micro level trend analysis, minimizing manual reporting and enhancing transparency and oversight [36].

Figure 2: Proposed Executive Dashboard.

The **Operational Dashboard** as shown in Figure 3, addressed unit-level management needs. It featured stacked bar charts for officer-assigned cases, complaint type distributions, resolution time charts, and donut charts for case complexity. Interactive filters and a monthly timeline support trend identification and balancing workload. All components update simultaneously for seamless drill-down navigation, promoting agile response to operational bottlenecks [21].

Figure 3: Proposed Operational Dashboard

The **KPI Dashboard** as illustrated in Figure 4 tracked six key performance indicators aligned with PCB service standards. Visuals include pie and donut charts for targets like complaint screening (90%), case activation (95%), and resolution timelines (60%). Real-time filtering by month and unit enables localized performance monitoring and strategic planning. This multi-tier dashboard design follows digital governance frameworks that emphasize data accessibility, accountability, and decision-making efficiency [21], [35].

Figure 4: Proposed KPI Dashboard

Design aesthetics incorporated accessible color schemes compliant with WCAG guidelines to ensure readability and usability for diverse users. Visual structure adhered to Tufte's and Shneiderman's principles of cognitive efficiency and information clarity [14], [32]. Collectively, dashboards reduce cognitive load, enhance operational visibility, and serve as practical tools for enabling data-driven public service management.

4.5 Dashboard Evaluation

The SISPAA dashboards were evaluated to assess their usability, functionality, and effectiveness in facilitating data-driven complaint management. This process involved structured user engagement through demonstrations and surveys. Following the development phase, the dashboards were presented to a group of selected complaint managers and frontline staff. Participants explored the system via guided walkthroughs and hands-on trials. Initial qualitative feedback was positive: users noted improved monitoring capabilities, reduced manual workload, faster access to key insights, and clearer visibility into KPIs, enhancing both strategic planning and team coordination.

A structured survey using the Goal-Question-Metric (GQM) framework [33] was subsequently deployed to quantify user perceptions. It targeted three main evaluation objectives: usability, functionality, and effectiveness. Each objective included five targeted questions using a 5-point Likert scale. The usability domain assessed interface intuitiveness and ease of navigation, while the functionality domain measured alignment with task requirements and system performance. Effectiveness questions focused on how well the dashboard supported operational decision-making. To facilitate broad participation, the survey was distributed via Google Forms, which also allowed for secure, anonymous submissions and efficient aggregation of responses for analysis.

Figures 5, 6, and 7 illustrate the hierarchical structures of the Goal-Question-Metric (GQM) framework applied in this study to assess the SISPAA dashboard. Each figure corresponds to one of the three primary evaluation objectives: usability (Figure 5), functionality (Figure 6), and effectiveness (Figure 7). These diagrams represent the logical breakdown from high-level evaluation goals into specific questions and measurable indicators, ensuring alignment between assessment objectives and user feedback. This structured approach enabled a comprehensive, targeted evaluation of the dashboard's interface intuitiveness, operational support features, and contribution to informed decision-making.

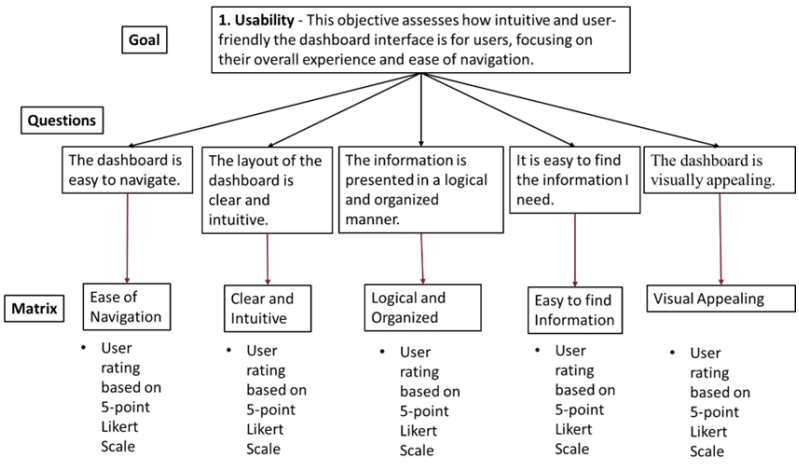

Figure 5 Goal 1 GQM Hierarchical Structure on Usability

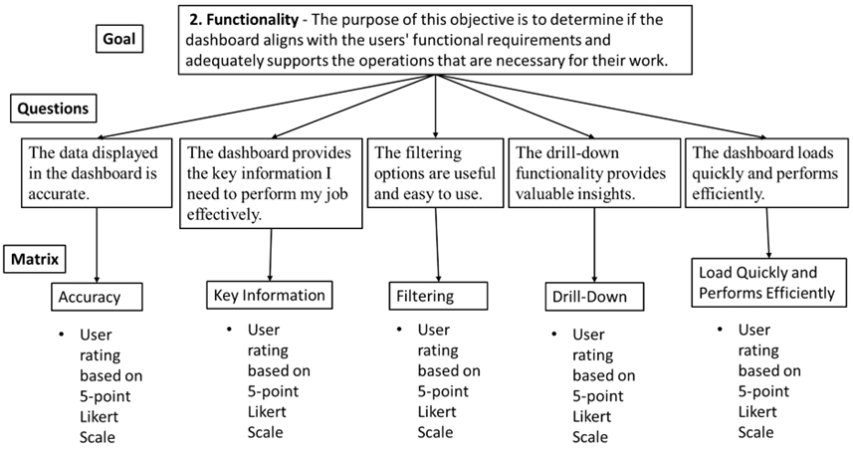

Figure 6: Goal 2 GQM Hierarchical Structure on Functionality

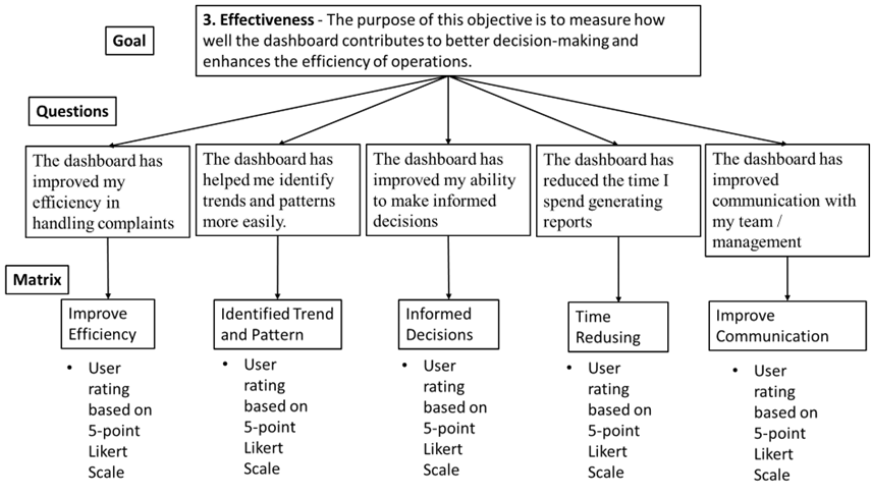

Figure 7: Goal 3 GQM Hierarchical Structure on Effectiveness

The use of the GQM model ensured consistency in aligning goals with user feedback and supported a data-driven assessment of system performance [37]. This evaluation phase was instrumental in verifying the dashboard's alignment with user needs and identifying areas for refinement. The results provided both validation of the dashboard's strategic impact and a foundation for future iterative enhancements.

4.5.3 Dashboard Evaluation Results and Insights

A comprehensive evaluation of the SISPAA dashboard was conducted using the Goal-Question-Metric (GQM) framework with 23 participants comprising supervisors and investigators. Usability metrics showed high user satisfaction: 87% strongly agreed the dashboard was easy to navigate, 83% confirmed the layout was clear, and 82.6% indicated that key information was easily accessible. While functionality also received positive feedback, 87% agreed that the data was accurate and up to date, 78.3% strongly agreed that the dashboard supported their operational needs, and 87% rated the filter functions as effective and easy to use. The drill-down feature garnered 100% positive feedback, 52.2% strongly agreed and 47.8% agreed, though several respondents noted the need for deeper levels of analysis. Visual

appeal, though still favorable, received the lowest score overall, with an even split between strong agreement (52.2%) and agreement (47.8%), indicating an opportunity to enhance the interface design and hierarchy.

Effective results affirmed the dashboard's operational value. A total of 87% reported improved complaint-handling efficiency, while 73.9% noted better trend identification, and 82.6% agreed that decision-making processes were enhanced. Notably, 91.3% of users strongly agreed that the dashboard significantly reduced the time required to generate reports, and 87% highlighted improved internal communication and collaboration. These findings underscore the dashboard's impact on transparency, productivity, and information access. No respondents provided neutral or negative responses, suggesting universal acceptance across different roles. However, feedback also highlighted several enhancement areas: users recommended a refreshed visual color scheme, customizable dashboards based on user roles, expanded filters for parameters like case duration and investigator assignment, and enriched case listings with real-time progress indicators. These suggestions provide a practical roadmap for iterative development to ensure long-term dashboard relevance, usability, and scalability within public service environments.

5. Conclusion and Future Works

This study investigated the development and evaluation of an interactive data visualization dashboard integrated into Malaysia's Public Complaint Management System (SISPAA). The goal was to enhance operational efficiency, strategic oversight, and accountability in public service delivery. Using a Design Science Research approach and incorporating stakeholder feedback, the dashboard was designed with user-centered principles, presenting complaint data through real-time, intuitive visualizations tailored to various managerial levels.

Evaluation results demonstrated strong user acceptance: over 85% of respondents reported improved usability, faster access to complaint trends, and greater decision-making support. Notably, 91.3% affirmed a reduction in manual reporting time, underscoring the system's impact on operational performance. These outcomes confirm the dashboard's potential to streamline complaint handling processes, improve transparency, and reinforce a culture of data-informed governance. Beyond its immediate operational benefits, the study contributes to the broader discourse on digital transformation in the public sector by offering a replicable, low-cost framework for visual analytics implementation. The integration of the Goal-Question-Metric (GQM) model further strengthened the dashboard's evaluation by systematically aligning user feedback with system performance objectives. Despite its contributions, the study has limitations. It focuses on a single agency and does not yet assess long-term effects such as improvements in resolution rates or citizen satisfaction. Additionally, unstructured data (e.g., complaint narratives) were not analyzed, limiting deeper insight extraction. External factors such as policy alignment, data interoperability, and inter-agency scalability were also beyond this study's scope.

Future development will follow a phased roadmap. Initial phases will prioritize enhancements to visual customization, dashboard filtering, and user interface design. Subsequent phases will focus on advanced analytics—including root cause analysis and predictive modeling, system integrations with platforms such as HR and CRM, and automation features such as real-time alerts. Longer-term goals include performance benchmarking and the incorporation of AI-based sentiment analysis to mine citizen feedback more effectively. In conclusion, the SISPAA dashboard offers a scalable model for digital innovation in public administration. It serves not only as a technical solution but as a strategic tool that enables responsive governance, supports performance management, and lays the foundation for future digital transformation initiatives across public sector institutions.

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Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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