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Designing a Knowledge-Based Performance Management System and Web-Based Inventory Recording System for Medical Device Distributors: Case Study of PT. Mulawarman Mitra Medika

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Abstract

PT Mulawarman Mitra Medika, a medical device distributor in Indonesia, faces operational challenges including declining revenue growth, poor inventory accuracy, extended stock opname cycles, and limited strategic performance visibility. This study proposes an integrated approach combining a Knowledge-Based Performance Management System (KBPMS) with a web-based inventory recording system to address these challenges. Using mixed methods—qualitative process mapping, stakeholder interviews, and quantitative analysis via Analytical Hierarchy Process (AHP)—the research identifies 22 performance variables across three perspectives: Business Result, Internal Process, and Resource Capability. AHP prioritization reveals revenue growth, stock opname cycle time, and system user adoption rate as critical levers for improvement. The paper presents a complete design and implementation roadmap, including system architecture, data flow diagrams, entity relationship models, service level agreements, and a three-month phased rollout plan. The proposed KBPMS-integrated web system is expected to reduce data entry errors, shorten inventory cycles, improve reporting reliability, and strengthen strategic alignment. This research contributes both practical guidance for SMEs in healthcare distribution and theoretical insights into integrating digital systems with performance management frameworks in developing-economy contexts.

Keywords: *Knowledge-Based Performance Management System, Web-Based Inventory System, Analytical Hierarchy Process, Medical Device Distribution*

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INTRODUCTION

The healthcare distribution sector in Indonesia is experiencing rapid growth, driven by increasing demand for medical devices and hospital supplies. However, small and medium enterprises (SMEs) in this sector, such as PT Mulawarman Mitra Medika, struggle to maintain competitiveness due to operational inefficiencies, fragmented business processes, and lack of systematic performance monitoring (Kemenkes RI, 2023).

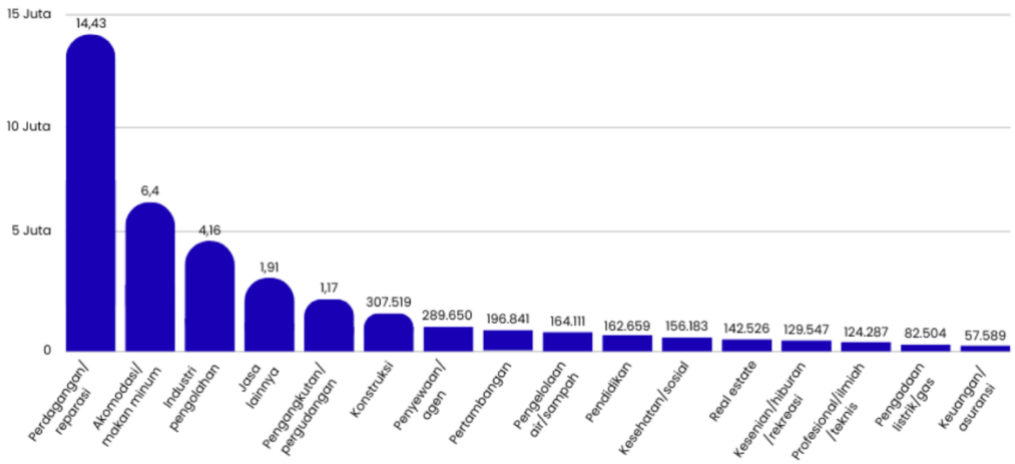

Figure 1. Number of SMEs in Indonesia based on sector

PT Mulawarman Mitra Medika, established as a medical device distributor, has experienced declining revenue growth, low inventory accuracy, and customer dissatisfaction stemming from unreliable order fulfillment. The root causes are largely operational: inventory data is managed manually using paper records, stock opname cycles are protracted and disruptive, data entry errors are frequent, and performance visibility for management is limited to informal awareness of problems after they occur.

Current operational challenges at PT Mulawarman Mitra Medika include: (1) stock opname cycles consuming 8 days with significant operational disruption, (2) frequent data entry errors of transactions, (3) customer complaints regarding stockouts and incorrect shipments, (4) lack of formalized performance measurement beyond basic financial accounting, (5) employee frustration with manual workarounds, and (6) strained vendor relationships due to order accuracy issues. The root causes are systemic: inventory data is managed entirely through manual paper records, performance visibility for management is limited to informal awareness of problems after they occur, and the organization lacks the technological infrastructure and structured processes necessary for real-time operational control.

LITERATURE REVIEW

1. Performance Management Systems in SMEs

Performance management systems are widely recognized as critical mechanisms for organizational strategy execution, operational improvement, and stakeholder accountability. Kaplan and Norton, 1992, 2004) established the balanced scorecard framework, demonstrating that organizations using structured performance measurement systems achieve superior financial and operational results. Neely et al. (2002) developed the performance prism, providing an alternative framework integrating stakeholder perspectives with organizational capabilities. More recently, Garvin (1991) and the Baldrige Foundation (2023) emphasized that high-performing organizations institutionalize systematic measurement, analysis, and continuous improvement as core management practices.

However, Taticchi et al. (2015) document that implementation of performance management systems in SMEs, particularly in developing economies, presents

distinctive challenges. SMEs typically face: limited financial resources for technology investment; informal organizational structures with undefined roles and responsibilities; low technical capacity and digital literacy among staff; insufficient awareness of PMS benefits; and competing urgent priorities that crowd out strategic improvement initiatives. Opoku et al. (2020) provide evidence from Ghana that SMEs with structured inventory management practices achieve significantly better operational performance and profitability than those relying on ad-hoc methods, but the gap between awareness of best practices and actual implementation remains substantial.

In the Indonesian context, Deloitte (2022) and the World Bank (2023) identify digitalization of SME operations as critical to competitive sustainability. Yet most Indonesian SMEs lack integrated approaches combining organizational capability development with technological investment. Digital transformation readiness remains low, with many SMEs uncertain about technology selection, implementation sequencing, and change management requirements.

2. Knowledge-Based Performance Management Systems (KBPMS)

Wibisono (2016, 2018) developed the KBPMS framework as an adaptation of international performance excellence models specifically for Indonesian organizational contexts. KBPMS integrates four foundational pillars: (1) Performance Measurement through relevant indicators aligned with strategy; (2) Result Evaluation comparing actual achievement against targets and benchmarks; (3) Problem Diagnosis identifying root causes of performance gaps using structured analysis; and (4) Systematic Follow-up implementing technical corrective actions (immediate operational fixes) and strategic actions (longer-term capability building and policy changes). This framework recognizes that effective PMS requires not just metrics and dashboards, but institutional processes and cultural evolution embedding continuous improvement into organizational DNA.

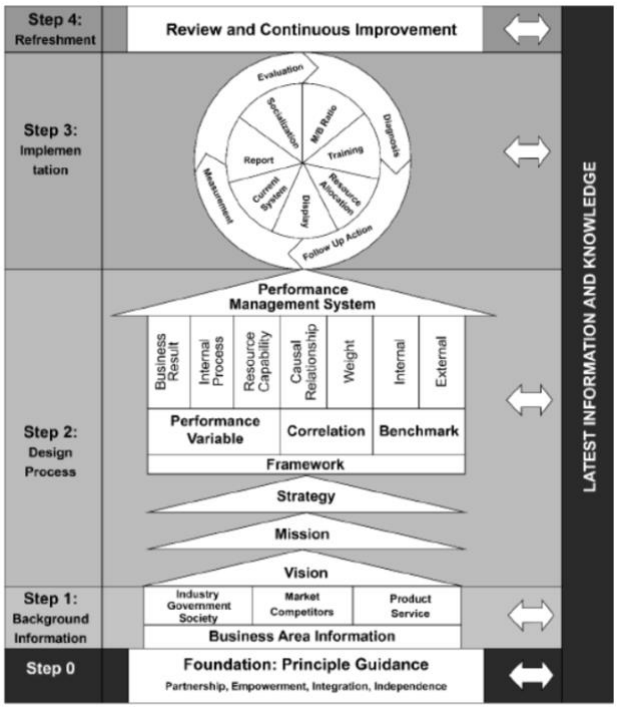

Figure 2. KBPMS Framework (Wibisono, 2016)

Atmojo et al. (2024) demonstrate successful KBPMS implementation in manufacturing and service organizations, showing that the framework effectively bridges the gap between strategic intent and operational execution. The KBPMS approach is particularly suited to SMEs because it emphasizes practical simplicity (KISS principle—Keep It Simple, Stupid), focusing on the vital few indicators rather than comprehensive but overwhelming dashboards. The framework explicitly acknowledges that SMEs operate with constrained resources and that performance management must be integrated into existing workflows rather than creating parallel systems consuming excessive management attention.

3. Web-Based Systems for Inventory Management

Digital inventory systems have been demonstrated to significantly improve data accuracy, operational efficiency, and decision-making quality compared to manual methods. Pressman and Maxim (2020) document that automated data capture, validation, and reporting eliminate error-prone manual processes while enabling real-time visibility and analysis. For healthcare and medical device distribution specifically, BPOM (2024) regulations require batch tracking, expiry date management, and complete audit trails which these capabilities that manual systems cannot reliably provide. Automated systems enable regulatory compliance while simultaneously improving operational efficiency.

Midway (2020) emphasizes that data visualization through dashboards and real-time reporting are essential components of effective system design, enabling managers to identify problems quickly and respond before they escalate into customer impact. The psychological impact of making performance visible is aligned with what Kennerley and Neely (2002) call "measurement as motivation" which often accelerates improvement beyond what the technical capabilities alone would suggest.

4. Analytical Hierarchy Process for Strategic Resource Allocation

Analytical Hierarchy Process is a structured, mathematically rigorous decision-making methodology enabling organizations to systematically weigh multiple variables and allocate limited resources strategically. Kaplan and Norton (2004) recognize AHP as a valuable complement to strategy mapping, providing quantified prioritization when organizations face numerous improvement opportunities but constrained budgets. Recent applications in healthcare contexts Nabovati et al. (2023) and business management Atmojo et al. (2024) demonstrate that AHP provides objective, defensible prioritization supporting resource allocation decisions which particularly valuable for SMEs where every rupiah of investment must be justified by impact.

5. Research Contribution

Indonesian SMEs in healthcare distribution lack practical, integrated design guidance for implementing comprehensive performance management coupled with supporting digital infrastructure. This research addresses this gap by: (1) designing a complete KBPMS framework customized to PT. Mulawarman Mitra Medika's specific operational and strategic context, (2) specifying functional and technical requirements

for a supporting web-based inventory system, (3) using AHP to prioritize performance variables, ensuring resource allocation focuses on highest-impact improvements, (4) providing a detailed, realistic implementation roadmap including change management, training, and phased rollout strategy, and (5) generating transferable insights for similar SMEs in healthcare distribution and related sectors. The contribution is both practical and theoretical, illustrating how KBPMS frameworks can be operationalized through integrated web-based systems and how performance management can be systematically institutionalized in resource-constrained SME environments in developing economies.

RESEARCH METHODOLOGY

This research employs a mixed-methods case study design combining qualitative and quantitative approaches. The qualitative component includes business process analysis, stakeholder interviews, and requirements elicitation to understand current state, identify pain points, and translate business needs into system specifications. The quantitative component applies Analytical Hierarchy Process to assign weights to performance variables and indicators, ensuring that the resulting system design prioritizes highest-impact improvements. This integrated approach ensures that the design is both theoretically grounded and practically validated against organizational realities.

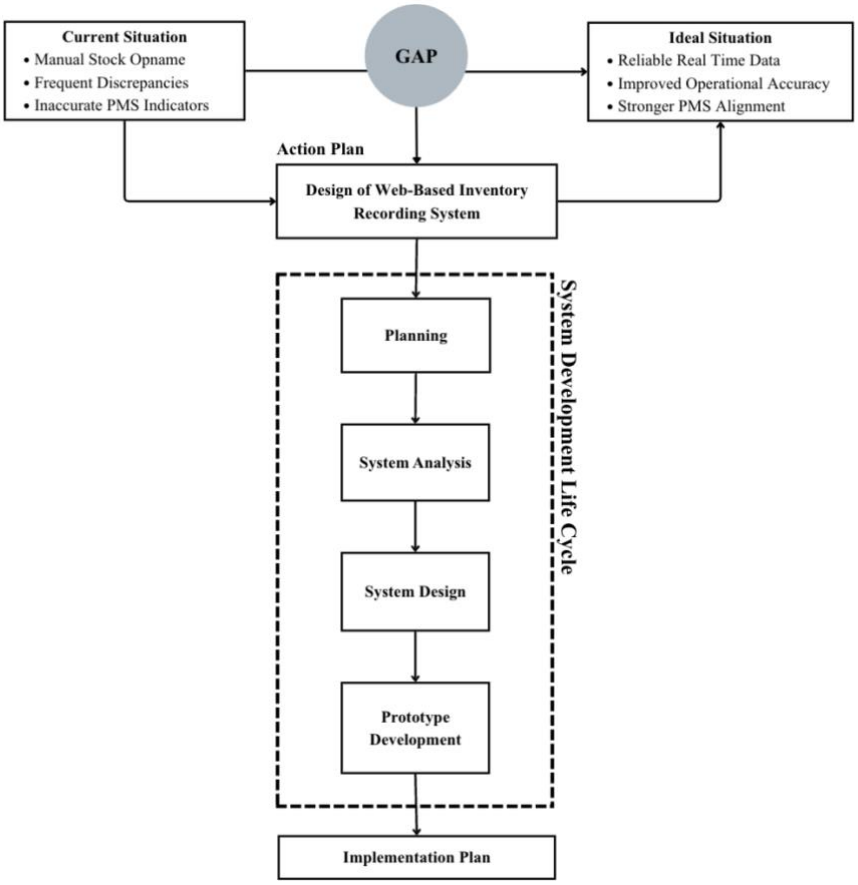

Figure 3. Conceptual Framework

RESULTS AND DISCUSSION

Analysis

PT. Mulawarman Mitra Medika currently operates with entirely manual inventory processes. Stock opname cycles consume approximately 8 days and cause significant operational disruption. Data entry errors are frequent, with warehouse staff estimating 5–10% of transactions contain mistakes. Customer complaints regarding stockouts and incorrect shipments are common. The company lacks formalized performance measurement beyond basic monthly financial accounting. Employee frustration with manual workarounds is evident from interviews. Vendor relationships are strained by repeated order accuracy issues.

Figure 4. Business Result Achievement

The company achieved only -182% of its Revenue Growth target (realized -14.56% versus target 8%), while other critical indicators such as profitability margins, asset returns, and customer satisfaction remain unmeasured (N/A). This visualization powerfully demonstrates that PT Mulawarman Mitra Medika lacks visibility into most performance dimensions critical to stakeholder assessment.

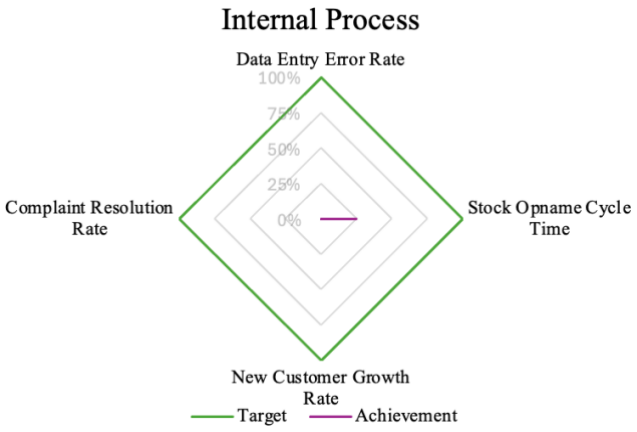

Figure 5. Internal Process Achievement

The figure above shows that the organization has measured Stock Opname Cycle Time at 8 days against a 2-day target, achieving only 25% of goal. Other crucial

operational indicators such as Data Entry Error Rate, New Customer Growth Rate, Complaint Resolution Rate are unmeasured, preventing management from identifying where operational improvements are needed.

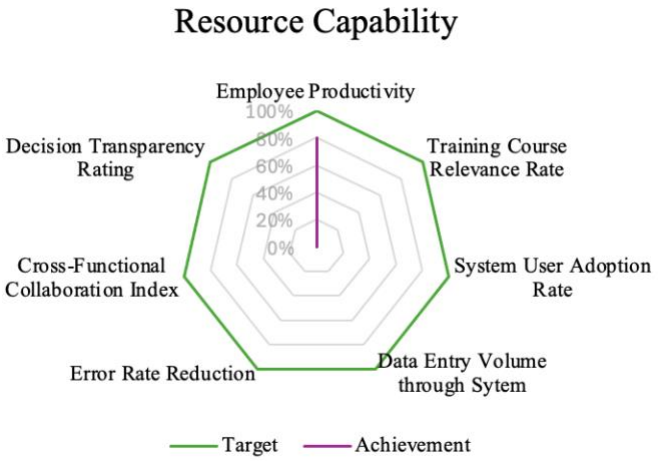

Figure 6. Resource Capability Achievement

While Employee Productivity has achieved 80% of target, all technology and organizational capability indicators are unmeasured. This gap directly explains why current manual processes cannot achieve required performance levels: the underlying technological and organizational infrastructure does not exist.

AHP Prioritization Results

Table 1. AHP Prioritization

Perspective	%	Aspect	%	Indicators	%
Business Result	55	Financial	87,5	Revenue Growth	49,1
				Net Profit Margin	20,7
				Return on Asset	9,1
				Return on Equity	7,4
				Current Ratio	3,7
				Debt to Equity Ratio	9,9
		Non-Financial	12,5	Customer Satisfaction Index	55
				Employee Satisfaction Index	24
				Vendor Satisfaction Index	21
Internal Process	24	Innovation	6,8	Data Entry Error Rate	100
		Operation Process	39,6	Stock Opname Cycle Time	100
		Marketing	34,6	New Customer Growth rate	100
		After Sales Service	19,0	Complain Resolution Rate	100
Resource Capability	21	Human Resources	19,2	Employee Productivity	75
				Training Course Relevance Rate	25
		Technology Resources	63,4	System User Adoption Rate	71
				Data Entry Volume Through System	13,5

				Error Rate Reduction	15,5
		Organizational Resources	17,4	Cross Functional Collaboration Index	66,7
				Decision Transparency Rating	33,3

This prioritization ensures that implementation efforts and resource allocation focus initially on areas with greatest impact: reducing inventory cycle time (operation process), achieving high system adoption (technology readiness), and translating operational improvements into revenue growth (business results).

Web-Based System Architecture and Design

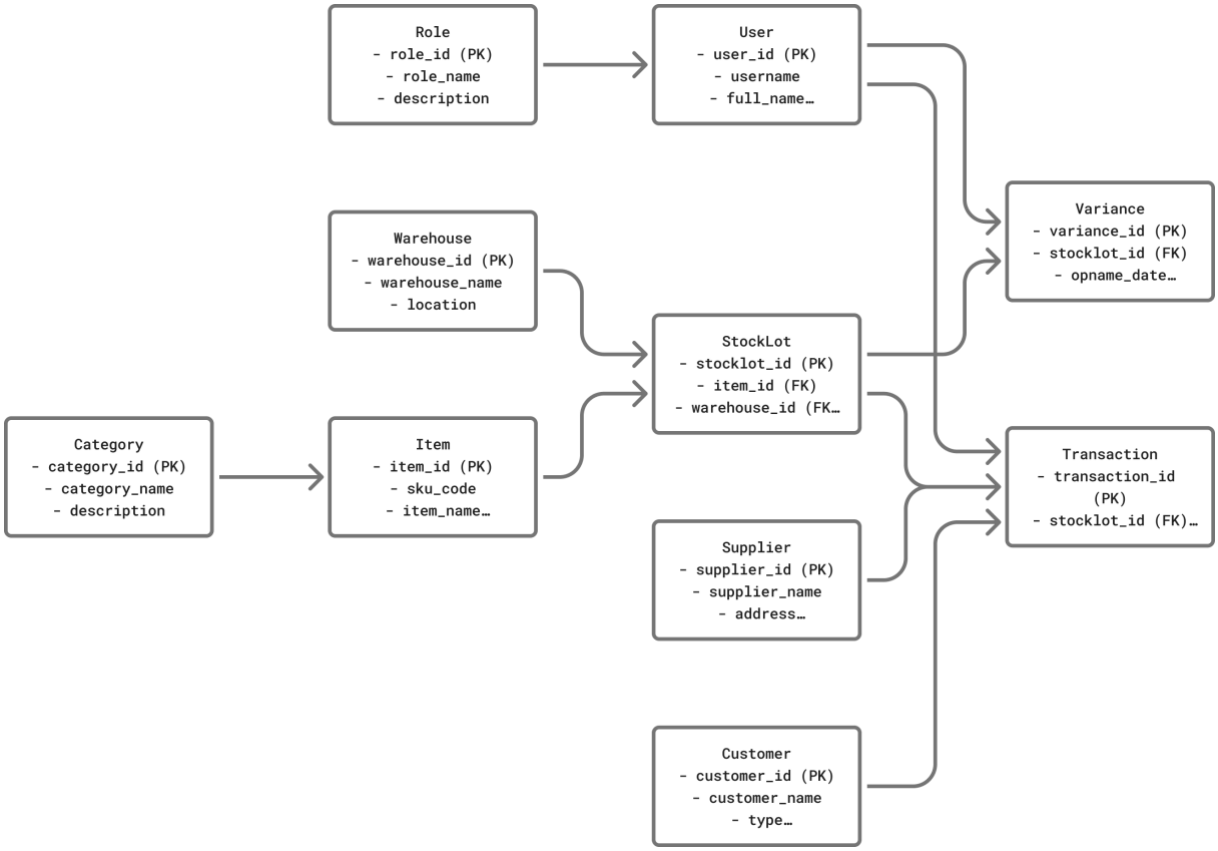

Figure 7. Entity Relationship Diagram

The above figure, illustrates the proposed database schema with core entities: User (managing access and roles), Item (product master data), Warehouse (physical locations), StockLot (batch-specific inventory with expiry tracking), Transaction (all inventory movements), Supplier and Customer (external parties), Variance (discrepancies detected during stock opname), and Role (access control). This structure ensures complete traceability: every stock movement traces back to a specific user, transaction type, batch, and external party, enabling both regulatory compliance and root cause analysis for improvements.

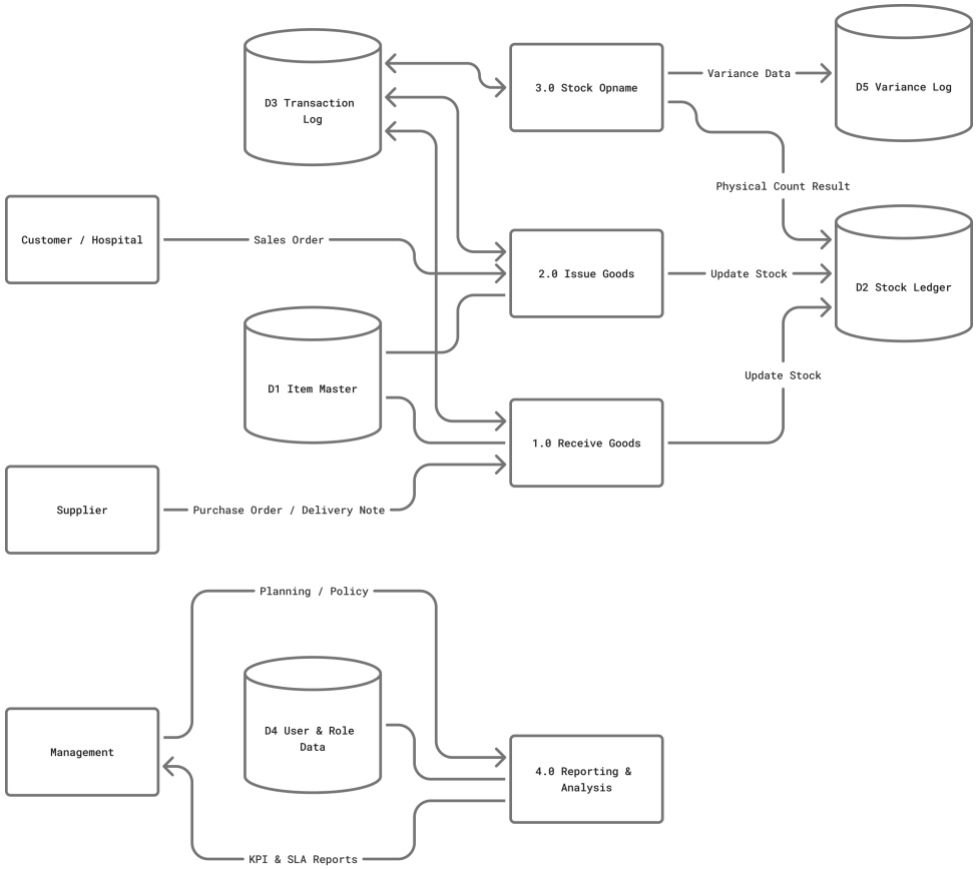

Figure 8. Entity Relationship Diagram

While on the other hand, figure 8 depicts data flow through four core processes: (1) Receive Goods (1.0): Suppliers send purchase orders, system records receipt into D1 Item Master and D2 Stock Ledger; (2) Issue Goods (2.0): Customers place orders, system processes sales and updates inventory; (3) Stock Opname (3.0): Physical counting compares actual inventory to system records, with discrepancies logged in D5 Variance Log; (4) Reporting & Analysis (4.0): System aggregates data from all logs to generate performance reports for management. This integration ensures that operational data automatically transforms into strategic insights without additional manual effort.

Service Level Agreements (SLAs)

These SLAs that are shown in the table below are embedded in system logic, automatically flagging violations and escalating to supervisors, enabling proactive management rather than reactive problem response.

Category	Metric	Target (SLA)	Measurement
System Performance	System Uptime	99.5%	Automated Server Logs
	Page Load Time	< 2 Seconds	Browser Performance Tracking
	Data Backup Frequency	Daily (Automated)	System Audit Logs
Operational Process	Purchase Order Processing	< 24 Hours from Request	Timestamp Tracking (Request to Approval)
	Sales Order Fulfillment	< 4 Hours from Entry	Timestamp Tracking (Entry to Pack)
	Stock Opname Completion	2 Days per Cycle	Duration from Start to Final Approval
	Variance Reduction	< 24 Hours from Detection	Duration from Flagging to Adjustment
	User Support Response	< 4 Hours	Helpdesk Ticket Timestamps

Table 2. SLA Parameters

Discussion

The integrated KBPMS and web-based system addresses PT. Mulawarman Mitra Medika's multifaceted challenges through complementary organizational and technological levers. The KBPMS framework ensures that every operational and technological change is aligned with clear strategic objectives and measured through relevant indicators. Organizational culture gradually shifts from reactive crisis management to proactive, data-driven continuous improvement. The web-based system automates data capture and validation, eliminating error-prone manual processes while simultaneously providing visibility enabling informed decisions.

The combination creates a self-reinforcing cycle: accurate digital data enables reliable reporting; reliable reporting enables informed management decisions; informed decisions improve operations; and improved operations build staff confidence and sustained adoption. Over time, this cycle strengthens organizational competitive capability.

The AHP prioritization ensures that resource allocation focuses on highest-impact areas. For PT. Mulawarman Mitra Medika, this means prioritizing stock opname cycle time reduction and inventory accuracy improvement as foundational operational improvements, which then enable revenue growth through service reliability and improved customer relationships. The emphasis on system user adoption rate recognizes that technology creates no value without sustained human adoption and that cultural change must accompany technological change.

The implementation roadmap balances urgency with realism. PT. Mulawarman Mitra Medika needs rapid improvement to restore market position, yet organizational change in SMEs with limited formal infrastructure requires careful pacing. The soft-launch pilot approach reduces risk by validating the system on limited scope before company-wide rollout. Systematic attention to training and change management acknowledges that digitalization in SMEs is as much cultural transformation as technological implementation.

The research also highlights contextual factors important for SME performance management implementation: (1) simplicity (KISS principle, (2) practicality, (3) relevance, (4) leadership commitment, (5) resource realism.

CONCLUSION

This research designs a comprehensive, integrated approach to improving performance management and operational efficiency in a medical device distribution SME. By combining the KBPMS framework with a purpose-built web-based inventory system, PT. Mulawarman Mitra Medika can transition from reactive crisis management to proactive, data-driven performance improvement. The Analytical Hierarchy Process provides objective prioritization ensuring that limited resources focus on highest-impact improvements. The detailed implementation roadmap, including change management, training, and phased rollout strategy, makes the design practically executable within SME constraints.

The approach is generalizable to similar SMEs in healthcare distribution, medical devices, pharmaceuticals, and related sectors seeking to improve performance through integrated digital and organizational transformation. The research contributes to understanding how KBPMS frameworks can be operationalized through web-based systems, how performance management can be systematically institutionalized in resource-constrained environments, and how developing-economy SMEs can strategically prioritize improvement investments.

Practitioners implementing similar systems should recognize: (1) technology alone solves nothing, (2) top management sponsorship and visible commitment are essential, (3) phased implementation reduces risk and enables learning, (4) simple, practical measurement systems outperform comprehensive but overwhelming dashboards, (5) connecting operational metrics to strategic objectives helps staff understand how daily work contributes to company success.

Future research should track implementation outcomes at PT. Mulawarman Mitra Medika, measuring actual achievement of performance targets and identifying barriers and enablers of sustainable adoption. Comparative studies across multiple SMEs would strengthen understanding of contextual factors influencing KBPMS effectiveness in developing-economy settings. Research exploring the long-term cultural and organizational evolution resulting from systematic performance management implementation would extend theoretical understanding beyond initial implementation phase.

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