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Web-based Supply Chain Information System using SCOR at PT Ebier Suth Cokran

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Abstract

A web-based supply chain information system is a strategic solution for addressing operational data transparency limitations in local commodity processing industries. PT Ebier Suth Cokran in Manokwari, West Papua, faces manual coordination constraints that create inefficiencies in production planning and product distribution processes for Mansel Chocolate. This study aims to design, implement, and deploy a web-based supply chain information system developed based on performance evaluation using the Supply Chain Operations Reference (SCOR) model. The research method includes field observation, KPI mapping across the five core SCOR processes, and system development using PHP, MySQL, HTML5, and responsive CSS3. The SCOR evaluation results show that the Plan and Deliver processes are at a marginal level with scores of 85% and 88%, respectively, while the Source process achieved maximum performance of 100%. Based on this gap analysis, an information system was successfully built with Production, Inventory, Logistics, and Historical Records modules, as well as a centralized archive consisting of 13 structured sections that categorize operational records from raw material procurement, production batch monitoring, quality control, inventory management, outbound delivery scheduling, distribution status tracking, return records, workforce data, plantation data, supplier records, SCOR performance history, notifications, and system settings — enabling comprehensive supply chain traceability. The live-deployed system has been proven to improve real-time data visibility, reduce dependence on manual coordination, and strengthen operational decision-making across the company's supply chain.

Keywords: cocoa industry, information system, SCOR model, supply chain, web development

1. Introduction

Effective supply chain management is a crucial factor in maintaining operational efficiency and competitiveness in agricultural processing industries, particularly for cocoa-based products [1]. The transition from traditional, siloed supply chain tracking to digital monitoring platforms has become an essential requirement for agricultural enterprises seeking to sustain growth and efficiency [2]. PT Ebier Suth Cokran, the primary producer of Mansel Chocolate in West Papua, manages an extensive end-to-end supply chain independently, encompassing plantation cultivation, fermentation, UV drying, manufacturing, and local distribution. Managing such a comprehensive lifecycle requires seamless data synchronization to ensure that material flows align precisely with administrative records. However, field observations conducted over a three-week period revealed specific operational inefficiencies: inter-departmental data relay delays averaging two to three working days, manual logbook entries with an estimated error rate of approximately 15% in production planning accuracy, and distribution coordination gaps resulting in 12% of deliveries failing to meet scheduled timeframes. This lack of visibility increases the risk of data fragmentation, tracking errors, and operational delays.

Addressing these tracking inefficiencies is essential to prevent operational friction and safeguard product quality. In the cocoa industry, delayed updates regarding raw material availability or distribution timelines can directly lead to inventory imbalances or distribution delays to partner stores. To resolve these challenges, a rigorous performance measurement model is required to systematically map operational workflows, evaluate baseline metrics, and translate underperforming areas into functional software specifications.

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Therefore, the primary objective of this research is to design, implement, and deploy a web-based supply chain information system for PT Ebier Suth Cokran based on performance gap analysis using the Supply Chain Operations Reference (SCOR) model. The significance of this study lies in its practical contribution to digitalizing local agro-industrial supply chains in West Papua by delivering a fully deployed, mobile-accessible web platform that enhances real-time data visibility, minimizes human error in operational recording, and strengthens data-driven decision-making. This developed system comprises five integrated modules: production monitoring, inventory management, logistics tracking, historical records archiving, and a centralized 13-section data repository.

2. Literature Review

The optimization of supply chain performance has been extensively explored through various analytical frameworks, with the Supply Chain Operations Reference (SCOR) model emerging as one of the most prominent standards for systematic evaluation. Recent studies emphasize the SCOR model's capability to break down complex operational workflows into measurable metrics. Prasetyo et al. [3] demonstrated SCOR's effectiveness in mapping production inefficiencies in Indonesian food SMEs, specifically identifying the Plan process as the most vulnerable dimension in manual-coordination environments. Extending this finding, Listiyono et al. [4] applied SCOR combined with AHP weighting to a manufacturing company, demonstrating that multi-criteria prioritization enhances diagnostic precision beyond single-metric scoring. Heitasari et al. [5] further validated SCOR's versatility in engineer-to-order manufacturing contexts, confirming its applicability across diverse industrial scales. Lubis et al. [6] further demonstrated that SCOR-based performance evaluations in Indonesian supply chains consistently reveal coordination inefficiencies as the primary driver of marginal scores.

In the specific context of agro-industries and the cocoa sector, maintaining raw material stability and operational standardization is paramount for sustaining local commodity competitiveness. Hendrarini et al. [1] confirmed that independent control over raw material sources provides critical stability to the supply chain, thereby significantly enhancing the added value of local cocoa commodities. Extending this operational perspective, Girsang et al. [7] highlighted that rigorous operational standardization and meticulous performance mapping using SCOR are determining factors in optimizing supply chain performance in cocoa processing facilities. From a risk management perspective, Farhana et al. [8] emphasized the need to address external supply chain risks to prevent distribution bottlenecks, while Iswari et al. [9] proposed a cocoa-specific supply chain performance measurement model applicable to Indonesian producers.

Simultaneously, the widespread integration of digital technologies into supply chains is acknowledged as a catalyst for organizational resilience. Jing and Fan [10] provided empirical evidence from Chinese manufacturing firms that digital supply chain integration directly elevates KPI scores through enhanced information sharing — establishing the business case for web-based monitoring in coordination-constrained environments like PT. Ebier Suth Cokran. Ivanov and Dolgui [11] extended this argument by demonstrating that real-time visualization dashboards outperform static reports in enabling proactive management responses, a capability particularly critical for agricultural production variables requiring continuous monitoring. Balakrishnan and Ramanathan [12] connected digital technology adoption to supply chain resilience in emerging market manufacturers, finding that web-based monitoring tools significantly improve disruption response capacity compared to manual coordination systems.

A critical synthesis of the aforementioned literature reveals a significant research gap. Previous studies predominantly stop at providing managerial recommendations, conceptual frameworks, or macro-level risk assessments without proceeding to the practical software engineering phase. What has not been adequately addressed in contemporary literature is the methodology to functionally translate analytical SCOR evaluation metrics — especially underperforming metrics within the Plan and Deliver phases — directly into the database schema and interactive architecture of a customized Supply Chain Management (SCM) information system. Benatiya Andaloussi [13] identified this integration as the most rapidly growing yet least saturated research frontier in digital supply chain literature, confirming that end-to-end studies connecting SCOR evaluation to deployed systems remain rare, especially in developing-country agroindustry contexts.

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Therefore, the novelty of this research lies in its end-to-end approach that bridges theoretical supply chain performance evaluation with practical software deployment. This article specifically focuses on transforming SCOR-based metric evaluations — Plan, Source, Make, Deliver, and Return — into functional parameters for a web-based monitoring dashboard at PT. Ebier Suth Cokran. Unlike previous studies that merely diagnose inefficiencies, this research utilizes the identified performance gaps to design tailored digital modules, including a structured 13-section digital archiving system for comprehensive historical tracking. By doing so, this study not only uncovers operational bottlenecks within the manual coordination of the cocoa industry but also provides a concrete, scalable digital solution specifically engineered to resolve those identified inefficiencies, establishing a new paradigm for utilizing the SCOR model as a foundation for information system design.

3. Research Method

A. Research Object and Location

This research was conducted at PT. Ebier Suth Cokran the primary manufacturer of Mansel Chocolate, located in Manokwari, West Papua, Indonesia. The scope and object of this study focus entirely on the end-to-end supply chain operational performance, encompassing raw cocoa bean procurement from internal plantations, manufacturing processes on the production floor, inventory handling, and local distribution to partner stores.

B. Data and Data Collection Techniques

The data utilized in this study consist of primary and secondary data. Primary data were gathered through direct, non-participant field observations of daily manufacturing processes and in-depth semi-structured interviews with key operational stakeholders, including plantation supervisors and warehouse administrators [14]. These interviews were conducted to meticulously map physical material flows and identify information bottlenecks within the existing manual coordination system. Secondary data were obtained from internal company logs, manual physical logbooks, operational reports, and historical production records.

Primary data collection was conducted over a three-week field observation period at PT. Ebier Suth Cokran, encompassing five structured interview sessions with key operational stakeholders: the Head of Production, Warehouse Administrator, Logistics Coordinator, Plantation Supervisor, and the company's General Manager. Each interview session was specifically designed to elicit operational data corresponding to one or more SCOR process metrics. Where numerical records were unavailable in digital form, data were triangulated between interview responses and physical logbook inspection to ensure cross-validated scoring accuracy. The complete data collection instruments for each SCOR KPI are presented in Table 1.

Table 1 Data collection instruments for SCOR KPI scoring

SCOR Process	KPI	Data Source	Collection Method
Plan	Production Planning Accuracy	Head of Production	Semi-structured interview + direct observation of daily planning sheets
Source	Raw Material Independence	Warehouse Administrator	Direct observation of procurement records + interview confirmation
Make	Moisture Content Consistency	Production Floor Supervisor	Direct observation of UV drying room + manual logbook inspection
Deliver	Distribution Punctuality	Logistics Coordinator	Semi-structured interview + delivery schedule cross-check
Return	Product Return Rate	Warehouse Administrator	Interview + physical inspection of return records

C. Approach and Research Tools

This study employs a combined qualitative and quantitative approach, integrating the Supply Chain Operations Reference (SCOR) performance framework as the analytical foundation with software engineering methodologies as the primary development instrument. The SCOR framework (version 12.0) was applied to systematically evaluate the company's operational processes across five

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core dimensions, generating quantitative performance gap data that directly informed the system's functional requirements. The system development process followed the waterfall software development methodology, progressing sequentially through requirements analysis, system design, implementation, and deployment phases.

The system was designed using a client-server architecture, in which operational data are entered through a web-based interface, processed on the server side, and stored in a relational MySQL database before being displayed on the dashboard in real time. This architecture ensures that every update submitted by authorized users is immediately synchronized across the system, supporting accurate monitoring and traceability of supply chain activities.

The primary development tools used in this study include PHP as the server-side scripting language for processing SCOR performance scoring algorithms and managing database transactions, and MySQL as the relational database management system (RDBMS) for storing operational data across five dedicated module tables produksi_harian, inventory_stok, logistics_delivery, arsip_penyimpanan, and kinerja_scor — each linked through relational foreign key constraints to maintain referential integrity across modules. The frontend interface was developed using Bootstrap 5 framework combined with responsive HTML5 and CSS3, ensuring dynamic layout adaptation across desktop and mobile devices. Additionally, Unified Modeling Language (UML) diagrams — specifically a Use Case Diagram and Activity Diagram — were utilized as the architectural blueprint prior to system implementation [15], [16]. The client-server architecture design employed in this proposed system is illustrated in Figure 1.

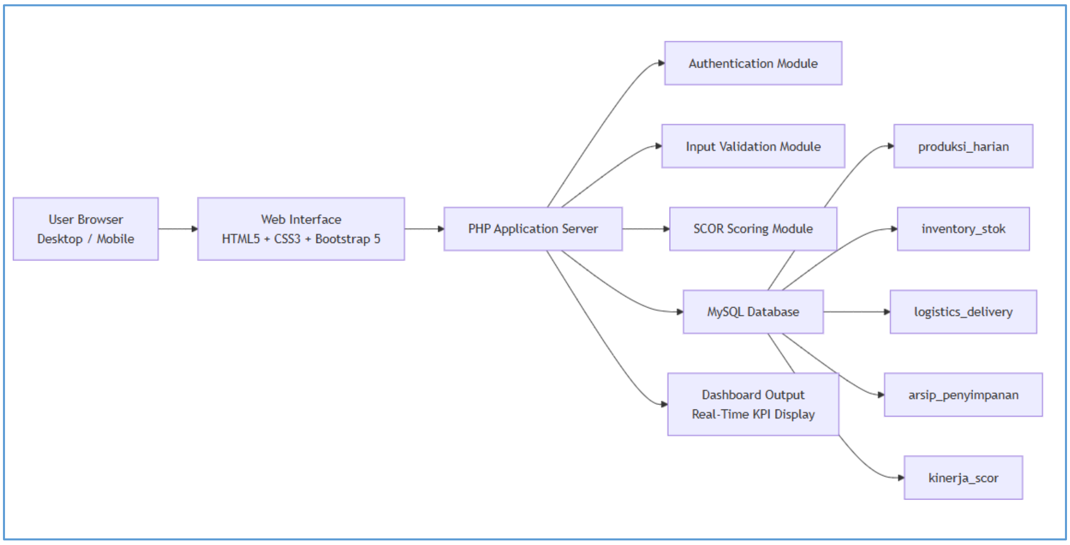

Figure 1 Client-server architecture of the proposed system

The database was structured into several relational tables to separate production, inventory, logistics, historical records, and SCOR performance data. Each table was designed with clearly defined primary keys and foreign key relationships to maintain data integrity, reduce redundancy, and support efficient querying across operational modules. To maintain data security and integrity, the system applies role-based access control, input validation, and structured form restrictions to prevent unauthorized access, duplicate entries, and incomplete submissions. These mechanisms help ensure that operational data remain consistent and reliable throughout the recording process. The comprehensive relational database schema supporting these operational modules is detailed in Figure 2.

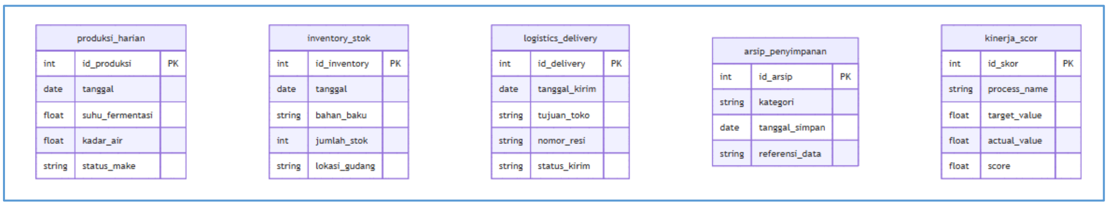

Figure 2 Relational database schema of the supply chain information system

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D. Operational Definition of Research Variables

The operational variables in this study are explicitly derived from the five core macro-processes of the SCOR model framework. *Plan* represents the accuracy of raw material requirements and daily production capacity planning, with a defined target of 95%. *Source* measures the procurement efficiency of raw cocoa beans from internal plantations, with a target of 100%. *Make* monitors processing quality control parameters — specifically fermentation room temperatures and UV drying moisture content levels — with a target of 100%. *Deliver* evaluates finished product inventory management and the punctuality of outbound distribution to partner stores, with a target of 95%. *Return* monitors reverse logistics and quality defect mitigation rates, with a target of 0%.

E. Activity Design and Analysis Techniques

The activity design follows a structured four-phase sequence integrating performance evaluation and system development. In the first phase, qualitative operational data collected from field observations and stakeholder interviews were analyzed quantitatively using a weighted scoring matrix to calculate the baseline percentage for each SCOR metric, producing one of three performance categories: *Excellent* (score meets or exceeds target ≥ 95%), *Good* (score is between 80–94% of target), or *Marginal* (score fails to meet the company's defined operational target, regardless of absolute value). A process is classified as Marginal when its actual performance falls below the company's defined target threshold, indicating a performance gap that requires digital intervention. In the second phase, metrics falling below the company's operational targets were explicitly mapped to functional system requirements, establishing a direct and traceable link between empirical performance gaps and software module specifications. The system workflow begins with user authentication, followed by role-based data entry, automatic validation, database storage, and SCOR score recalculation. After processing, the updated results are automatically reflected on the dashboard, allowing management to monitor operational performance without relying on manual reporting. The complete digital workflow of the proposed system across these phases is visualized in Figure 3.

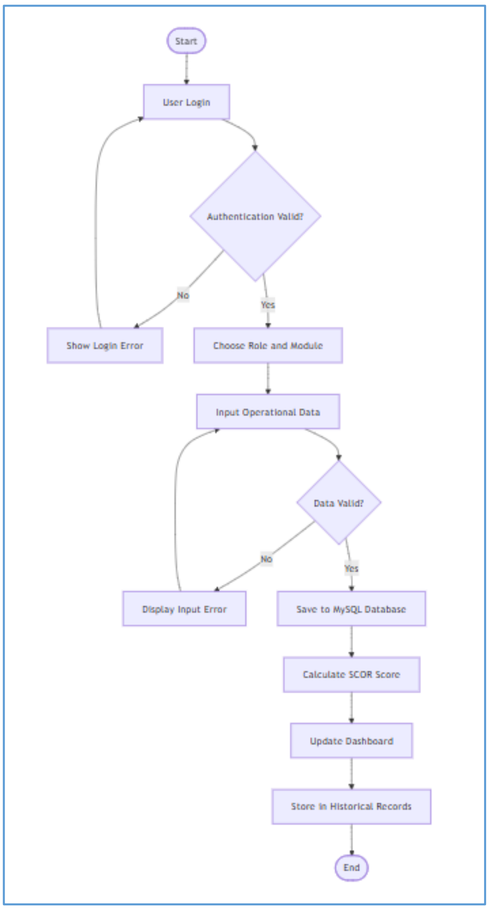

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Figure 3 Digital workflow of the proposed supply chain information system

In the third phase, the identified requirements were translated into a web-based information system architecture comprising five integrated operational modules. The **Production module** captures daily batch production data including fermentation temperature and UV drying moisture content, automatically calculating the Make process SCOR percentage in real-time. The **Inventory module** manages raw material, work-in-progress, and finished goods stock entries across warehouse locations, directly supporting the Source process monitoring. The **Logistics module** records outbound delivery schedules, shipment tracking numbers, destination partner stores, and delivery status updates, providing digital traceability for the Deliver process. The **Historical Records module** consolidates operational data from all modules into a unified chronological audit trail. The **13-section centralized archive** (arsip.php) provides structured long-term storage partitioned by operational category, enabling granular supply chain traceability from raw material procurement to final product distribution.

In the fourth and final phase, the completed system was deployed on a cloud hosting environment accessible via public network at cokelatmansel.free.nf, utilizing a centralized Control Panel configuration. The system incorporates input validation scripts across all data entry forms to prevent erroneous submissions, and adopts a responsive Bootstrap 5 interface ensuring full accessibility on both desktop workstations and mobile smartphone browsers — a critical requirement for field supervisors requiring on-site data entry capability.

The implemented system was evaluated through functional testing on both desktop and mobile browsers to verify that all modules operated correctly across different devices. The results show that the interface remains responsive and the dashboard updates accurately, confirming that the system supports practical field use and real-time decision-making.

The performance scoring thresholds applied in this study — *Excellent* (≥ 95%), *Good* (80–94%), and *Marginal* (score that fails to meet the company's defined operational target)— are consistent with the weighted scoring categorization adopted by Prasetyo et al. [3] in Indonesian food SMEs and Listiyono et al. [4] in the manufacturing sector. Each KPI score was calculated using the following standardized SCOR performance formula:

$$\textbf{Performance Score (\%)} = \textbf{(Actual Value} \div \textbf{Target Value)} \times \textbf{100\%}$$

Target values for each KPI were established through a combination of the company's stated operational standards confirmed during stakeholder interviews and cross-referenced SCOR version 12.0 benchmark indicators, ensuring the scoring framework reflects both localized operational realities and internationally recognized supply chain performance standards [2].

4. Results and Analysis

A. *SCOR-Based Operational Performance and KPI Scoring*

In accordance with the analytical framework established in the research methodology, the initial step involved converting qualitative operational data from PT. Ebier Suth Cokran into quantitative metrics. Performance indicators across the five core SCOR macro-processes were calculated using a weighted scoring matrix to establish a quantitative performance baseline for digital system integration [17]. Field observation data supporting the scoring process are documented in Figure 4.

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Figure 4 Field observation of manual data monitoring during (a) fermentation phase and (b) moisture reduction process in the uv drying room at pt. ebier suth cokran

As documented in Figure 4, critical production variables — such as fermentation temperatures and UV drying moisture levels — are currently recorded manually on physical logbooks with no digital entry mechanism available to production staff. This conventional approach creates an immediate data visibility gap, preventing administrative and logistics teams from accessing live manufacturing parameters. The complete KPI scoring results derived from the collected field data are compiled in Table 2.

Table 2 SCOR KPI achievement matrix of PT. ebier suth cokran

Process	Indicator (KPI)	Targe t	Actual	Performance Score
Plan	Production Planning Accuracy	95%	85%	***Marginal***
Source	Raw Material Independence	100%	100%	***Excellent***
Make	Moisture Content Consistency (Max 7.2%)	100%	92%	***Good***
Deliver	Distribution Punctuality	95%	88%	***Marginal***
Return	Product Return Rate	0%	0%	***Excellent***

It is important to note that the Marginal classification applied to the Plan (85%) and Deliver (88%) processes is based on their failure to achieve the company's defined operational targets of 95% respectively — representing gaps of 10% and 7% from target — rather than solely on the absolute scoring scale. This target-relative classification approach is consistent with SCOR version 12.0 benchmark guidance, which emphasizes performance gap measurement against organizational targets as the primary indicator of process vulnerability [2]. The Return process score of 0% is classified as Excellent because the operational target for this process is defined as zero product returns — meaning a 0% defect rate represents full target achievement, not underperformance. The baseline evaluation results compiled in Table 2 were derived by applying the SCOR performance formula to primary data collected through field observation and stakeholder interviews. The implemented system automatically converts operational input into structured digital records, computes SCOR-based performance values in real time, and stores the results in a relational database to ensure traceability and data consistency.

The detailed calculation and interpretation for each process are as follows.

Plan Process (Score: 85% — Marginal)

The Plan KPI measures Production Planning Accuracy, defined as the percentage of production days in which actual raw material intake met the planned daily capacity target. Based on interview data with the Head of Production, out of the observed production cycle, approximately 85% of planning targets were met, while the remaining 15% experienced shortfalls due to unscheduled delays in internal plantation harvest scheduling and inconsistent demand estimation:

$$\text{Plan Score} = \frac{85 \text{ fulfilled planning days}}{100 \text{ planned days}}\ x\ 100\% = 85\%$$

This score falls below the 95% target threshold, classifying the Plan process as *Marginal*. A 15% planning gap in cocoa processing is operationally significant — unmet capacity targets directly increase the risk of fermentation batch inconsistencies and facility underutilization. This finding is consistent with Prasetyo et al. [3], who identified the Plan process as the most vulnerable SCOR dimension in SME environments relying on verbal coordination rather than digital planning tools.

Source Process (Score: 100% — Excellent)

The Source KPI measures Raw Material Independence, defined as the percentage of total raw cocoa bean supply sourced from the company's own internal plantations. Interview confirmation from the Warehouse Administrator and direct procurement record observation confirmed that PT. Ebier Suth Cokran sources 100% of its raw cocoa bean requirements exclusively from its own plantation facilities in Manokwari:

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$$\text{Source Score} = \frac{100\%\ \text{internal supply}}{100\%\ \text{total requirement}}\ x\ 100\% = 100\%$$

This Excellent classification confirms Hendrarini et al.'s [1] finding that full internal plantation control provides maximum supply chain stability by eliminating procurement lead time variability and ensuring consistent raw material quality. The Source process therefore requires no digital intervention beyond standard inventory logging.

Make Process (Score: 92% — Good)

The Make KPI measures Moisture Content Consistency, defined as the percentage of cocoa bean production batches that successfully maintained a moisture level at or below the maximum permissible threshold of 7.2% following UV drying. Based on direct observation of the UV drying room and inspection of manual production logbooks, approximately 92% of batches met the moisture standard, while 8% recorded moisture levels exceeding the threshold due to irregular drying cycle durations:

$$\text{Make Score} = \frac{92\ \text{compliant batches}}{100\ \text{total batches}}\ x\ 100\% = 92\%$$

While the Good classification indicates generally adequate production control, the 8% moisture deviation carries a critical latent quality risk: batches with moisture content exceeding 7.2% are susceptible to mold development during storage, which would progressively compromise the currently perfect Return rate. This finding reinforces the necessity of implementing a Real-time Production Monitor that enforces digital logging of drying cycle parameters, preventing the gradual escalation of this latent risk into an active quality failure.

Deliver Process (Score: 88% — Marginal)

The Deliver KPI measures Distribution Punctuality, defined as the percentage of finished product deliveries that reached partner stores within the scheduled delivery timeframe. Based on interview data with the Logistics Coordinator and cross-referencing of available delivery schedule records, 88% of deliveries were fulfilled on time, while the remaining 12% experienced delays attributable to manual coordination gaps between the warehouse team and the distribution fleet:

$$\text{Deliver Score} = \frac{88\ \text{on} - \text{time deliveries}}{100\ \text{scheduled deliveries}}\ x\ 100\% = 88\%$$

The Marginal classification of the Deliver process is particularly significant because distribution punctuality directly impacts partner store inventory management and customer satisfaction. The 12% delay rate is directly traceable to the absence of a real-time digital dispatch system — delays occur because logistics staff rely on verbal handoffs and physical delivery notes, creating information asymmetries between the warehouse and the distribution fleet. This bottleneck corroborates the distribution vulnerability patterns documented by Farhana et al. [8] and validates the priority development of a Distribution Tracking Module with automated status dispatches.

Return Process (Score: Excellent)

The Return KPI measures the Product Return Rate, defined as the percentage of finished chocolate products returned by partner stores due to quality defects. Physical inspection of warehouse return records and interview confirmation from the Warehouse Administrator established that the company has maintained a zero product return rate throughout the observed period:

$$\text{Return Score} = \frac{0\ \text{returned products}}{\text{total delivered products}}\ x\ 100\% = 0\%$$

The Excellent classification of the Return process confirms that PT. Ebier Suth Cokran's pre-shipment quality control gates are functioning effectively. However, this metric must be interpreted in conjunction with the Make process — the current 8% moisture deviation in production represents a latent threat to this perfect Return score if left unaddressed through digital monitoring intervention.

From an information systems perspective, these results demonstrate that the system successfully transforms manual operational recording into an integrated digital workflow that improves data accessibility, traceability, and decision support.

B. Process Gap Analysis and Field Observations

To contextualize the marginal scores obtained from the KPI scoring matrix, the results were analyzed against root cause findings from field observations. The Plan metric's 85% accuracy is classified as Marginal because a 15% discrepancy between planned capacity and actual raw material

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intake in cocoa processing can lead to facility bottlenecking or premature cocoa bean spoilage — consistent with Prasetyo et al. [3], who identified the Plan process as the most vulnerable SCOR dimension in manual-coordination SME environments. The Deliver metric's marginal score of 88% highlights outbound logistics vulnerability, where reliance on physical logbooks causes delayed information relay between warehouse staff and the distribution fleet, corroborating distribution bottleneck patterns documented by Farhana et al. [8].

Conversely, the Excellent score in the Source process confirms Hendrarini et al.'s [1] finding that internal plantation control provides measurable supply chain stability. While the Make process achieved a Good classification, its 8% moisture deviation presents a latent quality risk: inconsistent UV drying can lead to mold development during storage, which would eventually compromise the currently perfect Return rate. This gap validates the urgency of implementing a real-time production monitoring module. The identified gaps were subsequently mapped to functional system requirements as presented in Table 3.

Table 3 Mapping of SCOR performance gaps to system feature requirements

SCOR Process	Identified Gap	Required System Feature
Plan	Verbal capacity planning without digital documentation	Dashboard KPI — real-time capacity planning input.
Source	Manual recording of raw cocoa bean intake	Inventory Module — Raw Material category and Plantation Data
Make	Inconsistent fermentation and UV drying monitoring	Production Module — batch QC & moisture logging (production.php).
Deliver	Delayed distribution status updates	Logistics Module — delivery tracking & status management (logistics.php).
Return	Zero-defect rate maintenance requires digital monitoring support at the pre-shipment quality gate	Production Module QC integration to prevent moisture-risk escalation

As structured in Table 3, each functional feature directly targets a specific empirically identified operational gap. For the Source process, a Digital Sourcing Log replaces manual intake logs to automatically bind raw cocoa shipments to specific plantation IDs. In the Make phase, a Real-time Production Monitor enforces digital logging of fermentation and moisture variables, directly addressing the 8% quality deviation. The Deliver process is optimized via a Distribution Tracking Module replacing delayed verbal coordination with automated status dispatches.

C. System Requirements and UML Architecture Design

To transform the gap analysis findings into a functional system blueprint, the identified supply chain actors and their module interactions were modeled using Unified Modeling Language (UML). The use case design clarifies user roles, access boundaries, and system interactions, ensuring that each operational actor interacts only with the relevant module. This structure supports role-based access control and contributes to system maintainability. The operational boundaries and interactions between these actors and the system modules are illustrated in the Use Case Diagram shown in Figure 5.

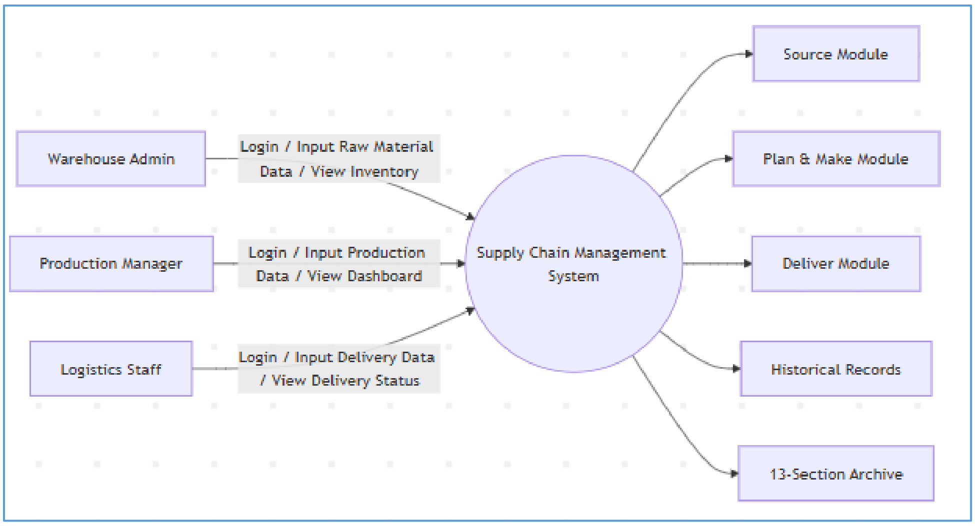

Figure 5 Use case diagram

The Use Case Diagram defines access boundaries for three primary actors: Warehouse Admin (Source module), Production Manager (Plan and Make modules), and Logistics Staff (Deliver module). All actors access their respective modules through role-based sidebar navigation, ensuring structured data entry boundaries and operational accountability across the supply chain workflow [15], [16]. The Use Case Diagram is presented in Figure 5. The system comprises five integrated modules accessible through the sidebar navigation: Dashboard, Production, Inventory, Logistics, Historical Records, 13 Saved Sections, and Plantation Data — each developed using PHP, MySQL, and Bootstrap 5 framework. The detailed operational logic, validation gates, and database storage pathways for data entries are illustrated in the Activity Diagram shown in Figure 6.

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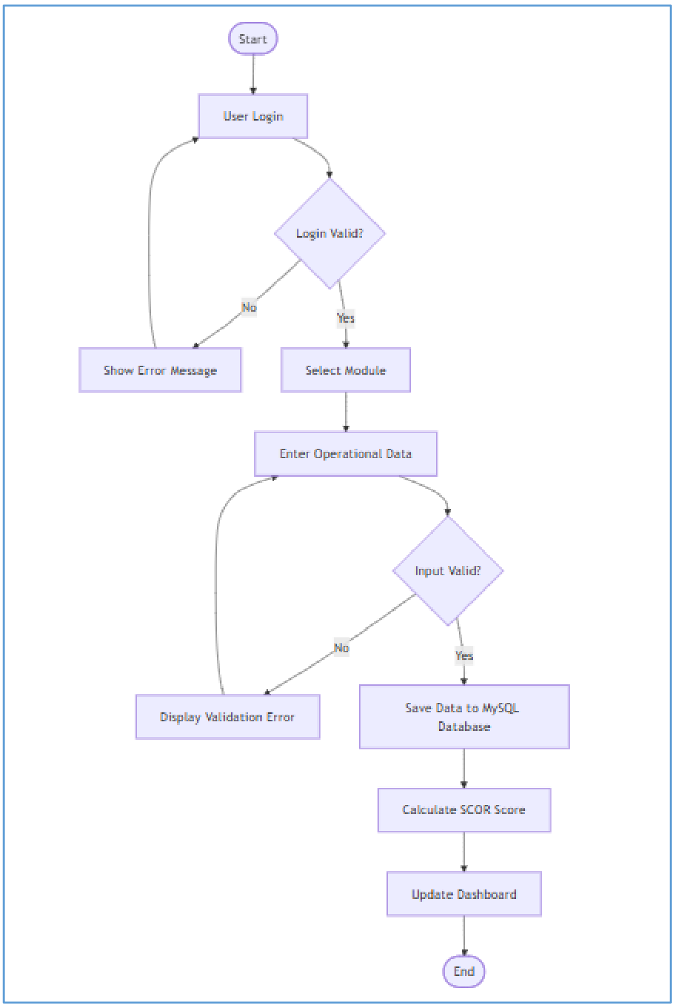

Figure 6 Activity diagram of data entry and SCOR calculation process

As illustrated in Figure 6, every data entry performed by the three actors is systematically aggregated into the centralized thirteen-section archive, ensuring comprehensive supply chain traceability from raw material procurement to final product delivery. The resulting dashboard interface prototype is presented in Figure 7.

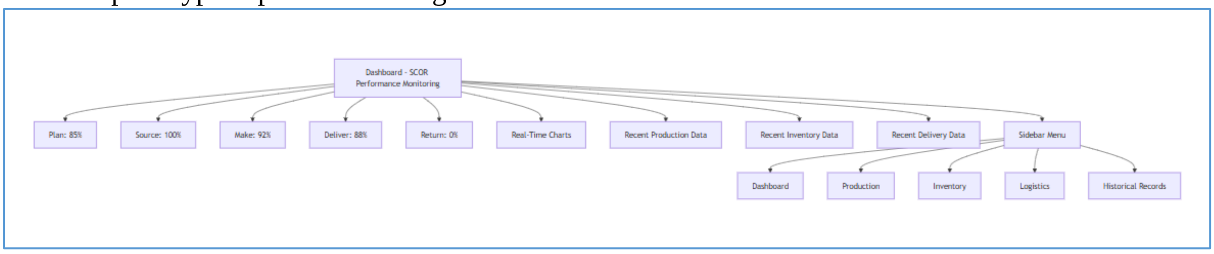

Figure 7 Dashboard layout

Figure 7 presents the structural layout of the dashboard system. The actual implemented dashboard interface is shown in Figure 8.

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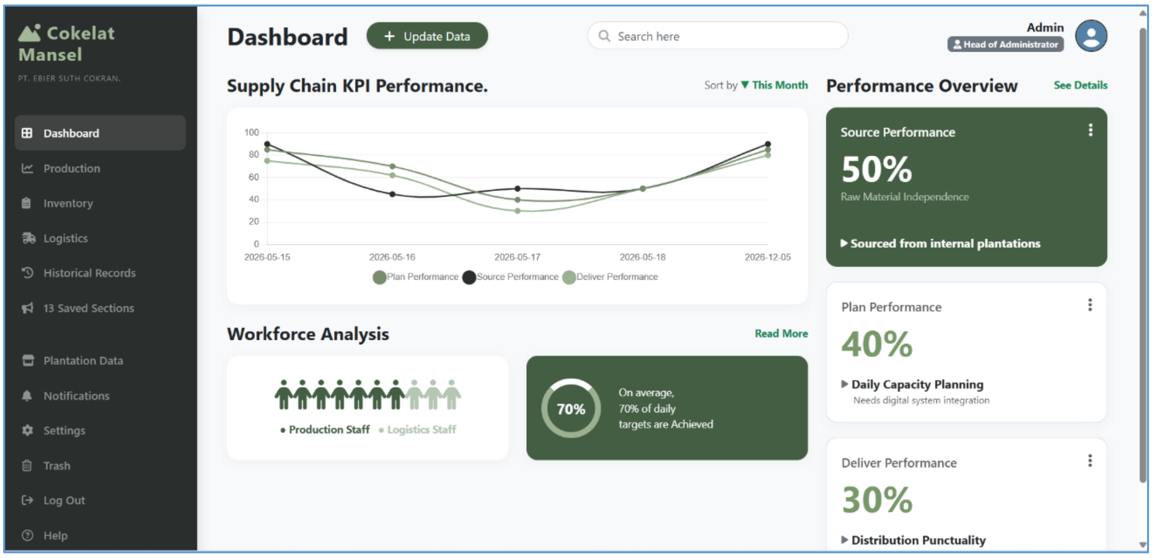

Figure 8 Proposed user interface of the supply chain performance dashboard

The dashboard prototype in Figure 8 integrates real-time SCOR monitoring panels displaying live performance percentages for all five processes. This real-time visibility directly addresses the core limitation identified in the Plan and Deliver gap analysis, enabling management to detect operational bottlenecks without waiting for end-of-month manual reports.

D. System Implementation and Deployment

Following the design phase, the system was fully implemented and deployed on a cloud hosting environment utilizing a centralized Control Panel configuration. The system is publicly accessible and can be verified directly at [*http://cokelatmansel.free.nf/*](http://cokelatmansel.free.nf/) — comprising five operational modules — Production, Inventory, Logistics, Historical Records, and 13-section centralized archive — each directly engineered to resolve the SCOR performance gaps identified in Table 3. To ensure high accessibility for field supervisors monitoring plantation and fermentation activities on-site, the platform incorporates a responsive HTML5 and CSS3 design architecture. The live deployed interface in mobile view is presented in Figure 9.

Figure 9 The live deployed dashboard interface (mobile view)

The implemented system was also tested across desktop and mobile browsers to verify responsive behavior, layout stability, and correct data submission across different screen sizes. The

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Production module enables daily batch production data entry including fermentation temperature and UV drying moisture content, automatically calculating the Make process SCOR percentage using the formula:

$$\text{Make Score} = \frac{\text{batch meeting standard}}{\text{total batches}} \, x \, 100\%$$

The module also classifies each batch's moisture status against the 7.2% threshold. The Inventory module manages raw material stock entries across Gudang A and Gudang B, supporting Source process monitoring. The Logistics module records outbound delivery schedules including shipment tracking numbers, destination partner stores, and delivery status updates, providing complete digital traceability for the Deliver process.

Table 4 Black box testing results of the web-based supply chain information system

No	Module	Test Case	Expected Output	Actual Output	Status
1	Dashboard	Access the dashboard through a web browser	The dashboard loads with KPI charts and performance overview panels	The dashboard is displayed correctly with real-time charts	Pass
2	Dashboard	Input SCOR data through a modal form	The data is saved and the KPI chart is updated automatically	The chart is updated with the new values	Pass
3	Dashboard	Select an archive section from 1 to 13	The data is routed to the correct archive section	The data is correctly routed to the selected section	Pass
4	Production	Input batch production data	The data is saved and the Make SCOR percentage is calculated automatically	The score is calculated and displayed in the table	Pass
5	Production	Input a production batch value exceeding the total batch limit	The system displays a validation error	The validation error is shown and the data is not saved	Pass
6	Production	Input moisture content above the 7.2% threshold	The status is marked as "Not Compliant"	The status is correctly flagged	Pass
7	Inventory	Add a new stock entry	The stock is recorded in the correct warehouse location	The data is saved to the correct warehouse	Pass
8	Logistics	Input a delivery schedule	The delivery data is saved with the status "Processing"	The data is saved correctly	Pass
9	Logistics	Update the delivery status to "Delivered"	The status is updated in the real-time tracking table	The status is updated correctly	Pass
10	Responsive	Access the system through a mobile browser	The layout adapts dynamically to the screen size	The layout is fully responsive on mobile devices	Pass

The status Pass indicates that the actual result is in accordance with the expected result, which means the tested system function operates correctly. The status Fail indicates that the actual result does not meet the expected result, so the related function or module requires further improvement or correction.

Table 4 presents the black box testing results of the web-based supply chain information system developed in this study. The testing was conducted to verify whether each functional module operated according to the expected behavior without examining the internal program structure. The tested

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modules include the dashboard, SCOR data input through modal forms, archive section selection, production data entry, inventory management, logistics scheduling, delivery status updates, and mobile responsiveness.

The results indicate that all test scenarios produced outputs consistent with the expected outcomes. The dashboard was able to display KPI charts and performance summaries correctly, the SCOR input form successfully updated the performance chart, and the archive section routing worked as intended. In the production module, the system correctly handled batch input validation, calculated the Make SCOR percentage automatically, and flagged moisture content values above the 7.2% threshold as not compliant.

Furthermore, the inventory and logistics modules successfully recorded stock data, delivery schedules, and delivery status updates in the appropriate tables. The responsive testing also confirmed that the interface adjusted properly on mobile browsers. Overall, the black box testing results demonstrate that the system fulfills its functional requirements and is suitable for operational use. From a software engineering perspective, these results confirm that the system successfully implements a three-tier client-server architecture — integrating PHP server-side processing, MySQL relational database management, and Bootstrap 5 responsive frontend — into a single deployable operational platform.

As shown in Figure 9, when accessed through mobile smartphone browsers, the layout dynamically optimizes its navigation and data visibility elements, successfully bridging the geographical gap between field execution and management oversight. The structural layout and user interface of the centralized archive module, showing the partition of the 13 saved historical sections, are illustrated in Figure 10.

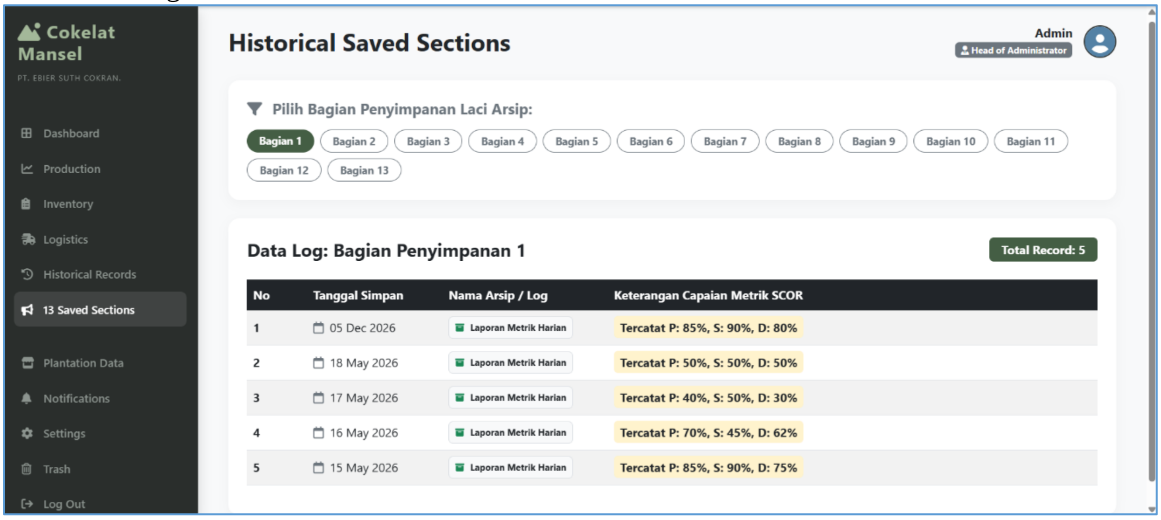

Figure 10 Centralized archive module showing the 13 saved historical sections

As illustrated in Figure 10, the thirteen saved sections systematically categorize historical records from procurement logs to final distribution timestamps, providing a searchable digital footprint for long-term strategic audits and directly resolving the fragmented manual recording limitation identified in the Enable process gap. To maximize data entry speed and prevent input errors, the dashboard incorporates interactive modal window interfaces, as shown in Figure 11.

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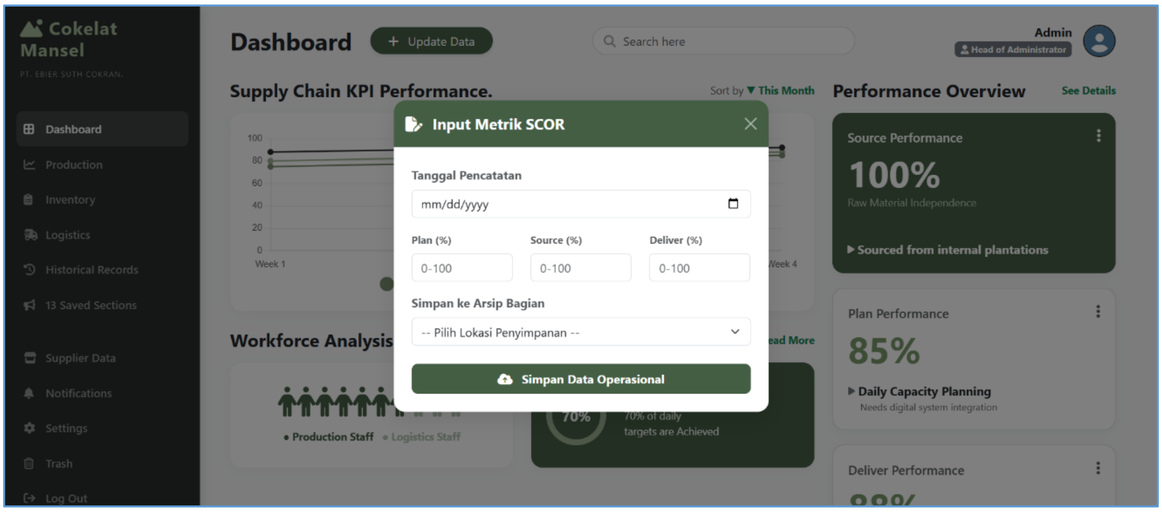

Figure 11 The interactive pop-up (modal window) interface for real-time data entry

As shown in Figure 11, when an operational variable is submitted through the modal form, the system executes an automated validation script before transmitting a PHP POST request to the server [15], [16]. The server-side logic instantly recalculates the active SCOR percentages and routes the record into the specific MySQL table corresponding to one of the thirteen saved sections [16], completely eradicating data fragmentation and transforming temporary field records into reliable permanent assets for supply chain auditing.

E. Discussion and Implications

From an information systems engineering perspective, this study contributes a fully operational three-tier web application comprising a presentation layer (HTML5, CSS3, Bootstrap 5), a business logic layer (PHP server-side processing for automated SCOR scoring algorithms), and a data layer (MySQL relational database with five dedicated module tables: produksi_harian, inventory_stok, logistics_delivery, arsip_penyimpanan, and kinerja_scor). This architectural separation ensures modularity and scalability, enabling future feature additions without disrupting existing operational modules. The implementation of input validation scripts, structured database schema with primary key relationships, and role-based sidebar navigation collectively strengthen data integrity and reduce the risk of incomplete or inconsistent operational records across the supply chain workflow. The deployment of this web-based **supply chain information system** introduces significant operational implications for agro-industrial supply chain management. From an information systems perspective, the main contribution of this study lies in converting manual supply chain recording into an integrated digital workflow that improves data accessibility, traceability, and operational decision support. The empirical findings align with Hendrarini et al. [1], confirming that raw material independence provides strong baseline stability to the cocoa supply chain. The results also reinforce Girsang et al.'s [7] assertion that operational standardization is a determining factor in optimizing cocoa processing performance. However, unlike Farhana et al. [8] who focused primarily on mitigating external supply chain risks, this research targets internal operational efficiency through standardized digital documentation — representing a distinct and complementary contribution to the cocoa supply chain literature.

The primary unique contribution of this research compared to previous SCOR studies [3], [4], [5] lies in its end-to-end integration approach: SCOR evaluation findings are not merely reported as managerial recommendations but are directly operationalized into a fully deployed, mobile-accessible web system. Unlike Girsang et al. [7] who applied SCOR-AHP exclusively for performance diagnosis, and Iswari et al. [9] who proposed a measurement model without digital implementation, this study delivers a concrete and scalable digital artifact that transforms identified performance gaps into operational monitoring tools. The system's 13-section archiving architecture further provides a level of supply chain traceability that has not been previously demonstrated in cocoa agroindustry literature, establishing a replicable model for digital supply chain monitoring in SME cocoa processors across Eastern Indonesia. The novelty of this study lies in its transformation of SCOR-based performance evaluation into a deployable web-based information system that combines real-

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time data capture, relational database management, and automated performance monitoring within a single integrated platform. The use of authentication, input validation, and structured database storage strengthens data integrity and reduces the risk of incomplete or inconsistent operational records.

5. Conclusion

This study successfully designed, implemented, and deployed a web-based supply chain information system for PT. Ebier Suth Cokran based on SCOR performance gap analysis. The evaluation of five core SCOR processes revealed that the Source and Return processes achieved Excellent performance, reflecting the company's full internal plantation control and effective pre-shipment quality gates. The Make process achieved a Good classification at 92%, while the Plan and Deliver processes were classified as Marginal due to their failure to meet company-defined operational targets of 95%, confirming that coordination latency and manual logbook dependency represent the primary operational vulnerabilities requiring digital intervention. Based on these findings, a fully functional web-based information system was developed and deployed, publicly accessible at http://cokelatmansel.free.nf/, comprising five integrated modules — Production, Inventory, Logistics, Historical Records, and a 13-section centralized archive — developed using PHP, MySQL, Bootstrap 5, responsive HTML5, and CSS3. Black box testing confirmed that all ten functional test scenarios produced outputs consistent with expected results, validating the system's operational readiness. The primary contribution of this study lies in its end-to-end approach: translating SCOR evaluation findings directly into a deployed, mobile-accessible digital platform — a methodology not previously demonstrated in cocoa agroindustry literature. Future research should incorporate longitudinal quantitative KPI datasets, AHP-based performance weighting, System Usability Scale (SUS) testing, and automated SCOR threshold alert notifications to further strengthen the system's analytical and operational capabilities.

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