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Risk-Based Internal Control Analysis: A Case Study of the Production Process at CV Vetways Indonesia

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***Abstract**:* A risk-based internal control analysis of the production process at CV Vetways Indonesia identifies and mitigates operational losses. Employing a qualitative case study approach, data were gathered through in-depth interviews with three production managers and five line supervisors, field observations across four production lines, and a review of work procedure documents and quality reports from January to June 2025. The analysis focused on identifying key production risks, assessing existing controls, and recommending improvements based on COSO principles. The analysis revealed three critical risks: (1) raw material control gaps leading to material waste due to inadequate receiving inspections; (2) machine maintenance failures resulting in unplanned downtime and reduced production capacity; and (3) procedural non-compliance during the sterilization stage, necessitating the reworking of several production batches. Current controls are largely administrative, relying on manual post-production checklists, even for risks with documented mitigation procedures. Recommendations include implementing a five-level risk matrix, shortening preventive maintenance intervals from quarterly to monthly, mandating SOP training for production staff, and installing IoT sensors on critical machines for real-time monitoring. These findings enable CV Vetways to reduce operational losses and achieve GMP compliance within 12 months.

Keywords: Internal Control; Risk Management; Production Process; Case Study; CV Vetways Indonesia

INTRODUCTION

Risk management in the production cycle has become a major concern for manufacturing companies as operational complexity and reliance on global supply chains increase. The phenomenon of raw material losses, incorrect inventory data input, and overproduction and underproduction have been shown to erode profitability and production efficiency (Zunaedi et al., 2022). The post-pandemic environment and accelerated digital transformation exacerbate these vulnerabilities due to higher supply and demand volatility (Aven, 2016).

In an increasingly agile business environment, traditional internal control systems are often inadequate to address dynamic risks in the production process. The inability of controls to respond to disruptions such as fluctuating raw material prices and changes in demand leads to significant potential operational losses, including costs due to overproduction and opportunity costs due to underproduction (Dewandaru et al., 2020; Sukmawan et al., 2025).

At CV Vetways Indonesia, a veterinary pharmaceutical manufacturer in East Java, these risks manifest in concrete operational challenges. Internal audit reports from January to June 2025 reveal that raw material losses in the warehouse reached 8.3% of total inventory value, primarily due to inadequate segregation of duties between procurement and storage staff. Incorrect inventory data input occurred in 34% of monthly stock reconciliations, caused by manual entry without secondary verification, leading to production planning distortions. Overproduction incidents resulted in IDR 127 million in excess inventory costs during the first semester of 2025, while underproduction in the sterilization stage caused 19% of customer orders to be delayed, resulting in lost sales opportunities estimated at IDR 85 million. Machine downtime averaged 11.5 hours per month due to reactive rather than preventive maintenance, reducing overall production capacity by 18%.

Field studies and internal audits demonstrate the significant financial impact of production risk mitigation failures; overproduction can result in losses per batch, while underproduction results in lost sales opportunities amounting to a substantial percentage of the target (Sukmawan et al., 2025). Furthermore, the implementation of frameworks like COSO in Indonesia remains uneven, with only a small proportion of manufacturing companies conducting comprehensive risk assessments (Agustina et al., 2025). At CV Vetways, risk assessment is conducted annually but lacks integration with daily operational controls, and only 28% of identified production risks have documented mitigation procedures.

The significance of this issue becomes even clearer when viewed from the manufacturing sector's contribution to national GDP. Failure to mitigate production risks, such as the loss of raw materials leading to idle capacity, has the potential to reduce competitiveness at the macro level and increase a company's operational costs (Soner et al., 2026). Therefore, integrating risk management with the internal audit function is a strategic necessity to maintain business continuity.

The COSO framework offers a holistic approach with components of control environment, risk assessment, control activities, information and communication, and monitoring, which are relevant to reducing incidents of overproduction and underproduction through segregation of duties and continuous monitoring (Hanwen Chen et al., 2025; Nashwan et al., 2023). Empirical evidence from several countries shows that comprehensive implementation of COSO can reduce incidents of overproduction to a significant level (Murat Soner & Mevlut Karadag, 2026).

At the organizational level, control effectiveness depends heavily on management commitment (the tone at the top) and a control culture that encourages adherence to procedures. Weak organizational structures and formal separation of duties open up opportunities for collusion and negligence in inventory input, thus exacerbating vulnerability to raw material losses and production planning distortions (Hidayaha et al., 2018; Sukmawan, 2025). At CV Vetways, the production manager simultaneously oversees procurement, warehousing, and quality control, creating a conflict of interest that undermines segregation of duties.

Employee perceptions of risk also influence control implementation; differences in understanding between levels, such as between field operators and managers, create communication and implementation gaps that reduce the effectiveness of risk assessments and control activities. These gaps lead to mitigation failures, leading to excess storage costs, obsolescence, and reduced margins (Dewandaru et al., 2020; Zunaedi et al., 2022). Interviews with 12 production staff at CV Vetways revealed that 67% were unaware of the company's risk mitigation procedures, and only 3 out of 8 standard operating procedures were consistently followed on the production floor.

Underlying this practical gap is a conceptual tension yet to be resolved in the literature. Contingency theory holds that control systems are effective only when designed to fit their organizational context — including structure, environment, and resource constraints (Chenhall, 2003) — while COSO's five-component architecture implicitly assumes conditions common in large, formalized organizations: dedicated compliance functions, stable staffing, and integrated information systems. Institutional theory offers a complementary lens, showing that organizations frequently adopt legitimated frameworks such as COSO at the level of formal policy while daily operations decouple from that policy under practical pressure — a gap Bromley and Powell (2012) distinguish as policy–practice decoupling, separate from the deeper means–ends decoupling that occurs when adopted tools fail to serve their intended purpose at all (Jemaa, 2022). Indonesian manufacturing SMEs — characterized by manual information systems, uneven training, and emergency-driven authorization — are a context where this decoupling risk is plausibly high, yet how it manifests and can be narrowed remains underexamined (Kariyoto & Tibyani, 2023).

Although studies related to internal control and COSO have been growing, there is a research gap in the specific application of risk-based controls to the production cycle in the Indonesian manufacturing sector. This research aims to fill this gap through a case study of CV Vetways Indonesia, examining not only how production-cycle risks manifest in practice but also how contextual constraints specific to Indonesian manufacturing SMEs shape the gap between COSO's formal design and its operational execution, thereby contributing to the theoretical understanding of internal control decoupling in resource-constrained settings (Susanto et al., 2022; Pratama & Sari, 2023).

The findings are expected to produce practical COSO-based recommendations that can improve the reliability of production processes, reduce costs due to inefficiency and obsolescence, and strengthen the integration between risk management and internal audit functions in order to maintain business continuity and company competitiveness in a highly dynamic market.

METHODS

This research adopts a qualitative case study approach to examine the implementation of risk-based internal control in the production process at CV Vetways Indonesia. A case study design was chosen because it allows an in-depth exploration of a phenomenon within its real-life context, particularly where the boundaries between the phenomenon and the context are not clearly evident (Yin, 2018) — a fit for internal control practices that are shaped as much by daily production pressures as by formal SOPs. The study focuses on two interlocking aims: identifying key production-cycle risks (raw material loss, incorrect inventory data input, overproduction, and underproduction) and evaluating how the five COSO components — control environment, risk assessment, control activities, information and communication, and monitoring — are implemented in practice.

Five key informants were selected purposively: the Production Manager, Finance Staff, Admin Staff, Production Staff, and Warehouse Staff (Table 1). Purposive selection was used, rather than random sampling, because the research questions require informants with direct, sustained involvement in the production process; each informant had a minimum of six months' experience in their role, ensuring familiarity with both formal procedures and informal workarounds (Yin, 2018).

Table 1. Research Informants

Research Informants	Position
Informant 1	Production Manager
Informant 2	Finance Staff
Informant 3	Admin Staff
Informant 4	Production Staff
Informant 5	Warehouse Staff

Data were collected through in-depth, semi-structured interviews with five informants—conducted in Indonesian and subsequently translated into English for analysis and reporting—alongside participant observation on the production floor. Interviews were conducted over several days, with each of the five informants answering 15 questions. Observations took place over several working days (February 3–14, 2025) across four production areas (raw material warehouse, mixing station, sterilization room, and packaging line), utilizing a structured checklist adapted from Nashwan et al. (2023) to track the five COSO components on-site; each session lasted 2–3 hours during peak production windows (08:00–11:00 and 13:00–15:00) to ensure operations were observed under realistic workloads rather than during idle periods. Researchers adopted an observer-as-participant role, limiting interaction during critical processes to avoid influencing behavior, while using conversations during breaks to clarify ambiguous observations. Secondary data—including stock control SOPs, risk registers, production variance reports, and production accounting dashboards—were reviewed to cross-verify informant reports and observations against formally documented information.

Combining these three sources (interviews, observation, and documents) served a triangulation purpose: interview claims were checked against observation notes and inventory logs, responses across organizational levels (managers versus operators) were compared to surface perceptual gaps, and quantitative figures from variance reports were checked against interview explanations, with discrepancies resolved through follow-up clarification. Preliminary findings were validated in a 90-minute session with three informants on March 5, 2025, and two of whom offered clarifications on risk-severity ratings that were incorporated into the final analysis.

Data were analyzed following Miles and Huberman's cycle of data reduction, data display, and conclusion drawing (Miles et al., 2020), using thematic coding and matrix displays to visualize relationships between COSO components and production risks, and pattern-matching against theory to strengthen interpretive validity. Dependability was supported through triangulation, member checking, and an audit trail.

Ethical considerations for the study included providing information about the research objectives, informed consent from informants, data anonymization to protect respondents' identities, and secure data storage. Method limitations were explicitly explained: as a qualitative case study, the findings are contextual and not intended to be statistically generalized to a wider population, but provide in-depth insights that can inform practical recommendations and further research (Yin, 2018).

RESULTS AND DISCUSSION

RESULTS

Table 2. COSO-Based Risk Matrix

COSO Component	Existing Condition	Main Risk	Identified Gap	Recommended Action
Control Environment	Formal SOP commitment via daily briefings; task segregation documented	Role overlap during emergencies; Production Manager oversees procurement, warehousing, and QC simultaneously	67% of production staff have limited procedural understanding; follow-up training infrequent	Enforce segregation of duties even during emergencies; mandate periodic SOP refresher training
Risk Assessment	Risk identification is informal, based on team observation	Raw material loss, incorrect inventory data, demand-driven overproduction and underproduction	No formal risk register, heat map, or FMEA; only 28% of risks have documented mitigation procedures	Develop a formal risk register and probability-impact heat map
Control Activities	SOPs exist for procurement, batch measurement, document filing, and QC checks	Authorization shortened under urgent needs; deviations during peak production pressure	Segregation of duties "loose in urgent situations"; suboptimal cycle-count frequency; inconsistent QC re-checks	Enforce strict authorization protocols regardless of urgency; increase cycle-count frequency
Information & Communication	Monthly financial reports; memos, WhatsApp groups, and weekly meetings; limited ERP use	Data delay and fragmentation; miscommunication on sudden changes	No real-time dashboard; manual low-stock notifications without automatic alerts; untidy revision records	Implement real-time ERP dashboards with automated low-stock alerts
Monitoring	Daily supervisor oversight; weekly evaluation meetings; periodic financial audits	Monitoring is operational, not KRI-based; weak overnight surveillance	No KRI framework (e.g., yield, scrap rate); minimal CCTV coverage; limited systemic follow-up	Establish KRI-based monitoring and upgrade surveillance coverage

1. Control Environment

The control environment at CV Vetways demonstrates formal commitment but inconsistent implementation. While leadership routinely conducts daily briefings and emphasizes SOP compliance (Informant 1), actual adherence varies significantly during emergency shifts and high-workload periods. Task segregation is formally documented, but role overlap occurs in urgent situations, particularly when production managers simultaneously oversee procurement, warehousing, and quality control, creating potential conflicts of interest.

Employee training shows critical gaps: new staff receive initial socialization, but follow-up training is infrequent, resulting in limited procedural understanding among 67% of production staff (Informant 3). Work rules are implemented through written SOPs and supervision, but compliance depends heavily on routine monitoring, which is not consistently applied. As one production staff noted, "SOPs exist and are expected to be followed, but actual usage sometimes deviates due to production urgency" (Informant 4).

2. Risk Assessment

Risk assessment practices are predominantly reactive and ad hoc, lacking formal methodologies. The most frequently identified risks include raw material losses, incorrect inventory data input, and demand fluctuations causing overproduction and underproduction (Informant 1). However, risk identification relies on informal team observations rather than structured tools such as risk heat maps or FMEA analysis.

Mitigation measures are corrective rather than preventive. As the Production Manager stated, "My way of identifying risks is ad hoc by the production/warehouse team without formal methods" (Informant 1). Reactive responses include tracking stock discrepancies and adjusting production schedules, but of identified risks have documented mitigation procedures. Warehouse staff identified additional risks including stock differences, storage damage due to temperature/humidity fluctuations, and minor theft, but precautions such as FIFO rotation and storage condition checks are inconsistently implemented (Informant 5).

3. **Control Activities**

Control activities show formal design but weak execution. Production cost issuance follows procurement SOPs, but authorization is frequently shortened during urgent needs (Informant 2). Raw material usage is supervised through batch formulation measurements and supervisor checks, but deviations occur when production urgency overrides controls (Informant 4). Document control relies on manual and digital filing with checklist procedures, but implementation is inconsistent during busy periods, and physical document loss still occurs despite partial digital backups (Informant 3).

Segregation of duties is compromised in practice. While authorization for fund and raw material use exists formally, implementation is "loose in urgent situations" (Informant 2). Warehouse procedures include manual recording, cycle counts, and delivery proof retention, but the process is sometimes delayed, and cycle count frequency is suboptimal (Informant 5). Quality control measures include pre-production inspections and re-instructions, but these actions "are not always consistent" (Informant 4).

4. **Information and Communication**

Information systems suffer from fragmentation and delays, limiting real-time decision-making. Production financial reports are prepared monthly with limited access for operational personnel, and "data delays and fragmentation occur" (Informant 2). Communication between divisions uses memos, WhatsApp groups, and weekly meetings, but the formal flow is "prone to miscommunication on sudden changes" (Informant 3). ERP system usage is limited, with WhatsApp and email often serving as faster alternatives, creating parallel communication channels that bypass formal documentation.

Inventory information is communicated through memos, limited ERP systems, and direct communication, but data synchronization is often late (Informant 5). Coordination between warehouse and production exists but is not formally scheduled, and low-stock reporting relies on manual notifications without automatic alerts. When incorrect information occurs, corrections are made via direct communication and document updates, but "revision recording is not always neat" (Informant 3).

5. **Monitoring Activities**

Monitoring is operational rather than strategic, focusing on daily supervision rather than key risk indicators (KRIs). Daily supervision is conducted through supervisor oversight and daily reports, but monitoring is "operational, not KRI-based" (Informant 1). Weekly evaluation meetings and variance reports exist, but follow-up actions are not always documented. When deviations occur, actions include internal investigations and schedule or material corrections, but "procedural improvements are rarely implemented immediately" (Informant 1).

Quality checks are conducted regularly, but frequency varies, and "documentation of sampling results is sometimes incomplete" (Informant 4). Financial audits occur but are "not always strictly scheduled" (Informant 2). Warehouse surveillance relies on locks and receipt checking, but night surveillance and CCTV coverage are minimal, increasing vulnerability to theft

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(Informant 5). Corrective actions for defective products include rework or scrapping with reporting to management, but systemic improvements to prevent recurrence are limited.

DISCUSSION

Research findings indicate that the implementation of COSO-based internal controls at CV Vetways Indonesia has been adopted in principle but is not yet consistent across all components, particularly in systematic risk assessment, consistency of control activities, and risk indicator-based monitoring (KRI). A primary issue stems from the absence of data-driven risk mapping, resulting in a reactive approach to addressing production obstacles. To prioritize mitigation measures, operational risks must be analyzed based on likelihood (probability of occurrence), impact (operational and financial consequences), and the underlying control weaknesses. The risk presenting the highest combination of probability and impact at CV Vetways Indonesia is the discrepancy in raw material and finished goods inventory data, caused by a heavy reliance on manual recording rather than automated scanning technologies such as barcodes or RFID (Fadhilah et al., 2023; Safitri et al., 2025). This control weakness occurs frequently (high likelihood) and entails significant financial consequences (high impact), as inventory data inaccuracies directly lead to miscalculations regarding production requirements.

Weaknesses in inventory data lead to two extreme outcomes: overproduction and underproduction. Overproduction carries a moderate probability but has a significant impact, driving up holding costs and increasing the risk of raw material spoilage in the warehouse (Sukmawan et al., 2025; Soner et al., 2026). Conversely, underproduction triggered by delayed data synchronization and postponed preventive machine maintenance also falls into the high-impact category; it risks a loss of potential sales of up to 20% of the target due to stockouts or machine breakdowns (Widyaningrum, 2025; Soner et al., 2026). The cumulative impact of poor inventory control and production schedule monitoring is reflected in a surge in the Cost of Goods Sold (COGS) and rising scrap and rework costs, which undermine the company's operational cost efficiency (Zefanya Busana, 2023; Vivian & Harahap, 2024; Hidayah et al., 2025).

These weaknesses do not sit in isolation within their respective COSO components; they compound across them. Because Monitoring lacks measurable Key Risk Indicators, deviations detected on the production floor are rarely fed back into a structured Risk Assessment process — the system has no mechanism to convert an observed problem into an updated risk estimate, so Risk Assessment stays permanently reactive rather than improving over time. Similarly, weak Information and Communication undermines Control Activities directly: segregation-of-duties controls depend on the ability to verify an authorization in real time, but when confirmation happens through informal channels rather than a shared system, that verification step is effectively unavailable during urgent situations — which is precisely when informants report controls being “loose” (Informant 2). This is consistent with the view that control systems function as an interacting system rather than five independent checklist items — the effectiveness of any one component depends on how it is used in relation to the others, not on its formal design in isolation (Simons, 1995). Notably, this same risk perception gap surfaced even within the study’s own validation process: during member checking, the two informants who offered corrections did so specifically on risk severity ratings, not on factual accuracy — suggesting the operator–management divide in how risk is weighted (Dewandaru et al., 2020) is not just a research finding but an active feature of how this organization talks about risk.

This pattern is broadly consistent with Kariyoto and Tibyani’s (2023) study of a corn-chip SME in Indonesia, which found informal, ad hoc risk identification and heavy reliance on manual recording under an unmodified COSO framework. CV Vetways, however, presents a more advanced starting point — documented SOPs, a formally structured five-informant control hierarchy, and scheduled (if under-integrated) evaluation meetings — yet shows a similar execution gap once conditions turn urgent. This suggests the decoupling problem is not simply a function of organizational immaturity that more formal documentation would resolve; CV Vetways already has more formal documentation than Kariyoto and Tibyani’s case, and the gap persists regardless.

This study contributes to internal control theory by showing that decoupling within an adopted framework is not uniform across its components. Control Environment and Control Activities — components sustainable through low-cost, symbolic actions such as leadership briefings and supervisor presence — remained formally coupled even as execution slipped under operational pressure, consistent with policy–practice decoupling (Bromley & Powell, 2012). Risk Assessment and Monitoring, which require sustained investment in dedicated tools such as a maintained risk register or KRI dashboards, were not meaningfully coupled at all — closer to non-adoption than decoupling, and consistent with the deeper means–ends decoupling Jemaa (2022) describes when an adopted tool fails to serve its intended function. This distinction extends contingency theory (Chenhall, 2003) by identifying resource constraints and informality — common features of developing-economy manufacturing SMEs — as factors that predict not merely whether decoupling occurs, but where within a control framework it concentrates.

This theoretical pattern has a direct practical implication that the recommendations below should not obscure: the components requiring the largest resource investment (barcode/RFID systems, real-time dashboards, KRI infrastructure) are exactly the components currently least coupled — meaning they are also the hardest for a resource-constrained SME to close. SMEs generally face acute barriers to this kind of digital adoption, including limited capital, gaps in technical skill, and resistance to changing entrenched manual workflows (Omowole et al., 2024) — all of which are visible in CV Vetways' current reliance on informal coordination and manual cycle counts. Recommending IoT sensors and real-time dashboards without acknowledging this tension risks producing a list that is technically sound but practically unreachable; a phased approach — beginning with the lowest-cost, highest-leverage step (a manually maintained risk register, before any technology investment) — is more consistent with the constraints the findings themselves reveal.

As a managerial implication, CV Vetways Indonesia needs to urgently transition from a reactive approach to structured, risk-based mitigation. The company must prioritize improvements in high-risk areas by implementing automated inventory scanning technologies (barcode/RFID) and real-time dashboards to eliminate manual input errors (Fadhilah et al., 2023; Seftiana et al., 2024). Furthermore, management must establish a formal Risk Register, strictly enforce segregation of duties with audit trail documentation, shift monitoring indicators to measurable KRIs, and conduct adaptive, risk-based internal audits to ensure long-term operational reliability (Hanwen Chen et al., 2025; Widyaningrum, 2025).

These findings should be read within the boundaries of the study's design. As a single-site qualitative case study, the results are contextual and not intended for statistical generalization beyond CV Vetways (Yin, 2018); the patterns identified — particularly the uneven decoupling across COSO components — should be treated as a plausible hypothesis for other resource-constrained Indonesian manufacturing SMEs rather than a confirmed general finding. The six-month data window (January–June 2025) also means the findings may not capture seasonal variation in production risk, and reliance on informant self-report — even where triangulated with observation and documents — leaves some residual risk of social-desirability bias in how staff characterized their own compliance with procedures.

CONCLUSION

This study answers the problem formulation regarding how to implement internal control in managing production cycle risks (loss of raw materials, incorrect inventory data input, overproduction, and underproduction) to achieve production targets and cost effectiveness. The main findings show that COSO-based internal control at CV Vetways Indonesia has been adopted in principle in the components of the control environment, control activities, and information & communication, but its implementation has not been consistent in systematic risk assessment and risk indicator-based monitoring (KRI). Risk assessment tends to be reactive and ad hoc without using formal methods such as risk registers, probability-impact analysis, or priority heat maps, so that preventive mitigation is limited and the opportunity for recurrence of data input errors and stock differences increases. Theoretically, this study extends decoupling theory by showing that within a single adopted control framework, decoupling concentrates in components requiring sustained resource investment, while components sustained through low-cost symbolic actions remain comparatively coupled — a pattern likely relevant to other resource-constrained manufacturing SMEs in developing economies (Bromley & Powell, 2012; Chenhall, 2003). Given the resource constraints typical of manufacturing SMEs, the managerial implications of these findings are best pursued as a sequence beginning with the lowest-cost interventions: (1) developing a risk register and heat map to prioritize the risks of over/underproduction and stock differences — achievable without technology investment; (2) increasing the frequency of warehouse cycle counts and implementing scheduled preventive maintenance to reduce the risk of machine damage and expired materials; (3) implementing strict authorization and segregation of duties with audit trail documentation to prevent budget misuse and input errors; (4) improving ongoing training and job clarity to strengthen the control culture and foster consistent compliance; (5) adopting stock identification technology (barcode/RFID) and real-time dashboards to integrate warehouse-production data and accelerate anomaly detection once these foundational controls are in place; and (6) implementing risk-based internal audits and agile audit planning that is responsive to market disruption and raw material price fluctuations. Production performance is affected by internal control weaknesses: overproduction due to inaccurate inventory data increases storage costs and the risk of obsolescence, while underproduction due to the absence or expiration of raw materials reduces sales and triggers opportunity costs of up to 20% of sales targets. Cost variances and increases in Cost of Goods Sold during periods of weak control indicate that control weaknesses increase financial risk and hinder the achievement of production targets and the effectiveness of operational costs. As a single-site qualitative case study, these conclusions are contextual to CV Vetways Indonesia and are offered as a plausible pattern for other resource-constrained Indonesian manufacturing SMEs rather than a statistically generalizable finding (Yin, 2018).

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