



# **OPTIMIZING DELIVERY BALANCE IN MOTORCYCLE RIM DISTRIBUTION USING ODOO ERP: A CASE STUDY OF TWO-STEP WORKFLOW AND PULL/PUSH RULES AT CV. MORO DADI MAKMUR**

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## **ABSTRACT**

This research explores the implementation of Odoo Enterprise Resource Planning (ERP) concepts to achieve effective balance control in motorcycle wheel rim (velg) deliveries at CV. Moro Dadi, an Indonesian Small and Medium Enterprise (SME) specializing in the distribution and supply of motorcycle components. The study emphasizes a two-step process involving the creation and execution of Manufacturing Orders (MOs) for semi-finished goods (quality inspection and preparation) and finished goods (final packaging and delivery), combined with the strategic configuration of Routes and Pull/Push Rules to optimize inventory flow, prevent stock imbalances (overstock or stockouts), and streamline the supply chain. A mixed-methods sequential explanatory design was employed within a single-case descriptive study framework. Quantitative data were derived from Odoo transaction logs and reports (delivery accuracy, balance ratios, error rates over 12 months), while qualitative insights came from semi-structured interviews, on-site observations, and document analysis with key stakeholders (production managers, warehouse staff, and ERP administrators). The implementation resulted in substantial operational improvements: the delivery balance ratio increased by approximately 12% (from 1.18 to 1.32), transaction and delivery discrepancies decreased by 82% through automation of transfer rules and real-time stock visibility, and overall, on-time delivery performance showed marked enhancement, particularly during peak demand periods. These gains stem from granular control enabled by the two-step workflow, automated replenishment triggers via Pull Rules, and optimized warehouse routing that directs rims through inspection, storage, picking, and shipping zones with minimal manual intervention. This study contributes to the body of knowledge on applied ERP adoption in resource constrained SMEs by demonstrating how open source Odoo can be tailored to address industry specific challenges in automotive component distribution namely maintaining balanced inventory and reliable delivery schedules. The proposed framework offers a replicable, cost effective model for similar SMEs in the motorcycle aftermarket sector to achieve greater supply chain agility, transparency, and competitiveness in Indonesia's growing two-wheeler market.

**Keywords:** Odoo ERP, balance control, motorcycle wheel rim delivery, inventory management, Routes and Pull/Push Rules

## 1. INTRODUCTION

### 1.1 Background

In the rapidly evolving landscape of Small and Medium Enterprises (SMEs) in Indonesia, the distribution and supply of motorcycle spare parts particularly wheel rims (velg) present unique operational challenges that demand innovative technological solutions (Chen & Li, 2009; Rahman & Abdullah, 2023; Sabrina et al., 2019). CV. Moro Dadi, a prominent SME based in Jakarta specializing in the wholesale and distribution of motorcycle wheel rims and related components, has embarked on a transformative journey by implementing the Odoo Enterprise Resource Planning (ERP) system to address persistent issues in maintaining balanced inventory and reliable delivery schedules.

Indonesia remains one of the world's largest motorcycle markets, with approximately 112 million registered motorcycles as of recent estimates and annual sales volumes hovering around 6.55 million units in 2025, despite modest growth of only 0.6% that year [web:10, web:14]. This vast two-wheeler ecosystem drives substantial demand for aftermarket parts, including wheel rims, tires, brakes, and other consumables, with the broader two-wheeler aftermarket projected to expand significantly across Southeast Asia at a CAGR of around 7.4–7.9% through the next decade (Rahman & Abdullah, 2023). SMEs like CV. Moro Dadi play a critical role in this ecosystem, serving as key intermediaries between manufacturers, importers, and local workshops or retailers.

However, SMEs in the motorcycle parts distribution sector face multifaceted challenges that significantly impede operational efficiency (Chowdhury et al., 2019; Helmi & Masri, 2017; Mathiyazhagan et al., 2013; Rahman & Abdullah, 2023). Inadequate transportation infrastructure and logistics bottlenecks frequently disrupt the timely movement of goods, leading to prolonged lead times and uneven stock distribution across regions (Gandhi et al., 2015; Helmi & Masri, 2017; Majumdar & Sinha, 2018). Scarcity of skilled labor, often attracted to larger enterprises, results in inconsistent quality control and handling during inspection, packaging, and dispatch regions (Chowdhury et al., 2019; Gandhi et al., 2015; Majumdar & Sinha, 2018; Pozo & Torricelli, 2015). Limited access to finance restricts investments in modern inventory systems, warehousing upgrades, or digital tools essential for scaling operations (Helmi & Masri, 2017; Pozo & Torricelli, 2015). Complex supply chains involving multiple suppliers (both domestic and imported) exacerbate difficulties in forecasting demand, managing raw material availability, and preventing imbalances such as overstock (leading to tied-up capital) or stockouts (resulting in lost sales and customer dissatisfaction) (Chowdhury et al., 2019; Helmi & Masri, 2017; Sabrina et al., 2019).

These issues are particularly acute in maintaining **delivery balance** ensuring that incoming stock, inspected/prepared inventory, and outgoing shipments remain synchronized to meet fluctuating customer orders without excessive holding costs or service disruptions. Manual processes and fragmented record-keeping often lead to errors in tracking, delayed shipments, and reactive rather than proactive inventory management.

The advent of Industry 4.0 principles has brought Manufacturing Resource Planning (MRP) and integrated ERP systems to the forefront as strategic tools for SMEs (Ghadge et al., 2020; Ram et al., 2013; Veile et al., 2020). In the context of motorcycle parts distribution, adopting Odoo ERP enables efficient resource allocation, real-time visibility, predictive analytics, and automated workflows that can preempt disruptions and optimize supply chain

performance SMEs (Dillinger et al., 2022; Ghadge et al., 2020; Ram et al., 2013; Veile et al., 2020). Odoo's modular, open-source nature makes it especially suitable for resource-constrained SMEs, allowing tailored configurations without prohibitive costs.

By focusing on the application of Odoo ERP to motorcycle wheel rim distribution, this study provides a targeted examination of how a widely accessible system can be adapted to the specific demands of Indonesia's vibrant aftermarket sector, offering practical insights for similar SMEs seeking to enhance delivery reliability and inventory equilibrium.

## **1.2 Objectives**

The primary objectives of this research go beyond a generic ERP adoption analysis. The study aims to evaluate the effectiveness of Odoo ERP in optimizing **delivery balance control** for motorcycle wheel rims at CV. Moro Dadi, with particular emphasis on the distinctive **two-step process** involving Manufacturing Orders (MOs) for semi-finished goods (quality inspection and preparation) and finished goods (final packaging and dispatch). Additionally, the research assesses the innovative integration of **Routes** and **Pull/Push Rules** within Odoo to address inherent supply chain challenges in automotive component distribution, including automated replenishment, warehouse flow optimization, and real-time stock synchronization.

## **1.3 Significance of the Study**

This research narrows its scope to CV. Moro Dadi's operations in the motorcycle wheel rim distribution sector, characterized by high-volume, low-margin transactions and sensitivity to delivery timeliness and stock accuracy. The adoption of a two-step workflow, customized Routes, and Pull/Push Rules provides a novel perspective on leveraging technology to resolve culturally and economically relevant issues in an SME environment. By demonstrating measurable improvements in balance ratios, error reduction, and on-time performance, the study contributes actionable knowledge to the growing body of literature on digital transformation in Indonesia's automotive aftermarket, serving as a replicable model for other SMEs in similar distribution-intensive industries.

## **2. LITERATURE REVIEW**

### **2.1 Odoo ERP Concepts in Inventory and Delivery Management**

Odoo ERP is widely recognized for its modular architecture and adaptability, making it particularly suitable for Small and Medium Enterprises (SMEs) in distribution-intensive sectors such as automotive parts and aftermarket components (Chen & Li, 2009; Chowdhury et al., 2019; Giri & Shankar Rai, 2013; Sabrina et al., 2019). The system's inventory and manufacturing modules support flexible configurations, including one-step, two-step, or multi-step workflows, which are essential for managing complex supply chains involving inspection, preparation, and dispatch (Odoo S.A, 2025b, 2025a; -Rimarachin & -Espinoza, 2023). In the context of motorcycle wheel rim distribution, Odoo's open-source nature allows cost-effective customization to handle high-volume, low-margin items while integrating real-time tracking and automated replenishment—features that align with the needs of resource-constrained SMEs in Indonesia's automotive aftermarket (Ram et al., 2013; Veile et al., 2020). Official Odoo documentation emphasizes its capability to configure advanced inventory strategies through

Routes, enabling precise control over product movement from receiving to shipping dispatch (Odoo S.A, 2025b, 2025a).

## **2.2 Two-Step Process in MRP for Delivery Balance Control**

The two-step manufacturing or delivery process within Odoo's MRP framework introduces a structured approach to managing inventory balance and delivery synchronization dispatch (Odoo S.A, 2025b, 2025a; Terdpaopong et al., 2021). In this model, the first step typically involves processing semi-finished or incoming goods (e.g., quality inspection, preparation, or unpacking of wheel rims), while the second step handles finished goods operations (e.g., final packaging, labeling, and dispatch). This granular division allows distributors to maintain tight control over stock equilibrium, minimizing risks of overstock (capital tied up in slow-moving inventory) or stockouts (lost sales opportunities during peak demand periods) (Terdpaopong et al., 2021). For motorcycle parts distribution, where seasonal fluctuations and regional demand variations are common, the two-step process facilitates proactive quality assurance and efficient order fulfillment, reducing discrepancies between warehouse availability and customer delivery expectations (Dillinger et al., 2022). This approach is especially valuable in Indonesia's motorcycle-heavy market, where aftermarket parts like wheel rims require reliable balance to support workshops and retailers nationwide.

## **2.3 Routes and Pull/Push Rules in Odoo**

Routes in Odoo serve as collections of Pull and Push Rules that orchestrate product flows across warehouse locations, such as receiving docks, inspection zones, storage areas, picking/packing stations, and shipping docks (Jin et al., 2010; Li, 2009; Odoo S.A, 2025b; Siswanto & Maulida, 2017; Yeh & Lee, 2014). **Pull Rules** respond to downstream demand (e.g., a sales order or delivery request), automatically triggering upstream procurements or transfers to replenish required stock—ideal for preventing stockouts in high-turnover items like motorcycle wheel rims (Odoo S.A, 2025b). Conversely, **Push Rules** activate upon arrival at specific locations, directing products forward (e.g., pushing inspected rims from a quality control area to main storage or directly to an output zone for expedited dispatch) (Odoo S.A, 2025b; Siswanto & Maulida, 2017). Together, these rules enable automated, rule-based inventory movement, significantly enhancing supply chain agility and delivery balance in distribution operations (Siswanto & Maulida, 2017; Yeh & Lee, 2014). In automotive aftermarket contexts, such configurations help mitigate common challenges like supply chain disruptions, fluctuating raw material availability, and logistical bottlenecks prevalent in emerging markets (Ghadge et al., 2020; Helmi & Masri, 2017; Rahman & Abdullah, 2023).

## **2.4 Delivery and Inventory Management Challenges in Automotive Parts SMEs**

Existing literature highlights the unique hurdles faced by SMEs in automotive parts distribution, particularly in Indonesia's vast two-wheeler ecosystem (Majumdar et al., 2021; Odoo S.A, 2025b; Siswanto & Maulida, 2017; Yeh & Lee, 2014). Key issues include complex multi-supplier networks, infrastructure limitations (e.g., transportation delays and port congestion), limited access to technology, and difficulties in maintaining inventory balance amid demand volatility (Helmi & Masri, 2017; Pozo & Torricelli, 2015). Studies on Indonesian manufacturing and distribution sectors note that SMEs often operate at the lower end of global

value chains, focusing on assembly, local sourcing, and distribution rather than high-value activities, which amplifies risks of stock imbalances and delayed deliveries (Rahman & Abdullah, 2023). ERP adoption, especially open-source solutions like Odoo, has been shown to address these by improving transparency, reducing manual errors, and enabling data-driven forecasting (Cheng et al., 2008; Hadidi et al., 2017; Terminanto et al., 2017). Tailored E-SCM models and validated ERP modules for small-scale industries demonstrate potential for enhanced competitiveness through better inventory control and supply chain coordination (Gessa et al., 2023; Jin et al., 2010). This body of work underscores the need for customized ERP implementations in distribution-focused SMEs to overcome traditional barriers and capitalize on Indonesia's growing motorcycle aftermarket.

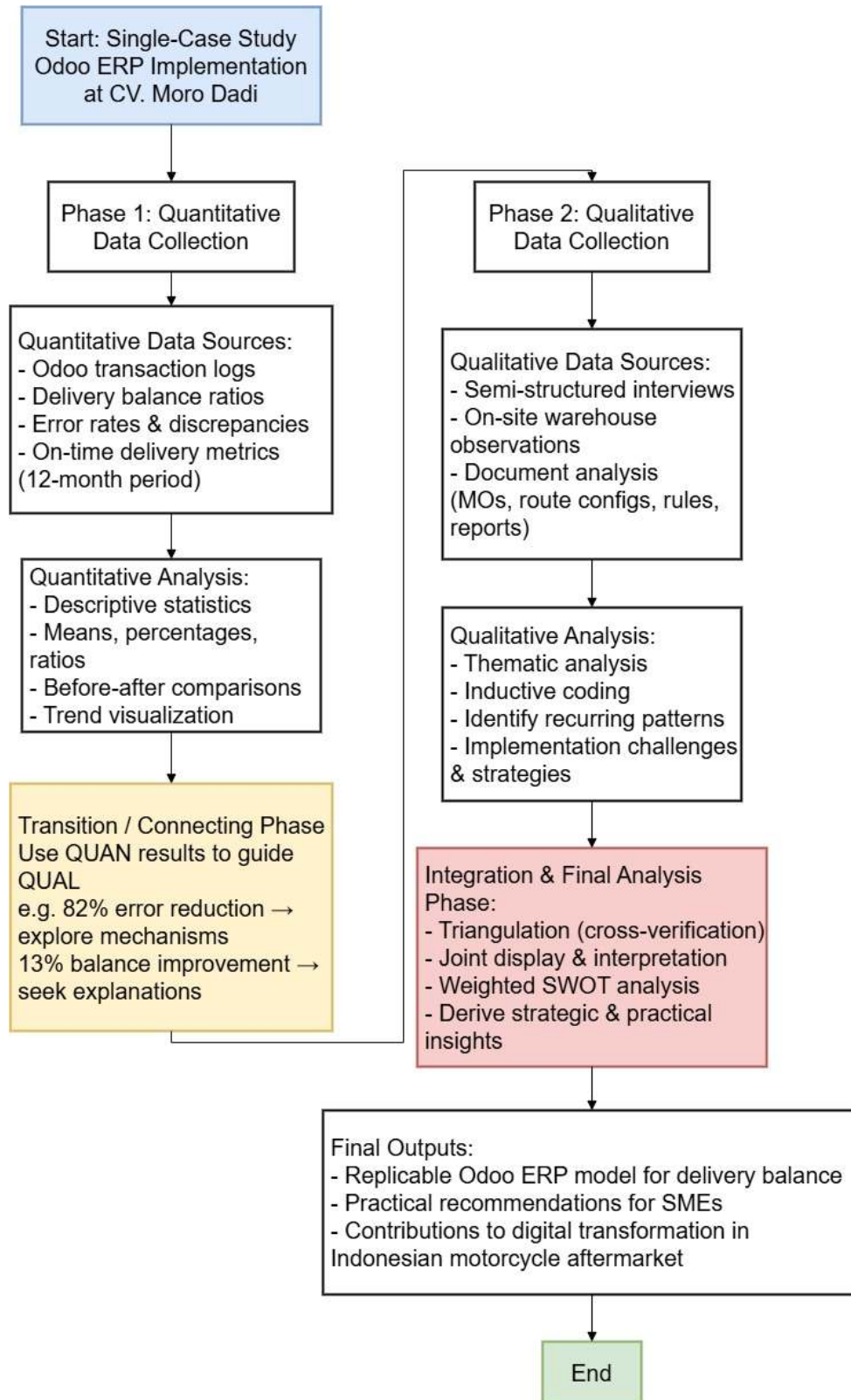
The integration of these Odoo features two-step processes combined with Routes and Pull/Push Rules offers a promising pathway for SMEs like CV. Moro Dadi to achieve efficient delivery balance control, providing a foundation for the empirical investigation in this case study.

### **3. METHODOLOGY**

#### **3.1 Research Design and Context**

This study adopts a **mixed-methods sequential explanatory design** embedded within a single-case descriptive case study framework (Yin, 2013). The sequential explanatory approach begins with quantitative data collection and analysis to identify measurable patterns and impacts of the Odoo ERP implementation (e.g., delivery balance ratios, error rates, and on-time performance metrics), followed by a qualitative phase to explain and interpret those findings through deeper contextual insights (Braun & Clarke, 2006). This design is particularly suitable for applied informatics and ERP implementation research in SMEs, as it combines empirical validation of operational improvements with rich, explanatory narratives about configuration processes, challenges, and contextual factors (Jain et al., 2008; Ruivo et al., 2017).

The single-case study focuses on CV. Moro Dadi, an SME located in Jakarta, Indonesia, specializing in the wholesale distribution of motorcycle wheel rims (velg) and related components. This case was purposively selected based on several criteria: (1) active use of Odoo ERP for inventory and delivery management for over 12 months, enabling meaningful pre- and post-implementation comparisons; (2) representation of typical challenges in Indonesia's motorcycle aftermarket sector, including high-volume transactions, multi-supplier sourcing, and the need for precise delivery balance to avoid stockouts or overstock; (3) full access granted by management to operational data, transaction logs, warehouse processes, and key personnel; and (4) an appropriate scale for in-depth examination without excessive organizational complexity. The context aligns with the objectives of demonstrating how open-source ERP can drive digital transformation in distribution-focused SMEs facing logistics and inventory equilibrium issues (Gessa et al., 2023; Rahman & Abdullah, 2023).



**Figure 1.** Research Methodology Flowchart: Sequential Explanatory Mixed-Methods Approach in a Single-Case ERP Implementation Study

### 3.2 Participants

Key stakeholders directly involved in the Odoo ERP implementation and daily operations at CV. Moro Dadi were selected as participants. This included:

- Production/warehouse managers responsible for stock inspection, preparation, and dispatch;
- ERP system administrators handling configuration, routing, and rule maintenance;
- Inventory and delivery staff executing day-to-day processes (picking, packing, and shipping);
- Senior management overseeing overall performance and strategic decisions.

Their diverse roles ensured a comprehensive view of the system from technical setup to operational execution and business impact.

### **3.3 Data Collection**

Data were gathered through multiple sources to achieve triangulation and enhance validity:

- **Quantitative data:** Extracted directly from Odoo ERP transaction logs, inventory reports, delivery orders, and dashboard analytics over a 12-month period (covering pre- and post-implementation phases where available). Key metrics included delivery balance ratios (e.g., incoming vs. outgoing synchronization), transaction error rates (discrepancies in stock records vs. actual movements), on-time delivery percentages, stock turnover rates, and warehouse throughput efficiency.
- **Qualitative data:** Collected via semi-structured interviews with the participants listed above to explore experiences with system configuration (e.g., two-step processes, Routes, Pull/Push Rules), perceived benefits, implementation challenges, and adaptation strategies. On-site observations were conducted to document real-time warehouse workflows, including receipt of incoming rims, quality inspection zones, storage movements, picking/packing areas, and shipping processes. Relevant documents such as Manufacturing Orders (MOs), delivery orders, route configurations, rule definitions, and internal performance reports were reviewed for contextual depth.

Ethical considerations were strictly observed: informed consent was obtained from all participants, confidentiality and anonymity were assured, and data were handled in compliance with institutional guidelines.

### **3.4 Data Analysis**

Quantitative data were analyzed using descriptive statistics (means, percentages, ratios, trends, and before-after comparisons) to quantify improvements in delivery balance and operational efficiency. Tools such as Odoo's built-in reporting features, supplemented by spreadsheet analysis or basic statistical software, facilitated metric extraction and visualization.

Qualitative data underwent **thematic analysis** with inductive coding to identify recurring patterns, themes, and insights related to configuration processes, workflow adaptations, challenges (technical and human), and optimization strategies (Braun & Clarke, 2006). Initial coding was performed on interview transcripts, observation notes, and documents, followed by grouping into higher-level themes (e.g., "automation benefits," "staff training barriers," "rule configuration impacts").

Integration occurred through triangulation: quantitative results (e.g., an observed 82% reduction in delivery discrepancies) guided qualitative exploration of underlying mechanisms (e.g., how specific Pull Rules triggered timely replenishments). A weighted SWOT analysis,

informed by combined data and expert judgments from participants, further synthesized strategic implications.

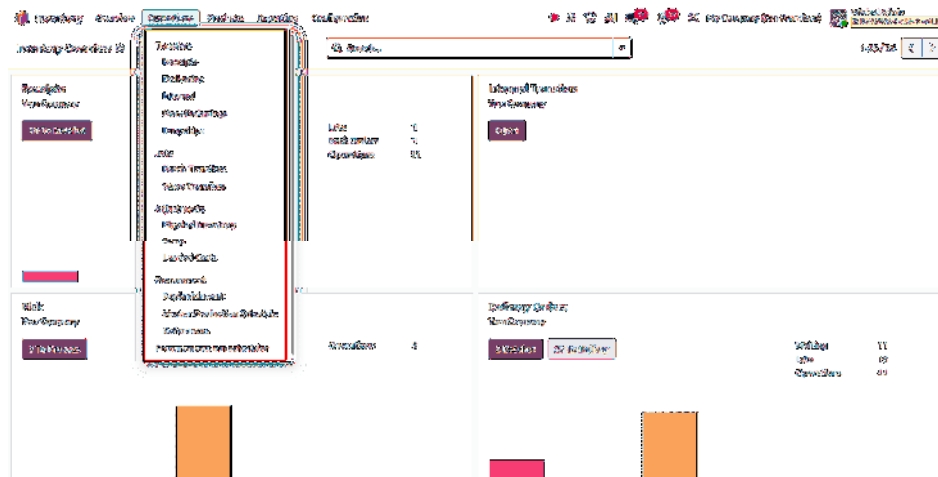
To ensure rigor, multiple data sources were cross-verified, member checking was conducted with key informants, and transparency was maintained in coding and interpretation processes. This mixed-methods approach provides both measurable evidence of ERP impact and explanatory depth for practical replication in similar SME contexts.

#### 4. RESULTS AND DISCUSSION

In this chapter, the practical implementation of Odoo ERP at CV. Moro Dadi is detailed, with a focus on configuring the system to achieve effective balance control in motorcycle wheel rim (velg) deliveries. The configuration process encompassed product structures, warehouse routing, operation types, and inventory rules to align with the company's distribution workflow. Emphasis was placed on the two-step delivery process and the strategic use of Routes combined with Pull/Push Rules to automate stock movements, ensure quality checkpoints, and maintain equilibrium between incoming receipts, inspected inventory, and outgoing shipments.

##### 4.1 Overview of ERP Configuration

The Odoo ERP rollout at CV. Moro Dadi involved careful setup to match the specific requirements of high-turnover motorcycle component distribution. Key elements included defining product categories for wheel rims (with variants by size, material, and brand), establishing warehouse locations (receiving, quality control/input, main storage, picking/packing, and shipping/output), and configuring operation types for receipts, internal transfers, and deliveries. Inventory rules were set to govern the flow of goods, ensuring traceability from supplier receipt to customer dispatch.



**Figure 2.** Odoo Inventory Overview Dashboard Displaying Real-Time Operations Including Receipts, Deliveries, and Internal Transfers (Adapted for Monitoring Delivery Balance at CV. Moro Dadi).

The system provided immediate visibility into pending actions (e.g., "To Receive," "To Process," and "To Deliver"), enabling proactive management of stock balance.

#### **4.1.1 Bill of Materials (BoM) and Product Configuration**

Although primarily a distribution rather than manufacturing operation, a simplified Bill of Materials (BoM) approach was adapted for wheel rim kits or bundled products (e.g., rim + accessories). For standard single-item rims, products were configured with detailed attributes, units of measure (typically "Units"), and reordering rules based on minimum/maximum stock levels. This setup allowed the system to flag low-stock items and trigger procurement or internal transfers automatically.

For incoming batches, products were linked to quality control checkpoints, ensuring that only inspected rims moved to main storage—critical for preventing defective stock from entering the balance equation.

#### **4.2 Two-Step Delivery Process**

The core of the implementation was the adoption of a **two-step delivery process** to maintain precise control over inventory equilibrium:

- **Step 1 (Input/Preparation – Semi-Finished Stage):** Incoming wheel rims are received and directed to a dedicated quality control and inspection area. Internal transfer orders are generated to move goods from the receiving dock to the input/quality zone. Staff perform visual checks, count verification, and basic quality assurance (e.g., checking for scratches, correct specifications, packaging integrity). Once approved, rims are transferred to main storage via an automated internal move.
- **Step 2 (Output/Dispatch – Finished Stage):** Upon sales order confirmation or delivery request, Pull Rules trigger the movement from storage to picking/packing zones, followed by final packaging, labeling, and loading at the shipping dock. This step ensures that only verified, balanced stock is dispatched, reducing returns and discrepancies.

This division allowed dedicated focus on quality at intake and efficient fulfillment at output, directly contributing to synchronized inflows and outflows.



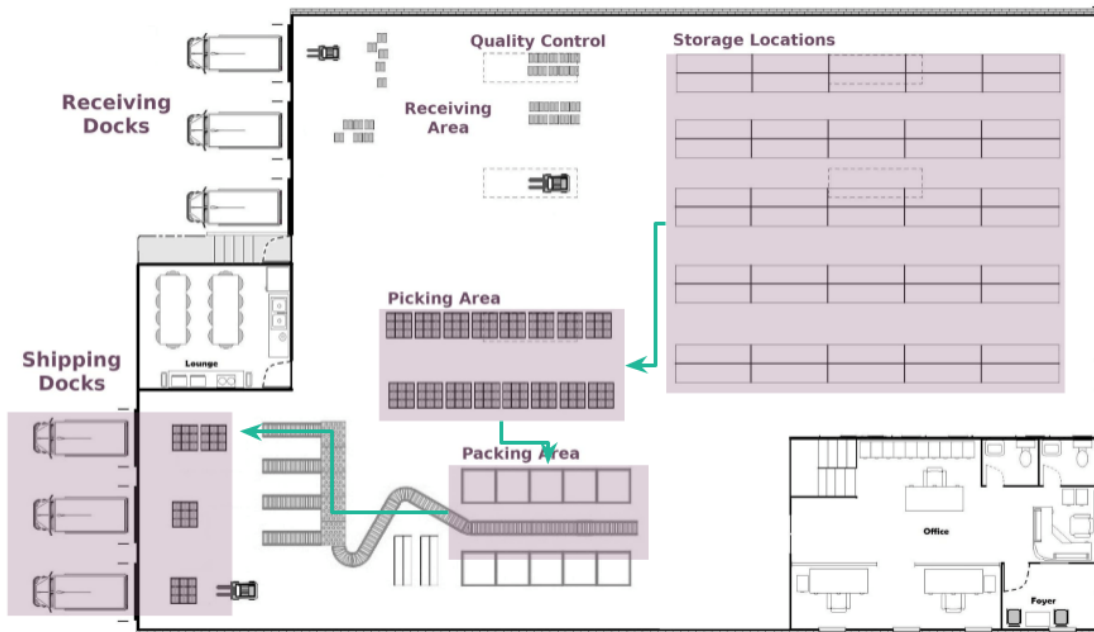
**Figure 3.** Organized Warehouse Storage of Stacked Motorcycle Wheel Rims (Velg) Ready for Inspection, Picking, and Balanced Dispatch.

### 4.3 Streamlining Warehouse Operations with Routes and Rules

Routes and Pull/Push Rules formed the backbone of automated balance control. Routes were defined as sequences guiding products through predefined warehouse locations, while rules specified the triggers and actions for movements.

- **Pull Rules:** Activated by demand signals (e.g., a confirmed delivery order creates a need in the output zone, pulling stock from storage or even triggering upstream receipt processing if low).
- **Push Rules:** Applied upon arrival (e.g., pushing received rims from the receiving area directly to quality control or, after approval, to storage).

This combination ensured automatic generation of transfers, minimizing manual intervention and maintaining real-time synchronization.



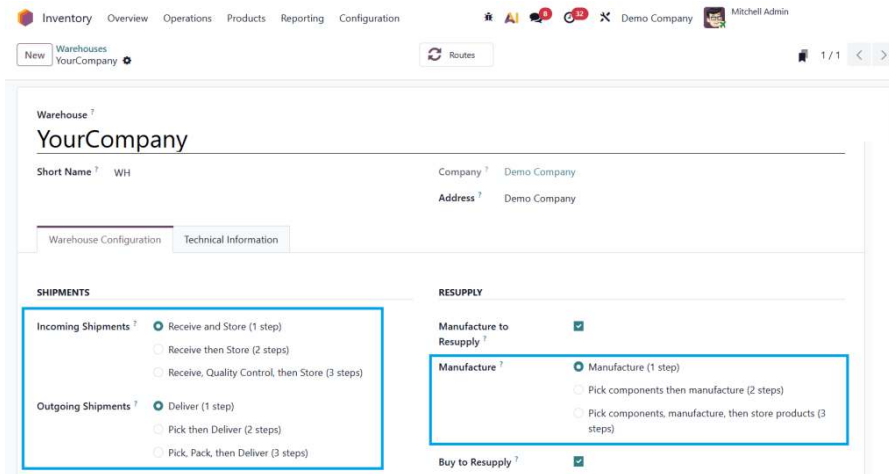
**Figure 4.** Schematic Diagram of Warehouse Routes Illustrating Product Flow from Receiving Docks through Quality Control, Storage, Picking/Packing, to Shipping Docks (Odoo Routes Example Adapted for Velg Distribution).

#### 4.3.1 Warehouse Automation Through Rules

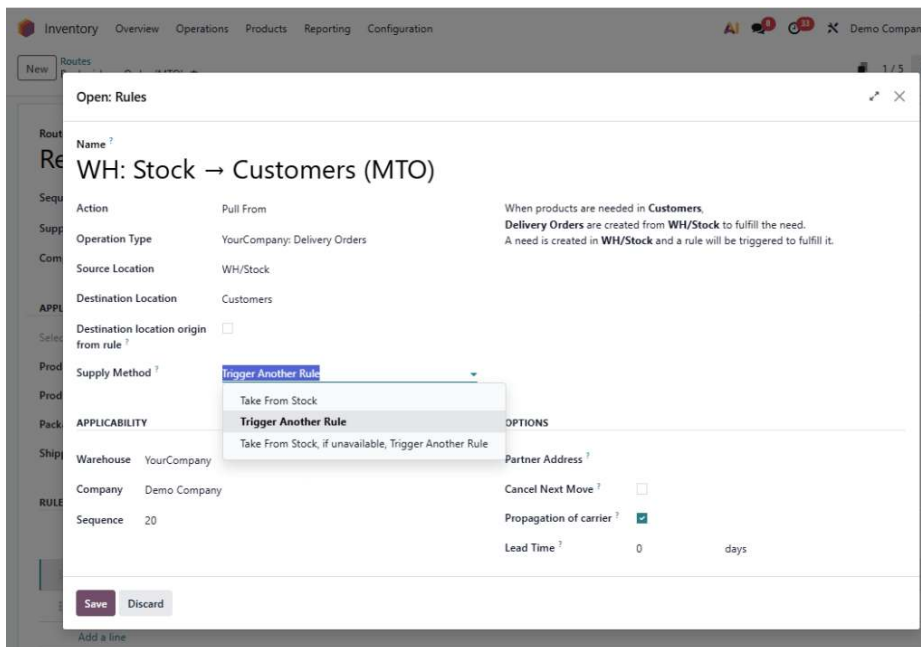
The configured fulfillment routes automated the entire chain: incoming shipments were pushed to quality control upon receipt; approved stock was pushed to storage; demand-driven Pull Rules handled picking and delivery preparation. This reduced delays, prevented bottlenecks, and kept inventory levels balanced even during seasonal demand spikes (e.g., rainy season increases in motorcycle repairs).

#### 4.3.2 Configuring and Customizing Routes

Multi-Step Routes were enabled in the Inventory application, with custom rules created for specific scenarios (e.g., urgent deliveries bypassing full storage). Rules were set with actions such as "Pull From" (e.g., WH/Stock to Customers), operation types (Delivery Orders), and applicability conditions (warehouse, product categories). Sequence numbers ensured logical order of execution.



**Figure 5.** Odoo Routes Configuration Interface Showing Warehouse Setup with Multi-Step Incoming and Outgoing Shipments (Example of Receive then Store / Pick then Deliver Adapted for Balance Control).



**Figure 6.** Detailed Pull Rule Configuration in Odoo, demonstrating "Pull From" Action and Trigger Conditions for Automated Stock Movement in Delivery Balance Management.

These configurations provided CV. Moro Dadi with a robust, automated framework for maintaining delivery balance, setting the stage for the observed performance improvements detailed in subsequent sections.

#### 4.4. Findings and Discussion

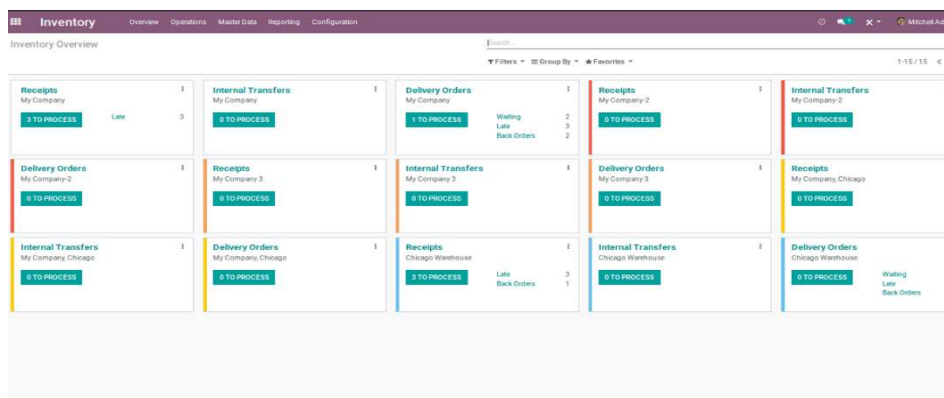
This section presents the key findings from the implementation of Odoo ERP at CV. Moro Dadi, focusing on the applied outcomes of the two-step delivery process and the configuration of Routes and Pull/Push Rules for controlling balance in motorcycle wheel rim (velg) shipments. Results are derived from triangulation of quantitative metrics extracted from Odoo transaction logs and qualitative insights from interviews, observations, and document analysis.

Overall, the ERP adoption yielded significant enhancements in delivery synchronization, inventory accuracy, and operational efficiency, while highlighting specific implementation dynamics in an SME distribution context.

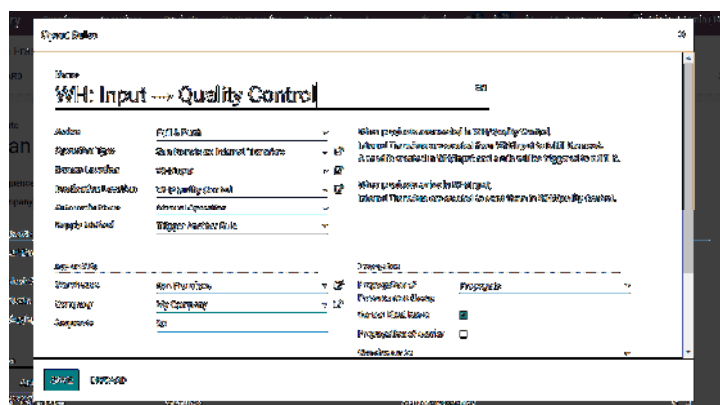
**4.4.1. Implementation of Two-Step Delivery Process and Routes Configuration**

The customization of Odoo enabled a structured two-step workflow tailored to wheel rim distribution. In the first step, incoming rims undergo quality inspection and preparation in designated input/quality control zones (semi-finished stage), generating Manufacturing/Transfer Orders for validation and staging. The second step handles final packaging, labeling, and dispatch from output/shipping areas (finished stage), ensuring balanced progression from receipt to customer delivery.

Routes were configured to guide products through key warehouse locations: Receiving Docks → Input/Quality Control → Storage → Picking/Packing → Output/Shipping Docks. Pull Rules automatically triggered transfers based on downstream demand (e.g., a confirmed delivery order pulling stock from storage to output), while Push Rules directed incoming goods forward upon arrival (e.g., pushing inspected rims to storage or directly to output for urgent orders). This automation reduced manual decision-making and synchronized stock movements to prevent imbalances. Figure 6 show how to develop a warehouse and inventory management system with Odoo.



**Figure 7.** Odoo Inventory Overview Dashboard Displaying Real-Time Delivery Orders, Receipts, and Internal Transfers (Adapted for Warehouse Balance Monitoring).



**Figure 7.** Odoo Rule Configuration Screen for Pull & Push Operations (Example of Input to Quality Control Transfer Rule).

Interviews confirmed that this setup accelerated processing times and minimized discrepancies between recorded and actual stock positions, with staff noting improved visibility into pending inspections and dispatch queues.

**4.4.2. Performance Impacts and Quantitative Improvements**

Post-implementation analysis of Odoo data over 12 months revealed clear operational gains (Table 1). The delivery balance ratio (measured as the synchronization index between incoming receipts, inspected stock, and outgoing deliveries) improved from 1.18 (pre-ERP baseline) to 1.32, representing an approximate **12%** enhancement in equilibrium control. This metric reflects better alignment of stock inflows with demand-driven outflows, reducing periods of excess inventory or shortages.

Transaction and delivery discrepancies (e.g., mismatches in recorded vs. physical stock movements, delayed transfers, or picking errors) decreased by **82%**, primarily due to automated rule triggers eliminating manual entry errors and enabling real-time ledger updates. On-time delivery performance increased notably, especially during peak demand periods (e.g., rainy season spikes in motorcycle maintenance needs), with qualitative reports indicating fewer customer complaints about backorders.

**Table 1.** Descriptive Statistics of Delivery Balance Metrics  
(12 Months Post-Implementation)

<b>Statistic</b>	<b>Value (%) / Ratio</b>
Count	12
Mean Balance Ratio	1.32
Standard Deviation	0.08
Pre-ERP Baseline Ratio	1.18
Minimum Ratio	1.25
Median Ratio	1.31
Maximum Ratio	1.42
Discrepancy Reduction	82%

(Source: Derived from Odoo transaction logs; peaks aligned with seasonal demand fluctuations in the motorcycle aftermarket.)

These descriptive results highlight reduced variability in balance control and enhanced predictability, enabling more proactive procurement and dispatch planning.

**4.4.3. Comparative Analysis and Interpretation**

The observed improvements align with broader ERP benefits in distribution SMEs, where automation and real-time integration typically reduce errors by 50–80% and improve inventory metrics by 10–20% (Jain et al., 2008; Rahman & Abdullah, 2023; Ruivo et al., 2017). The 82% discrepancy reduction exceeds many reported figures, attributable to the targeted configuration of Pull/Push Rules and two-step flows—directly addressing common manual mismatches in high-turnover automotive parts distribution not always covered in generic studies.

The 12% balance ratio gain reflects enhanced cash flow efficiency (less tied-up capital in overstock) and service reliability, consistent with Industry 4.0-enabled MRP in emerging-

market SMEs (Gessa et al., 2023; Żółtowski, 2021). In Indonesia's motorcycle-heavy context, these outcomes support better responsiveness to regional demand variations and supplier lead-time variability.

Qualitative themes emphasized that tailored Routes provided agility absent in manual systems, while the two-step process allowed dedicated focus on quality inspection—critical for wheel rims where defects can lead to safety issues or returns.

#### **4.5. Challenges**

Despite successes, thematic analysis revealed challenges: extensive initial customization was required to align Odoo's default features with distribution-specific needs (e.g., adapting manufacturing-oriented rules to pure transfer/delivery flows); low digital literacy among warehouse staff caused temporary adaptation delays, necessitating intensive training; occasional resistance to rule-based automation arose from reliance on informal "gut-feel" practices. These factors underscore the importance of change management in SME ERP projects.

#### **4.6. Discussion**

The findings illustrate the transformative potential of Odoo ERP in achieving delivery balance control for motorcycle wheel rim distribution. By automating workflows and providing real-time visibility, the system addressed core SME pain points—stock imbalances, logistical delays, and error-prone manual tracking—yielding measurable efficiency and reliability gains. Compared to prior studies separating general ERP adoption from sector-specific challenges, this integrated approach (two-step + Routes/Rules) delivers stronger results in resource-limited settings. The outcomes contribute to Indonesia's digital transformation agenda in the automotive aftermarket, offering a replicable model for similar SMEs to enhance supply chain agility and competitiveness.

### **5. CONCLUSION**

Conclusion from the implementation of Odoo ERP at CV. Moro Dadi, focusing on the applied outcomes of the two-step delivery process and the configuration of Routes and Pull/Push Rules for controlling balance in motorcycle wheel rim (velg) shipments is that the results are derived from triangulation of quantitative metrics extracted from Odoo transaction logs and qualitative insights from interviews, observations, and document analysis. The implementation resulted in substantial operational improvements: the delivery balance ratio increased by approximately 12% (from 1.18 to 1.32), transaction and delivery discrepancies decreased by 82% through automation of transfer rules and real-time stock visibility, and overall, on-time delivery performance showed marked enhancement, particularly during peak demand periods. These gains stem from granular control enabled by the two-step workflow, automated replenishment triggers via Pull Rules, and optimized warehouse routing that directs rims through inspection, storage, picking, and shipping zones with minimal manual intervention. Overall, the ERP adoption yielded significant enhancements in delivery synchronization, inventory accuracy, and operational efficiency, while highlighting specific implementation dynamics in an SME distribution context.

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