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SUPPLY CHAIN EVOLUTION

Supply Chain Viability KPI Shortlist

30 Key Performance Indicators for Assessing Efficiency, Resilience and Sustainability

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Foreword

This shortlist provides a consolidated set of 30 key performance indicators (KPIs) for assessing and measuring supply chain viability (SCV). The KPIs are organized according to the three central dimensions of SCV: efficiency (operating in a cost-effective and resource-efficient manner); resilience (withstanding disruptions and maintaining continuity); and sustainability (operating in a manner that considers environmental and social impact).

Why Metrics Matter

In today's volatile environment, supply chains are subject to an increasing number of disruptions and stricter sustainability demands, as well as mounting cost pressures. Relying on intuition or financial ratios is insufficient. Meaningful KPIs are essential for balancing efficiency, resilience and sustainability. KPIs quantify SCV, highlight trade-offs, support decision-making and facilitate stakeholder communication.

The KPI Shortlist

The shortlist helps organizations identify relevant metrics, with the central idea that KPIs are tracked over a longer period, thereby becoming a key control element in developing SCV. This shortlist therefore lays the groundwork for the SCV Dashboard, which can be accessed at www.sc-evolution.ch/dashboard.

Efficiency

- On-Time Delivery (OTD)
- Inventory Turnover
- Total Logistics Cost
- Customer Order Cycle Time
- Total Inventory Cost Ratio
- Overall Utilization Rate
- Warehouse Utilization Rate
- Cash-to-Cash Cycle Time
- Fill Rate
- Total Cost of Production Ratio

Resilience

- On-Time Delivery (OTD)
- Forecast Accuracy
- Inventory-to-Sales Ratio
- Minimum Recovery Time
- Cost of Recovery Activities
- Alertness
- Redundancy Ratio
- Average Lead Time per Part
- Average Number of Possible Transportation Modes per Product
- Average Changeover Time

Sustainability

- CO_2 Emissions per Unit
- Recycling Rate
- Energy Consumption per Unit
- Percentage of Waste
- Carbon Intensity
- Occupational Health and Safety Performance
- Green Certificate Ratio
- Hazardous Share of Total Waste
- Average Hours of Training per Employee
- Philantropic Investment Ratio

Efficiency KPIs

On-Time-Delivery (OTD) [%]

On-Time Delivery (OTD) measures the percentage of customer deliveries that arrive on time as promised. This KPI can be found, e.g., in order management system, delivery records, shipping confirmations, or customer feedback.

Typical benchmarks (depends on industry)

- Poor: < 70-80 %
- Good: > 95 %

Possible calculation

$$\text{OTD} = \frac{\text{Number of On–Time Deliveries}}{\text{Total Deliveries}} * 100$$

Inventory Turnover [turns/year]

Inventory Turnover measures how often stock is turned over within a period. Provides information on efficiency in warehousing and materials management. This KPI can be found, e.g., in annual report, inventory records, or accounting system.

Typical benchmarks (depends on industry)

Highly depends on industry and ranges from two to 12 turns per year (e.g., for FMCG). Range-best KPI.

Possible calculation

$$\text{IT} = \frac{\text{Cost of Goods Sold (COGS)}}{\text{Average Inventory Value}}$$

Total Logistics Cost [%]

Sums up all costs related to logistics (e.g., transp-ortation, warehousing, packaging, IT). Can be measured in USD per year or as a % of total revenue. Can be found, e.g., in cost accounting, logistics invoices, ERP cost centers, supplier bills.

Typical benchmarks (depends on industry)

- Poor: > 30 %
- Good: < 20 %

Possible calculation

$$\text{TLC} = \frac{\text{All Logistics Costs}}{\text{Total Revenue per Year}} * 100$$

Customer Order Cycle Time [days]

Measures the average time (in days) between a customer placing an order and receiving the product. It reflects responsiveness and operational speed. Can be found, e.g., in ERP system, sales order log, delivery confirmations

Typical benchmarks (depends on industry)

- Poor: > 120 days in B2B, depending on product
- Good: e.g., 1-5 days (retail/e-commerce)

Possible calculation

$$\text{COCT} = \frac{\sum(\text{Delivery Date i} - \text{Order Entry Date i})}{\text{Total Number of Orders}}$$

Total Inventory Cost Ratio [%]

Includes all expenses related to holding inventory, such as storage, personnel, depreciation and capital costs. The KPI can be found, e.g., in accounting system, warehouse reports, or balance sheet data.

Typical benchmarks (depends on industry)

- Poor: Below 2-3 % or higher than 10-15 %
- Good: Usually between 5 % and 10 %

Possible calculation

$$\text{TICR} = \frac{\text{Inventory Holding Costs}}{\text{Total Revenue per Year}} * 100$$

Overall Utilization Rate [%]

Indicates how intensively a company uses its resources (e.g. machines or staff) in relation to their full capacity. Can be found, e.g., in machine logs, timesheets, production schedules, shop floor monitoring tools.

Typical benchmarks (depends on industry)

- Poor: < 60 % // > 90 %
- Good: > 60 % // < 90 %

Possible calculation

$$\text{OUR} = \frac{\text{Actual Operating Time in Hours}}{\text{Available Capacity Time in Hours}} * 100$$

Warehouse Utilization Rate [%]

Measures the proportion of storage capacity currently in use compared to the total capacity available. Can be found, e.g., in warehouse management system, ERP (inventory and capacity records), manual tracking.

Typical benchmarks (depends on industry)

- Poor: < 60 % // > 90 %
- Good: > 60 % // < 90 %

Possible calculation

$$\text{WU} = \frac{\text{Occupied Storage Space in m2}}{\text{Total Available Storage Space in m2}} * 100$$

Total Cost of Production Ratio [%]

Measures the total expenses directly associated with manufacturing goods, including materials, labor and overheads. Can be found, e.g., in ERP, financial/controlling data (cost centers, production overheads), or manufacturing execution systems.

Typical benchmarks (depends on industry)

- Poor: > 70 % of revenue
- Good: < 40 % of revenue (attention: quality?)

Possible calculation

$$\text{TCOPR} = \frac{\text{Total Production Cost)}}{\text{Revenue}} * 100$$

Fill Rate [%]

Is the percentage of customer demand that can be met directly from available stock without delay or backorders. It should be averaged not over time, but rather over a specified number of units of demand (for example, every thousand or million). Can be found in ERP or WMS, customer order databases, KPI dashboards in SCM software.

Typical benchmarks (depends on industry)

- Poor: < 70 %
- Good: > 90 %

Possible calculation

$$\text{FT} = \frac{\text{Units Delivered on First Shipment}}{\text{Total Units Ordered}} * 100$$

Variants: line fill rate, order fill rate, volume fill rate, depending on the level of measurement.

Cash-to-Cash Cycle Time [days]

Measures the number of days a company's cash is tied up in the supply chain. It indicates how long it takes to convert investments in inventory and other resources into cash flows from customer sales. Can be found in, e.g., inventory records, accounts receivable/payable modules, or financial statements.

Typical benchmarks (depends on industry)

Can range from -20 days (e.g., FMCG), to up to 100 days for example in machine industry.

Possible calculation

CCCT = Days Inventory Outstanding (DIO) + Days Sales Outstanding (DSO) – Days Payables Outstanding (DPO)

Resilience KPIs

On-Time-Delivery (OTD) [%]

On-Time Delivery (OTD) measures the percentage of customer deliveries that arrive on time as promised. This KPI can be found, e.g., in order management system, delivery records, shipping confirmations, or customer feedback.

Typical benchmarks (depends on industry)

- Poor: < 70-80 %
- Good: > 95 %

Possible calculation

$$\text{OTD} = \frac{\text{Number of On–Time Deliveries}}{\text{Total Deliveries}} * 100$$

Forecast Accuracy [%]

Evaluates how closely demand forecasts align with actual sales. It is a key measure of planning reliability. The KPI is based on MAPE (Mean Absolute Percentage Error). Can be found, in sales forecast files, order data, ERP, or sales tracking tools.

Typical benchmarks (depends on industry)

- Poor: < 50 %
- Good: > 90 %

Possible calculation

FA = 100 – MAPE

MAPE = (1/n) × Σ |(Forecast – Actual) / Actual| × 100

Inventory-to-Sales Ratio [%]

Measures the proportion of inventory held in relation to the sales generated. Indicates how much inventory a company keeps on hand to support a given level of sales. Can be found, e.g., in inventory value, ERP, or net sales (e.g., income statement).

Typical benchmarks (depends on industry)

- Poor: > 30 %
- Good: < 20 %

Possible calculation

$$\text{ITSR} = \frac{\text{Inventory Value}}{\text{Net Sales}} * 100$$

Minimum Recovery Time [days]

Refers to the shortest amount of time required to resume operations following a disruption. Measured in hours or days. Can be found, e.g., in incident reports, business continuity plans, internal escalation protocols.

Typical benchmarks (depends on industry)

- Poor: > 30 days
- Good: < 5 days

Possible calculation

$$\text{MRT} = \frac{\sum i=1n(\text{Time of Full Recovery i} - \text{Time of Disruption Start i})}{\text{Number of Detected Disruptions per Year}}$$

Cost of Recovery Activities [%]

Tracks all internal and external costs associated with recovering from a disruption (e.g., emergency transport, overtime labor and replacement sourcing). Can be found, e.g., in finance department, incident logs, or procurement records.

Typical benchmarks (depends on industry)

It varies greatly. A value of between 0.1% and 5% of total revenue is reasonable.

Possible calculation

$$\text{CORA} = \frac{\text{Total Recovery Costs}}{\text{Total Operating Expenditures}} * 100$$

Alertness [hours]

The time it takes to take the first mitigating action after risk detection. It is measured in hours. Can be found, e.g., in alerting systems, monitoring dashboards, communication logs, risk sensors

Typical benchmarks (depends on industry)

It varies greatly. A notification within 1 to several hours could be considered very good.

Possible calculation

$$\text{A} = \frac{\sum(\text{Time of First Action} - \text{Time of Detection})}{\text{Number of Risk Detections per Year}}$$

Redundancy Ratio [%]

Indicates the extent to which a supply chain has backup or alternative sourcing options. The KPI can be found in supplier master data, procurement records, or approved vendor lists.

Typical benchmarks (depends on industry)

Varies greatly. Values between 30 and 70% can be considered as solid.

Possible calculation

$$RR = \frac{\text{Number of Alternative Suppliers}}{\text{Total Number of Suppliers}} * 100$$

Average Lead Time per Part [days]

The average time it takes for a company's direct suppliers to deliver ordered parts. Can be found in ERP and procurement systems, supplier performance reports, or procurement logs.

Typical benchmarks (depends on industry)

Depends on product, industry and supplier. Between a few days and a few weeks is good.

Possible calculation

$$ALTPP = \frac{\sum i=1n(\text{Delivery Date i} - \text{Order Date i})}{\text{Number of Parts Ordered per Year}} * 100$$

Average Number of Possible Transportation Modes per Product [number]

Measures the average number of available transportation modes (e.g. road, rail, air or sea) per product. Can be found in logistics/transportation management systems (TMS), supplier and carrier contracts, procurement and logistics department surveys, or industry databases.

Typical benchmarks (depends on industry)

Having only one mode is certainly not very resilient. Having more than three is mostly unnecessary.

Possible calculation

$$ANPTMPP = \frac{\sum (\text{Available modes for each product})}{\text{Number of Products}}$$

Average Changeover Time [hours]

Measures the time it takes to switch a production line or machine from producing one product to another. Can be found, e.g., in manufacturing execution systems, ERP production data, stopwatch/time tracking studies on the shop floor, or lean/Kaizen event records.

Typical benchmarks (depends on industry)

Can range from a few minutes to several hours or even days for large production lines.

Possible calculation

$$ACT = \frac{\sum (\text{Changeover Times})}{\text{Number of Changeovers per Year}}$$

Sustainability KPIs

CO_2 Emissions / Shipped Unit [kg/unit]

Quantifies the greenhouse gas emissions caused by logistics. Can be found in, e.g., transport logs, shipment data, emission calculators (e.g. Eco-TransIT, CO_2 databases), or weight/distance data.

Typical benchmarks (depends on industry)

Can range from 0.1–0.2 kg of CO_2 per unit to 5–6 kg of CO_2 per unit, e.g., for air freight/express services.

Possible calculation

$$\text{ESU} = \frac{\text{Total Transport Emissions}}{\text{Number of Units Shipped}}$$

Recycling Rate [%]

Shows the percentage of total waste that is recycled. Can be found in, e.g., waste management data, recycling contractor reports, or weighbridge protocols.

Typical benchmarks (depends on industry)

Generally, recycling rates below 20% are poor, over 50% can be seen positive.

Possible calculation

$$\text{RR} = \frac{\text{Recycled Waste}}{\text{Total Waste}} * 100$$

Green Certificate Ratio [%]

Measures the proportion of a company's total electricity consumption that is covered by renewable energy certificates (RECs, Guarantees of Origin, I-RECs or TÜV/EECS). Can be found in energy provider invoices, internal energy consumption reports, or sustainability reporting systems.

Typical benchmarks (depends on industry)

Varies greatly. Values between 20% and 100% are reasonable, depending on the individual goals.

Possible calculation

$$\text{GCR} = \frac{\textit{Electricity Consumption Covered by Certificates}}{\text{Total Electricity Consumption}} * 100$$

Percentage of Waste [%]

Measures the proportion of material or production waste in relation to the total input. Can be found in production reports, material input logs, waste collection records, or environmental logs.

Typical benchmarks (depends on industry)

Very good results can achieve below 2%, over 20% can be considered as poor already.

Possible calculation

$$\text{POW} = \frac{\text{Waste Volume or Weight}}{\textit{Total Material Input}} * 100$$

Carbon Intensity [kg/USD]

Measures the total amount of CO_2 emitted relative to economic output, typically measured in kilograms olf CO_2 per dollar of revenue. Can be found in carbon accounting reports, ESG reports, or revenue data from financial statements.

Typical benchmarks (depends on industry)

A possible benchmark range could be from 0.2 kg/USD to up to 2-3 kg/USD, e.g., metal industry.

Possible calculation

$$\text{CI} = \frac{\text{Total } CO_2 \text{ Emissions}}{\text{Revenue (USD)}}$$

Philantropic Investments Ratio [%]

Measures the financial contributions an organization makes to philanthropic activities (e.g., donations, community projects, or sponsorships). Can be found in annual financial reports, CSR/ESG budget documents, GRI or CSRD reports.

Typical benchmarks (depends on industry)

Usually lies between 0.1% and 0.5% of yearly revenue, with some exceptions.

Possible calculation

$$\text{PIR} = \frac{\text{Total philanthropic spending}}{\text{Total annual revenue}} * 100$$

Occupational Health and Safety Performance [LTIFR]

Measures how well the supply chain protects workers' health and safety. The Lost Time Injury Frequency Rate (LTIFR) is the number of lost-time injuries that occur in a workplace for every million hours worked. An LTIFR of 7, for instance, means that seven lost-time injuries occur on a construction site for every million hours worked. Can be found in internal HR and EHS reports, supplier audits and certifications, or annual sustainability reports.

Typical benchmarks (depends on industry)

Very good values are 0.5 to 1, above 7-8 could be considered as poor (related to high-risk industries).

Possible calculation

$$\text{LTIFR} = \frac{\text{Number of Lost Time Injuries} * 1{,}000{,}000}{\text{Total Hours Worked by Employees}}$$

Average Hours of Training per Employee

[hours/employee/year]

Measures the average number of training hours completed by each employee within a defined period (usually one year). Can be found in HR systems (e.g., LMS), training attendance sheets, or HR annual reports/personnel development reports.

Typical benchmarks (depends on industry)

Can range from nearly no training per employee to up to 120 hours (3 weeks) per year.

Possible calculation

$$\text{AHT} = \frac{\text{Total training hours completed by all employees}}{\text{Total number of employees}}$$

Hazardous Share of Total Waste [%]

Measures the volume of hazardous materials generated during production or logistics processes. Can be found in environmental management systems, waste management invoices from certified disposal companies, safety data sheets (SDS) or material input-output balances.

Typical benchmarks (depends on industry)

Typical ranges are between 1 and 2%, and over 20%, of hazardous material per unit.

Possible calculation

$$\text{HTW} = \frac{\text{Hazardous Wase}}{\text{Total Waste}} * 100$$

Energy Consumption per Unit [kWh/product]

The energy intensity measures the amount of energy consumed per unit produced, typically in kWh/product. The goal is continuous reduction. Can be found in energy meters, utility bills, production output reports, or machine usage logs.

Typical benchmarks (depends on industry)

Very efficient productions can achieve 0.1-0.2 kWh/unit, less efficient ones up to 10-15 kWh/unit.

Possible calculation

$$\text{ECU} = \frac{\text{Total Energy Consumed}}{\text{Number of Units Produced}}$$

Relevant References

[1] Anand, N., and N. Grover. 2015. "Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs)." Benchmarking 22 (1): 135-166. https://doi.org/10.1108/BIJ-05-2012-0034.

[2] Catellani, L., and E. Bottani. 2022. "Supply Chain Performance Metrics in the Lean, Agile, Resilient, Green Perspectives: a survey and model." 24th International Conference on Harbor, Maritime and Multimodal Logistics Modelling and Simulation, HMS 2022.

[3] Elrod, C., S. Murray, and S. Bande. 2013. "A review of performance metrics for supply chain management." EMJ - Engineering Management Journal 25 (3): 39-50. https://doi.org/10.1080/10429247.2013.11431981.

[4] Gunasekaran, A., C. Patel, and Ronald E. McGaughey. 2004. "A framework for supply chain performance measurement." International Journal of Production Economics 87 (3): 333-347. https://doi.org/10.1016/j.ijpe.2003.08.003.

[5] Huq, F., and K. Cutright. 2003. "A Framework for Measuring Supply Chain Agility: The Performance Metrics Approach." Proceedings - Annual Meeting of the Decision Sciences Institute.

[6] Neri, A., E. Cagno, M. Lepri, and A. Trianni. 2021. "A triple bottom line balanced set of key performance indicators to measure the sustainability performance of industrial supply chains." Sustainable Production and Consumption 26: 648-691. https://doi.org/10.1016/j.spc.2020.12.018.

[7] Piotrowicz, W., and R. Cuthbertson. 2015. "Performance measurement and metrics in supply chains: an exploratory study." International Journal of Productivity and Performance Management 64 (8): 1068-1091. https://doi.org/10.1108/IJPPM-04-2014-0064.

[8] Rao, Purba, and Diane Holt. 2005. "Do green supply chains lead to competitiveness and economic performance?" International journal of operations & production management 25 (9): 898-916.

[9] Rangan, R. P., R. Kumanan, K. R. Prasad, and M. Nishal. 2024. "Performance Metrics in Digital Supply Chain Paradigm." In Environmental Footprints and Eco-Design of Products and Processes, 159-173. Springer.

[10] Saeed, M. A., and W. Kersten. 2017. "Supply chain sustainability performance indicators - A content analysis based on published standards and guidelines." Logistics Research 10 (1). https://doi.org/10.23773/2017_12.

[11] Singh, C. S., G. Soni, and G. K. Badhotiya. 2019. "Performance indicators for supply chain resilience: review and conceptual framework." Journal of Industrial Engineering International 15: 105-117. https://doi.org/10.1007/s40092-019-00322-2.

[12] Varsei, M., C. Soosay, B. Fahimnia, and J. Sarkis. 2014. "Framing sustainability performance of supply chains with multidimensional indicators." Supply Chain Management 19 (3): 242-257. https://doi.org/10.1108/SCM-12-2013-0436.

[13] Zhang, W., and M. Reimann. 2014. "Towards a multi-objective performance assessment and optimization model of a two-echelon supply chain using SCOR metrics." Central European Journal of Operations Research 22 (4): 591-622. https://doi.org/10.1007/s10100-013-0294-7.

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