

KEY DEFINITIONS AND MEASURES

Category 4.0 Manage Supply Chain for Physical Products

APQC's Process Classification Framework (PCF)® is a reliable and robust framework used by hundreds of leading companies worldwide. The PCF is made up of 13 categories, as seen in Figure 1. This article highlights the definitions for each element and suggested key performance indicators (KPIs) for category **4.0 Manage Supply Chain for Physical Products**, specifically. If you're looking to learn more about the PCF, or download the PCF itself, please visit <https://www.apqc.org/process-frameworks>.

APQC's Process Classification Framework (PCF)®



Figure 1

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STRUCTURE OF THE ARTICLE

Throughout this article, you will see multiple tables, with different colored headers. They relate to the levels of the PCF (Figure 2).

PCF Levels

LEVEL 1 CATEGORY	11.0 Manage Enterprise Risk, Compliance, Remediation and Resiliency (16437) Represents the highest level of process in the enterprise in general groupings such as manage customer service, supply chain, finance, and human capital.
LEVEL 2 PROCESS GROUP	11.1 Manage Enterprise Risk (17060) Groups of processes that are part of executing a category. Examples include perform after sales repairs, procurement, accounts payable, recruit/source, and develop sales strategy.
LEVEL 3 PROCESS	11.1.3 Manage Business Unit and Function Risk (17462) A single process that may include elements related to variants and rework in addition to the core elements needed to accomplish the process. Examples include invoice customer and develop and manage IT security, privacy, and data protection.
LEVEL 4 ACTIVITY	11.1.3.3 Develop Mitigation Plans for Risks (16458) A key step performed to execute a process. Examples include maintain chart of accounts and develop salary/compensation structure and plan.
LEVEL 5 TASK	11.1.3.3.1 Assess Adequacy of Insurance Coverage (18129) An element of work that goes into executing an activity. They are generally much more fine-grained and may vary widely across industries. Examples include create a business case and obtain funding, and design recognition and reward approaches.

Figure 2

Where applicable, additional rows will be added to the tables with suggested KPIs and metric IDs. Below is a definition of the different elements and numbers you will see throughout the article.

Element Name

This is the name of the element within the PCF. For example, “Manage supply chain for physical products,” as seen in Figure 3.

4.0 Manage supply chain for physical products (20022)
Performing supply chain activities include planning supply chain, procuring materials and services, and managing logistics.

Figure 3

Hierarchy ID

In the PCF, there are identifying numbers to the left of each process element (each Category, Process Group, Process, Activity, or Task). These numbers are called hierarchy ID numbers and are used by people to help quickly locate a specific process element. Figure 4 has an example of “4.0.”

4.0 Manage supply chain for physical products (20022)
Performing supply chain activities include planning supply chain, procuring materials and services, and managing logistics.

Figure 4

Element ID

The numbers to the right of the process elements (20022 in Figure 5) are called process element identification numbers. Each process element in the PCF has a unique five-digit reference number.

4.0 Manage supply chain for physical products (20022)
Performing supply chain activities include planning supply chain, procuring materials and services, and managing logistics.

Figure 5

Element Definition

Each element in the cross-industry PCF has a definition associated with it. The definition is designed to provide detail and information around what type of work the element consists of.

In Figure 6, and for all elements in this article, you’ll find the definition directly under the colored heading that contains the name of the process element.

4.0 Manage supply chain for physical products (20022)
Performing supply chain activities include planning supply chain, procuring materials and services, and managing logistics.

Figure 6

Outside of the Key Definitions and Measures articles (like this one), element definitions can be found in the [Excel version](#) of the PCF, which includes a tab that has definitions for each element.

Key Performance Indicators (KPIs)

A KPI is a specific measure used to gauge a quantifiable component of an organization’s performance at the functional, process, or activity level.

KPIs typically correspond to the organization’s critical success factors and business goals.

Throughout this article, KPIs (when available) will show up in a table underneath the element definition (Figure 7). The KPIs will be listed in the right column and the metric IDs will be listed in the left column.

4.1 Plan for and align supply chain resources (10215)	
Creating strategies for production and materials. Handle the demand for the products of the organization. Develop plans for handling materials. Develop and administer the schedule for master production. Plan for distribution requirements and its constraints by reviewing and assessing distribution policies and performance and by establishing quality standards and procedures.	
Suggested KPIs for Process Group 4.1 Plan for and align supply chain resources (10215)	
Metric ID	KPI
100395	Cash-to-cash cycle time in days
100654	Demand/supply planning costs per \$1,000 revenue

Figure 7

Metric ID

Where KPIs are available, there is a metric ID included for KPIs that can be found in [APQC’s Benchmarks on Demand portal](#). The metric ID can be utilized by organizations to search for data related to that metric, such as top, bottom, and median performers.

Throughout this article, KPIs (when available) will show up as a table underneath the element definition (Figure 8). The KPIs will be listed in the right column and the metric IDs will be listed in the left column.

4.1 Plan for and align supply chain resources (10215)	
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Suggested KPIs for Process Group 4.1 Plan for and align supply chain resources (10215)	
Metric ID	KPI
100395	Cash-to-cash cycle time in days
100654	Demand/supply planning costs per \$1,000 revenue

Figure 8

DEFINITIONS AND SUGGESTED KEY PERFORMANCE INDICATORS (KPIs)

4.0 Manage Supply Chain for Physical Products (20022)

Performing supply chain activities include planning supply chain, procuring materials and services, and managing logistics.

4.1 Plan for and align supply chain resources (10215)

Creating strategies for production and materials. Handle the demand for the products of the organization. Develop plans for handling materials. Develop and administer the schedule for master production. Plan for distribution requirements and its constraints by reviewing and assessing distribution policies and performance and by establishing quality standards and procedures.

Suggested KPIs

Metric ID	KPI
100395	Cash-to-cash cycle time in days
100654	Demand/supply planning costs per \$1,000 revenue
101218	Number of FTEs that perform the process group "plan for and align supply chain resources" per \$1 billion revenue
103210	Supply chain management costs per \$1,000 revenue

4.1.1 Develop production and materials strategies (10221)

Creating strategies for production processes, as well as the process of managing materials. Define production and supply constraints. Design a blueprint of the workplace. Establish rules and regulations regarding the employees, outsourcing of services, and the expenditure to be incurred on the manufacturing capital.

4.1.1.1 Define manufacturing goals (10229)

Creating quantifiable strategic objectives for each manufacturing segment in conjunction with sales projections.

4.1.1.2 Define labor and materials policies (10230)

Setting up internal rules and regulations regarding the employees and the materials.

4.1.1.3 Define outsourcing policies (10231)

Creating rules and regulations regarding contracting out of a business process to another party in order to reduce costs.

4.1.1.4 Define capital expense policies (10232)

Designing rules and regulations pertaining to the expenditure incurred in acquiring or upgrading the existing stock of manufacturing capital.

4.1.1.5 Define capacities (10233)

Outlining the manufacturing and processing capacities of the organization. Delineate the capabilities required for optimizing output with available resources. Analyze capabilities possessed by the organization concerning the raw materials required and the process necessitated for producing finished products.

4.1.1.6 Define production network and supply constraints (10234)

Defining limitations in the ability of the organization's supply chain to deliver a new stock, and creating a network of production stakeholders. Frame and manage relationships within the flow of manufacturing and processing operations. Identify probable supply issues.

4.1.1.7 Define production process (14193)

Outlining the scheme of processing inventory into finished products/services. This includes the use of raw materials, machinery, skill sets, and knowledge to create new offerings.

4.1.1.8 Define standard operating procedures (19551)

Establishing or prescribing methods to be followed routinely for the performance of designated operations or in designated situations. This may include step-by-step instructions to help workers carry out complex routine operations. The goal is to improve efficiency, quality, and uniformity of performance, while reducing miscommunication, failure, or rework.

4.1.1.9 Define production workplace layout and infrastructure (14194)

Determining the floor plans for the processing facility that is meant for delivering finished products/services. Identify the totality of infrastructure needed for using this space in the manufacturing process, including machinery, factory floors, offices, and furniture.

4.1.2 Manage demand for products (10222)

Forecasting demand for products using secondary research and customer feedback. Refine these forecasts. Inspect the approach used in creating forecasts, and determine its accuracy.

4.1.2.1 Develop baseline demand forecasts (10235)

Identify the bedrock levels of market demand anticipated for the organization's products/services. Estimate future demand for product and services using historical data, analysis of the market environment and any externalities, etc. to create ex ante approximations.

4.1.2.2 Collaborate demand with customers (10236)

Working closely with the organization's customers to understand their drives and behavior, with the objective of estimating future demand. Reach out to customers through various means to understand their behavior patterns, usage elasticity, and degree of variability--and ultimately determine demand for each offering.

4.1.2.3 Develop demand consensus forecast (10237)

Arriving at a consensus over the forecasted levels of demand for products/services. Consensus is achieved by juxtaposing decisions developed in the baseline forecast with those reached at by collaborating with customers. Enlist senior-level decision makers of the sales and marketing functions.

4.1.2.4 Determine available to promise (10238)

Identify the volume of products/services that may be committed for delivery to fulfill sales. Figure out the amount of stock available. Forecast its volumes.

4.1.2.5 Monitor activity against demand forecast and revise forecast (10239)

Picking out any activity that deviates from the forecast, and adjusting it. Closely track and study the levels of demand as they emerge. Refine the consensus forecast as needed.

4.1.2.6 Evaluate and revise demand forecasting approach (10240)

Examining the methodology used to estimate future demand. Refine it in light of current market realities and demand.

4.1.2.7 Measure demand forecast accuracy (10241)

Calculating and inspecting the accuracy of demand forecasts. Use metrics to check the reliability of the forecasts created.

4.1.3 Create materials plan (10223)

Developing a scheme that allows for advance planning for the availability of raw materials and spares. Start with an unconstrained plan, and refine based on supply chain realities by identifying critical materials required for production, checking material specifications, and collaborating with all vendors over the supply.

4.1.3.1 Create unconstrained plan (10242)

Developing a plan for raw materials and other inventory items in order to meet market demand. Ensure the availability of all inventory items such as raw materials and spares. Create a blueprint in line with Define labor and materials policies [10230].

4.1.3.2 Collaborate with supplier and contract manufacturers (10243)

Collaborating with vendors and contractual manufacturers with the objective of ensuring a continual supply of raw materials and spares. Leverage long-term connections/relationships with various suppliers, and cultivate new ones. Track the activities of all vendors. Receive regular updates to prepare for any fluctuations in supply.

4.1.3.3 Identify critical materials and supplier capacity (10244)

Identifying principal materials needed for the manufacturing process and the levels of supply that may be ensured for them. Determine the essential and crucial inventory items required for the smooth functioning of all manufacturing processes. Estimate the average, peak, and baseline capacities of various vendors and suppliers. Establish the capability of individual suppliers from the market and the vendors.

4.1.3.4 Monitor material specifications (10245)

Observing and surveying all inventory items in order to check for the veracity of their specifications. Monitor various attributes and characteristics for respective inventory items such as density, volume, and size, as well as contextualized specifications particular to the respective materials.

4.1.3.5 Generate constrained plan (10246)

Generating a bounded plan that takes stock of the actual supply chain scenario. Take stock of all information collected while creating an inventory supply plan.

4.1.3.6 Define production balance and control (14196)

Defining an equitable volume for the production of products/services that adheres to an equilibrium value, and creating a scheme of control for processing items. Create schematics for systematically planning, coordinating, and directing the manufacturing activities in line with the production balance determined.

4.1.4 Create and manage master production schedule (10224)

Taking care of the master production plan. The master production includes creation and implementation of the site-level production plan, as well as management of the inventory that is currently in the production process.

4.1.4.1 Model production network to enable simulation and optimization (20023)

Create representative logical system that provides the framework to attain strategic objectives based on resources, product volumes, and processes. Provides the general sequential flow and capacity requirement relationships among raw materials, parts, resources, finished products, and product families.

4.1.4.2 Create master production schedule (20024)

Creating the plan for internal activities such as production, inventory, and staffing. Include forecasted quantity of items to produce based on inputs from sales planning, demand planning/forecasting, and supply chain partners.

4.1.4.3 Maintain master production schedule (17041)

Supervising and overseeing the plan for internal activities such as production, inventory, and staffing. Set the quantity of items to produce each week of a short-range planning horizon.

4.1.5 Plan distribution requirements (17042)

Maintaining master data of finished products and inventory. Identify the requirements of finished products at the destination, as well as partner requirements. Calculate the consolidation at source. Manage replenishment planning. Create and administer a dispatch plan. Calculate load plans for destinations and partners. Manage the cost of supplying these products. Ensure effective utilization of capacity.

4.1.5.1 Maintain master data (10252)

Maintaining and preserving the master data plan for distribution requirements. Create a systematic collection of facts and figures regarding the distribution of the inventories. Maintain policies, processes, and tools covering the distribution function.

4.1.5.2 Determine finished goods inventory requirements at destination (10253)

Interact with the concerned person at the destination to validate the requirements and to avoid any miscommunication of information.

4.1.5.3 Determine product storage facility requirements (19555)

Evaluate constraints, needs, parameters, and conditions for physical storage and retrieval of components or products for future use or shipment in a storage facility within a certain timeframe.

4.1.5.4 Calculate requirements at destination (10254)

Interact with the concerned authority at the destination to reach a specific figure that correctly represents requirements.

4.1.5.5 Calculate consolidation at source (10255)

Determining the aggregate volume of products/services consolidated at the source. Calculate the number of finished products that are ready to be delivered to the customers, particularly at one date.

4.1.5.6 Manage collaborative replenishment planning (10256)

Administering the plan for collaborative replenishment of goods. Replenish inventory by creating a plan in case of faulty production.

4.1.5.7 Calculate and optimize destination dispatch plan (10258)

Estimating the timing and duration of the delivery of the inventory from the source to the destination. Plan the logistic details of all the distribution routes and activities.

4.1.5.8 Manage dispatch plan attainment (10259)

Accomplishing the dispatch plan. Strictly follow the schedule, and adjust for deviations. Coordinate with the concerned authorities at various destinations.

4.1.5.9 Calculate and optimize destination load plans (10260)

Evaluating the plans for delivering loads to destinations. Create a systematic plan that specifies the load plans for every single destination.

4.1.5.10 Manage partner load plan (10261)

Administering the load plan for partners. Manage the delivery, and dispatch from the source to the partners.

4.1.5.11 Manage cost of supply (10262)

Managing all expenses to provide products/services in the market. Estimate the overall cost of supplying of products/inventory, including the cost distributing it through various partners and channels. Consider the cost of all the logistical processes that occur from the moment a product is ready to be dispatched to the time it reaches the destination.

4.1.5.12 Manage capacity utilization (10263)

Determining the capacity utilization of the organization's production process. Realize the extent to which an enterprise uses its installed productive capacity (i.e., the relationship between output and the potential output if capacity was fully used).

4.1.6 Establish distribution planning constraints (10226)

Instituting the constraints for planning of distribution process. Create a plan that specifies every element in the distribution process from the blueprint of the distribution centers to how and when the inventory would reach the distribution centers.

4.1.6.1 Establish distribution center layout constraints (10267)

Instituting the constraints for creating a layout for distribution center. Consider factors such as the number of customers, demand forecasting, product groups, condition of product conservation, warehousing, and transportation management.

4.1.6.2 Establish inventory management constraints (10268)

Determining any problems that might be faced while managing inventory. Identify problems and possible issues in managing the warehousing of the raw materials, spares, and other items of inventory. Take stock of inventory needs, and determine the exact quantity of the inventory needed in the near future.

4.1.6.3 Establish transportation management constraints (10269)

Identifying any potential constraints while deciding on the dispatch and delivery plan from the source to the various distribution centers. Decide how the inventory will be transported , which and how many transportation means to use, what route to take, etc.

4.1.6.4 Establish storage management constraints (19558)

Determining potential constraints for physical storage and retrieval of components or products in a storage facility within a certain timeframe. Consider factors such as the building shape, height, capacity, door locations, lift equipment, automation, etc.

4.1.7 Review distribution planning policies (10227)

Revisiting and refurbishing the policies for planning the distribution process. Asses the distribution strategies, including how the products are to be made available and sent to different distributors. Set guidelines regarding relationships between the sources and the distribution centers.

4.1.7.1 Review distribution network (10264)

Evaluating the system that defines how the products/inventory would reach from the source (i.e., manufacturer) to the destination (i.e., retailer/distributor).

4.1.7.2 Establish sourcing relationships (10265)

Establishing relationships with transportation/distribution sources in order to ensure an effective distribution network and strategy. Screen and evaluate various sources available to pick out the best among them.

4.1.7.3 Establish dynamic deployment policies (10266)

Creating strategic guidelines on the availability of the products at all the distribution centers. Create a dynamic network to ensure availability at all times, even in cases of defaults.

4.1.8 Develop quality standards and procedures (10368)

Developing standards and procedures for maintaining the quality of products/services. Establish desired quality targets. Create standardized procedures for the quality. Ensure quality specifications are effectively communicated.

4.1.8.1 Establish quality targets (10371)

Defining specific qualitative and quantitative target figures.

4.1.8.2 Develop standard testing procedures (10372)

Creating standard procedures for testing the quality of products/services. Describe the steps of key processes to help ensure consistent and quality output. Define the routine instructions for performing the quality testing activity.

4.1.8.3 Communicate quality specifications (10373)

Communicating the desired quality specifications to the manufacturing units, as well as the distribution centers, to avoid any misunderstanding or misinterpretation.

4.2 Procure materials and services (10216)

Creating a plan for procuring materials and services. Develop strategies for sourcing materials and services. Choose the most appropriate suppliers, and develop contracts with them. Order the materials and services as per the requirements. Manage relationships with suppliers.

Suggested KPI

Metric ID	KPI
101214	Number of FTEs that perform the process group "procure materials and services" per \$1 billion purchases

4.2.1 Provide sourcing governance and perform category management (10277)

Creating strategies for procuring materials and services from various sources, and for managing and evaluating categories. Establish a procurement process that describes the approach for obtaining products and purchasing activities. Evaluate the sources. Create sourcing relationships in order to continuously improve. Re-evaluate purchasing activities.

Suggested KPIs

Metric ID	KPI
101008	Number of FTEs that perform the process "develop sourcing strategies" per \$1 billion purchases
103644	Total cost to perform the process "develop sourcing strategies" per \$1,000 purchases

4.2.1.1 Develop procurement plan (10281)

Creating a plan for procuring materials and services. Plan what to buy, when, and from what sources. Include project requirements, the procurement team, the justification for the procurement, a timeline of events, and an explanation of the supplier selection process. Outline specific actions to start and complete purchases in order to adhere to best practices.

4.2.1.2 Clarify purchasing requirements (10282)

Defining the purchasing requirements for materials and services. Specify the exact inventory required for the production process. Create a specific quotation for all the sources in order to avoid any duplication or overlap.

4.2.1.3 Establish materials management contingency plans (10283)

Developing a strategy to deal with issues projected to arise during implementation of the inventory plan. Identify how to react to issues that arise and require changes to the inventory plan, such as a vendor failing to deliver materials on time. Collaborate with production and suppliers to prepare solutions to projected problems.

4.2.1.4 Match needs to supply capabilities (10284)

Synchronizing the requirements of materials and services and the capacity of suppliers for providing these materials and services. Revamp the procurement needs of the company in consideration of the capabilities of the suppliers.

4.2.1.5 Analyze organization's spend profile (10285)

Evaluating the spend profile of the organization. Collect, cleanse, classify, and analyze the procurement data with the purpose of reducing procurement costs, improving efficiency, and monitoring compliance.

4.2.1.6 Seek opportunities to improve efficiency and value (10286)

Seeking the most efficient sourcing and procurement opportunities.

4.2.1.7 Collaborate with suppliers to identify sourcing opportunities (10287)

Collaborating with the suppliers of materials and services in order to determine new opportunities for sourcing.

4.2.2 Select suppliers and develop/maintain contracts (10278)

Evaluating supplier options to select the most effective and efficient suppliers. Validate selected suppliers. Establish and manage supplier contracts.

Suggested KPI

Metric ID	KPI
101071	Number of FTEs that perform the process "order materials and services" per \$1 billion purchases
101391	Number of purchase order line items processed per FTE that performs the process "order materials and services"
103791	Total cost to perform the process "order materials and services" per \$1,000 purchases

4.2.2.1 Select suppliers (10288)

Evaluating the pros and cons of various suppliers. Choose the most appropriate and cost-effective suppliers on the basis of their material quality, delivery schedules, and costs.

4.2.2.2 Certify and validate suppliers (10289)

Validating the supply sources, and provide certification as an official supplier.

4.2.2.3 Negotiate and establish contracts (10290)

Legally binding suppliers with the company. Negotiate contracts individually with all the suppliers that include the promised material delivery, the delivery dates and duration, etc.

4.2.2.4 Manage contracts (10291)

Keeping contracts up-to-date with routine evaluation. Maintain order and discipline with the contracts in order to avoid any loss of information and mishaps.

4.2.3 Order materials and services (10279)	
Creating and approving requisitions and distributing purchase orders accordingly. Hasten the procurement process to satisfy internal needs.	
Suggested KPI	
Metric ID	KPI
100985	Number of FTEs that perform the process "manage suppliers" per \$1 billion purchases
103568	Total cost to perform the process "manage suppliers" per \$1,000 purchases

4.2.3.1 Process/Review requisitions (10292)

Handling operations related to processing/reviewing the requisitions. Establish and maintain procedures for the initiation, authorization, and processing of purchase requirements to procure products/services.

4.2.3.2 Approve requisitions (10293)

Approving requisitions for materials and services. Examine distributor-specific requests, and validate them individually.

4.2.3.3 Solicit supplier quotes (10294)

Requesting quotes from suppliers. Use a request for quotation (RFQ) to invite suppliers into a bidding process for specific products/services.

4.2.3.4 Create/Distribute purchase orders (10295)

Creating and placing the orders for purchasing materials and services from suppliers. Analyze vendor quotes. Choose the most cost-effective vendors. Create vendor-specific orders. Distribute them in order to initiate the purchasing process.

4.2.3.5 Expedite orders and satisfy inquiries (10296)

Accelerating the purchase orders in order to fulfill the internal needs (for raw materials) depicted through inquiries.

4.2.3.6 Reconcile purchase orders (10297)

Verify that purchase orders are filled as expected: verify that items and quantities are delivered as expected, based on purchase order details and goods receipts.

4.2.3.7 Research/Resolve order exceptions (10298)

Identifying and resolving any exceptions. Address the internal needs/inquiries for materials that cannot be procured immediately. Research inquiries that require the need of exceptional materials.

4.2.4 Manage suppliers (10280)

Collecting and analyzing new information in order to track and rate suppliers through a supplier information management system.

4.2.4.1 Monitor/Manage supplier information (10299)

Examining procurement and vendor performance. Report delivery timing and the quality of the materials procured through different vendors.

4.2.4.2 Prepare/Analyze procurement and supplier performance (10300)

Assisting the production and inventory processes through the information and reports created. Use the information and metrics of the procurement and vendor performance to enhance or improve the production process.

4.2.4.3 Support inventory and production processes (10301)

Support inventory and production processes by analyzing impact of procurement decisions and collaborating to constantly improve. (For example, perhaps minimum order requirements could be negotiated to be lower, to reduce excessive inventory and make production more flexible.)

4.2.4.4 Monitor quality of product delivered (10302)

Track the performance of the suppliers on product quality. Use this information to further improve sourcing and supplier performance.

4.3 Produce/Assemble/Test product (10217)

Processing and delivering the finished goods manufactured by the organization. Schedule the production of products. Execute the product production activities. Perform tests to oversee and ensure quality of production. Maintain records of the production process. Track lots.

Suggested KPI

Metric ID	KPI
104786	Total cost to perform the process group "produce/manufacture/deliver product" per \$1,000 revenue
104176	Unplanned machine/equipment downtime as a percentage of scheduled run time

4.3.1 Schedule production (10303)

Scheduling the production of final products. Generate a detailed schedule plan. Create and release production orders and lots. Schedule the planned and unplanned maintenance orders.

4.3.1.1 Model and simulate plant (19563)

Creating a representation of plant facilities to optimize material flow, resource utilization, and logistics for all levels of plant planning from global production facilities, through local plants, to specific lines and enabling the comparison of production alternatives.

4.3.1.2 Generate line level plan (10306)

Initiating the line-level plan for production. Break down the production schedule into specific lines, specifying the various objectives the production schedule.

4.3.1.3 Generate detailed schedule (10307)

Broadening the line-level plan. Specify all the individual production processes, along with the timing and the duration to come up with a working schedule that tracks the whole process and any deviations that might occur.

4.3.1.4 Schedule production orders and create lots (10308)

Creating a schedule to commence production of orders received, and creating lots to consolidate the processing. Plan when the production orders are to be initiated by commencing the operations for processing products/services. Specify which materials to produce, where to produce them, which operations will facilitate this, and on which date production is to start. Define the size of production lots, demarcating the durations of batch production.

4.3.1.5 Plan for preventive maintenance (10315)

Scheduling planned maintenance of the production equipment.

4.3.1.6 Request unplanned maintenance (10316)

Scheduling requested maintenance in order to address breakdowns where repairs or corrective remedies are needed immediately. Create a scheme for undertaking unplanned maintenance work on equipment/machinery that has come to be in urgent need for it. Express turnaround to redress using specialized personnel.

4.3.1.7 Release production orders and create lots (10309)

Initiating the delivery of production orders, and creating lots. Communicate the order that specifies which material to produce, where to produce it, which operations to require, and on which date production takes place. Define how to settle the order costs. Create production lots, which is a particular production unit of an assembly that is planned and manufactured.

4.3.2 Produce/Assemble product (10304)

Manufacturing the product. Convert the raw materials to develop consumer-ready products. Manage the raw materials to implement the detailed production schedule. Reproduce defectives to establish and remediate cause. Ensure production optimization and benchmark performance.

Suggested KPIs

Metric ID	KPI
100014	Actual production rate as a percentage of maximum capable production rate
100726	Finished-product first-pass quality yield for primary products
100854	Primary product manufacturing cycle time in hours

4.3.2.1 Manage raw material inventory (10310)

Administering the inventory of raw materials. Manage the total cost of all component parts in stock but not yet used. Manage the cost of the direct materials (i.e., materials incorporated into the final product) and indirect materials (i.e., materials not incorporated into the final product but consumed during the production process).

4.3.2.2 Execute detailed line schedule (10311)

Creating and implementing the detailed line production schedule on the ground level.

4.3.2.3 Report maintenance issues (10319)

Recording and reporting any deviations or issues in the maintenance schedule, in the performance to the production management team, and for unplanned maintenance.

4.3.2.4 Rerun defective items (10313)

Reproducing the items produced defectively. Assess the produced items by conducting quality and standardization tests in order to diagnose any discrepancies. Reproduce defective items.

4.3.2.5 Monitor and optimize production process (19566)

Integrating different resources in the production process: material, personnel, equipment, robotics, etc. Includes automating and controlling the plant, performing advanced process control and real-time optimization. This activity also includes managing plant alarms and alerts.

4.3.2.5.1 Automate and control plant (19567)

Creating and applying technology to monitor and control the production and delivery of products and services. Automation involves a broad range of technologies.

4.3.2.5.2 Perform advanced process control (19568)

Including a broad range of techniques and technologies implemented within industrial process control systems that are routinely reviewed, audited, and improved, advanced process controls typically address particular performance or economic improvement opportunities. An advanced set of process control measures can be used to reduce variation and identify primary improvement options. Results of analysis are fed back into process design for incorporation into production.

4.3.2.5.3 Perform real-time optimization (19569)

Helping organizations increase performance and efficiency, real-time optimization is a category of closed-loop process control that aims at optimizing process performance in real time for systems. It is normally built upon model-based optimization systems and is usually large scale. Real-time optimization automatically detects errors, and can modify and eliminate both random and non-random errors, as well as analyze and monitor all systems involved.

4.3.2.5.4 Manage plant alarms and alerts (19570)

Applying human factors and instrumentation engineering and systems thinking to manage the design of an alarm or alert system to increase its usability. Typical challenges include having too many alarms in a plant, poorly designed alarms/alerts, improperly set alarm/alert points, unclear alarm/alert messages, etc. Poor alarm management is one of the leading causes of unplanned downtime.

4.3.2.6 Assess production performance (10314)

Analyzing and benchmarking the production process to judge its effectiveness and efficiency. Create production metrics to numerically calculate the performance of the production process.

4.3.3 Perform quality testing (10369)

Executing tests to evaluate the quality of the products manufactured. Calibrate the test equipment. Conduct the actual tests. Record the results and outcomes of the quality test conducted.

4.3.3.1 Calibrate test equipment (10318)

Regulating the equipment used for performing quality tests. Assess correspondence between the quality testing equipment and the desired quality standards. Ensure the calibration standard is more accurate than the instrument being tested.

4.3.3.2 Perform testing using the standard testing procedure (10374)

Performing testing using calibrated equipment and in consent with the standard testing procedure, including testing time.

4.3.3.3 Manage quality samples (20956)

Selecting a set of elements from a product lot to draw conclusions or make inferences about the quality of the product lot from which the sample is drawn. Sampling is frequently used because gathering data on every product produced by a company is often impossible, impractical, or too costly to collect.

4.3.3.4 Record test results (10375)

Documenting the results and outcomes of the quality tests. Track the performance of the production process. Record/Document it to evaluate the qualitative efficiency of the production process. Use electronic devices and software in order to ensure effectiveness in recording the results and outcomes of the test.

4.3.3.5 Track and analyze non-conformance trends (12045)

Managing and monitoring the occurrences of problems with a process or product. It is important that nonconformance occurrences are tracked in a standardized way so the data can easily be reviewed to assess the impact of the problem. Ongoing analysis of trends in nonconformance gives an organization the ability to make process changes to reduce the incidence and cost of nonconformances.

4.3.3.6 Perform root cause analysis (12046)

Using a technique that helps people answer the question of why a problem occurred in the first place. It seeks to identify the origin of a problem using a specific set of steps, with associated tools, to find the primary cause of the problem to determine what happened, why, and how to reduce the likelihood that it will happen again.

4.3.4 Maintain production records and manage lot traceability (10370)

Perpetuating the production records by systematically documenting and using it to ensure the effective management of lots. Determine the lot numbering system and its use. (The lot number enables tracking of the constituent parts, as well as labor and equipment records involved in the manufacturing of a product. It enables manufacturers and to perform quality control checks, calculate expiration dates, and issue corrections of their production output.)

4.3.4.1 Determine lot numbering system (10376)

Allotting an identification number to a particular quantity or lot of material manufactured. Assign lot numbers on the basis of specific production units, material similarity, etc. Place lot numbers on the outside of packaging.

4.3.4.2 Determine lot use (10377)

Identifying the use of production lots. Define where, how, and when to use a specific production lot.

4.4 Manage logistics and warehousing (10219)

Administering and overseeing all activities related to logistics and warehousing. Outline and establish a strategy for the logistics function. Plan and administer the flow of inbound materials. Administer the operational activities of warehousing and outbound transportation. Manage reverse logistics including returns and exchanges.

Suggested KPIs

Metric ID	KPI
101221	Number of FTEs that perform the process group "manage logistics and warehousing" excluding "manage returns; manage reverse logistics" per \$1 billion revenue
103747	Total cost to perform the process "manage returns; manage reverse logistics" per \$1,000 revenue
103506	Total cost to perform the process group "manage logistics and warehousing" per \$1,000 revenue

4.4.1 Provide logistics governance (10338)

Outlining the strategy for managing logistics. Translate customer requirements logistic requirements. Create an efficient logistic network and outsourcing portions of logistics activities. Design a logistics strategy that optimizes transportation costs and schedule. Define key performance indicators.

4.4.1.1 Translate customer service requirements into logistics requirements (10343)

Determining the requirements for managing the flow of things between the point of origin and the point of consumption by assessing the service requirements of the customers.

4.4.1.2 Design logistics network (10344)

Developing a network for logistical activities. Create a network of entities through which materials and information flow, encompassing all related activities associated with the flow of transformation of products.

4.4.1.3 Communicate outsourcing needs (10345)

Conveying outsourcing needs within the organization, with the objective of sourcing the assistance required. Define the portion of logistical activities that can be transferred to outside suppliers. Assess third-party agencies to carefully select the most appropriate agencies for outsourcing. Convey these needs to management or the appropriate authority.

4.4.1.4 Develop and maintain delivery service policy (10346)

Establishing rules and regulations, as well as the terms and conditions regarding the delivery of service by the company. Develop a delivery plan that specifies what, how, when, and in which way to deliver services to the customer.

4.4.1.5 Optimize transportation schedules and costs (10347)

Optimizing the schedule and costs of transportation services. Design a logistics strategy by strategically creating delivery routes and systems, which optimizes the overall transportation schedules and costs. Evaluate different transportation sources in order to select the most appropriate and cost-effective sources.

4.4.1.6 Define key performance measures (10348)

Establishing measures for evaluating the performance of the logistics strategy of the organization. Establish key performance indicators, including the logistics performance index, delivery in full, and delivery on time.

4.4.1.7 Define reverse logistics strategy (16905)

Establish a strategy that includes rules and regulations for the physical handling, information processing, and disposition of product and packaging returned by the buyer to the seller or an intermediary. Include return approval, transportation coordination, advance communication, product tracking, receipt, disposition of the return, and processing warranty claims in the strategy.

4.4.2 Plan and manage inbound material flow (20936)

Creating and executing a strategy for all the internal activities related to the flow/transfer of inbound materials. This process includes planning inbound material receipts, managing inbound material flow, monitoring inbound delivery performance, managing the flow of returned products, controlling the quality of returned parts, and salvaging or repairing returned products.

Suggested KPI

Metric ID	KPI
101235	Number of FTEs that perform the process "plan and manage inbound material flow" per \$1 billion revenue

4.4.2.1 Plan inbound material receipts (10349)

Managing the receipts of inbound materials. Create a plan accounting for the materials procured from the source of supply and the materials delivered to the distribution center or the warehouse.

4.4.2.2 Manage inbound material flow (10350)

Managing all the internal activities related to the flow/transfer of materials. Manage materials being delivered to distribution center or warehouse. Gauge the time taken for delivery and if the delivery process is on time.

4.4.2.3 Monitor inbound delivery performance (10351)

Overseeing the performance of an inbound delivery system. Check the present delivery system's efficiency, cost effectiveness, and adherence to a delivery schedule.

4.4.2.4 Manage flow of returned products (10352)

Tracking and taking care of the products that have been internally returned either because of their deficiency or in cases of incorrect delivery.

4.4.2.5 Manage disposition of returned products (20109)

Determining if a returned product can be salvaged or repaired. Salvage or repair is dependent upon the product, the condition of the product, or the availability of a like item.

4.4.2.5.1 Determine quality of controlled part (12708)

Implement a checks and balances system to verify that returned parts meet acceptable quality standards to determine appropriate disposition activity.

4.4.2.5.2 Perform salvage activities (10366)

Executing activities for reinstating the returned products. Present the customer with additional incentives of compensation in case of any defective products delivery or any discrepancy in the product specifications in order to save the order from being permanently returned.

4.4.2.5.3 Manage repair/refurbishment (21604)

Administering the reinstatement of the returned product in order to return them back to customers. Repair or remanufacture the defective or ineffective products returned by the customer. Process the delivery of the repaired or remanufactured products back to the customer.

4.4.2.5.4 Return to finished goods inventory (21605)

Moving a returned product back to inventory or stock. Whether a product is sufficient as returned, repaired, or refurbished, moving that product back to inventory for resale or returning to customer is the final step in Manage disposition of returned products.

4.4.3 Operate warehousing (10340)

Tracking the inventory deployment. Accept and store products. Ship the products. Measure the accuracy of the inventory. Assess the performance of the outsourced logistics activities.

Suggested KPIs

Metric ID	KPI
100784	Inventory carrying cost as a percentage of average inventory value
101231	Number of FTEs that perform the process "operate warehousing" per \$1 billion revenue
103072	Pick-to-ship cycle time in hours for customer orders
103784	Total cost to perform the process "operate warehousing" per \$1,000 revenue

4.4.3.1 Manage and track inventory deployment (10353)

Tracking the logistical act of delivering or releasing an inventory item or entity to targeted end users. Track how much inventory has been deployed at all the distribution centers, individually.

4.4.3.2 Receive, inspect, and store inbound deliveries (10354)

Coordinating the incoming inbound materials/products. Accept the delivery of these materials and the subsequent storage. Track them at the warehouse/distribution center.

4.4.3.3 Track product availability (10355)

Keeping track of the availability of different materials/products at the warehouse and distribution centers.

4.4.3.4 Pick, pack, and ship product for delivery (10356)

Packing and shipping the product to deliver to the customer. Take care of the internal and external packaging of the products in order to ensure safe transportation of the products from the warehouse to delivery locations. Notify the ERP system and/or Accounts Receivable Dept.

4.4.3.5 Track inventory accuracy (10357)

Monitoring any discrepancies between electronic records that represent the inventory and the physical state of the inventory. Look for discrepancies such as phantom inventory, which includes products that an inventory accounting system considers to be available at the storage location but are not actually available.

4.4.3.6 Track third-party logistics storage and shipping performance (10358)

Keeping a track on the storage and shipping performance of third-party agencies. Monitor logistics storage and shipping performance for third-party agencies. Use measures such as a logistics scoreboard, activity-based costing, economic value analysis, and balanced scorecards.

4.4.3.7 Manage physical finished goods inventory (10359)

Administering the movement of the finished products that are processed by the organization through its warehouses. Track goods through the use of systems such as barcodes in order to monitor the volumes available, quantity of out-flowing goods, remaining shelf life of the product, etc.--ultimately, to best manage the warehouse capacity.

4.4.3.8 Manage warehouse transfers (20957)

Shipping items from one warehouse to another in a multi-warehouse environment. A warehouse transfer is typically handled electronically in a system designed to replicate the physical processes involved with transferring items from one warehouse to another.

4.4.4 Operate outbound transportation (10341)

Creating a plan that specifies the schedule and system for transportation and delivery of the outbound products, as well as tracking the performance of the carrier delivery system. Conduct vehicle management and processing of all carrier-related documents.

Suggested KPIs

Metric ID	KPI
101227	Number of FTEs that perform the process "operate outbound transportation" per \$1 billion revenue
103774	Total cost to perform the process "operate outbound transportation" per \$1,000 revenue

4.4.4.1 Plan, transport, and deliver outbound product (10360)

Organizing the transportation and delivery of outbound products. Plan and organize the transportation, shipping, and delivery of the end products. Create a plan that specifies dispatch and delivery of the product to its destination, as well the transportation.

4.4.4.2 Track carrier delivery performance (10361)

Monitoring delivery performance when carrying products from the warehouse/distribution centers to the retailers or end consumers. Create a performance metrics based on the key performance indicators.

4.4.4.3 Manage transportation fleet (10362)

Taking care of a range of functions related to the means of transport used for delivering the end products. Manage vehicle financing, vehicle maintenance, vehicle telematics (tracking and diagnostics), driver management, speed management, fuel management, and health and safety management.

4.4.4.4 Process and audit carrier invoices and documents (10363)

Organizing and inspecting all account statements and any other documentation for the carriers used in delivery. Create, manage, and inspect all documents related to the financial, regulatory, and administrative accounts of all the carriers/freights. Generate receipts for all freight transactions.

ABOUT APQC'S PROCESS CLASSIFICATION FRAMEWORK (PCF)[®]

The Framework for Process Improvement

Experience shows that benchmarking's potential to drive dramatic improvement lies squarely in making out-of-the-box comparisons and searching for insights not typically found within intra-industry paradigms. To enable this type of beneficial benchmarking, APQC's Process Classification Framework (PCF) serves as a high-level, industry-neutral enterprise model that allows organizations to see their activities from a cross-industry process viewpoint.

The PCF enables organizations to understand their inner workings from a horizontal process perspective, rather than a vertical functional viewpoint. The PCF does not list all processes within a specific organization, and every process listed in the framework is not present in every organization.

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