

Material requirements planning: making demand available on time, in the right quantity and quality

Material requirements planning refers to the systematic determination of material requirements and their timely coverage through purchase orders, manufacturing orders or stock withdrawals. It forms the operational heart of procurement logistics and ensures that production and assembly never come to a standstill due to missing parts. At the same time, it acts as a cost lever, because shortages cause downtime, while excess stock ties up capital and drives up warehousing costs. For buyers and supply chain managers, it is therefore the interface where demand planning, supplier management and inventory control converge.

Key facts

- Material requirements planning covers demand determination, lot sizing, scheduling and the triggering of procurement or manufacturing orders.
- In practice, discrete, stochastic and consumption-based methods have become established, with the choice depending on the nature of demand.
- Typical A, B and C classifications determine the level of planning effort devoted to individual materials.
- Core KPIs are service level or fill rate, inventory coverage, inventory turnover and planning accuracy.
- Digital systems such as ERP and MRP increase automation but do not replace expert review of critical positions.
- Coordination with suppliers on reliability and data quality is often the biggest factor influencing planning success.

Definition: material requirements planning

Material requirements planning is the totality of all measures that ensure the material required for production, assembly and spare parts supply is available in the right quantity, quality and on time. It links demand analysis from bills of materials and customer orders with operational procurement.

Distinction from production planning

Material requirements planning deals with the supply side of materials: which material has to be ordered or produced when and in what quantity. Production planning, by contrast, determines sequences, capacities and manufacturing dates. The two areas are closely interlinked, because a changed production sequence immediately changes the planning dates. In practice, both functions often work in a shared ERP system but are organisationally separate.

Position in the procurement process

For purchasing, material requirements planning is the triggering element: without planned demand there

is no enquiry, no quotation comparison and no purchase order. Planning provides order quantities, deadlines and priorities on which subsequent procurement, supplier management and dunning processes are based. Weaknesses in planning therefore have a direct impact on delivery capability and working capital.

Methods and approach of planning

The choice of planning method depends on the demand structure, depth of value creation and supplier delivery behaviour. In practice, the decision is usually made per material class rather than using a single method for the entire range.

Discrete and stochastic methods

In customer-order-based manufacturing, discrete demand determination from bills of materials and orders dominates, typically as a gross-to-net calculation in the MRP run. For consumption-oriented parts, stochastic methods are used, based on historical consumption and statistical safety stocks. Both approaches can be combined when a part is used both for orders and for service requirements. Reliable results require well-maintained unit and currency master data as well as consistent bills of materials.

- Gross demand from bill of materials and order minus stock on hand yields net demand
- Stochastic methods use consumption figures, variance and replenishment lead time
- Safety stocks cover fluctuations in consumption and delivery

Consumption-based planning

Consumption-based planning works with reorder points and replenishment quantities without an individual demand being present. It is suitable for C parts, standard parts and auxiliary materials with uniform consumption. Typical triggers are minimum stock levels, reorder points and reorder cycles. The advantage lies in low planning effort, the disadvantage in lower flexibility during demand peaks. In practice, this method is often complemented by vendor managed inventory, in which the supplier itself monitors stock levels.

ABC and XYZ analysis

The ABC analysis classifies materials by value share, the XYZ analysis by demand continuity. A-X parts with high value and stable demand usually receive automated procedures with regular review, while C-Z parts with low value and erratic demand receive high safety stocks or special manual treatment. The combination of both analyses governs planning effort, order quantities and supplier commitment. It forms the basis for single sourcing or multiple sourcing per material class.

Roles and tasks in the planning process

Material requirements planning is teamwork between planners, purchasing, production planning and suppliers. Clear responsibilities prevent critical parts from getting lost between areas of responsibility.

The planner's tasks

The planner monitors stock levels, contribution margins and open orders, reviews system proposals and triggers replenishment orders. They respond to demand changes, delivery schedule deviations and quality problems with alternative procurement or schedule adjustments. For A parts, they often also handle supplier communication, for example in the event of scheduling conflicts or quantity adjustments. The role requires a good understanding of delivery times, lot sizes and manufacturing processes.

Interface with the supplier

Reliable delivery dates are the prerequisite for lean inventories. Against this background, supplier qualification and ongoing supplier evaluation are directly relevant planning topics: unreliable suppliers cause safety stocks and planning effort. For critical materials, framework agreements with fixed quantities and call-off control or a strategic partnership that creates priority in bottleneck situations are recommended. Measures for material tracking also support rapid decisions when batches or deliveries are affected.

Coordination with sales and planning

Demand changes from sales or customer orders hit planning first. Regular sales and operations meetings translate forecasts into material strategies before they lead to shortages. Change management in design requires planned returns or residual quantity recovery when parts are no longer needed after a design change. Without this coordination, obsolescence and unplanned procurement costs arise.

Key KPIs of material requirements planning

Planning quality can be measured. In practice, a few consistently maintained metrics that are regularly evaluated and discussed with suppliers have proven effective.

Service level and delivery capability

The service level or fill rate indicates what percentage of demand was covered on time. Values above 98 per cent are often regarded as the target in series production, whereby each additional percentage point increases inventory costs. Differentiation by material class is important: a higher service level applies to A parts than to standard items. Closely related is supplier delivery reliability, which largely determines one's own planning options.

Inventory and coverage metrics

Inventory coverage, inventory turnover and tied-up capital show whether planning is operating economically. Typical guideline values vary considerably by industry, so comparisons are meaningful primarily over time. Combining them with the value of inventories is informative, because high coverage for low-cost parts is less critical than for A material. VAT-related effects from early payment discounts and payment terms also affect inventory valuation.

Planning and process quality

KPIs such as planning accuracy, share of manual corrections or number of express orders make process quality visible. Frequent emergency scenarios indicate poor master data, incorrect replenishment times or unreliable suppliers. The share of automated planning steps, comparable to the touchless rate in procurement, also shows progress in digitalisation. These metrics are well suited for lessons learned after each project completion.

Risks and controls

Material requirements planning only works as well as its data and its supply base. Risks arise from imprecise planning, unreliable suppliers and a lack of transparency.

Data quality and master data

Incorrect replenishment times, invalid lot sizes or outdated bills of materials are the most common causes of planning errors in practice. Effective master data governance with clear responsibilities and regular reviews is therefore indispensable. Unit and currency master data must also be consistent, otherwise quantities and prices do not add up. A functioning e-procurement system additionally reduces errors when transferring requirements into purchase orders.

Supply chain and procurement risks

Single sourcing reduces procurement costs but increases the risk of supply failure. Systematic risk management identifies critical materials and suppliers and defines alternative procurement and contingency plans before the bottleneck occurs. Especially for imported goods and long sea transports, the documentation situation, such as the bill of lading as contract of carriage and document of title, belongs in the risk set. Contract risks such as unwanted automatic contract renewal with fixed quantities further constrain planning.

Controls and escalation paths

Effective controls include regular stock and open order reconciliations, plausibility checks of system proposals for critical parts and defined escalation paths for missed deadlines. Responsibilities for returns and residual stock must be clarified so that unusable material does not remain unexamined in the warehouse. Retention of title by the supplier can become relevant in payment difficulties and should be considered as part of contract reviews. These legal questions must be assessed on a case-by-case basis.

Current developments and digitalisation

Artificial intelligence, real-time data and closer supplier cooperation are fundamentally changing planning. Their benefit arises not from technology alone, however, but from clean processes and data.

Automation and forecasting

Modern ERP and planning systems generate planning proposals automatically, check alternative dates and warn of bottlenecks. AI-supported forecasts work with market data and order indicators to detect demand jumps earlier. The degree of automation should increase step by step: first data quality, then rule-based automation, then intelligent forecasting. Manual review remains indispensable for critical A parts and initial procurement.

Transparency across the entire supply chain

Supplier dashboards, delivery schedules via data exchange and track-and-trace applications give planners visibility of stock levels and deadlines at the supplier. This transparency reduces safety stocks and speeds up decisions in the event of disruptions. The prerequisites are coordinated processes and functioning supplier qualification, because unverified data creates a false sense of security. Increasingly, sustainability and compliance information also flows into planning decisions.

Cost transparency and strategic control

Planning increasingly intersects with price and cost tools: should-cost analyses provide the basis for quantity and deadline negotiations, and a well-maintained savings pipeline and savings forecast make procurement savings potential visible. Metrics such as spend under management show how much

volume is actively managed. Material requirements planning thus evolves from a pure replenishment mechanism to a strategic control function that jointly optimises costs, delivery capability and risks.

Typical metrics

Service level / fill rate: > 98%

typical target value in series production, differentiated by material class

Supplier delivery reliability: > 95%

a prerequisite for lean inventories and stable planning

Inventory coverage of A parts: 2–6 weeks

common guideline value, industry-dependent

Inventory turnover: 6–12 per year

in practice varies considerably by industry

Share of automated planning proposals: > 70%

grows with data quality, remainder checked manually

Practical example

A mid-sized mechanical engineering company with around 30,000 active items suffered repeated production stoppages due to missing purchased parts and simultaneously growing inventories. The cause lay in outdated replenishment times and a lack of prioritisation across more than 4,000 manual planning transactions per week.

- ABC/XYZ analysis across all items and simplification of C-part procedures to reorder point control
- Cleansing of master data and delivery times as part of a master data governance framework with defined responsibilities
- Framework agreements and call-off systems with key suppliers for A parts, supplemented by supplier evaluation with fill rate targets
- Introduction of a bottleneck early warning system with escalation levels and regular lessons-learned sessions with purchasing and planning

Conclusion

Material requirements planning is more than replenishment administration: it determines delivery capability, inventory costs and supply chain resilience. It succeeds when methods are chosen appropriately per material class, master data is properly maintained and suppliers are actively involved in planning. Metrics such as service level, inventory coverage and delivery reliability make quality measurable and provide the basis for improvements. Digitalisation and AI increase speed and transparency but do not replace expert control of critical positions. Those who understand planning as a control task turn it from a cost risk into a genuine competitive advantage.

Frequently asked questions

What does material requirements planning mean?

Material requirements planning (MRP) encompasses all measures for supplying materials for production, assembly and spare parts requirements on time and in the right quantities. It determines demand from bills of materials, orders and consumption figures and triggers purchase orders or

manufacturing orders. The objective is to avoid both shortages and excess stock.

What planning methods are there?

In practice, three groups of methods are distinguished: discrete methods based on bills of materials and customer orders, stochastic methods based on statistical consumption figures, and consumption-based planning with reorder points or reorder cycles. The choice depends on the demand structure, value and criticality of the material. Several methods often run in parallel for different material classes.

Which KPIs are relevant for material requirements planning?

Key performance indicators include service level or fill rate, inventory coverage, inventory turnover, supplier delivery reliability and planning accuracy. In addition, express orders and manual corrections reveal process weaknesses. It is important to evaluate them over time and by material class, as industry benchmark values vary considerably.

What role does purchasing play in material requirements planning?

Purchasing converts the planned requirements into enquiries and purchase orders and manages suppliers with regard to delivery reliability, quantities and framework agreements. It contributes to the reliability of planning through supplier qualification, agreed delivery times and clear escalation paths. Close coordination between planners and buyers significantly shortens response times in the event of shortages.

How can material requirements planning be improved?

Levers include cleansing master data such as delivery times and lot sizes, introducing class-specific planning methods and automating routine decisions. In addition, supplier cooperation, transparency over open orders and regular KPI reviews improve quality. It is important to introduce changes step by step and to verify their impact in a measurable way.

What is the difference between material requirements planning and inventory management?

Material requirements planning controls replenishment: it decides when and in what quantity to order or manufacture. Inventory management is broader in scope and additionally covers warehouse organisation, inventory valuation and physical availability. The two fields are mutually dependent, because without clean inventory data, planning cannot work reliably.