

What are supply chain management and product lifecycle management systems? 2001

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SCM - the grand vision

Supply Chain Management (SCM) systems support manufacturing managers in making decisions that optimise the trade off between capital tied up in stocks and inventories, versus the ability to deliver goods at prices and delivery dates agreed with customers. In principle, both inwards logistics operations to acquire materials to make products and outwards logistics operations shipping finished goods to final customers are monitored.

The system builds a computer model of the supply and demand networks with transport delays and storage locations to serve the known points of supply and demand. It then loads the network with a forecast of the flows of materials caused by the demand plan and, using various algorithms, develops an optimum plan.

SCM sub-systems

Within this grand vision, industry currently deploys a series of more digestible sub-systems:

Demand Management. Co-ordinating sales forecasts from all the players, including sales representatives at the point of sale through production to raw material suppliers, so that everyone is working to the same plan, rather than creating unnecessary safety stocks.

Distribution Resources Planning (DRP). Keeping track of the status of production and procurement of materials for each order, where the goods are located, what transport and warehousing is in use, what stock to keep and when to re-order. Plus, when it all goes wrong, what resources are available to mitigate problems and costs.

Transport Management Systems (TMS). What modes of transport at what cost are available to the shipper; what costs and timings are associated with each route; the order in which to load transport; optimisation of multi-segment deliveries; compliance with documentation required for customs and shippers.

Warehouse Management Systems (WMS). Systems to optimise the storage and picking of goods in a warehouse, including compliance with carrier and customer documentation standards.

Supplier Relationship Management (SRM). Information about suppliers of direct and indirect materials, such as agreed terms of trade, records of status, records of contacts between the enterprise and the various points of contact in suppliers. There is an overlap with CSM systems (see below) but SRM tends to be more oriented towards making contacts more effective.

Component Supplier Management (CSM). Management of lists of preferred suppliers and preferred parts; terms of trade such as delivery and price associated with them; rationalisation of

existing parts to minimise costs by substituting equivalent parts. There is an overlap with SRM systems (see above), but CSM tends to be more oriented towards product information.

PLM - the grand vision

Product Lifecycle Management (PLM) systems support the management of a portfolio of products, processes and services from initial concept, through design, launch, production and use to final disposal. They co-ordinate products, project and process information throughout new product introduction, production, service and retirement among the various players, internal and external to the OEM, who must collaborate to bring the concept to fruition.

The system maintains a vault, which may be physically distributed, but has a single logical index to all the documents containing product, project and process information. PLM applications use workflow and authorisation rules to give orderly access to this vault's information. The various processes of new product introduction, production, service and retirement use a single source of product information. Often browser access with viewer plug-ins means that information can be accessed by an authorised person on an extranet, any place, any time. At present, the granularity of access is by file or document. In the future, systems should support access at a higher granularity e.g., by a field within a record or a feature of a model.

PLM sub-systems

Today the vast majority of PLM expenditure is on mainstream Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) systems. In addition to these, sub-systems deployed today include:

Electronic Design Automation (EDA). Electronics are an increasing proportion of many products such as cars. These systems allow engineers to model the requirements of the system, then generate manufacturing instructions to realise the design in a variety of technologies, such as Field Programmable Gate Arrays (FPGA).

Technical Document Management. Products don't only have drawings but also spec sheets, process plans, and work instructions. These systems provide a vault for all drawings and documents, as well as mechanisms to index and access them.

Digital Mock Up (DMU) or Virtual Product Mock Up (VMU). These systems provide a system to visualise an assembly of parts from various sources and check for fitness for purpose, interference etc. They also offer cross variant configurations of a single product line (sometimes referred to as Configuration Management).

Release Authorisation and Engineering Change Control Systems. These systems maintain information about the design status of various parts, who has approved their fitness for purpose, and what other parts are affected by changes in design. They also track the status of changes requested and those parts impacted.

Mechanical Computer Aided Engineering. These systems offer a range of disciplines that allow the digital modelling of a part or assembly, often in approximate terms, then the simulation of its behaviour in operation. This can include stress analysis, kinematics, vibration and failure analysis, fluid dynamics etc.

Maintenance, Repair and Operations (MRO). This software tracks the status of finished products, records maintenance carried out, as-built and as-maintained configurations, repair processes and alternatives, including product upgrades.

Project and Program Management Systems. These systems monitor the resources used to perform the development tasks, their relationships and progress against deadlines. In addition, Programme Management tends to consider risks and contingency plans, and the case where a fixed resource has to be shared over several projects.

Computer Aided Production Engineering (CAPE). This software models the factory, production line or work cell layout to simulate production processes and generate efficient operations plans and train operators.

As PLM deployment matures, integration of common elements (e.g. bill of materials) of these, often disparate, modules will occur.