Let's break down the key components of a Manufacturing Operations Management (MOM) system.

What is a MOM System?

A Manufacturing Operations Management (MOM) system is a suite of software applications that manage and synchronize production operations within a manufacturing facility.[1] It sits between Enterprise Resource Planning (ERP) systems (which handle business planning) and control systems (like SCADA and PLC's on the shop floor).[2] MOM systems aim to optimize manufacturing execution, improve efficiency, and ensure quality.[3]

Core Components of a MOM System

While specific MOM solutions can vary, they generally include these core components:

1. **Production Management**
    - **Detailed Scheduling:**
        - Creating and managing production schedules based on orders, material availability, and resource capacity.[4]
        - Optimizing schedules to minimize changeovers, maximize throughput, and meet delivery deadlines.[5]
    - **Dispatching:**
        - Releasing production orders to the shop floor.[6]
        - Providing instructions and information to operators.
    - **Execution Management:**
        - Tracking the progress of production in real-time.[7]
        - Managing work-in-process (WIP).[8]
        - Capturing production data (e.g., cycle times, quantities, resource usage).[9]
    - **Campaign Management:**
        - Managing the execution of production campaigns, especially in process industries.[10]
        - Coordinating the steps and resources involved in a campaign.
2. **Quality Management**
    - **Quality Planning:**
        - Defining quality control procedures and specifications.[11]
        - Creating inspection plans.
    - **Quality Control:**
        - Capturing quality data from inspections and tests.[12]
        - Analyzing quality data to identify trends and issues.[13]
    - **Quality Assurance:**
        - Managing non-conformances and corrective actions.[14]
        - Ensuring compliance with quality standards.[15]
3. **Maintenance Operations Management**

- **Preventive Maintenance:**
  - Scheduling and managing routine maintenance tasks.[16]
- **Corrective Maintenance:**
  - Tracking and managing unscheduled repairs.[17]
- **Asset Management:**
  - Maintaining information about equipment and assets.
  - Tracking maintenance history.
- **Predictive Maintenance:**
  - Analyzing data to predict equipment failures and optimize maintenance schedules (increasingly important).[18]

4. **Materials Management**
   - **Inventory Tracking:**
     - Managing and tracking raw materials, WIP, and finished goods.[19]
   - **Material Flow Management:**
     - Controlling the movement of materials within the factory.
   - **Warehouse Management:**
     - Integrating with warehouse management systems to optimize storage and retrieval.[20]
5. **Performance Management**
   - **Key Performance Indicator (KPI) Monitoring:**
     - Tracking and visualizing key metrics related to production, quality, and efficiency.[21]
   - **Overall Equipment Effectiveness (OEE) Calculation:**
     - Analyzing OEE to identify areas for improvement.[22]
   - **Reporting and Analysis:**
     - Generating reports on production performance.
     - Providing data for analysis and decision-making.[23]

Integration is Key

It's crucial to understand that a MOM system's power comes from the *integration* of these components. When they work together seamlessly, manufacturers gain a holistic view of their operations and can optimize them effectively.

How the Database Schema Relates

The database schema you provided supports many of these MOM functions:

- **Production Management:** The FACT_TABLE records production data, linked to products (PRODUCT_DIM), time (TIME_DIM), and potentially promotions that influence production.
- **Quality Management:** While not explicitly detailed, quality data could be incorporated into

the FACT_TABLE or related tables, using product IDs to track quality metrics.
- **Materials Management:** The schema indirectly supports this by tracking product sales and time, which can be used to infer demand and material needs.

To be a full MOM, the database would likely need to be expanded to include more tables and data fields related to:

- Work orders[24]
- Equipment/assets
- Maintenance schedules[25]
- Detailed inventory tracking[26]
- Quality inspection results[27]

Let me know if you'd like to explore any of these MOM components in more detail!

MOM functionality can be categorized in four primary domains, plus a fifth domain that is applicable to process industries. Each of these domains represents a pillar of MOM software in a digital MOM solution:

• The MES is used to manage actual production activities, equipment and processes in a proactive and systematic way, making sure quality and efficiency are built in and enforced in the manufacturing process

• A quality management system (QMS) enables manufacturers to monitor, manage and document their quality processes to help make sure products are manufactured in tolerance, they comply with all applicable standards and do not contain defects. Quality planning supports processes such as failure mode and effects analysis (FMEA), advanced product quality planning (APQP) together with a product part approval process (PPAP). For example, quality execution supports statistical process control (SPC) and continuous improvement supports 8D and the five whys

• Advanced planning and scheduling (APS) is used to develop and optimize a long-term production plan and short-term production schedule that account for demand (forecasts and orders), availability of supplies (raw materials and supplied components) and production capacity (machines and labor). Additionally, APS automatically recalculates the optimal schedule when changes occur

• Analytics and business intelligence (EMI) enables manufacturers to integrate, connect and unify information from MOM and other systems in one accessible analytical data model, which can be used for shop floor reporting and analytics including closed-loop, continuous improvements. EMI also contextualizes data from IIoT and other digital sources and relates them to manufacturing operations.

• Research, development and laboratory (RD&L) helps streamline, optimize and align all formulated product data management. It is used to manage specifications, formulations and laboratory operations

• Logistics increases supply chain reliability by decreasing supply chain volatility, uncertainty, complexity and ambiguity. Factors such as shortened product lifecycles and scarce resources make planning supply processes difficult. Business operations become uncertain due to sudden and unforeseen macroeconomic developments such as rising energy prices, labor actions and higher labor costs. Increasing product variability and product data volumes cause complexity. Situation and information can often be interpreted in different ways leading to ambiguity