

IIoT Enabled **PLANNING** and **SCHEDULING**



Content

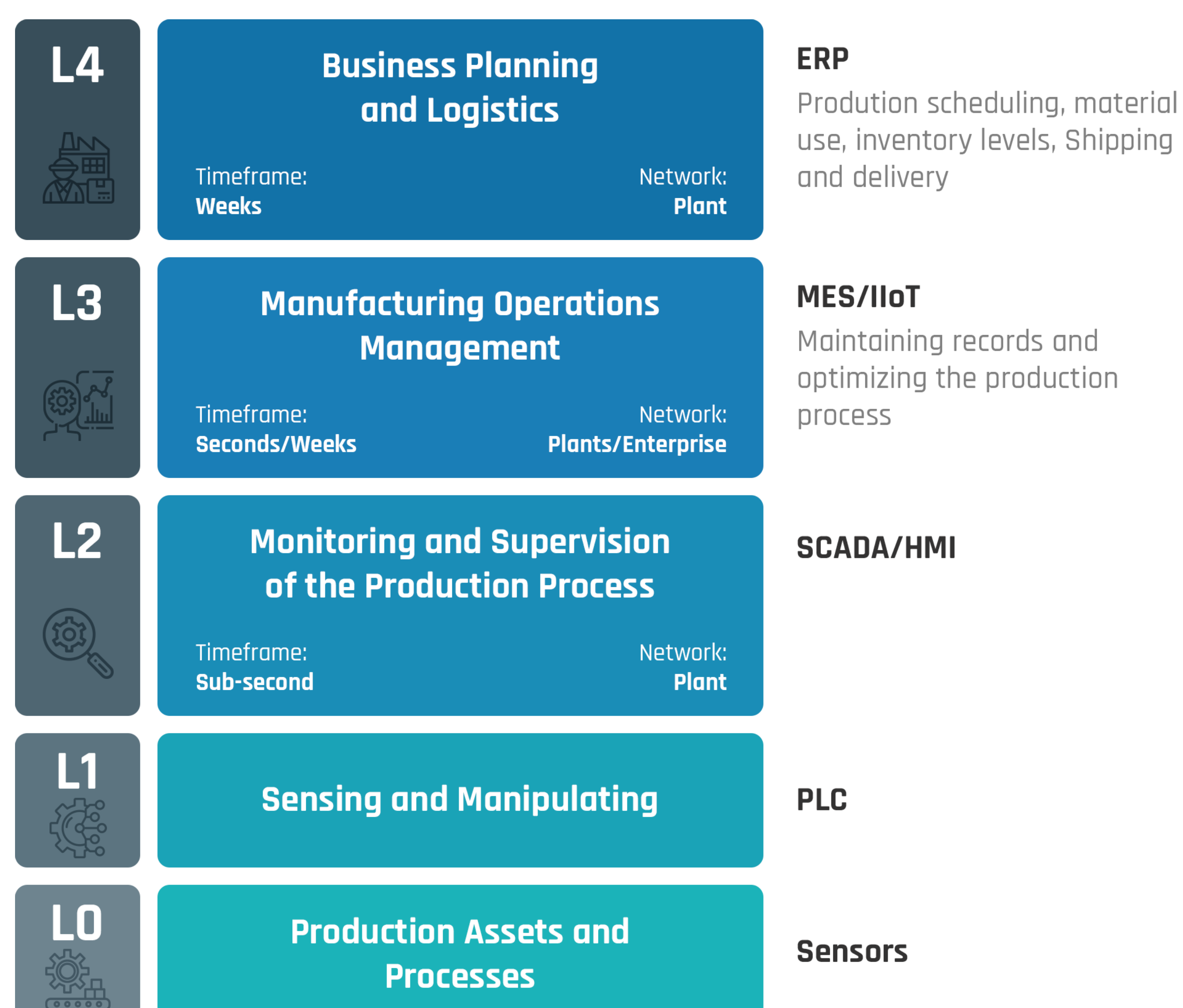
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INTRODUCTION TO MANUFACTURING TECHNOLOGY

Manufacturing technology can broadly be divided into enterprise systems and control systems. In 2001, the International Society of Automation (ISA) published a standard called ISA-95 that formally defined the interface between automation systems and control systems. This standard provided formal definitions and well supported integration points between business level systems and shop floor systems. The standard also paved the way for interoperability between systems.

The standard is applicable for all industries and all kinds of processes, including batch and continuous processes. Here is how the ISA-95 standard views the manufacturing technology stack.

FIGURE 1. MANUFACTURING TECHNOLOGY STACK AS PER ISA-95 STANDARD



The levels that impact planning and scheduling are Level 3 (MOM) and Level 4 (ERP). The standard defines the responsibilities of these levels as:

RESPONSIBILITIES OF LEVEL 3 SOFTWARE: MANUFACTURING OPERATIONS MANAGEMENT

- Management of data related to production, inventory, personnel, raw materials, replacement parts and energy
- Management of data related to personnel, which includes training, schedule, resource allocation and related information
- Detailed planning for production and maintenance
 - Ensuring that plans take machine loading, breakdown and other shop-floor conditions into account
- Process monitoring
- Management of quality and maintenance

RESPONSIBILITIES OF LEVEL 4 SOFTWARE: ERP

- Management of raw materials and parts
- Definition of the master data for the purchase of raw materials and replacement parts
 - Master data for maintenance, specifically in the area of preventive maintenance
 - Master data for personnel participating in manufacturing operations
- Maintenance of energy resources
- Production planning and scheduled maintenance
- Maintenance of warehouse master data
- Assessment of optimal stock

Manufacturing Operations (Level 3) and Planning Software (Level 4) should share a symbiotic relationship. The operations software provides real-time feedback about the operating conditions of the manufacturing process. This influences the planning process. This has rarely worked in practice though with the two systems largely operating in isolation in most manufacturing facilities, across industry verticals.

LACK OF EFFECTIVENESS OF PLANNING SYSTEMS

In the earlier days, the manufacturers were mainly concerned with the two parameters 'Time' and 'Quantity'. The required amount of material had to be stocked on time. ERP brought in a better sense of constraints and bottlenecks that were standing in the way of achieving a goal.

Advanced Planning and Scheduling (APS) software run sophisticated algorithms to generate constraint-based plans, along with

scenario planning and simulation capabilities. These systems are often integrated with Enterprise Resource Planning (ERP) systems for transactional and master data exchange. It is often observed that the adherence to plans is not more than 50% due to several execution related challenges, which include:

- Out-of-sync input master data such as cycle times, lead times and resource availability
- Lack of real-time visibility into shop floor and supply chain performance
- High dependency on the planner's capability to understand the system-level view and re-plan in case of exigencies
- Limited analytics on the supply chain data to enable prudent planning and optimization decisions

In the absence of operational insights, planners tend to rely on their instinct and on static best practices. The results, naturally, have a high degree of variance. Critical resources such as skilled manpower, energy and utilities are assumed to be in abundant supply and are overlooked in the planning process. Concepts such as sustainability are often not considered.

THE IMPACT OF IIOT PLATFORMS ON MANUFACTURING OPERATIONS

It is estimated that 80% of factories do not have MOM software. Even in places where it exists, it has not scaled across plants. Plant operations are managed using a combination of homegrown software, specialized vertical tools, MS Excel and documents. There are several key reasons for the lack of adoption.

- Manufacturing operations vary across discrete and process manufacturing and across industry sub-verticals.
- MOM software has been rooted in traditional architecture. It is monolithic, complex and inflexible. Upgrades and customizations are expensive and time consuming.
- Operations data – especially asset-related data – is massive. There are limitations on the amount of information that such systems can process. These systems cannot seamlessly scale across an enterprise.

Industrial IoT platforms, with their focus on asset and operations data could be the springboard for the next generation of MOM software.

- IIoT platforms are modern, cloud-based platforms that are highly scalable. These platforms can store and analyze vast amounts of asset and operations data.
- IIoT platforms are Application Enablement Platforms (AEPs), accelerating the build out of apps that can digitize all aspects of the manufacturing process.
- The process is flexible, agile and non monolithic. Applications are simple & lightweight and can be rapidly customized.
- Applications are mobile-first, allowing operations personnel to easily interface with them on the plant floor.
- The platforms are Open and API driven, simplifying integrations with third-party systems including ERP.

FIGURE 2. MANUFACTURING APPLICATIONS THAT ACCELERATE DIGITAL TRANSFORMATION



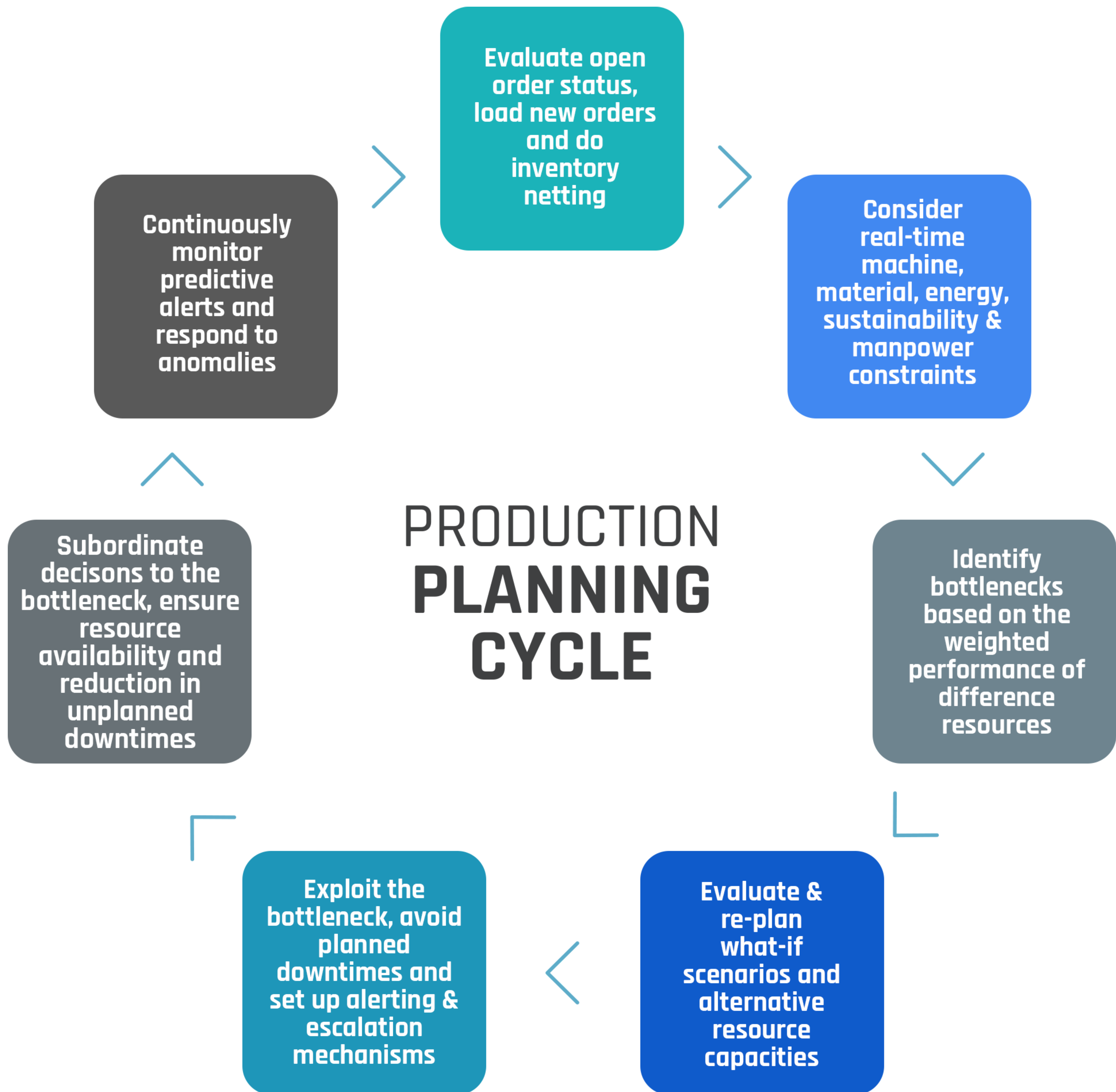
By accelerating digitization, IIoT platforms can act as a decision support tool for the planner and the planning system. Here's how combining IIoT data with APS and ERP can drive the next level of supply chain optimization:

- Availability of accurate and updated master data on actual cycle times, lead times, bill of materials consumption, asset availability and specific energy consumption sets the ground for planning optimization.
- Real-time visibility of actual operational performance and identification of bottlenecks in the value chain is critical for making informed planning decisions.
- Early warning and predictive alerting mechanisms present an opportunity to the planners to respond rapidly to unforeseen issues and re-plan.
- IoT breaks down data silos between different functions, enabling collaboration among key stakeholders.

PRODUCTION PLANNING WITH OPERATIONS INSIGHT

Here is how a day in the life of a production planner in a digitized shop floor will look like.

FIGURE 3. PRODUCTION PLANNING WITH FEEDBACK FROM OPERATIONS DATA



EXAMPLES Altizon has worked with manufacturers across verticals to integrate operations insight into planning. Here are two examples:

Chemical Manufacturer Reduces Energy Cost and Improves Turnaround

Chemical manufacturing is an energy-heavy process. The primary utilities consumed are electricity, steam and compressed air. The cost of energy and utilities in this process is approximately 40% of total conversion cost.

Traditionally, the manufacturer used to run order-based production planning based on capacity and material constraints that were manually entered. Altizon introduced the Datonis IIoT platform to analyze and integrate process & energy data with the planning system. This data enables the manufacturer to establish critical KPIs such as energy consumed per unit of production. The planners also receive key updates on cycle times and resource availability. Using this information, the manufacturer can move to energy and utilities-based production planning. The system provides decision support to the planner to load energy-efficient equipment first.

As a consequence of this integration, the manufacturer has realized 8% reduction in direct energy cost to date along with significant improvement in due date adherence and customer service levels.

In an ideal manufacturing world, Manufacturing Operations and Planning Software should be able to work together and offer real value. However, most factories do not have Level 3 software and even if they do, it operates in isolation. Siloed data, limited insight and lack of a single source of truth have created visibility gaps on the floors for the longest time.

As a manufacturer, you can now address these gaps by building operations applications on IIoT platforms. The modern software architecture of these platforms allows for new, scalable modules to be rapidly rolled out. IIoT platforms are finding their place in plants as part of their core operations software. This enables APS and ERP are to transition from systems of planning to systems of intelligence.

Tire Manufacturer Improves Planning Effectiveness With IIoT

Production planning at this leading Tire manufacturer was fairly traditional. The shift personnel used to log production updates manually in the ERP system at the end of each shift. The planners would then make a weekly plan based on this data. The inventory updates after material movement from the production floor to the warehouse were manual and lagged by one day.

Altizon introduced the Datonis IIoT platform to connect the entire production process from mixing to testing. The production data of each machine is now automatically integrated with the ERP system. The planning system sends each order's details and the IIoT platform logs the actual booking. This in turn updates the inventory status and warehouse stock. Real-time feedback on cycle times also has a significant impact on production planning.

The customer's planning effectiveness increased dramatically, with 80% reduction in the number of redundant batches being planned due to lack of visibility.



ABOUT ALTIZON

Altizon, a global industrial IoT company, powers digital revolutions by helping enterprises leverage machine data to drive business decisions. Altizon's Datonis Manufacturing Suite applies advanced analytics and machine learning algorithms to accelerate smart manufacturing initiatives, modernize asset performance management and pioneer new business models for service delivery.

Altizon has been spearheading digital transformation initiatives in Industry 4.0 across a range of industry verticals, including Automotive, Tire, CPG, Chemicals and Remote Industrial Assets.

Altizon is headquartered in Palo Alto (USA) with offices in Boston (USA) and Pune (India).

For more information, visit: www.altizon.com