Key Corporate IT Capabilities for Manufacturing Operations

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Introduction

How **Manufacturing IT** is viewed and managed in an organization plays an important role in how IT is leveraged for strategic value. High Performance Organizations (**or HPOs**) recognize that with technology, it is not so much an issue of what technology an organization is using, rather, it is the way the organization is deploying and using its technology that influences its ability to create superior competitive advantage and performance.

Because the management of **Manufacturing IT** can be enormously complex and becoming more intricate on a daily basis, organizations need to constantly seek to optimize its use. **Line-of-business managers should expect to achieve larger economies of scale and economies of scope** when their technology helps them to achieve the following goals;

i. Facilitating integration
ii. Managing IT as an enterprise resource
iii. Managing physical resources as well as optimizing human resources for application deployment
iv. Business Process and Technology Harmonization

Wonderware technology is designed to help HPOs in standard infrastructure, manufacturing and industrial operations address the strategic goal of leveraging their Corporate and Manufacturing IT capability, and use it as a competitive advantage. Wonderware technology is ideally positioned to help HPOs establish a manufacturing collaborative platform amongst their respective value chain and increase the effectiveness of their operational processes.

By using Wonderware System Platform, HPOs establish the foundation for which to achieve extraordinary leverage of their unique human resource knowledge, innovative processes, and agility required to deliver superior results.

By using Wonderware System Platform, HPOs steer away from the traditional IT pitfalls like investing in redundant, duplicative technologies. Wonderware technology delivers one operational framework that helps improve processes across the organization. This means that valuable IT resources do not need to constantly re-design, develop, commission and maintain a collaborative platform set of software services required for optimal use of technology (security, templates, diagnostics, definition and deployment of applications, high availability, etc.).

The net result is your organization's talent is used where it most counts; in adding value. By using Wonderware System Platform, not only do HPOs now have the opportunity to scale, deploy and manage applications at an unprecedented pace, but they also contribute to building the manufacturing collaborative platform that enable business, manufacturing or daily processes to achieve extraordinary integration between processes and yield superior results.

HPOs leverage their IT capabilities to address the following requirements;

1. Selectively **integrate** important operational aspects of their organizations
    a. In most organizations, core processes include three (3) main activities; generating Demand, Supplying Demand and Planning, Managing the Enterprise (see figure 1 below).
    b. In the last decade the consumer products industry experienced a shift of power from manufacturers over to retailers. The net effect to manufacturers has been to protect margins through the acceleration of the Supply Chain. Shorter replenishment time calls for a price premium and compliance is now mandated around the globe. This has cascaded towards increasing importance given to **Manufacturing Operations Management** – the successful use of physical resources to meet demand with supply.
    c. Independent of their industry, Wonderware System Platform and modules allow HPOs to address their particular business drivers, whether it be making better products and/or services, or delivering faster or cheaper (at the right quality), while still providing with the same manufacturing collaborative platform set of services.

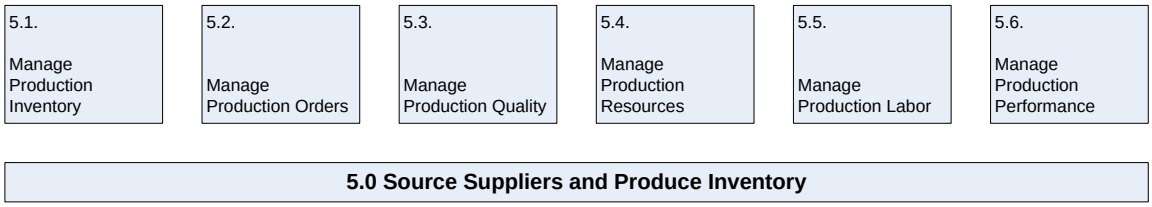

Figure 1, General Business and Manufacturing Processes

2. **Extend** their enterprise to suppliers, vendors and customers
    a. Wonderware System Platform enables the creation of a world-wide ecosystem where value can be harnessed, encapsulated, and managed as standards supporting best practices.
    b. Wonderware System Platform can develop specific applications that meet your unique requirement set, yet leverage the collaborative platform used throughout the organization (Equipment, OEMs, technology partners, etc.).
    c. Wonderware also develops industry-specific applications that support a myriad of processes. These applications are called Industry Packs. They help a given stakeholder visualize how Wonderware technology supports his or her requirement set.

3. **Create** Execution speed, agility, maintain quality and measure Actual Performance

a. Wonderware System Platform and modules takes this requirement and delivers;

i. **Execution** of activities and processes

Inter-related and cross-departmental processes are part of HPOs daily activities. Often these processes are distributed, require regulatory compliance and are carried in different parts of the world. Process workflow, contextualization, and recording are necessary in delivering products or services.

The figure below is an example of how processes are sequenced, and how they cross boundaries between Inventory, Production Orders, Quality, Resources and People.

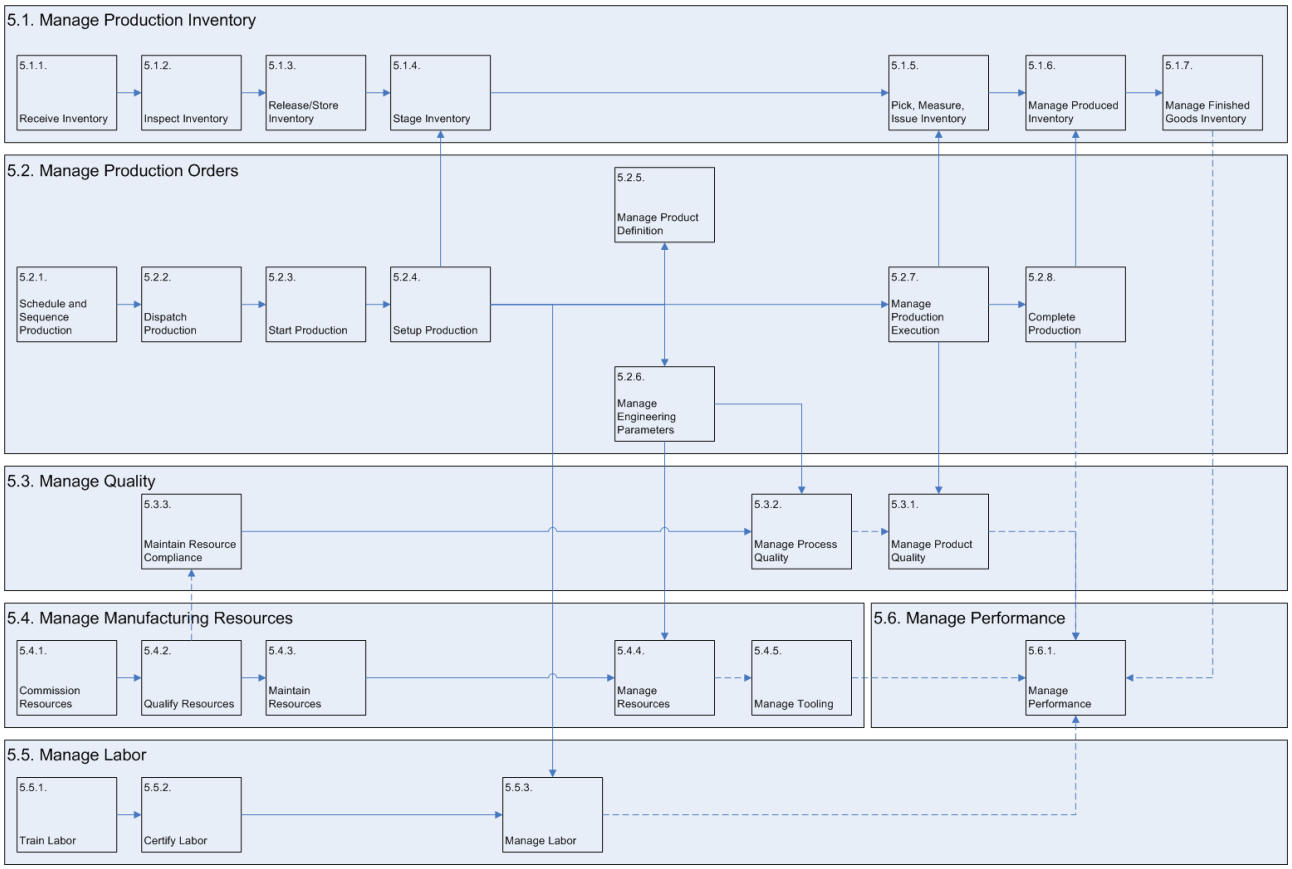

Figure 2, Equipment Performance Analysis

ii. **Performance** or measuring actual critical processes

All processes typically have a 'transformation' function. They have one or many inputs and produce one or many outputs. Some processes are critical and need to be monitored closely. Actual measure should be compared to standards to determine levels of performance.

Wonderware System Platform and Modules have the ability to measure the performance of different process elements, whether it be input, outputs or 'transformation variables' (like Performance Rate when measure Equipment Overall Effectiveness).

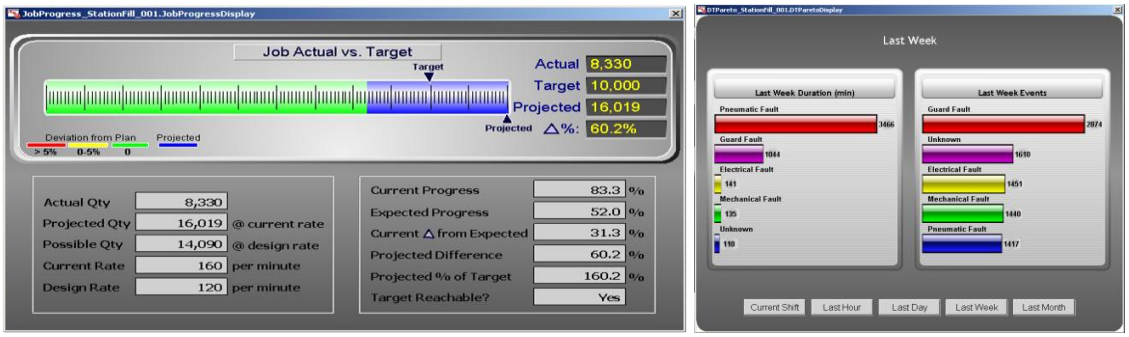

Figure 3, Equipment Performance Analysis

iii. **Quality** or complying to stakeholders' product or service specifications

In fulfilling activities that are part of a process, the process output typically comes with quality specifications. Measuring specifications against actual process output ensures the product or service meets all specifications. The following figure shows how Statistical Process Control is used to prevent defects by spotting process problems before defective units are produced by the process.

Figure 4, X-Chart Example

Manufacturing Operations Can Leverage your Corporate DATA MODEL

Wonderware System Platform and Modules approach to solving this opportunity is to enable the Manufacturing IT & Control System technology to **deliver both economies of scope and economies of scale**. **Binding your Corporate Data Model with Manufacturing Operations** delivers one common operational context that abstracts and normalizes manufacturing both legacy and new systems. The plant model serves as the logical representation of the physical equipment and processes being controlled and supervised with the Wonderware software application. The technology delivers;

1. **<u>Economies of Scope through;</u>**
   1.1. Common Services
   1.2. Communication, Security, Diagnostics and Highly Granular Data Storage
   1.3. Leveraging the Corporate IT Data Model with Manufacturing Operations Name Space, Event Handling, Alarming and History
   1.4. Process, Production and Performance
   1.5. Common Plant and Production Object Model
   1.6. Common Visualization, Reporting and Analysis
   1.7. Common Integration Name Space with Corporate IT Master Data Model

Wonderware System Platform provides shop floor visibility and real-time information for;

i. **Physical Process** (~Supervisory)
   a. Visualization, Alarming, Command, Event Handling
ii. **Production** (~MES)
   a. Execute Production Orders
   b. Manage Operational Master Data
   c. Visualize Production Status and History
   d. Integration with ERP, IT and Plant Resources
iii. **Performance** (~Mfg. Int.)
   a. Record actual/deviations from targets.
   b. Manufacturing Key Performance Indicators.
   c. Notification, Visualization and Analysis.
   d. Performance Data in Production Context

2. **<u>Economies of Scale through;</u>**
   2.1. Standard Object Library
   2.2. Encapsulate knowledge and best practices
   2.3. Distributed, yet centralized knowledge management
   2.4. Incremental Implementation
   2.5. Function points added based on tactical or strategic need
      i. Connectivity to 1000's systems.
      ii. Library of Standard Objects
         a. Logical view of asset/ resources

b. Common services for Communication and Diagnostics
c. Alarming and Historization
d. Data storage

Looking at a CASE Example

In dealing with many complex processes, numerous Actors need to collaborate together. There are a number of potential communication channels or paths which grow in complexity depending on the number of Actors. With the myriad of custom Manufacturing Execution and Control Systems already in use, managers and users are now faced with the need to reduce maintenance costs and maximize contextualized content. The number of **Integration Points typically/IP** are a function of the number of **actors (A)** and vary according to the following formula;

$$IP = (A\ (A-1))/2$$

The following figure shows the **complexity arising from networks five (5) data sources together**. Under **Scenario A**, or Wonderware System Platform provides with contextualized information whereas under Scenario B, different systems are connected together through ad-hoc point-to-point solutions.

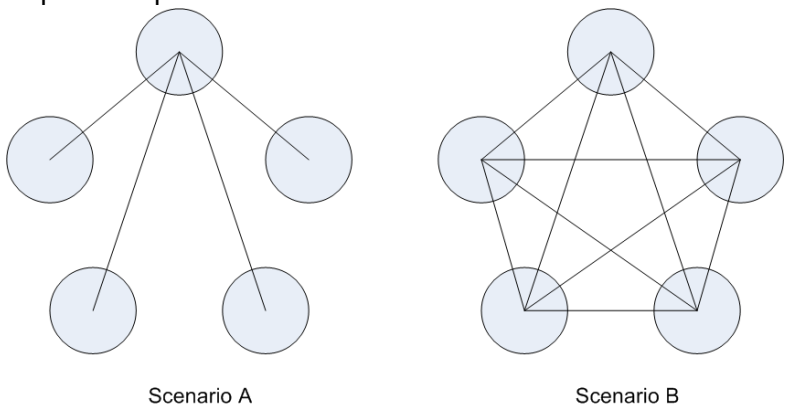

Figure 5, Wonderware System Platform Scenario A vs. Point-to-Point Integration Scenario B

The following table lists an example (under Scenario B, Figure 5.) where multiple Systems (either MES or Control Systems) need to be integrated to deliver the required base functionality.

		Manufacturing Execution Function Point / Full Data Contextualization Analysis									
Manufacturing Execution	1.1	1	2	3	4	5	6	7	8	9	10
System #	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
System #	2	1.08	1.16	1.24	1.32	1.40	1.48	1.56	1.64	1.72	1.80
System #	3	1.24	1.48	1.72	1.96	2.20	2.44	2.68	2.92	3.16	3.40
System #	4	1.48	1.96	2.44	2.92	3.40	3.88	4.36	4.84	5.32	5.80
System #	5	1.80	2.60	3.40	4.20	5.00	5.80	6.60	7.40	8.20	9.00

Manufacturing Execution IT System Standardization Analysis

Table 1, Complexity Factor Analysis

In table 1 above, the **Green (or System #1) row** is considered the "**Baseline**" if all Production information (Production and Performance) is managed in one Unique Common Manufacturing Namespace using Wonderware System Platform.

From Table 1 above, the Manufacturing Function Points are listed in Figure 2 below. Function points (**horizontally in Table 1 and 2**) can be a complete or a subset list of the functions required for complex processes.

MES Function Point
Production Scheduling
Production Update
Asset Utilization
Quality SPC
Quality Sampling
Maintenance
Equipment Operation
Reporting/Analysis
Resource Status
Control System
Interface

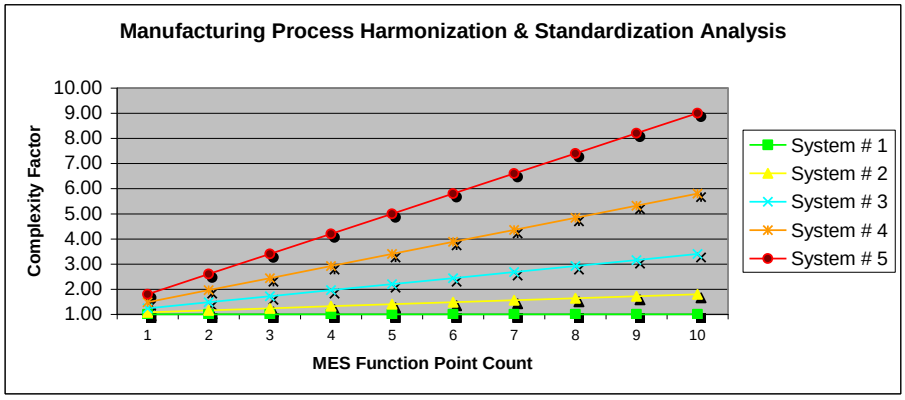

Table 2, Standardization Analysis

The **Complexity Factor** (vertical axis on Table 2) illustrates the how an increase in the number of Function Point grows the integration complexity.

This integration complexity is counter-productive to providing Stakeholders, Agents, Supervisors, Managers, Operators and End Users with Full Contextualization and Visibility in complex processes.

Wonderware technology is a key enabler in reducing the Manufacturing Operations (or MES) COMPLEXITY FACTOR for shop floor Integration/Information and provides the basis for sustainable operations and continuous improvements in performance.

Contact Wonderware or your local Wonderware Distributor for more information on industrial automation and information solutions.

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