

LAYERLESS MANUFACTURING & SAP - CREATING RESPONSIVE SHOP FLOOR IN THE SUPPLY CHAIN

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Abstract:

This paper shall explore the fundamental science behind the ever changing global supply chain. An analogous view of supply chain evolution to that of organic survival theory yields philosophies and methods for achieving strategic advantage and tactical superiority. Manufacturing execution systems (MES) are helping manufacturers bridge the gaps between the shop floor, the supply chain and the ERP system. By doing this, these systems are giving manufacturers more visibility and the control they need to make their production processes more efficient. Many businesses find it difficult to truly maximize Supply Chain or Manufacturing efficiency from back office to mobile worker and maintain real time visibility of what happens on the shop floor. We have successfully implemented true real-time mobile integration for major production sites across globe. SAP investment by reducing critical errors and enhancing customer service. We utilize standard Windows interfaces and WLAN technology to make it easy for shop floor personnel to interact with SAP in real time, using standard automation system. Nothing is installed in our systems that changes SAP in any way, but we can dramatically reduce errors, speed transactions, and give true visibility of day-to-day activities using standard BI tools provided by SAP. Provide Technology and Services for Manufacturing and Process Industry Plant Floor to SAP Integration using mobile technologies.

Keywords: SAP, Automation system, MES

1. Introduction:

The gap between current supply chain performance and that which is possible is the weapon that a savvy competitor will turn against corporate. The relative magnitude of Operations Performance Gap (OPG) in comparison to that of our competition is, therefore, a

concise indicator of our vulnerability. A relatively small OPG may not be much of a threat since strong branding, sales, and marketing will often carry a somewhat weakened operations presence. However, tip the scales a bit too much and may find that larger OPG indices provide sufficient leverage for a competitor to corporate. Maintaining evolutionary supremacy in business demands a commitment to continuous improvement and periodic evaluation of the supply chain efficacy is certainly one of the fundamental requirements. As part of this ongoing effort, perhaps the most important element is sensitivity testing of the key variables in the model. Supply chain survival is predicated upon being prepared for what may happen and adapting our organization to change. Only by answering the “what if” questions before a crisis occurs can operations professionals be prepared to outlast the competition. Most manufacturers implement manufacturing execution system (MES) software within their own plants to cut production costs and cope with regulatory requirements for traceability. But MES technology holds even greater potential when it's used to connect the extended supply chain. By integrating their MES with the systems of their largest customers and suppliers, a manufacturer will achieve greater supply chain agility.

2. Improve Production Process Visibility:-

To enable a more adaptive enterprise, organizations need transparency in all aspects of manufacturing operations. They need improved execution efficiency through real-time process monitoring and control; enhanced communications between management and production personnel; and fast access to accurate, relevant, and timely data. SAP Manufacturing Execution joins the shop floor with the rest of the enterprise, providing managers with rapid access to critical data, enhanced intrabusiness communication,

and real-time process monitoring. Managers and executives can tap the pulse of the organization without slowing down the production process or adding to lead time. Shop-floor workers can perform more efficiently and effectively. And we can make engineering changes to products currently in production for greater speed and flexibility. (Figure 1)

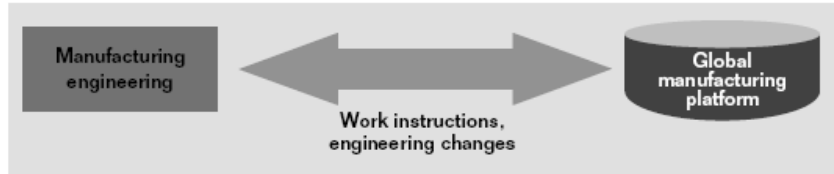


Figure 1: On-the-Fly Engineering Changes

3. Integrating MES with the supply chain:

However, integrating a manufacturing execution system with the MES of a partner, supplier or customer is not simple task. Because of the complexity of real-time shop floor systems, this type of development is strictly for companies that have significant integration experience. They were feeding that information right into the OEM's shop automation system on the factory floor,"

3.1 Open standards makes MES integration

The task is considerably easier if our MES is open and connectable based on a standard such as .NET, Microsoft BizTalk or an XML variant. Newer tools based on a service-oriented architecture (SOA) are expected to facilitate broader MES integration within the supply chain "If have an open and secure MES system, can give r customer visibility and access," said Miklovic. "If they have production schedule changes, they can automatically send those to r MES rather than going through r ERP [system]."

3.2 Security still critical issue

Security is paramount when sharing production data outside the enterprise. "We don't want r customer to see what are producing in r factory for their competitor," Miklovic said. "They should only be able to access information related to their specific order." Smaller manufacturers should proceed with

caution when selecting an MES if they intend to integrate with their supply chain. Vendors that cater to smaller companies may not offer the robustness of communication or security afforded by market leaders such as Siemens or GE Fanuc or able to control through migration system workbench.

3.3 Optimize Shop-Floor Execution

SAP Manufacturing Execution is an enterprise-level, scalable, J2EE manufacturing application that enables global manufacturers to manage and control manufacturing and shop-floor operations. This powerful application provides a multifaceted set of features that integrates business systems with the shop floor, allowing complete component and item-level visibility for single and global installations. SAP Manufacturing Execution helps ensure that products are designed and built right the first time. It collects data from multiple sources, integrating data systems with shop-floor activities to create one comprehensive production record. The result is an aggregate record of the entire product history, stored and available to drive effective decision making and regulatory compliance. SAP Manufacturing Execution includes specific functionality that supports the following manufacturing requirements.

3.4 Coordinated Manufacturing Operations

The ability to collect information from multiple sources enables the coordination of manufacturing functions with data systems to create a single comprehensive production record. With role-based interfaces, users from the shop floor to the boardroom can access real-time information to perform more efficiently. Taking advantage of up-to-the-minute data on all operations, can greatly streamline and empower decision-making processes and even eliminate time-consuming production meetings that often work off outdated information and assumptions. can manage plant activities with the executive dashboard viewer (see Figure 2) and get an up-close view of manufacturing activities with the production operator dashboard (see Figure 3).

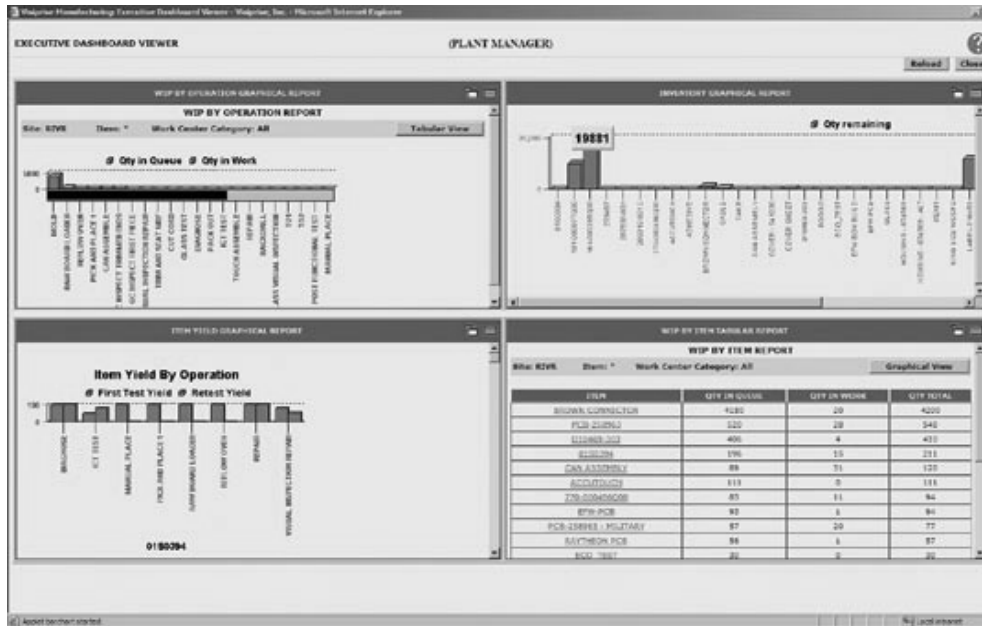


Figure 2: Executive Dashboard

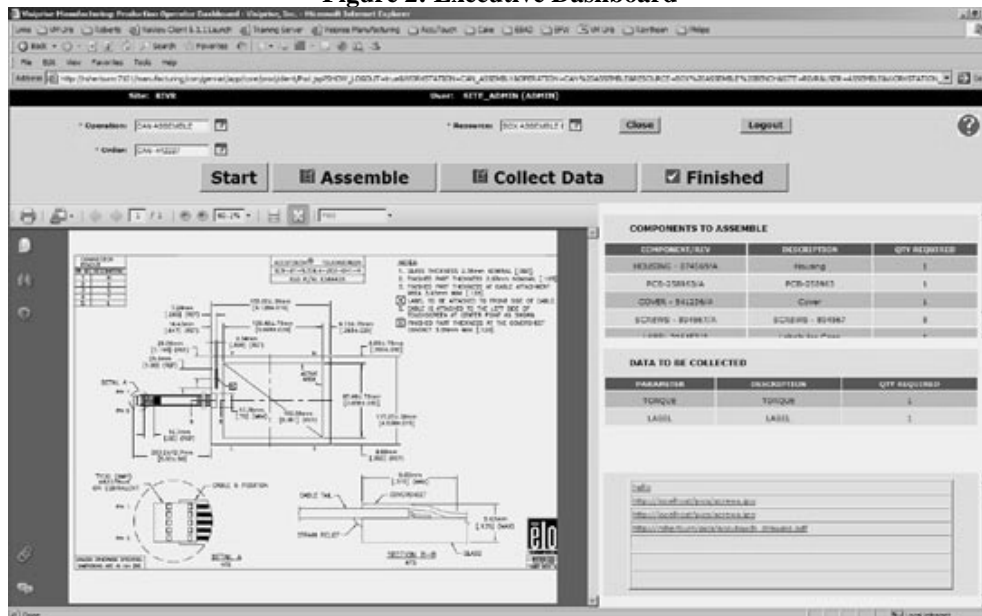


Figure 3: Production Operator Dashboard.

3.5 Production Transfer:

Beyond connecting the wider enterprise to the production organization, SAP Manufacturing Execution helps integrate r enterprise with numerous production facilities, greatly enhancing visibility and flexibility across multiple locations. The application enables to configure and automatically transfer product configuration and production information – including related activity records, component traceability records, and nonconformance data – to single or multiple sites (see Figure 6). This lets preserve a complete, as-built history of the product for future reference. By electronically

sending the complete product history from the NPI site to the recipient production site(s), the application helps eliminate delays associated with the manual transfer of records and setup of a production line. This information can be received automatically or, at r shop-floor manager’s discretion, manually and then inserted into the production line. Match Production to Available Resources SAP Manufacturing Execution enables to transfer current WIP to other sites, including all the traceability information, activity logs, and nonconformance data associated with the product configuration. This allows r planners to distribute production properly across available sites

and labor resources. It also enables shop-floor managers to see all the information associated with the product. The application preserves a complete manufacturing history of the product at one site even if the product is produced at different sites, letting work more efficiently, reduce product cycle times, and increase customer satisfaction.

3.6 Engineering Change Management:-

Traditionally, manufacturers have reacted to a change request by making the necessary adjustments to an order released into production. However, the change



details often never make it back to engineering, leading to confusion when the job returns to the shop floor. To avoid confusion and keep production plans on schedule, need to manage feedback from numerous parties. The SAP Manufacturing Execution application helps ensure an effective, closed loop feedback process for changes driven by design integrity, cost control, inventory, and other issues – for example, a part requirement change in the bill of materials. Product and process engineering changes can be readily communicated to the shop floor. can initiate change requests in real time, not after the fact, maintaining order integrity while controlling costs and keeping a complete historical reference. Further, it can process engineering change orders for products currently in production for great flexibility and speed.

3.7 Strive for the Perfect Plant

Improve Performance with Enhanced Visibility To achieve the ultimate goal of running the “perfect plant,” need 360-degree visibility into all aspects of r manufacturing operations. With SAP software, gain the visibility to optimize manufacturing asset utilization and increase production performance.

4. SAP xMII

The SAP xMII leverages advanced Web server technology to extract data from multiple data sources; aggregate the data at the server, transform it into a business context, and personalize and deliver results to users. The user community can include existing personal computers running Internet browsers, wireless PDAs, or other business applications. The SAP xMII is logically constructed as shown below.

Ref: SAP x MII

The SAP xMII leverages existing legacy systems and unlocks data for casual users throughout the enterprise. By exposing data from existing databases, the SAP xMII provides an environment to allow users to correlate data from multiple systems via a simple browser interface. The software does not need to be managed at the client site and no requirement for complex data warehouses or data models exist with an SAP xMII implementation.

4.1 Product Architecture

The SAP xMII was designed as an N-tier application that is platform and browser neutral, scalable, and extensible. Its basic architecture can be divided into three sections: the data source layer; the application layer consisting of connectors, transformation objects, and agents; and the user layer consisting of

display components such as applets and reports or dynamically-generated XML content.

All of the SAP xMII functionality is exposed using a standard Web services-based architecture via uniform resource identifier (URI) requests. Data and functionality with the SAP xMII can be accessed using standard transports such as HTTP, SMTP, FTP, and others. The SAP xMII can also function as a client to any Web service-based application via SOAP or other XML-based transactional interaction.

4.2 Application Layer

The application layer is based on a standard Web server (typically Microsoft IIS) with a servlet engine running Java servlet technology. The server side functions are designed to get data, transform it, and deliver it to any requesting client in a form that is compatible with the device. The SAP xMII core data representation is XML-based, allowing data manipulation, mapping, and transformations to/from almost any format. The SAP xMII abstracts the underlying data sources using connectors.

4.3 Connectors

Connectors integrate any plant focused data source into the SAP xMII. The connectors provide data collection, conversion, aggregation and abstraction, allowing the SAP xMII to become the universal window in to all process and production related information.

4.4 Product Operation

Connectors run on the Web server and respond to authenticated requests for information from a client. The client identifies the server alias (defines the data source, type, and location), the mode or class of data requested (historical, current, command, etc.), the specific items requested, and the data rendering choice for the returned data. The connector protocol layer manages the request and returns the appropriate data in XML format to the data rendering layer.

4.5 Protocol Layer

The protocol layer manages all of the communication to the plant data sources. Each connector contains protocol beans that convert data requests into device specific queries for the target data sources. Connectors understand the data types, structures and requests that a device supports. For user-created databases.

4.6 Data Rendering Layer

Once the connector protocol layer has retrieved the data from the plant data source, SAP xMII 'renders'

the information into the appropriate format for the client. The rendering layer abstracts the data source from the data presentation, allowing SAP xMII to support all existing (and future) communication standards. Current outputs and their typical uses include:

4.6.1 HTML (HyperText Mark-up Language)

The connector dynamically builds the Web page at the server. The connector supports 'server side includes' in SAP xMII report pages allowing complex Web pages, perhaps consisting of data from multiple sources, to be built on the fly. This output is supported by any browser and is ideal for reports, internet appliances, PDA's, and low bandwidth connections.

4.6.2 SAP xMII Applets

The connector sends a highly optimized binary data stream to any applet created by SAP xMII or by a third party using the SAP xMII Client Toolkit. This output offers the most interactive user experience and is recommended for any JAVA-enabled browser. See the SAP xMII Client JAVA Applet User's Guide for more information on the availability and use of applets.

4.6.3 Server-Side Images

This renders the equivalent of an applet's output to the client in a graphic/image format such as GIF, JPEG, PNG, BMP, or WBMP. Since the conversion is done on the Web server, it is ideal for displaying sophisticated graphical images (trends, charts, etc.) .

4.6.4 XML (eXtensible Mark-up Language)

The connector renders the data in XML, the new standard for application-to-application communications. XML allows any business application to directly access all plant data through SAP xMII. Typical applications include: ERP/MRP, Customer Relationship Management, Supply Chain applications, Available-to-Promise, and Advanced Planning.

4.7 Productivity Tools

A variety of productivity tools are available to get started immediately. The Template Editor makes constructing a query against a data source quick and easy. The Dynamic Page Generator allows any end user to create a dynamic, data connected HTML page with embedded applets with no knowledge of Web applications. An add-in for Microsoft FrontPage and Macromedia Dreamweaver provides both an easy way to construct applets and images from SAP xMII data sources.

4.8 SPC Data Analysis

One of the options available with SAP xMII Manufacturing Portal is SPC data analysis. It includes a complete SPC analysis suite and a comprehensive set of SAP xMII SPC applets, which provide visual feedback to users.

SPC data analysis takes advantage of the SAP xMII Application Layer and associated Data Connectors. Based on a user request (URL) or response to an SAP xMII Alert/Event, SAP xMII gathers data from existing data sources and streams the resulting query into an SPC calculation engine. The resulting quality calculations are abstracted into an XML layer and then delivered in a view through the SPC applet library.

Furthermore, the calculation results may be interrogated by SAP xMII Agents, allowing for alert notifications of rule violations through email and other messaging services.

Along with the calculation, SAP xMII provides a framework to store and persist calculation results, attribute data, comments, and other collaborative information useful in examining results in a continuous improvement initiative. The data queries, associated, attributes, comments and applet views may be stored and cataloged as iSPCChart objects.

5. Conclusion:

The benefits of MES-to-ERP integration go far beyond the rudimentary integration efforts. To become agile and responsive, manufacturers must gain vision into their operations to enable them to make decisions based on real-time information, understanding both the impact of those decisions and the alternatives that may be available to them. Joining manufacturing with planning systems is the first step toward that agility. Today, there really is no lack of communication mechanisms to constrain the successful integration of MES – and with standards such as ISA 95, and ANSI's version of the ISA specification, an MES that conforms to those standards can greatly ease the efforts of that development. It also assures that the terminology, functionality, and communication capabilities are consistent. Finally, an integrated system will show real returns: from the ability to monitor – in real time – key performance indicators on productivity, quality, yields, and throughput; to managing inventory locations and raw materials; through remediation processes to isolate and or rework nonconforming products. Integration, rather than merely a blending of two discrete systems, becomes

the key enabler for a more profitable, responsive business.

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