GLOBAL TRACEABILITY FOR DISCRETE MANUFACTURERS
INTEGRATED TECHNOLOGY FOR CONTINUOUS IMPROVEMENT
The SAP® Manufacturing Execution application is a powerful manufacturing business solution that enables global manufacturers to manage and control manufacturing operations while integrating these operations with the rest of the business.
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15 Summary
In today’s dynamic and competitive global economy, manufacturers face mounting pressure to continuously increase profitability, reduce cost, improve quality, and maintain compliance with customer, industry, and government mandates. Increasing competition and downward price trends require manufacturers to become more efficient and provide both downstream and upstream traceability for products.

Manufacturers are challenged to avoid product recalls, improve product safety, and increase customer satisfaction. In an era of globalization, the ability to track an item to its source is essential for quality management and for compliance with regulations. Driven by these requirements, traceability has become a hot topic. Without adequate process traceability and product genealogy, a company’s ability to deliver quality products and customer satisfaction are at risk.

Many manufacturers struggle with traceability requirements for their products, which involve maintaining the history of every process and every step that a single serialized product experiences. Manufacturers achieve this capability by capturing and maintaining a complete and permanent genealogy record of the build process and by quickly retrieving product, process, resource, and material information.

For manufacturing industries four factors drive requirements for traceability and product genealogy:

- Maintain product quality and reduce the cost of nonconformance
- Proactively manage product recalls with near-real-time corrective action
- Comply with directives from regulators and quality standards from industry and independent standards organizations
- Improve customer satisfaction and profit margin

Manufacturers use traceability and genealogy as strategic capabilities to get the upper hand on competitors by delivering high-quality products with minimum product recalls. When a recall occurs, manufacturers manage them proactively. They trace the issue in real time to a specific product batch or process and take corrective action in near-real-time with minimum negative impact.
**THE NEED FOR TRACEABILITY**

**MULTIPLE LEVELS OF CONTROL FOR MATERIAL ACCOUNTABILITY**

**What Is Traceability?**

To have a common understanding, manufacturers must recognize what is meant by traceability. This term is widely used with different meanings. Traceability often refers to work-in-process (WIP) tracking. But, in simple terms, traceability refers to the completeness of the information about every step in a process chain. For manufacturers, traceability is the ability to trace, track, and control raw materials, work in progress, and finished products through all stages of the supply chain (receiving, production, processing, warehousing, and distribution).

Traceability is carried out in all phases of manufacturing including planning, materials management, production, and distribution. It automatically captures detailed manufacturing process information from the shop floor, compares it with manufacturing standards, and alerts management about any gaps to take corrective actions. It also provides historical data for production processes for any given production or work order, thereby enabling root cause analysis. Varying levels of traceability are used in different industries. This thought leadership paper covers these levels in subsequent sections.

Distributed or global manufacturing is common business practice today, requiring product traceability to achieve operational excellence across manufacturing locations. International markets may provide your manufacturing company with more customers and sales opportunities, but they also lead to increased competition and more legal requirements. Global markets make it increasingly important to improve product quality while driving costs down and ensuring full product traceability. To be successful in this environment and keep pace with changing customer demands, you must maintain an overview of your manufacturing operations at all times and synchronize them with upstream and downstream processes. This integrated level of traceability achieved by a manufacturer is key to a successful global strategy.

**Multiple Levels of Control for Product Traceability**

Traceability uses serial, lot, and effectivity to support customer and government requirements for visibility to component usage in the manufacturing process. When controlled via a manufacturing execution system (MES), traceability provides a ready tool to compile an as-built structure containing a hierarchical list of traceable items from a manufacturing line, along with related data such as process verification. Multiple levels of control are used to provide material accountability within complex assembly manufacturing.

**Lot control** logic is collective. It is used at a lower level to group materials or components made from a common process. Lot data is used to connect the material (component) to its manufacturing parent. It provides an accountability method for materials with a common manufacture point. Because of its collective nature, it does not provide a unique identification for each component material.

**Serial control** is used to interconnect uniquely identifiable part and assembly instances in a way that is verifiable and traceable within multilevel structures. Serial logic is used to uniquely identify parts and their associated processes that exceed a cost threshold or are considered “mission critical.” When a failure occurs in the field, the manufactured item may be traced back to its point of manufacture. Serial numbers may be used in conjunction with a unique ID for the company and for the associated part number (if required).

**Effectivity control** is used to identify and control major assembly part numbers and deliverables. The component parts for these entities are not necessarily traceable, but the manufactured assemblies are. The major assembly components are tracked from the point in the manufacturing process where effectivity is initiated up to the end-item deliverable. The primary purpose of effectivity is to support master production schedule (MPS) for complex, multilevel assemblies with variable configuration in key areas of production. However, it also provides traceability for those items during production and in the field.

Serial and effectivity processes provide accountability through multiple levels in a product structure. Serial logic is for component parts and assemblies, while effectivity is used primarily for major assembly part numbers and end-item deliverables. For this reason they are often used in tandem, with serialized components traced up the structure into an effectivity-controlled structure. At that point, the use of effectivity...
control along with part number provides the traceability for the serialized components into the end-item deliverable.

Lot, serial, and effectivity control are valuable in quality control. When a defect is found in production or the field, the subject part’s lot, serial, and effectivity attributes help to quickly identify the affected items. These attributes tie the items to the unique conditions occurring during the manufacturing process that may have contributed to the defect. Status information can include who worked on a product; component materials by supplier, lot, and serial number; current production conditions; and any rework or other exceptions related to the product. For example, a disposition to a nonconformance may have contributed to the failure of a part associated to an effectivity-controlled item.

An example of traceability used within a group of lot-controlled material is the identification of a defect on a piece of material. The manufacturer of the material can then identify and inspect any material housed internally and notify customers that have received the material. These customers can identify where the material from the defective lot was used and initiate an inspection regimen to correct the issue.

A tight, closed-looped manufacturing and ERP-integrated environment provides an immediate business impact through greater shop-floor control, enhanced collaboration, and increased traceability of manufacturing processes.
With many of the core manufacturers outsourcing their operations, the supply chain is becoming more complex (see Figure 1). Traceability within this distributed supply chain for manufacturing is key to delivering high-quality products, controlling cost, and maximizing profitability.

A supply chain is only as strong as its weakest link. Frequency and severity of product recalls have been on the rise. To improve product quality, mitigate risk, control cost, and sustain a competitive advantage, many manufacturers are turning to supply chain traceability, requiring data about manufacturing, suppliers, and customers to be accessible in a single record. The ability to trace the origin, movement, and destination of products along the supply chain has been associated with improvements in operational performance, inventory optimization, product quality, and safety.

Increasingly, consumers, retailers, customers, suppliers, and regulators are encouraging industries to be able to trace the origin of materials, processes, and products “one step forward and one step back” along the supply chain. In parallel with this trend, recent technological developments, such as radio frequency identification (RFID) and mobile devices, have enabled manufacturers to trace and track products using real-time data. Various types of traceability within the supply chain include:

- Trace back to the source (suppliers) – backward traceability
- Track to the customer – forward traceability
- Component traceability
- WIP and product tracking
- Manufacturing process traceability

Traceability and Genealogy with Business Process Integration

End-to-end traceability is essential to protect your brand, your customers, and your relationship with them. Enterprise software and services should provide you the capabilities you need for supply network traceability by enabling:

- Product genealogy – Maintain the links between end products and the raw materials, components, labor, processes, machines, and time invested in manufacturing them, providing the ability to trace products based on their manufacturing input
- Tracking and integrity assurance – Secure the supply chain through authentication, visibility, and condition monitoring, ensuring that only authentic products in the desired condition reach the intended customer
Impact analysis and response planning – Optimize strategy selection in response to quality, safety, or compliance issues to protect the brand, the customer, and the public

Recall management – Execute efficiently the reverse logistic processes associated with recalls and proactively manage all aspects of your company’s response

Continuous improvement – Identify bottlenecks and underperforming resources and processes and take actions for improvement

Manufacturing industries achieve process and product traceability with genealogy through business process integration. Integrating manufacturing execution systems with systems for enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM) enables traceability to customers, suppliers, and across the supply chain. Enterprise visibility is achieved through enterprise intelligence or manufacturing intelligence systems, which could drive actionable intelligence across the supply chain.

Traceability and Genealogy in Manufacturing Operations

To achieve the business values mentioned in the section above, manufacturers need to trace, track, and control work in process as well as finished products. When there are process or product issues, manufacturers need to understand the history through a tracing capability. Manufacturers also need to find out the process step at which the product is located through a tracking capability.

Best-in-class manufacturers are using traceability to their strategic advantage to produce and deliver high-quality products in compliance, to adhere to schedule, and to improve the overall efficiency (equipment, human resources, and so on). These manufacturers have become best in class not only by having manufacturing and production traceability through factory automation and manufacturing execution capabilities. They also have good traceability across the supply chain by integrating business processes.

Key manufacturing performance indicators monitored by the best-in-class manufacturers include:

- Product compliance
- Schedule compliance and on-time delivery
- Overall equipment efficiency (OEE)
- Yield
- Operating margin
- Customer complaints

More than ever, manufacturers are striving to maximize productivity and reduce costs. To achieve this, manufacturers must monitor every step in the manufacturing process and maintain comprehensive historical records. Manufacturing problems that affect product quality must be identified and corrected quickly before products continue down the production line.

With traceability capability, you can answer the following key questions within your manufacturing operations:

- How much of the order have we finished?
- Where is my product in the process?
- What percentage of the parts are we scrapping?
- Are the products in compliance?
- Are we using our equipment efficiently?
- Do we have enough raw materials to make this order?
- How effectively is product quality managed prior to shipping?
- What is the root cause of the quality issues?
  - Equipment fault?
  - Poor quality materials?
  - Poor resource training?
- If a quality escape occurs, what is my liability?
  - How many units are still on the manufacturing floor?
  - How many are in inventory?
  - How many are in the distribution channel?
- Which customers are affected?

Increased enterprise-wide visibility, integration, and enforcement enable an accelerated adaptive product transition to the manufacturing environment while facilitating engineering and change compliance.

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In the following section, we discuss various levels of integration that manufacturers follow to address traceability and product genealogy requirements.

**Level 1: Manual**

In many manufacturing environments today, management of production-process and product-assembly data is accomplished manually utilizing home-grown disparate data systems and spreadsheets (see Figure 2). The accuracy of data collection and recording can be hindered by the cumbersome, time-consuming, manual activities associated with creation of a product record, especially given the dynamic nature of manufacturing. Handwritten product and process records often must be transcribed from shop-floor logs or journals and reentered into electronic spreadsheets and databases. This manual shop-floor behavior yields production inefficiency. There is significant opportunity for product data errors to be generated, which impacts the execution of product builds and the accuracy and scope of supporting historical product and process genealogy data. Accessing the data can be time consuming and labor intensive.

From a macro-manufacturing level, challenges impacting product delivery, cost, quality, compliance, and safety in today’s global production environments are made worse as a result of production decisions being based on outdated and potentially inaccurate shop-floor data.

**Level 2: Stand-Alone MES**

Level 2 traceability introduces a manufacturing execution system to the shop floor (see Figure 3). Component-level traceability can be captured and managed, and pertinent information can be shared among the various work elements comprising plant floor activities. An MES provides a means by which component-level traceability is ensured by the automated creation of an accurate product genealogy record, which captures all relevant data required for the creation of a comprehensive as-built record. An MES provides the vehicle through which shop-floor operations can quickly, easily, and accurately capture...
the production process and component consumption details required for recording complete product traceability and genealogy. In addition, while generating product genealogy the MES ensures the enforcement of assembly processes. Procedures defining each component are exercised at each step during a given product’s production lifecycle.

With the introduction of an MES into the shop-floor environment, complete serial number and batch traceability of items consumed during the production process can be stored electronically. The resulting permanent genealogy record with multilevel details enables quick and accurate accessibility of product, process, resource, and material information.

The key benefits of this approach include:
- Retaining a complete as-built history for regulatory and customer compliance
- Providing the ability to quickly identify which products are defective

However, there are several issues:
- Even though an MES gives plant floor–level visibility and tracking, visibility at the enterprise level is lacking due to lack of integration with enterprise systems.
- When a quality issue is raised by a customer, it has to be communicated manually to the plant floor. This delays the ability to put a corrective action in place for the product or the process.
- Due to lack of integration with other business systems (ERP, SCM, CRM, and quality management), forward traceability to customers and backward traceability to suppliers is manual and time consuming.

Level 3: MES Integrated with Quality Management Systems

The expanded environment of level 3 brings suppliers directly into the shop floor through a quality management (QM) system interfacing with the shop floor and ERP environment. This provides a landscape in which suppliers are notified automatically when production issues arise with the materials they delivered via the supply chain. Limited visibility of WIP, quality, and cost information can manifest itself in poor production decisions, delayed responses, and a great deal of non-value-added work that impacts customer service. At the supply chain level, we have now introduced real-time, end-to-end supply chain visibility and control, facilitating a rapid corrective and preventative action (CAPA) response for both internally and externally generated quality escapes. This real-time integration with the manufacturing environment provides the information exchange required to greatly enhance the enforcement of quality requirements, supply planning, and demand management.

Level 4: MES Integrated with ERP System, Suppliers, Customers

To achieve complete traceability, manufacturers must tie data from the shop floor into suppliers and especially customers. Level 4 traceability provides the ability to obtain additional enterprise information, thus expanding the traceability footprint to include both comprehensive product and customer information. This results from a tightly integrated shop floor and ERP system that provides traceability both upstream at suppliers and downstream to customers. When a nonconformance takes place, the next step is to identify the damage. Were the defects contained within the four walls of the plant, or did we have a quality escape? If defective products are in the supply chain, are they still in the warehouse? Who are the customers with defective or potentially defective products? In essence, comprehensive global traceability is facilitated via tight closed-loop shop-floor and ERP integration with the associated supply chain and the customer base. Having “shop floor to top floor” end-to-end integration becomes extremely valuable in constructing accurate as-built and as-shipped records. End-to-end process integration is particularly useful when managing finished goods being shipped to customers. The closed-loop integration of these disparate, manually generated shop-floor data sources with an enterprise’s planning, execution, and asset management systems can dramatically impact the efficiencies targeted for a best-practices manufacturing environment.
Traceability helps decision makers understand more about product movement. It is also useful for identifying problem suppliers or weak elements of your production system, resolving bottlenecks, refining future labor and scheduling needs, and engineering improvements into the product line. Having real-time access to this traceability data helps decision makers observe trends and take the steps necessary to reduce the risks of defective products escaping from the shop floor.

Utilizing an MES in an integrated enterprise environment provides significant benefits by delivering enhanced traceability functionality via a real-time feedback loop with product lifecycle management, quality management, and other key enterprise components. As a result, you can instill a valuable mechanism for continuous product and process improvement enterprise-wide. Traceability now includes the tools to generate manufacturing data and information for real-time adjustment and improvement in manufacturing processes, resources, and inventory management.

The Role of Technology

Opportunities to leverage technology are defined in response to the operating needs of the value-stream flows, especially when the use of technology drives and sustains business goals and objectives. Best-of-breed companies use information systems to enable higher levels of operating performance by using databases to create electronic records of as-built data that can be easily accessed. Information technology systems have become powerful tools for manufacturers to record production data needed for isolating quality, warranty, and safety issues while minimizing any disruption to production. Information technology is a vital success factor of any enterprise-wide decision system for traceability and quality data. Traceability begins on the shop floor, moves upstream into the supplier community, and then goes out to the distribution channel and customers. Paper-based manual traceability systems are pervasive in production environments, resulting in a labor-intensive process for finding and accessing data. Linking accurate and timely production data creates a competitive advantage, helping global manufacturers address their business challenges.

The SAP Difference

SAP delivers powerful software solutions that integrate manufacturing with the rest of your enterprise – as well as a comprehensive solution for managing manufacturing operations. The SAP® Manufacturing Execution application is a powerful manufacturing business solution that enables global manufacturers to manage and control manufacturing operations while integrating these operations with the rest of the business. SAP Manufacturing Execution helps ensure that the product is built right the first time by collecting data from multiple sources and integrating data systems with shop-floor activities to create a single, comprehensive, as-built record. The result is an aggregate record of the entire product history, stored and available for effective decision making and for meeting quality and compliance requirements.

Manufacturers who integrate their manufacturing operations using SAP Manufacturing Execution can:

- Provide users with real-time visibility across the entire enterprise
- Access real-time manufacturing data to make quick and informed decisions
- Accurately track and manage work in progress so that the right products are being made at the right time
- Optimize plant performance and profitability
- Improve quality and reduce variation through corrective-action processes that prevent escapes of defective products

Functionally rich, SAP Manufacturing Execution provides real-time data capture and global visibility across a manufacturing line, plant, or enterprise, enabling you to:

- Recognize and respond to configuration or quality changes, resulting in the production of the highest quality product at the lowest cost
- Control manufacturing routes and process management in a centralized environment
- Collect a complete record of serialized components and processes in a mixed-mode manufacturing environment
- Maintain detailed product records, nonconformance information, product yields, and quality data – available in real time to the entire organization
- Manage and track complex WIP scenarios – order splits, merges, and configuration changes
SAP Manufacturing Execution is a comprehensive, integrated, manufacturing operations solution. It helps manufacturers gain visibility into manufacturing operations, achieve shop-floor control, and manage process and product traceability. The application captures data at the component level, which not only provides extensive insight into the production process but also benefits the enterprise as a whole.

As an example, an item’s as-built device history details the complete build history of a particular component. For a given production site, a specific unit’s production history can be captured as a result of this increased level of traceability provided by SAP Manufacturing Execution. Details such as item number, associated bill of materials, and production routing used during the build process are available. Drilling down via the data collection group presents the various recorded values associated with the component. Manufacturing parameters, such as temperature and humidity of the reflow oven used in the production of a printed circuit board, can be captured and permanently recorded and associated with the given component. In most cases this data collection can be done via a machine interface, eliminating the need to manually record such values.

Further drilling from the device history report into the activity log provides additional step-by-step visibility into the various assembly activities involving the component. Data about individual operations, resources, user identification, child and parent assembly details, work instructions, and router details used during component assembly are permanently recorded. Each of these production activities has an associated date and time stamp capturing and confirming when a given activity is executed. SAP Manufacturing Execution automates and significantly enhances the shop-floor experience. By facilitating the optimal presentation and collection of pertinent shop-floor data, it provides comprehensive shop-floor traceability and transparency missing with level 1 traceability. If any nonconformances are written against a particular item, all the details associated with those incidents are recorded and available for review and further processing if and when required.

A configurable role-based dashboard presents operators with a user interface that displays only the information and tasks needed to perform the job. For example, the user interface supports data collection tasks encountered during specific production processes. Work instructions and other supporting documentation are presented to assist throughout the build process. This dashboard enforces production standards, helping to ensure complete and accurate builds.

In summary, SAP Manufacturing Execution offers the following functionality:
- Serialized component traceability can now be facilitated and greatly enhances the creation of comprehensive as-built records.
- Real-time enforcement of engineering changes, quality standards, and regulatory requirements can be performed on the production floor.
- Routings can be adapted based on real-time process characteristics.
- Granular WIP tracking can now include critical characteristics of interest to the enterprise as a whole.
- Production visibility supports multi-level nonconformance processing.

In total, these functions assist in helping to ensure true manufacturing process reliability.

A Vital Tool for Continuous Process Improvement
From yet another perspective, employees in design, manufacturing, supply chain management, and business operations must come together and collaborate to enable the timely delivery of quality products to customers while managing costs and ensuring compliance. The need to have multiple information views depending on functions or roles varies within an enterprise.

However, access to accurate, real-time information greatly enhances the top-floor-to-shop-floor communication required to support critical decisions and continuous improvement during a product’s entire lifecycle.

The principles of higher efficiency and lower costs have been realized repeatedly in real-world manufacturing environments. SAP Manufacturing Execution delivers tangible competitive advantages through:
- Role-based visibility across all levels of your manufacturing operations; that is, increasing the level of traceability from the shop floor to the top floor.
- A flexible framework for continuous improvement.
- Software rich in functionality to innovate and support integrated, simplified business processes.
SAP Manufacturing Execution is a vital tool for continuous-improvement initiatives. It enables manufacturers to capture the complete product genealogy – from order to shipment. It helps manufacturers respond in a timely manner to immediate product concerns or to inquiries from regulatory agencies or customers with complete and accurate data.

Lack of visibility into production data and the inability to make well-informed decisions based on real-time information limits the ability to carry out quality processes. This can result in delayed enforcement of quality standards and containment of nonconforming product. Quality processes benefit from an integrated production landscape that provides the required visibility and communication functionality needed to ensure proper enforcement of quality standards. Enforcement can occur any time – prior to supply chain components entering the manufacturing environment and during shop-floor processing, for example.

SAP Manufacturing Execution provides a configurable dashboard for shop-floor production operators. Using this dashboard, operators can efficiently record a quality-related defect against a specific item being consumed or tested in a production environment. Furthermore, the processing of nonconformances is enhanced by grouping defects and assigning nonconformance codes to each group. Operators use drop-down menus when recording values and can add comments to provide further details useful in documenting deficiencies and providing corrective actions. Failure IDs and location details can also be provided as a point of reference.

Once a quality defect is identified in SAP Manufacturing Execution, a quality notification is generated in SAP ERP, which initiates the CAPA process to resolve quality issues at the source. Based on the severity of the nonconformance, material can be quarantined and suppliers notified.

This ability to quickly and easily capture nonconformance data against a specific material is important. The integration of SAP Manufacturing Execution and quality management functionality in SAP ERP (see Figure 4) provides a more efficient means to communicate and log actions taken to correct deficiencies and to expedite CAPA needed.

![Figure 4: Integration of SAP Manufacturing Execution and SAP ERP for Quality Management](image-url)

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both internally and externally with the supply chain. Increased enterprise-wide visibility, integration, and enforcement enable an accelerated adaptive product transition to the manufacturing environment while facilitating engineering and change compliance.

Building an Integrated Environment for Traceability
To progress from level 2 traceability functionality of SAP Manufacturing Execution in a stand-alone environment to the integrated traceability models of levels 3 and 4, we need a tool to facilitate a tightly integrated environment. The integration of SAP Manufacturing Execution with SAP ERP is accomplished via integration content that is delivered with the SAP Manufacturing Integration and Intelligence (SAP MII) application (see Figure 5).

As a result, you can achieve tight, closed-loop production integration within your entire enterprise, facilitating visibility into your global manufacturing operations. Additionally, this comprehensive shop-floor integration is tested and certified utilizing SAP technology. SAP ERP intermediate documents (IDocs) are used to send packages of information down to each integration point. When return information needs to be posted into SAP ERP, the integration...
makes the proper BAPI® programming interface call or remote function call (RFC) for each integration point.

SAP MII serves as the middle layer that is running the integration content to facilitate communication between SAP ERP and SAP Manufacturing Execution. SAP MII enables an interface between SAP ERP and SAP Manufacturing using XSLTs for data transformation. SAP MII provides a flexible process that allows the interface to be easily extended and customized to meet a customer’s needs via data enrichment or customer-specific workflows. This communication middle layer provides specific integration points for both inbound and outbound data processing. For inbound data, SAP Manufacturing Execution provides both request and response Web services messaging that can be used to process external data into SAP Manufacturing Execution. Then as processing occurs on the shop floor, SAP Manufacturing Execution provides outbound collaboration processes that can send data to external systems.

Many benefits are provided by a tight, closed-looped manufacturing and ERP-integrated environment:
- This integration provides an immediate business impact through greater shop-floor control, enhanced collaboration, and increased traceability of manufacturing processes.
- Data collection and communication of real-time manufacturing data from the shop floor to the enterprise system are extremely valuable for timely and optimal manufacturing operations.
- Access to real-time and historical manufacturing data is essential for conducting comprehensive analyses and supporting continuous improvement activities.
- Integration risks for manufacturers wishing to realize the value of integrating the shop floor and enterprise are mitigated with a SAP-certified integration solution.
- Real-time shop-floor data integration enables you to achieve enterprise-wide visibility, providing a better understanding of capacity, costing, labor, material inventory, and manufacturing capabilities.

These benefits translate directly into better operational decision making and faster responsiveness to customers. Integrated traceability functionality in SAP software applications enables you to accurately track material and processes throughout your global operations. You can tie production as-built data with cost, customer, and supplier data to quickly isolate quality problems, take corrective action, and mitigate risk.

Summary

Everyone – including consumers, customers, and government agencies – are demanding high-quality products from manufacturers. They expect manufacturers to monitor and track processes and products and provide information related to quality and safety. In addition, manufacturers are required to comply with government and other regulatory mandates. These, along with quality standards many of the manufacturing industries are required to follow, are driving the need for traceability and product genealogy.

SAP can help. Find out how you can gain increased enterprise-wide visibility, integration, and enforcement. Learn how to accelerate adaptive product transition to the manufacturing environment while facilitating engineering and change compliance. For more information, contact your SAP representative or visit us online at [www.sap.com/solutions/manufacturing/manufacturing-execution/index.epx](http://www.sap.com/solutions/manufacturing/manufacturing-execution/index.epx).

1. Extensible Stylesheet Language Transformations (XSLT) is a language for transforming XML documents into XHTML documents or to other XML documents.