

An Epicor® White Paper

The Business Benefits of Service-Oriented Architecture:

A Guide for Manufacturing Executives





Executive Summary

Manufacturers in make-to-order and mixed-mode production environments must satisfy increasingly demanding customers by continually reducing lead times, increasing quality, and reducing costs—all while addressing evermore stringent government regulations. To achieve a competitive advantage in this environment, they must optimize their internal operations and the entire supply chain.

The right technology can play a major role in this effort. Yet many existing legacy and ERP solutions are not up to the task. These systems are incomplete, difficult to modify in the face of changing business conditions, and unable to furnish the visibility necessary to streamline enterprise and supply chain operations.

This white paper describes new enterprise applications for make-to-order and mixedmode manufacturers. These integrated, manufacturing enterprise applications are built on a service-oriented architecture (SOA) and incorporate modern business rules and business intelligence to furnish flexibility, interoperability, and visibility. With these solutions, manufacturers can improve productivity, streamline the supply chain, reduce costs, achieve regulatory compliance—and thereby enhance customer service and increase their competitive advantage.



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The Need to Satisfy More Demanding Customers

Make-to-order and mixed-mode manufacturers have long staked their reputations on their ability to respond to unique customer specifications for each product they manufacture, under short deadlines, with consistently high product quality and reliability.

What's different today is that customers have become increasingly demanding. Manufacturers must continually reduce lead times and adjust to more volatile customer requirements—all while reducing costs and complying with a growing list of government regulations.

To meet these challenges, manufacturers must increase the agility of their internal business practices. And they must extend this flexibility to the entire supply chain, optimizing their supply chain interactions to enable more rapid responses. They also need to increase outsource manufacturing to global suppliers in order to reduce costs.

Implementing these initiatives requires greater visibility, all the way from the customer to the factory floor to suppliers to logistics, in order to synchronize inbound and outbound processes and supplies. Strong communication and collaboration is even more essential when working with global suppliers.

Existing Technologies are not up to the Task

Technology is a critical enabler for addressing manufacturing business challenges. Yet, much of the technology that make-to-order and mixed-mode manufacturers currently have in place is unable to support today's requirements.

Some manufacturers continue to use stovepipe legacy applications. Because these systems automate only a single business function, not an entire, cross-functional business process, they demand manual, labor-intensive processes, such as re-keying data into separate systems. Legacy systems are also inflexible. They do not permit manufacturers to change their business processes to adapt to changing business requirements. Nor do they provide visibility across the organization—let alone across the supply chain.

Other manufacturers continue to use early enterprise resource planning (ERP) solutions installed prior to the Y2K crisis in the late 1990s. These solutions improved on legacy systems by enabling a single data repository to serve multiple operations across the organization, including financials, human resources, order entry, and inventory. This eliminated manual re-keying of data and simplified reporting.

However, these ERP systems are composed of a large, monolithic code base that makes them difficult to change. Early solutions, moreover, were not complete. Manufacturers often purchased several separate solutions including enterprise resource management (ERP), customer relationship management (CRM), and supply chain management (SCM). As a result, achieving visibility across the organization—as well as with customers and the extended supply chain—required extensive integration. Business intelligence relied on a data warehouse that pulled data from these multiple systems in batch mode, resulting in delays. Developing automated workflows to streamline business processes required similar extensive integrations.



Early systems were also unable to link easily to customer and supplier systems. Until recently, the flow of information between manufacturers and their customer and partner systems, required complex electronic data interchange systems that required all parties to rigorously adhere to pre-specified standards. Newer cloud-based technologies, however, are now available that can make such collaboration easier.

How Modern Technology can Support Manufacturers

Although older solutions are inadequate, more modern solutions are becoming available that address make-to-order and mixed-mode manufacturers' requirements by furnishing the following:

- ▶ Complete make-to-order and mixed-mode manufacturing specific capabilities that simplify implementation and reduce costs
- ▶ A services-based platform that enhances business agility
- ▶ Automated, fully customizable workflows that streamline business processes
- ▶ Full integration and embedded business intelligence that enhance visibility
- ▶ Integrated support for device flexibility

A complete enterprise solution simplifies implementation and reduces costs

Today, discrete and mixed-mode manufacturers have the option of replacing piecemeal, unconnected systems with complete solutions. State-of-the-art solutions incorporate a complete set of manufacturing modules—all on a single platform.

These capabilities include advanced planning and scheduling, product configuration, field service, customer relationship management, projects, financials, product data management, and eBusiness capabilities. Such solutions also include business intelligence that enables manufacturers to monitor key performance indicators in real time, and business rules and workflows that streamline cross-functional operations.

Manufacturers can find solutions that are highly customized to their business requirements. For example, build-to-stock and build-to-order are completely different processes, and need to be handled from within the same system as manufacturers that increasingly operate in mixed modes. Modern solutions can meet this requirement.

By purchasing a complete solution from a single vendor, manufacturers can reduce total cost of ownership. By using one solution, manufacturers lower implementation as well as IT and end user training costs. Annual maintenance fees for a single solution are likely to be less than those for multiple solutions performing the same functions. Accountability is greater when support comes from a single vendor. And all applications can share a single source of data, enhancing visibility across the organization while eliminating the need for systems integration.



Support for an SOA platform enhances agility

While an enterprise solution should offer a full range of manufacturing functionality, customer requirements and the business environment are a moving target. Make-to-order and mixed-mode manufacturers' agility in responding to change depends on their ability to continuously modify their business systems.

Only a system built from the ground up, to support a service-oriented architecture (SOA) can offer the requisite flexibility. Web services provide a simplified mechanism for connecting applications regardless of their location or the technology or devices they use. Based on industry-standard protocols, such as XML and SOAP, with universal vendor support, Web services leverage the Internet for low-cost communications. Web services' loosely coupled messaging approach supports multiple connectivity and information-sharing scenarios via services that are selfdescribing and can be automatically discovered. These capabilities reduce the risks of interconnecting disparate systems and enable organizations to future-proof their application architecture.

What Do Web Services and an SOA Mean for Manufacturers?

Quite simply, by using enterprise applications based on an SOA, make-to-order and mixed-mode, manufacturers can easily add new functionality in a highly granular fashion, as they need it, and can easily reconfigure workflows with minimal integration costs or impact on their business operations. Organizations can purchase just what they need today with minimum risk; as their organizations grow and expand, their ERP can grow and expand along with them.

Organizations can also use Web services to more easily communicate with and streamline workflows involving customers and suppliers over the Internet. With an SOA, manufacturers can make functional areas within their manufacturing enterprise application available to other authorized systems over the Internet. For example, a manufacturer can make its internal systems available directly to its customers' purchasing systems, allowing the two systems to function as a single system via the SOA. As a result, Web services can transform relationships between business partners into a real-time relationship.

Automated workflows streamline business processes

Improving internal efficiency can go a long way toward boosting a manufacturer's responsiveness. Workflow tools included within leading-edge enterprise systems improve productivity—thereby enhancing operational efficiency and reducing costs.

A workflow is a description of everything that needs to occur to complete each step in a business or manufacturing process. A workflow can include the personnel involved, the tasks that must be completed, the procedures to be followed, and the necessary data input or output. Enterprise application workflow tools use business rules to automate numerous steps in the workflow, as well as to assign and track tasks that require human intervention. Enterprise workflow tools can automate both standard processes and exceptions to those processes.



Enterprise workflow tools improve on manual work processes in numerous respects. Unlike human workers who do not work 24 hours a day, automated workflows continually monitor and detect business events in the enterprise system. They can handle more—and more complex—events than humans. They react to events in a more consistent and disciplined manner—which makes it easier for the manufacturer to follow the best practices that improve efficiency and address regulatory requirements. Automated processes move at rapid machine speeds and they facilitate smooth handoffs between individuals and departments. A workflow solution built on an SOA platform, with its interoperability over the Internet, enables manufacturers to extend workflows to external suppliers and partners.

A state-of-the-art enterprise workflow solution may provide graphical tools to enable the business analysts that know the business best (rather than programmers) to develop and implement workflows. Analysts start by documenting existing processes and eliminating non-valued-added activities. They then describe the events or combination of events that trigger an action, define the conditional business logic that will dictate appropriate actions, and identify the recipients and how they will be notified. Graphical tools also enable analysts to easily modify processes to improve operations on an ongoing basis and to address changing business and customer requirements.

By reducing the time it takes to handle individual tasks and to hand off tasks between actors, enterprise workflows improve responsiveness and reduce lead times. Take the example of an order fulfillment process. As soon as the customer places the order, the enterprise workflow immediately notifies planning, production, and shipping to start fulfilling the customer's requests. If connected to trading partners over the Web through an SOA, the workflow could instantly order any necessary parts from external suppliers or request capacity from outsourced manufacturers. Such a system can also synchronize all participants' activities to work effectively toward fulfilling the customer request.

Full integration and embedded business intelligence enhance visibility

While workflow engines certainly help improve responsiveness, make-to-order and mixed-mode manufacturers who wish to reduce lead times also need realtime visibility within their organization, as well as up and down the supply chain. They need accurate forecasts based on historical forecasts and actual demand, real-time knowledge of actual orders, real-time understanding of available internal and outsourced production capacity—not to mention the availability of any necessary parts—and real-time insight into distributors' capabilities. The added complexity of managing offshore suppliers only adds to the need for instant information.

Unlike integrated applications, which process requests for information in sometimes unpredictable timeframes, an enterprise solution with a complete set of robust, embedded applications that are all part of a single system, can provide all modules with data in real time.



The ability to perform real-time collaboration throughout their operations enables manufacturers to optimize their production schedules in light of the available supply of parts and shop floor capacity. This reduces waste and helps improve customer satisfaction. The following are just a few examples of how manufacturers can benefit:

- ▶ Embedded real-time forecasting capabilities in advanced planning and scheduling modules can provide more accurate forecasts by analyzing the most appropriate real-time data (as quotations, orders, bookings, shipments, payments, inventory, and job usage), using sophisticated algorithms that compare historical forecasts with what really happened
- ▶ Capable-to-promise functionality can provide accurate, real-time delivery dates to customers by determining how a quote would fit into the manufacturer's current schedule
- ▶ A scheduling capability with a real-time view of multiple resources gives the master scheduler and management the ability to visually locate overload problems and slack conditions, and then perform cost and throughput analysis on schedule changes before they are firmly committed
- ▶ A real-time materials resource planning (MRP) module generation process can balance the demand of customer orders and forecasts with the supply of jobs. As orders and forecasts change, the MRP can automatically adjust corresponding jobs so manufacturers are in balance; they can even reschedule the plant
- ▶ Embedded Product Configuration capabilities can enable on-the-fly configuration of highly customizable and dimensional products via a straightforward question-and-answer evaluation

When an enterprise solution is built on top of an SOA, it can extend these capabilities to enhance visibility across the supply chain—both upstream and downstream. For example, when a new order coming in is a custom product requiring unique parts or materials not in stock, a services-based manufacturing system could send a request to a supplier's system asking about availability of the component and get a response confirming when it can be received. The manufacturer could then immediately provide a validated available and ship date to the customer.

An enterprise application that incorporates business intelligence, moreover, allows make-to-order and mixed-mode manufacturers to view and analyze all relevant real-time information in a highly actionable fashion through tools such as business activity monitors, dashboards, and balanced scorecards. Business activity monitors deliver user-defined, real-time views of all areas of the business. For example, dashboards include real-time, exception-driving indicator flags that alert users of possible problems in the business and enable users to drill down to see more detailed information. Tools such as Balanced Scorecards permit executives and line-of-business managers to monitor activities by company, business unit, or department to determine how well activities are aligned with strategies, helping synchronize tactical tools with long-term objectives.



Enhanced Competitive Advantage

By purchasing a discrete manufacturing solution that includes complete, integrated functionality based on a service-oriented platform, with business rules engines, complete visibility throughout the supply chain, and specific configuration capabilities, discrete manufacturers can achieve these benefits:

- ▶ Foster business and process innovation in an increasingly competitive, global market through a flexible business platform
- ▶ Improve customer satisfaction (and thus repeat business) through streamlined workflows that fulfill customer orders in a more accurate and timely manner
- ▶ Enable regulatory compliance through automated business and financial processes
- ▶ Enhance internal and supply chain operations through increased visibility
- ▶ Gain competitive advantage by better meeting customers' requirements

Epicor ERP Offers a Complete Solution

Epicor Software Corporation offers a complete solution for make-to-order and mixed-mode manufacturers that furnishes these advantages. Epicor ERP is a manufacturing enterprise application that allows manufacturers in make-to-order and mixed-mode production environments to manage their complete order cycle with a single, integrated, highly functional and easy-to-use-and-implement application. Epicor ERP has been designed from the ground up using Microsoft® .NET technology, to offer a service-oriented architecture that enables the most dynamic, flexible, and responsive manufacturing application on the market today. The solution's Service Connect capability empowers business analysts to use a graphical environment to build automated workflows based on rules and push them live in real time. In this way, manufacturers can easily enhance business efficiency, as well as change business rules on an ongoing basis to reflect changing business conditions. The solution offers full order-cycle visibility through robust applications and associated embedded business intelligence, advanced planning and scheduling, and a full range of other applications.

Conclusion

A complete enterprise manufacturing solution such as Epicor ERP is one that enables manufacturers working in make-to-order and mixed-mode production environments to automate their end-to-end order processes. One that sits on a service-oriented architecture, which allows these organizations to modify their applications as needed in a highly granular fashion, and to easily interact with customers, suppliers, and partners over the Internet. One that includes workflow to enable manufacturers to streamline their cross-functional business applications to improve productivity and reduce costs. One with a full complement of business-specific manufacturing modules and business intelligence to provide real-time visibility, enabling manufacturers to quickly answer customer questions and proactively head off issues before they can have a negative impact. Using such a manufacturing solution, make-to-order and mixed-mode manufacturers can improve customer satisfaction, reduce costs, enhance regulatory compliance, and boost competitive advantage.



About Epicor

Epicor Software Corporation drives business growth. We provide flexible, industry-specific software that is designed around the needs of our manufacturing, distribution, retail, and service industry customers. More than 40 years of experience with our customers' unique business processes and operational requirements is built into every solution—in the cloud, hosted, or on premises. With a deep understanding of your industry, Epicor solutions spur growth while managing complexity. The result is powerful solutions that free your resources so you can grow your business. For more information, [connect with Epicor](#) or visit www.epicor.com.



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