SAP Thought Leadership
Mill Products – Manufacturers of Building Materials

BEST-PRACTICE IT FOR THE BULK CONSTRUCTION MATERIALS INDUSTRY

HARMONIZE END-TO-END BUSINESS PROCESSES TO CUT COST AND RISK

Rapid acquisitions and other market forces have created a fractured IT landscape that inhibits vertical integration, cost control, and transparency. This, in turn, reduces pricing power. To drive scale and efficiency, the industry must standardize and consolidate its IT landscape.

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BEST PRACTICES FOR ECONOMICAL AND TRANSPARENT IT SYSTEMS

IT systems for the bulk construction materials industry are fractured. Years of acquisitions and leveraged cost structure have left material producers with dozens of redundant, overlapping systems that handle everything from plant controls to enterprise resource planning. This has resulted in broken business processes and higher costs. The industry faces challenges in the following key areas:

- **Transparency.** CEOs lack **visibility** across the whole enterprise. Their ability to measure, control, and improve business processes is reduced – which sacrifices productivity. Risk increases, and compliance with government-mandated corporate laws becomes more difficult.
- **Investment.** CFOs struggle to achieve timely financial closings across all business lines and subsidiaries. Basic business processes such as customer credit control are impaired. Allocating additional resources to computerized systems is essential, but the **return on investment** is uncertain.
- **Ownership.** CIOs are forced to spend too much of their resources on maintaining legacy systems – resources that could instead add value to the company through innovation. As a result, best practices for integration and standardized business processes are neglected. The already limited IT budget is consumed by high **total cost of ownership** for the "accidental architecture" of acquisition.

To increase enterprise scale and complexity, material producers require end-to-end business processes that are distributed across as few systems as possible and a well-harmonized IT landscape.

> Alignment between the IT and business sides of a company is essential to delivering competent IT systems. The business drivers must be adequately identified and absolutely clear to everyone involved in designing, developing, and delivering automated computer systems.

This document presents a vision for reaching those goals. Best practices composed of new technology and business processes can make economical and transparent IT systems a reality. The discussion presents research findings from an SAP working group on the bulk construction materials industry. Volunteers from the group committed resources to identify, define, and seek answers to common IT problems within their industry. While many questions remain, the result is a prescription for lowering the cost and risk of IT systems and delivering transparent, reliable control that will drive operational efficiency.

INTRODUCTION

AN IT VISION FOR THE BULK CONSTRUCTION MATERIALS INDUSTRY

A common demand of the bulk construction materials industry has been for a clear road map for improving IT systems. The request has been raised by many companies in many forums. This paper is an installment on that vision. It is based on a collaboration among SAP customers, technology partners, and industry experts who form the SAP working group on ready-mix concrete (RMC). It addresses the challenges that construction materials producers face today: vertically integrating the supply chain, incorporating industry best practices, and reducing the number and type of IT systems. Examples in the paper focus on issues related to the business of ready-mix concrete – a sector that poses the biggest problem for distributed business processes due to the product's short shelf life and rapidly changing customer demands. Other lines of business such as cement, aggregate, and asphalt are important but out of the scope of this document.

The Business Problem

The construction materials industry is in transition. This asset-intensive, highly commoditized industry is undergoing rapid consolidation and vertical integration. Historically, a strategic advantage has been achieved by controlling natural resources and production facilities close to local markets. Control of resources near markets remains a key to success. However, the rapid regional and global growth of individual companies has made scalable IT systems increasingly essential to maintaining pricing power, driving cost control, and enabling further growth.

The problem is that rapid acquisitions and other market forces have created a fractured IT landscape that inhibits vertical integration, cost control, and transparency (see Figure 1). This, in turn, reduces pricing power. To drive scale and efficiency, the industry must standardize and consolidate its IT landscape.

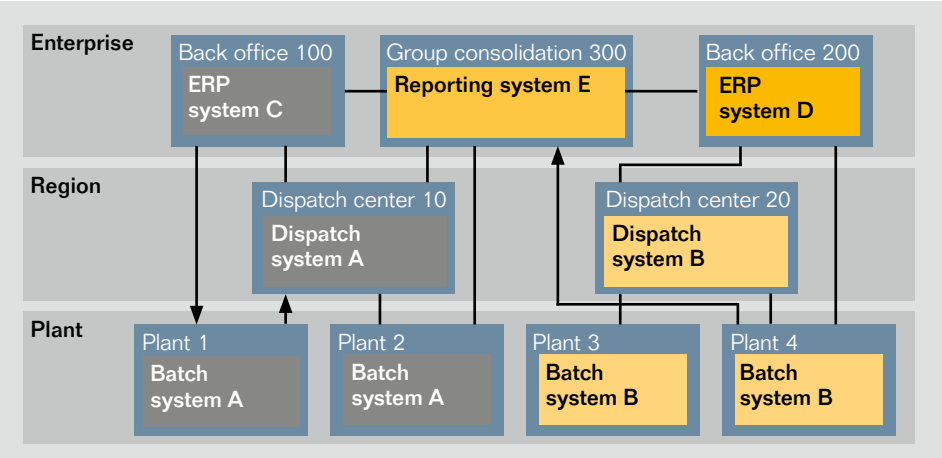

Figure 1: "Accidental Architecture" Created by Consolidation

Essential Business Issues

Effective IT systems require time for planning and investment. However, operations must run at or near capacity to distribute high fixed costs and debt, leaving little time and few resources for IT. Meanwhile, consolidation has thrown together multiple layers of different and sometimes duplicate IT systems that are minimally integrated within the enterprise. As producers struggle with basic information flow and transparency between existing systems, market forces are increasing the demand for uniform and distributed integration of business processes. The industry faces a major need for advanced, vertical business integration, while struggling with the most basic issues of transparency and coordination:

- **Product-line specialization complicates the problem**. Aggregates, portland cement, ready-mix concrete, and asphalt have different dynamics. Ready-mix has a short shelf life; aggregates do not. Cement is high value per unit volume and can be shipped globally; asphalt is always a local product. The industry has both top- and bottom-line specialization, demanding more than just a single generic approach to enterprise resource planning (ERP).
- **Material producers want pricing power**. In a competitive market, pricing power is achieved by vertical integration of the product lines and by cost cutting. The current state of IT makes vertical integration difficult. Lack of transparency hides inefficient cost structures in the supply chain and reduces pricing power.

- **The most efficient operators win**. Poor automation of business processes reduces a company's access to capital and could put it at risk for takeover.
- **Measurement is essential for control**. Producers need routine, reliable access to any computerized system in the enterprise to gather and analyze information in near-real time. Layers of incompatible IT systems resulting from acquisitions reduce control.
- **Transparency is demanded by regulating agencies**. Producers must know and control what happens from the top to the bottom of the enterprise. Gaps of information between operations and ERP, between divisions, and throughout the enterprise make true transparency impossible.

Producers of bulk construction materials need competent IT systems. Today there is redundancy, overlap, and gaps between operational and enterprise systems. The essential business issues for the bulk construction materials industry are clear. Now, key market drivers must be understood and combined with business issues to define a vision for future solutions.

Key Market Drivers

Alignment between the IT and business sides of a company is essential to delivering competent IT systems. The business drivers must be adequately identified and absolutely clear to everyone involved in designing, developing, and delivering automated computer systems. There are several key business drivers for the construction materials industry:

- **Volume is king for aggregate and cement**. Production has high fixed costs. Higher volumes lower the fixed cost per unit. Plants are pushed to run at or near maximum capacity whenever possible, based on the rule "Sell what you make."
- **Cash is king for ready-mix concrete and asphalt**. In these sectors, production is handled by relatively inexpensive plants and largely variable costs for labor and materials. Just-in-time production of highly customized products, fixed delivery capacity, and disruptive demands from the customers lead to prioritized service. Customers who pay well are served well. The rule of this market is "Make what you sell."
- **Pricing power is driven by margins**. With better vertical integration, visibility, and process control, margins can be increased through smart cost reductions.
- **Customer credit and risk management is essential**. A single view of each customer across all lines of business allows producers to reduce liability through proper management of credit and construction liens.
- **Customer service matters**. Producers that offer the highest value-added services at market prices win more volume. Services like online delivery notification to handhelds can drive down internal customer costs. This makes customers more loyal and reluctant to price hop.

With these external and internal drivers established, management and operations can establish underlying business processes. The responsibility of IT is to transform core business processes into economical solutions for the enterprise. However, historical difficulties with delivering IT solutions in the industry must be overcome.

The IT Challenge

Providers of bulk construction materials increasingly rely on IT to improve their competitive position. Operational cost must be cut, and agility increased, to harvest new market opportunities. All this must be accomplished with a budget ranging from just 0.8% to 1.5% of revenue. To increase enterprise productivity, IT must itself be more productive.

Management and Operational Perspective

Producers want to concentrate on the business of construction materials. While IT is becoming a core industry competency, its influence is still smaller than historical drivers such as location and reserves. Smart leaders focus on the business and treat IT as both an operational necessity and, when appropriate, a strategic enabler. Still, producers have many concerns:

- **IT projects are risky**. Many high-profile projects have gone terribly wrong. Some have even hurt producers badly enough to force sales of companies to their competitors. Even small and medium-size projects can interrupt operations.
- **IT underdelivers**. Costs are high and benefits are not always clear. Other than expenses to provide desktop tools and connectivity, the return on IT investment is often questionable.
- **Too many parts are required**. Acquisition introduces chaos to hardware, software, and networks. Producers want to simplify their landscapes and get control of enterprise assets.

- **Producers want to consume, not invent IT**. Without a common industry blueprint, IT projects constantly reinvent existing solutions. Costs and risk go up, and alignment with business needs is reduced.
- **IT must serve conflicting agendas**. Management, operations, and other segments of the company often have overlapping and conflicting requirements. Management wants broad visibility, for example, while operations wants tight control over and protection of the production process.

Producers want leadership. At present, there are many technology options but few answers to these challenges. Producers want a clear road map for the future, complete with step-by-step blueprints by product line and business size.

Current Business Process Integration

Current integration practices for business processes are a sum of limitations. A minimum amount of information can be transferred between two systems. A third system further limits the amount of transferrable information, and so on, until only the most basic information is coordinated across the enterprise. This approach will never deliver the transparency, measurement, and control that leading producers require, because significant effort is needed to resolve various technical obstacles:

- **Manual integration**. No standard interfaces exist, so each company must reinvent and program the interfaces.
- **Logic in interfaces**. Business logic is stuffed into the interfaces to make up for individual system limitations.
- **Technical limitations**. Information is lost during semantic transformation between systems.

Today, ready-mix integration typically defaults to handling all quote-to-cash applications on traditional "dispatch and batch" systems. Duplicate, generic functionality exists on the ERP back-office level for most of the dispatch functionality – including the entire sales process, material management, inventory, and accounts receivable invoicing. Most companies follow a model similar to that in Figure 2, which greatly limits information exchange.

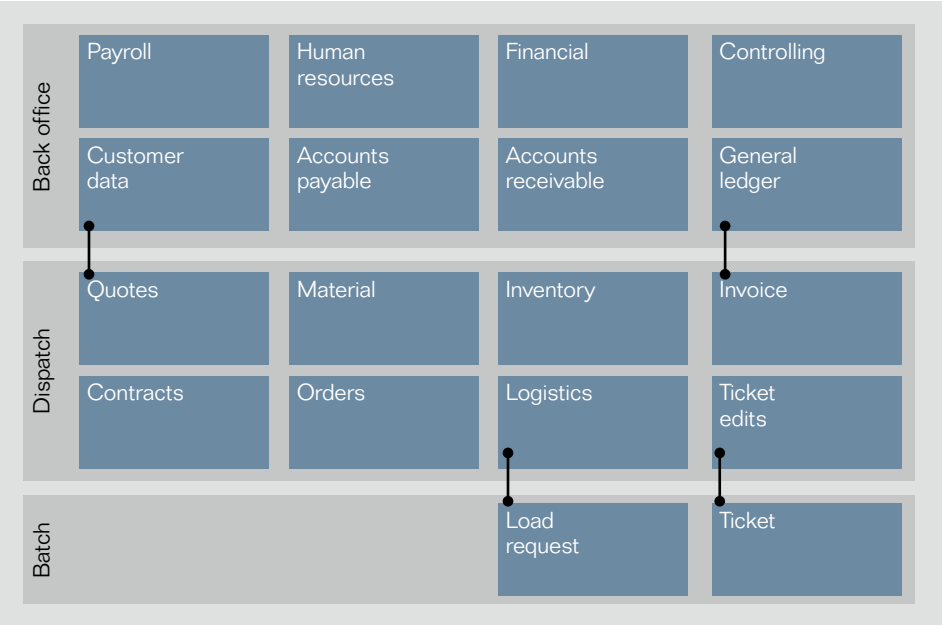

Figure 2: Very Little Information Allowed to Flow Between System Levels

Implications of Current Integration

This model creates an information gap between the plant and enterprise IT systems. Information exchanged between systems is limited to a fraction of what would be possible with greater integration. Point-to-point integration becomes more expensive with every system, and information gaps isolate systems. The model results in a largely isolated ERP system surrounded by islands of operational systems (see Figure 3).

Summary of the Challenge

Current integration practices for industry IT systems have led directly to structural inefficiencies. As a result, management does not recognize IT as an enabler for the enterprise but just sees it as providing necessary services. A good example of the potential offered by IT is increased pricing power.

Pricing power across multiple lines of business is the lifeblood of producers. To achieve this power, they must cut costs and respond to local market needs. Lower costs give producers the pricing power to improve volumes, margin, or both. Because business processes drive both direct and indirect costs, producers can cut costs through process improvements. IT systems that enhance agility help providers quickly adapt their business process for changing market conditions. Customers stick with producers that can serve both their current and future needs.

Most IT systems fail to deliver either pricing power or agility due to a fractured IT landscape. Because of acquisitions and leveraged cost structure, IT is faced with dozens of redundant, overlapping systems for everything from plant controls to enterprise resource planning. This fixed, inherited landscape is expensive to maintain and risky to change. Instead of driving innovation and enabling business strategies, current IT systems drive up costs and reduce agility.

Modern IT solutions enable a new paradigm based on standards and open systems. Use of these tools, combined with standards and best practices, will reduce risk and costs for IT projects and deliver measurable business benefits. Proper use of the tools can make IT a strategic business partner and improve transparency, return on investment, and total cost of ownership.

SAP is taking the lead in identifying industry best practices and developing technology standards by sponsoring a collaboration of producers, technology partners, and service providers that is defining a clear IT vision for the future.

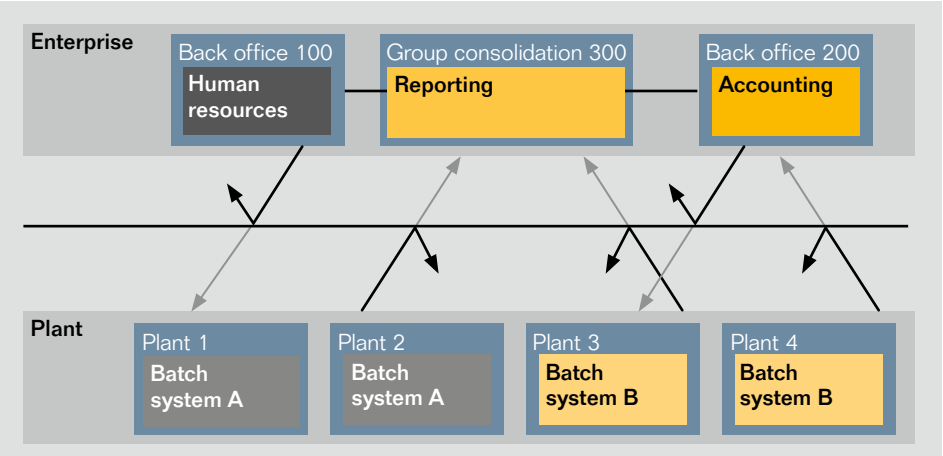

Figure 3: The Reality of Integration Limiting Visibility and Information Flow

IMPROVING INTEGRATION ON A COMMON PLATFORM

INDUSTRY BEST PRACTICES WITH NEW TECHNOLOGY

Market-leading producers demand standardized, best-practice business processes and integration. A lack of current standards has forced producers to "reinvent" ERP integration, driving up risk and cost. Standardized best practices drive down costs for designing, implementing, and maintaining an integrated system landscape and economically deliver operational efficiencies and local agility.

SAP's Role

Through the working group on ready-mix concrete, SAP has structured an industry collaboration of partners interested in creating a vision for the future of IT systems and establishing executable best practices. While the working group's job has just begun, SAP plans to help the industry build a library of best practices and blueprints that will be freely shared among its customers to drive down risk and cost.

This effort will be sustained through an ecosystem of producers, partners, and providers who are all keenly interested in effective IT systems for the construction materials industry. By providing the catalyst to bring the different parties together, SAP is helping to foster long-lasting technological change.

The ecosystem will be particularly helpful in incorporating solutions from smaller software vendors. Specialized technology providers have historically been both a blessing and a curse to the industry. Their domain expertise helps the industry answer many key questions, but their viability puts larger producers at risk. A common playbook of standards and best practices helps reduce single-supplier risk, along with costs for new IT projects and pain from ongoing acquisitions.

SAP is also providing a framework, in the form of service-oriented architecture (SOA), upon which partners with specialized domain knowledge can build their own solutions. SOA replaces disparate hardware and software requirements for individual solutions with a single platform. It embodies a universal-standard philosophy of the open exchange of information and distribution of business processes across multiple systems. With SOA, producers are freed from ties to any given technology partner and can accumulate best-of-breed solutions in a more logical and controlled manner.

The Recommended Approach Toward Standardization

Moving toward standardization requires first a matrix for evaluating the status of a producer's technical and business processes and then a method for developing best practices to improve those processes. An honest self-evaluation is essential for producers who want to understand where they are on the standardization scale and how they can move forward. All of the information presented below was developed in close coordination with industry producers, their technology partners, and domain experts.

In both their technology and business processes, producers have different levels of standardization. Painful rip-and-replace enterprise change is rare and usually not advisable. Improvements must be evolutionary and economically justifiable.

SOA is evolutionary by design; it fully assumes a heterogeneous environment and allows more to be done with the same resources. The move to SOA can be started at any level of a business and slowly migrated throughout an enterprise as is economically justified. Producers can also start and deploy technology and process in an SOA landscape regardless of their current level of IT sophistication.

Using an Evaluation Matrix

Producers need a path to success. The SAP® ecosystem within the industry has created an evaluation matrix that itemizes four distinct stages of standardization (see Figure 4). This is not a scorecard but an assessment to help determine next steps. The matrix shows a producer's general sophistication level. It is not intended to create an exact recipe for implementing an industry-specific SOA landscape. The intent of the matrix is to evaluate the company's current status and point out what the next steps toward standardization might be.

The lowest level of the matrix reflects the current status of most producers. It involves islands of automation, system-driven business process, and limited information exchange. The highest level of the matrix combines best-practice business processes with a fully enabled, composite SOA landscape. For any given producer, progress from one level to the next will not be uniform. Some applications or geographical regions will reach the goal sooner than others.

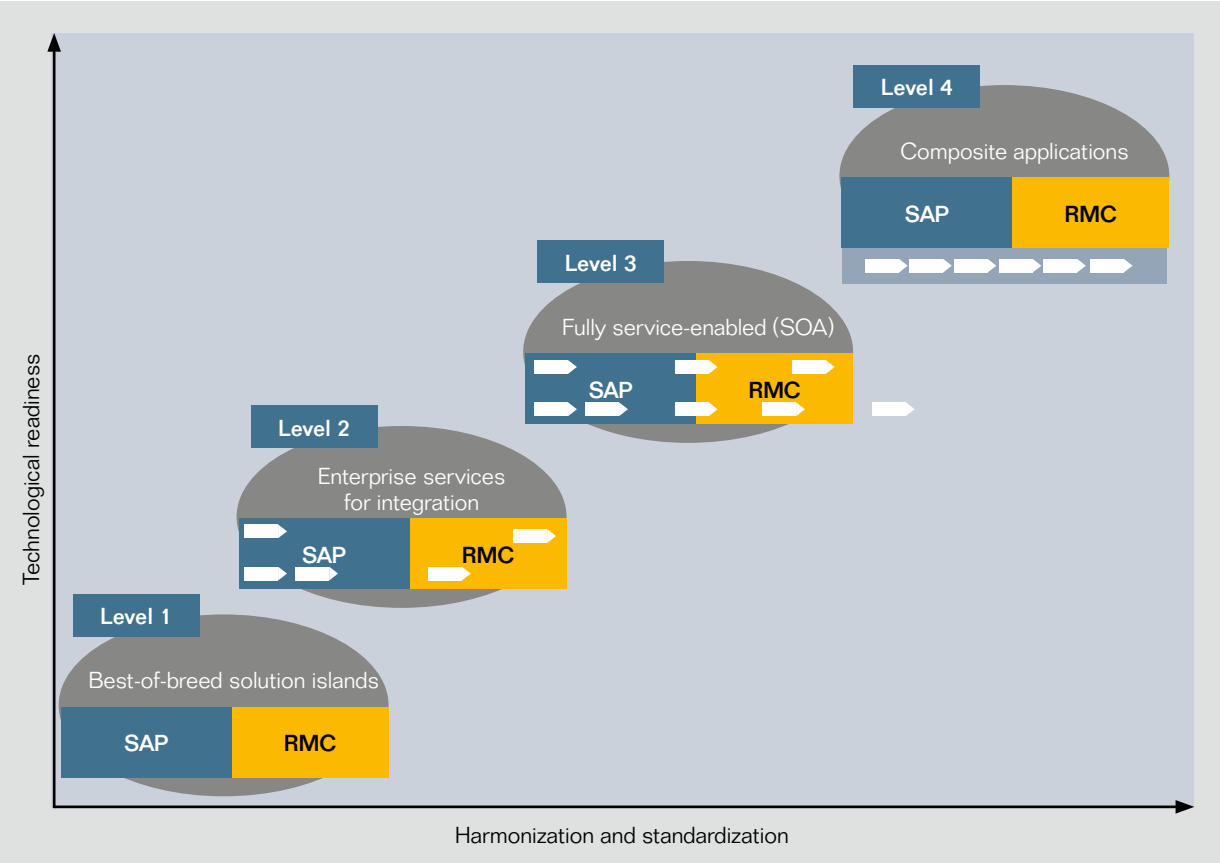

Figure 4: Evaluation Matrix of Ready-Mix Concrete (RMC)

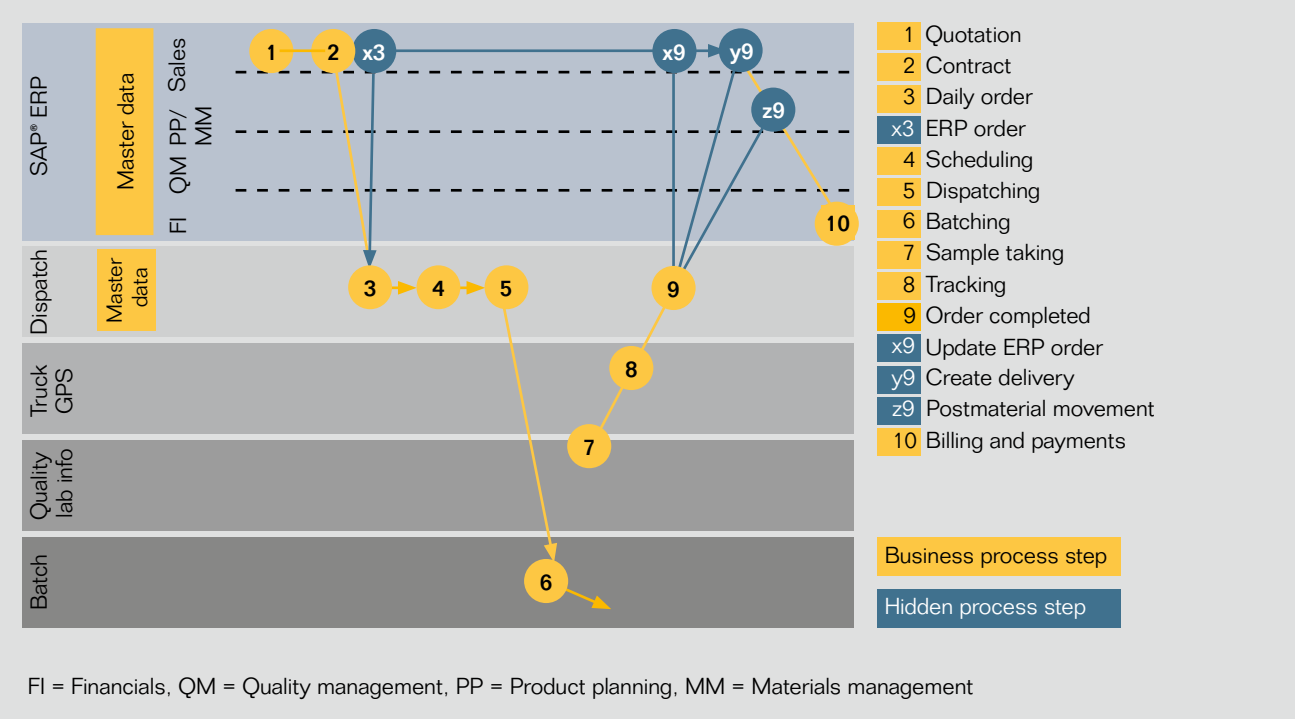

Figure 5: Level 2 – Services Integrated with Processes Limited to a Given System

Level 1: Most producers are at Level 1 of the evaluation matrix or below. At this level, business processes are implicitly defined by particular systems and are usually contained within that system. Data flow is integrated to support the handoff of master data and transactions. Each system generally remains a silo of automation, which allows very little information sharing. Often, entire subsystems are isolated and cannot be considered best of breed.

Level 2: At this point on the matrix, data can be transferred in batch or in near-real time (see Figure 5). Best-practice processes use basic services from other applications to support business processes but still need to duplicate information and some process steps on other systems. A Level 2 system will access information from other applications using SOA. Master data shared through services should be harmonized for this to work effectively.

Level 3: This level eliminates duplicate functionality and data and provides real-time information flow across the enterprise (see Figure 6). Best-practice processes use services to support business processes without duplication on other systems. A Level 3 system would use dedicated services provided by technology partners, such as dispatch. The services might be hosted by the provider, a data center, or the customer. An example would be the creation of an order on the ERP system, followed by the dispatch service used to allocate loads to the batch stack directly.

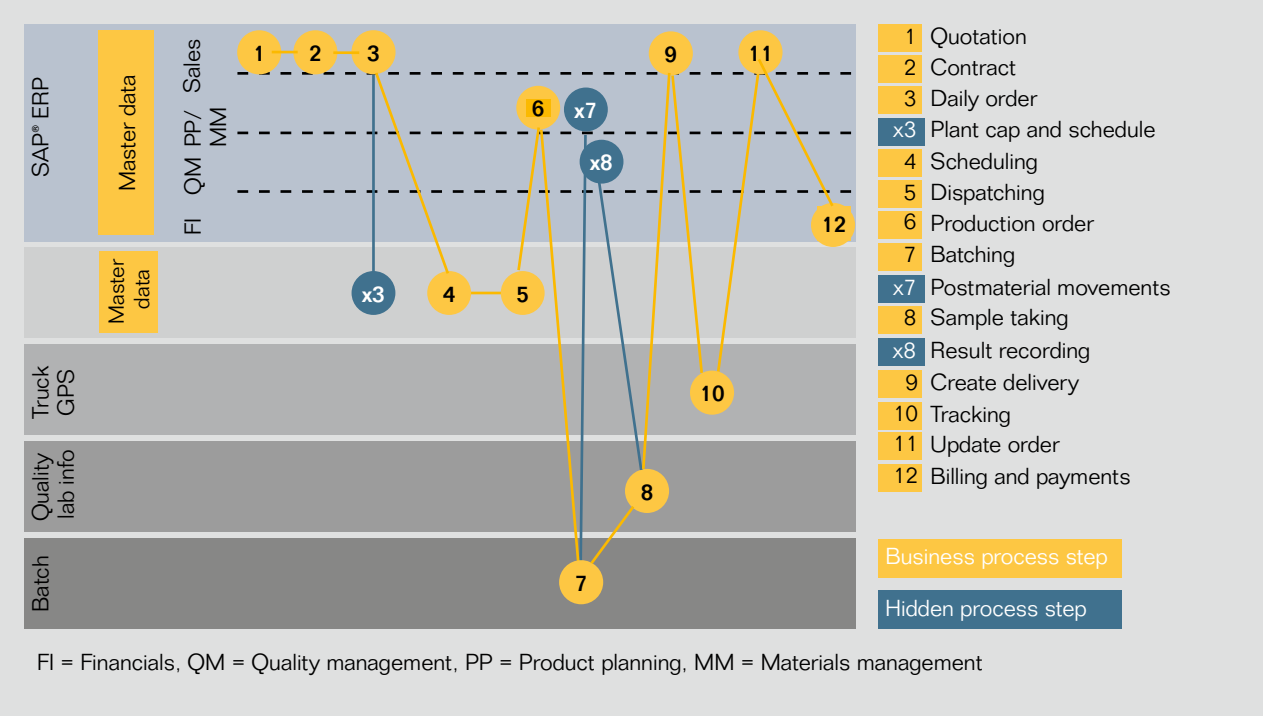

Figure 6: Level 3 – Many Systems Supporting a Business Process with Services

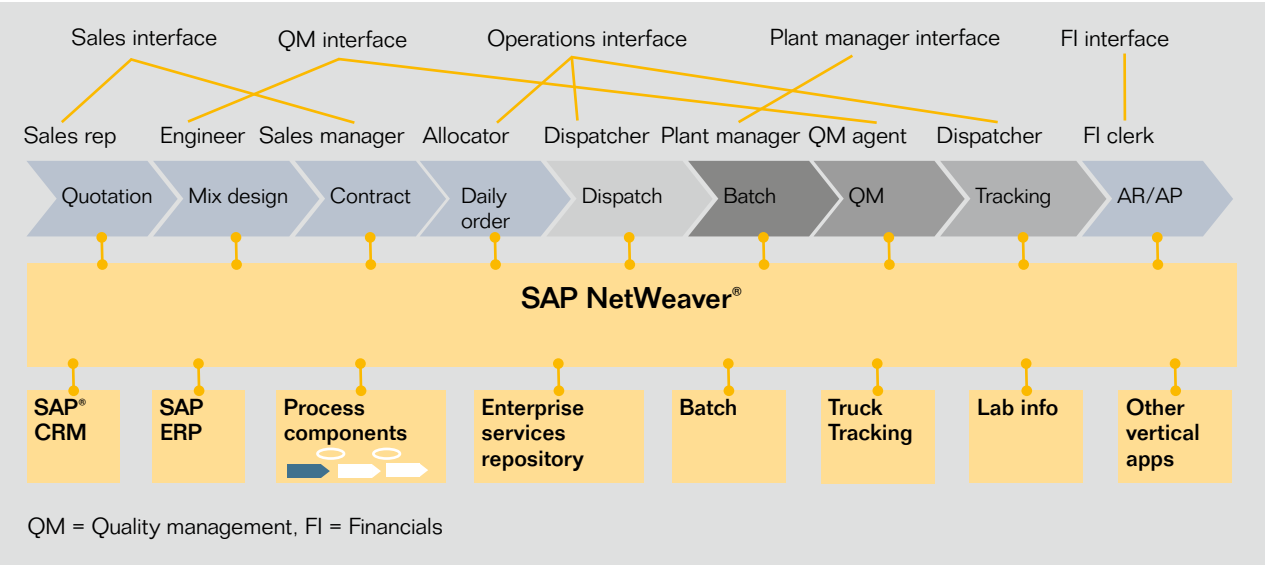

Figure 7: Level 4 – Composite Services and Single User Interfaces Unifying Processes

Level 4: At this level, composite applications use multiple services to present a single user experience (see Figure 7). For example, a dispatch tool can be created by bringing many services onto one user interface. The user experience is defined by the business process imposed on a system-neutral interface. Some applications are owned by the producer. Some applications use the software-as-a-service model. Others are commonly available as Web-based services. The user interface is an assembly of all applications needed for a dedicated business role. Users can access the interface from any modern computer system using standard browser technology. The notion of working on an ERP or dispatch system is no longer relevant. At Level 4, users think in terms of business process – such as allocating a truck, taking an order, or creating a batch – and not in terms of using a specific system to accomplish the task.

Overcoming Disassociated Systems

Ready-mix concrete plants are sometimes in locations with inconsistent network connectivity. When a plant is used to running in "connected" mode, unplanned switching to "unconnected" mode can reduce profit margins through lost business, inadequate credit checking, and poor customer service. An increased workload is required to process transactions based on manual tickets. Surprisingly, the problem is not limited to remote, third-world locations but often appears in technologically underserved areas of first-world urban centers. While disassociated locations remain a real problem, advances in communications technology are significantly reducing their impact.

In many areas of the world, networking technology such as multiple protocol label switching (MPLS) has led to nearly 100% uptime. MPLS is a networking option that exploits the Internet-node-based model yet builds in redundancy to prevent disruption. Additionally, redundant options are now economically available for satellite or cellular communication systems. Cellular systems, in particular, are bounding forward with network speeds and reliability to rival hardwired communication. Because we must anticipate some problems, however, requiring strict connectivity to the ERP system for all operations is not yet practical in all regions.

Best practices suggest multiple models for connectivity. Regions with reliable or redundant communications can push forward to higher levels on the evaluation matrix. Regions of poor communications will remain at Level 1 until the infrastructure is improved. Mixed models would exist within a particular geographical area as needed. The communications problem is real but getting smaller and may be effectively mitigated. The key is to prevent past problems from hijacking future benefits.

Through the working group on ready-mix concrete, SAP has structured an industry collaboration of partners interested in creating a vision for the future of IT systems and establishing executable best practices. While the working group's job has just begun, SAP plans to help the industry build a library of best practices and blueprints that will be freely shared among its customers to drive down risk and cost.

Developing Best Practices

Moving forward with standardization and reducing IT systems without disrupting operations is a critical challenge. The SAP working group on RMC has defined a best-practices model that takes a complete view, combining both technology and business process, to help producers move to higher levels on the evaluation matrix. Many best practices have already been developed. The effort to date has concentrated on the most problematic issues identified by producers in the working group. More best practices are needed. Below is a partial list of service areas in which best practices are available:

- Material and products
- Quote to order
- Order-to-load request
- Load request to ticket
- Ticket to invoice
- Invoice to cash
- Procure to pay

Applied Technology

Alignment of IT to business needs has suffered due to old technology that is still in use due to years of acquisition and limited budgets. Flat files, direct database exchange, and islands of automation reduce the ability of IT to develop comprehensive business solutions.

The Benefits of Service-Oriented Architecture

Service-oriented architecture changes the rules. The direct benefit of SOA for the construction materials industry is that most computerized systems can remain in place and be fully integrated into the enterprise. A rip-and-replace approach is not generally needed. Most important, technology partners now have the platform for developing and delivering SOA-based services for industry-specialized applications.

No longer must producers purchase entire application stacks to get a few specialized functions. Instead, they can directly access highly specialized services such as logistics optimization (true dispatch) or use native SAP services for ready-mix pricing. Highly specialized services can run in the same environment as general ERP services.

The SOA philosophy is to build once and reuse often. Consider ready-mix batching computers. If a logistics optimization service is run on the SAP software framework, then load requests can be sent to the plants. Producers have many different types and versions of batch controllers in operation. A uniform connector can be created for the SOA environment and individual connectors created by batch-control suppliers. The uniform connection definition can then be used throughout the enterprise. For example, customers often want to receive automatic notifications as loads are shipped. The service providing the text messages would reuse the defined connectors instead of reinventing a specialized interface. Once a connector is defined and created, it can be reused by applications across the enterprise.

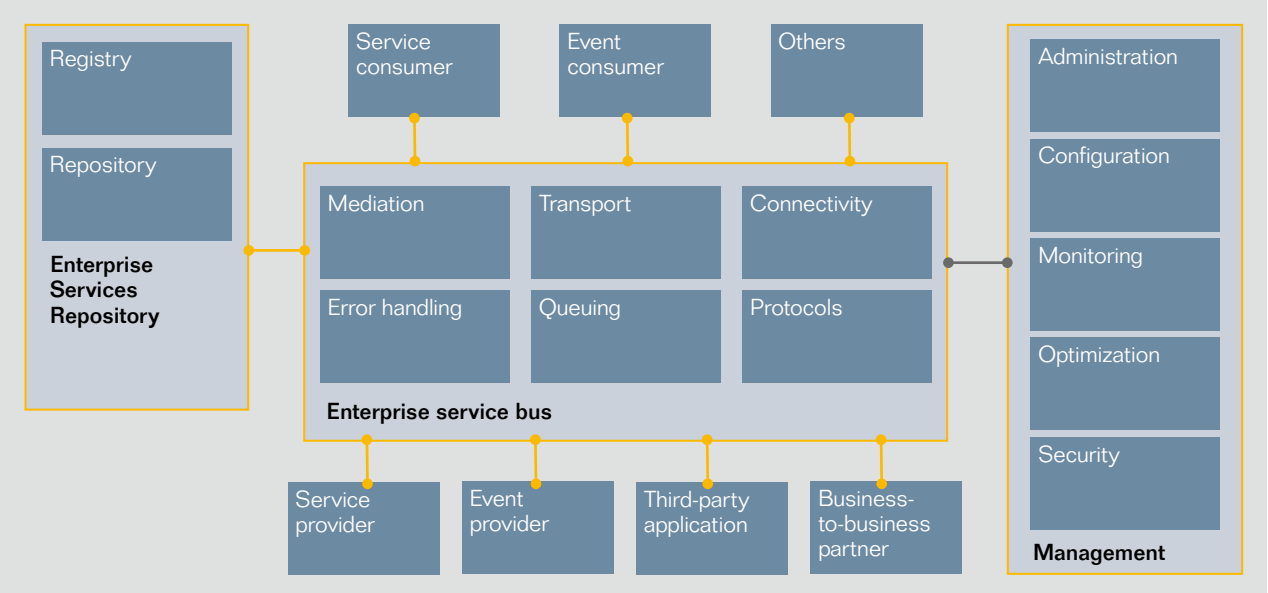

Figure 8: Typical SOA Landscape

An Overview of the SOA Landscape

The SOA landscape connects a **service provider** to a **service consumer**. (See Figure 8.) It includes these elements:

- The **registry** catalogs what each service is and where it is located. A Web Services Description Language (WSDL) file defines information for each service. A universal description, discovery, and integration (UDDI) library keeps track of all the WSDL files.
- The **repository** contains details on how to exchange information. Service-interface definitions and their metadata information are stored for each service. The repository works closely with the registry. The enterprise services repository (ESR) is a company-specific repository for encapsulated services.
- An **enterprise service bus** provides a single economical platform for the supporting functionality.
- **Management tools** are specialized services for the setup and daily operation of the environment.

BEST-PRACTICE EXAMPLES USING SOA

A HIGHLY FLEXIBLE FRAMEWORK

Producers need answers now. However, pressing daily demands of the industry make it difficult to reach the vision of best practices for technology and business process. Several examples presented below suggest how producers might move forward.

Opportunity Development: A General Example

New construction projects are closely tracked by service companies. A producer of ready-mix concrete could pay for a service that would provide information on all future projects in a region. The sales staff could then monitor future projects and provide quotations for qualified subcontractors. Figure 9 shows how such a service would be integrated. The composite user interface could be any neutral user interface, such as a Web browser, or could be directly included in the ERP interface.

Sales Order Existing Service Deployment: A Detailed Example

Historically, handling sales orders with different systems has been very problematic for the industry. The structure and data content of an industry sales order does not match most ERP systems. The SOA approach standardizes the information that must be exchanged and provides connectivity to any system. If the sales order master (see Figure 10) was contained on a third-party system, for example, the ERP system used for billing could have continuous, near-real-time access to the information.

The integration presented in this example uses the SAP NetWeaver® technology platform. The SAP NetWeaver Process Integration (SAP NetWeaver PI) technology allows virtually any type of connectivity, both into the platform and out of it. Legacy systems can thus be integrated with any system, including other legacy systems. In Figure 11, sales orders are coordinated between third-party applications and the SAP ERP application. The sales orders could just have easily been coordinated between two third-party systems. SAP NetWeaver PI has proved very useful and is often employed as a stand-alone integration platform.

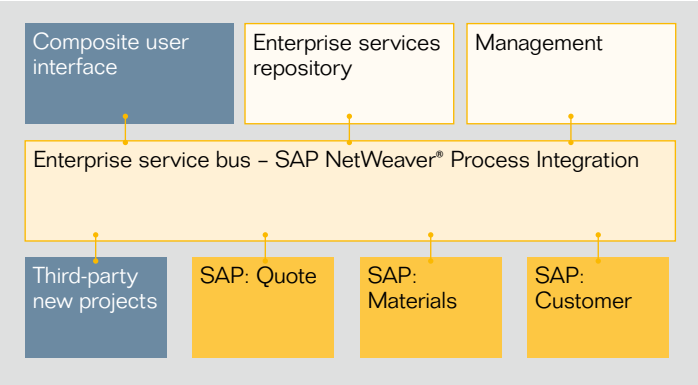

Figure 9: New Project Service Feed

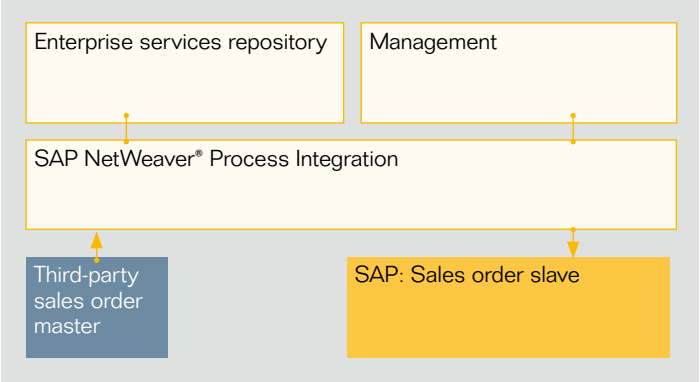

Figure 10: SOA Landscape Supporting Sales Order Data Exchange

Operations covered by the diagram are as follows:

1 Either an event triggers or a batch is initiated for the transfer of sales order data through the SOA adaptor.
2 The adaptor transmits the data to SAP NetWeaver PI for data transformation.
3 The transformed data is provided to a native SAP standard interface.
4 SAP NetWeaver PI transmits the sales order data to SAP ERP.
5 The sales order tables in SAP ERP receive the information.

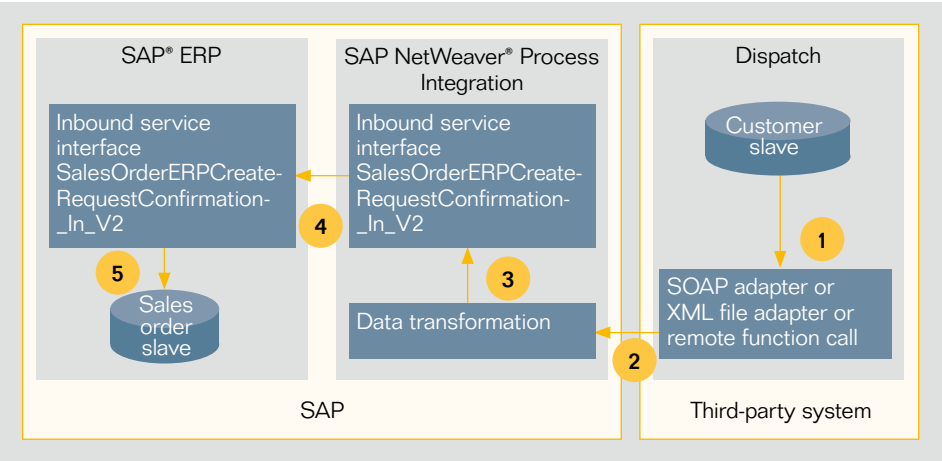

Figure 11: Real-Time Integration of Sales Orders with a Third-Party System

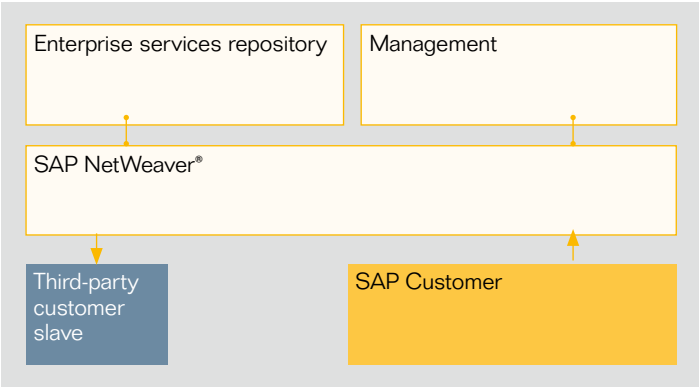

Figure 12: SOA Landscape Supporting Customer Master Data Exchange

Customer Master Data New-Service Creation: Detailed Example

The library of SAP services is large, but circumstances exist that require customized services. For instance, standard services exist for creating, reading, and changing customer master data by third-party systems. The third-party systems use the simple method explained above to inquire if any customers have been created, updated, or deleted. If there are changes, the information is returned to the requesting system.

If we want the third-party system to receive changes automatically, we can create an unsolicited, event-driven notification of changes (see Figure 12). This type of service can be created by assembling existing services in a straightforward manner.

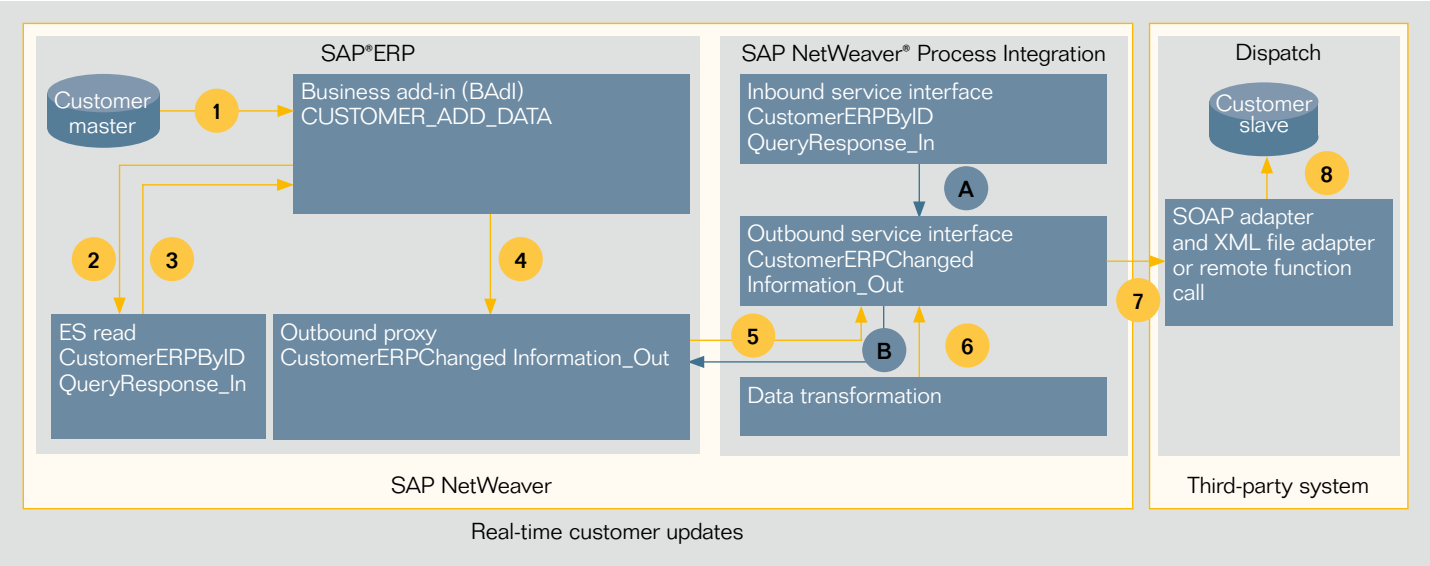

Figure 13: Custom Service Creation to Support Customer Master Data Transfer

Figure 13 illustrates an end-to-end example for unsolicited, event-driven updates of customer data. The example assumes that SAP software contains the master for all customer information. SAP NetWeaver PI is fully compatible with all prior versions and integration technologies of SAP software.

A dispatch system is connected to SAP software, per Level 1 of the evaluation matrix. The dispatch system is not capable of using the SAP customer records interactively and thus must have its own slave copy of the data. This is a current requirement of legacy systems. Since all customer record updates, creation, and deletion must happen on SAP software, a mechanism is needed to transfer the new information to the dispatch system automatically, provided the customer record is in the specified sales region.

In step A, the inbound "ReadCustomer" service interface is copied to an outbound service interface. In step B, an outbound proxy is generated from the newly created outbound service interface in SAP ERP via a transaction.

Operations covered by the diagram are as follows:

1 Any change to any customer record triggers an event.
2 An enterprise service read action is started.
3 Information from the read action is pushed directly into the interface of the outbound proxy.
4 An outbound proxy is triggered to send the information to SAP NetWeaver PI.
5 SAP NetWeaver PI receives the data.
6 Data transformations are performed.
7 SAP NetWeaver PI makes the data available to external services.

The total amount of coding for this operation in SAP tools is less than 50 lines. Once done, the code can be readily reused for other data types or transactions.

Integration for Legacy Systems

Most major producers are already using SAP software. The technical examples provided above will work with both old and new software versions through use of SAP NetWeaver PI. The software can handle almost any type of interface needed, from the simplest flat file transfer to highly sophisticated Web-based services. Producers can use best practices to define their business processes first and then distribute those processes using SAP NetWeaver PI and SOA.

SUMMARY AND CONCLUSION

MENDING IT SYSTEMS, CUTTING RISK, AND IMPROVING RESULTS

SOA is evolutionary by design; it fully assumes a heterogeneous environment and allows more to be done with the same resources. The move to SOA can be started at any level of a business and slowly migrated throughout an enterprise as is economically justified. Producers can also start and deploy technology and process in an SOA landscape regardless of their current level of IT sophistication.

IT Systems Are Broken

IT systems for the bulk construction materials industry are fractured. Producers have dozens of redundant, overlapping systems and business processes. As a result, producers are handicapped by lacking the basic information they need to run their companies. They are reluctant to invest in fixing the problem, however, because IT projects have often failed to establish clear financial paybacks.

The default course of action is to put systems together quickly in small projects that will minimize risk. This requires customized interfaces with embedded business logic that severely limit transparency. Creating and maintaining the systems are expensive due to complexity. If the original programmer leaves the company, the interfaces often become "toxic" – impossible to change and left alone at all costs. A change of any one system will disrupt an entire series of custom interfaces and jeopardize productivity.

Some producers have surveyed their system landscapes and found them unacceptable. In the absence of other options, they have commissioned large, expensive, rip-and-replace projects. For every verifiable large project success, there are multiple examples of costly failure – many resulting in the job loss of senior leaders and some in the demise of the company. The net result is an industry of accidental architecture in deadlock.

A Better Way Forward

Producers must eliminate duplicate systems and process, avoid disruptive rip-and-replace projects, and demonstrate a clear return on investment for IT expenditures. They can increase efficiency by leveraging domain services from niche technology partners operated on an ERP backbone with standardized best practices and open architecture. This creates a win-win-win ecosystem for the producer, niche technology partners, and SAP. Niche technology partners will increase the depth and breadth of their services by concentrating on their specialized domain expertise. Producers get harmonized systems with comprehensive business processes at lower cost and risk due to:

- **Service-oriented architecture** – SOA accepts today's fractured reality and incrementally drives a harmonized, lower-cost IT landscape. SOA provides tools to build once and reuse often. As interfaces are converted, they are available to all other systems. Expensive, duplicate functionality and systems are removed.
- **Uniform business processes** – Common business processes allow the measurement, correction, and control that lead directly to best practices. Inefficiencies are driven out, transparency increases, and vertical integration delivers on the promise of pricing power.
- **Composite applications** – Vendor-neutral user interfaces that combine functionality from many systems on one screen can boost productivity. Employees using composite applications have access to all the information they require to make good decisions quickly. Selected customers can participate in the quote-to-cash process, driving down back-office labor costs for both producer and end customer.

Special thanks go to Craig Yeack, a consultant to SAP partners and former global IT director for Hanson PLC, for guiding the content of this paper with his deep knowledge of and comprehensive experience in the construction materials industry.

Conclusion

The bulk construction materials industry can reduce costs of implementation and operation by using SOA, business process management, and best practices. A working platform exists to deliver those results today. Clear and common processes can be distributed across fractured systems using an SOA platform supported by SAP NetWeaver. As redundant processes are eliminated, employees become more productive and overlapping systems can be removed. As best practices are identified, they can be imposed on the common framework, further increasing productivity.

This vision allows producers to achieve computer automation in very small chunks using a common set of tools. IT risks are lowered, project time is reduced, and a clear connection between deliverables and return on investment is possible. The old industry IT practices are insufficient to meet new market-driven demands. Advanced methods that exploit proven tools such as SAP NetWeaver deliver low-risk results, cut enterprise costs, and improve agility.

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