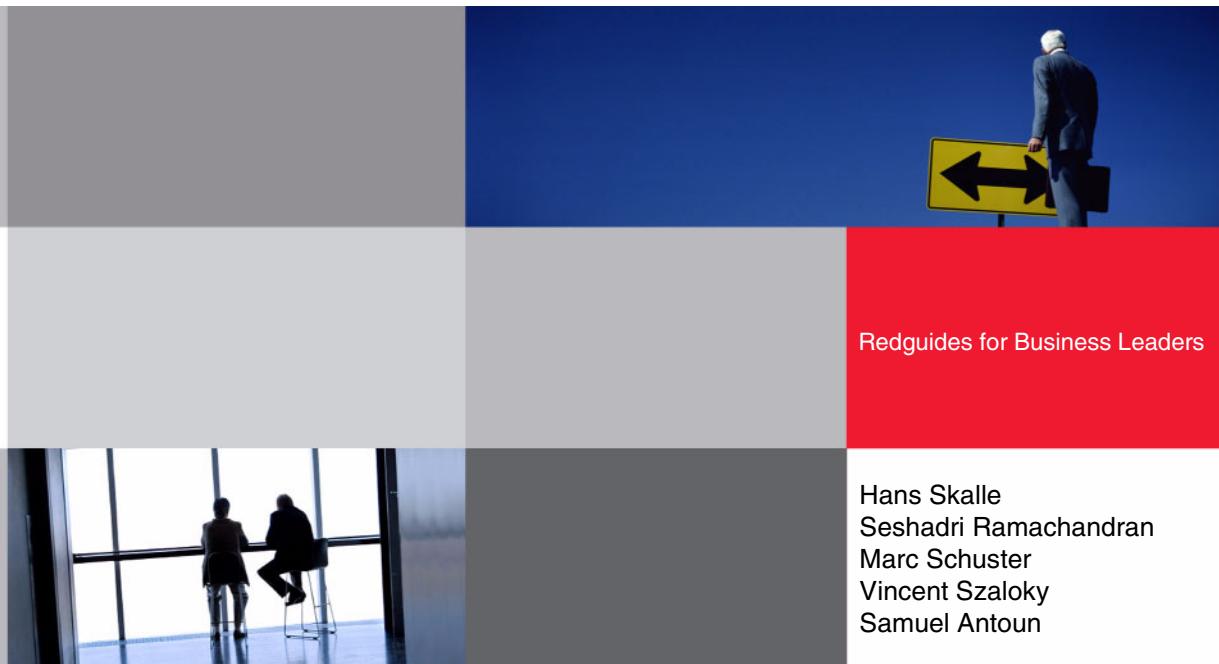


Aligning Business Process Management, Service-Oriented Architecture, and Lean Six Sigma for Real Business Results



- Realize the value of business process management
- Understand how SOA enables BPM and Lean Six Sigma
- Learn about the think big, start now steps



Executive overview

Lean Six Sigma (LSS) produces real results in difficult economic times by uncovering process waste, reducing non-value adding activity, and increasing productivity. The benefits are even felt in IT. According to the consulting firm McKinsey & Company, “companies can reduce application development and maintenance costs by up to 40%.” That application development productivity can be improved “by up to 50%” by applying LSS techniques, freeing budget for needed investments.¹

Business process management (BPM) and service-oriented architectures (SOAs) combine with LSS to accelerate improvements and results. At the same time, they increase organizational flexibility and technology enabled responsiveness.

Many successful companies have found that the linkages are clear. Early adopters who have worked their way past cultural and organizational barriers are seeing impressive performance and financial results:

- ▶ Improved responsiveness to market challenges and changes through aligned and significantly more flexible business and technical architectures
- ▶ Improved ability to innovate and achieve strategic differentiation by driving change into the market and tuning processes to meet the specific needs of key market segments
- ▶ Reduced process costs through automation and an improved ability to monitor, detect, and respond to problems by using real-time data, automated alerts, and planned escalation
- ▶ Significantly lower technical implementation costs through shared process models and higher levels of component reuse
- ▶ Lower analysis costs and reduced risk through process simulation capabilities and an improved ability to gain feedback and buy-in prior to coding

The rewards can be great, especially for those who take action now.

This IBM® Redguide™ publication is intended to help companies that are leaders in their markets and are looking for new ways to differentiate themselves from their competitors. In this guide, we describe the key BPM, SOA, and LSS components, highlight the linkages between them, and summarize the results that leading firms have achieved. We outline the

¹ “Applying lean to application development and maintenance,” *The McKinsey Quarterly*, May 2007:
http://www.mckinseyquarterly.com/Information_Technology/Applying_lean_to_application_development_and_maintenance_1979_abstract

think big, start now steps that are needed to move your own initiative forward. In this guide, we also suggest ways to successfully avoid some of the barriers that have hampered others by focusing on the tools that deliver measurable results quickly.

Key concepts

Lean Six Sigma and business process management have much in common. Both methodologies use iterative improvement and design techniques to deliver financial and performance benefits through better managed and optimized processes. By combining key concepts from LSS with the capabilities of BPM (including process modeling and analysis, automation, and executive dashboards that deliver real-time performance metrics to process consumers), a company can ensure that its people are focused on the most meaningful value-added work. SOAs add increased flexibility so that processes can be quickly assembled from reusable Lego-type building blocks of technical functionality. Companies that successfully bring together LSS, BPM, and SOA initiatives will realize a competitive advantage.

To fully understand the linkages between BPM, SOA, and LSS, and fully realize the benefits of these linkages, it is important to establish definitions and list key concepts for each initiative.

Business process management

Business process management is a management discipline that focuses on the following areas:

- ▶ Aligning internal and external business process performance and results with the core competencies, strategic objectives, and business goals of the organization
- ▶ Understanding and documenting business processes so that they can be consistently executed
- ▶ Measuring, monitoring, and controlling process performance including key inputs and outputs
- ▶ Actively designing and improving business processes to meet or exceed the expectations of customers while achieving organizational goals (for example, cost and revenue)

Within the BPM discipline, business processes are normally considered corporate assets that are both the source of differentiation and value to customers and shareholders. Viewing processes as assets is an important perspective. Those who lack this perspective often spend unnecessary time chasing and dealing with process-related problems. Time spent on resolving problems (fire fighting) limits the time that is available to focus on growth and innovation. It also impacts customer satisfaction. A more disciplined approach, especially one that takes advantage of BPM technology, is proving to be worth the investment.

The role of technology, then and now

For years, BPM referred to application customization and the creation of large, sophisticated systems that were the source of both competitive advantage and business stability. Companies that invested in these systems often came to dominate their industries.

Over time, however, business process logic became more deeply embedded in these customized applications, locked away in millions of lines of undocumented code and proprietary data structures that were slow, risky, and expensive to change. To make matters worse, as change became more difficult, the frequently chosen alternative was to duplicate

needed functionality which meant that even more specialized code and manual processes were created.

What was the result? The result was higher IT costs and lower productivity, growing IT project backlogs, and an inability to respond to new or changing market opportunities. According to IBM Research, over 70% of the typical IT budget is spent on overcoming the limitations of existing systems, while less than 30% is spent on acquiring new capabilities that can provide a competitive edge to the business. When you add to this the business costs associated with manual workarounds and the impact of bad or stale data on decision making, the picture becomes bleaker still.

Here is something else to consider: According to studies by the Radicati Group, in 2008, business users sent or received 156 e-mails per day “with no guarantee that users actually read the messages that are most important.”² Many of today’s business processes are loosely structured and held together with e-mail, spreadsheets, instant messaging, and phone calls. In fact, we have even run across improvement teams whose newly designed processes were based on sending and receiving e-mails. An e-mail based process, by its nature, is unstructured and invisible to process owners (unless they are copied, which increases the e-mail overload). BPM technology provides structure and visibility through managed work lists and process monitors that track transactions in near real time. It also reveals bottlenecks before larger problems occur.

Today the pressure is on the CIO and the IT organization to identify, enable, and create new business opportunities while dramatically reducing operating costs. In virtually every industry, aggressive, more technologically agile competitors are now offering new products and services faster or are executing processes more efficiently, to win customers, market share, and profit.

Thankfully, advances in technology and technical standards, specifically SOAs, are now allowing IT budgets to be reclaimed and the organization to be repositioned. New technical tools and capabilities complement traditional BPM methods and even unlock existing application functionality to greatly accelerate process improvement and innovation. Leading firms are using BPM technologies to accomplish the following tasks:

- ▶ Choreograph human and system interactions
- ▶ Provide real-time visibility into key performance indicators (KPIs)
- ▶ Manage escalations in the event of failure or missed targets
- ▶ Provide the foundation for continued process improvement and optimization

IBM WebSphere Dynamic Process Edition

IBM WebSphere® Dynamic Process Edition is an integrated, SOA and standards-based BPM platform. It is proven to be highly flexible, reliable, and capable of securely handling large transaction volumes. A BPM platform, unlike some stand-alone BPM solutions, works with and simplifies existing technical environments. It does so by enabling back-end systems integration, working easily with e-mail systems and portals, and providing capability that can be extended to manage the services environment through registries and repositories. Table 1 on page 4 shows the capabilities that WebSphere Dynamic Process Edition includes.

² “Does E-mail Truly Waste Time?”, Radicati Group, Sept. 9, 2008: <http://www.radicati.com/?p=1394> and
“Addressing Information Overload in Corporate E-mail”, Radicati Group, April 23, 2007:
<http://www.radicati.com/?p=1042>

Table 1 WebSphere Dynamic Process Edition capabilities

BPM platform component	WebSphere Dynamic Process Edition capabilities
Process modeling, analysis, and simulation capability (WebSphere Business Modeler)	<ul style="list-style-type: none"> ▶ It enables current and future state processes to be modeled, compared, and analyzed from different perspectives including value-add, waste, unnecessary complexity, time/cost, and the ability to meet regulatory requirements. ▶ Through simulation, it allows improvement alternatives to be evaluated with minimal risk, aiding in project and implementation planning so that the benefit of each improvement phase can be more easily determined.
Process choreography and exception handling	<ul style="list-style-type: none"> ▶ It manages human workflows and systems interactions including exception handling, escalation, and compensation (rollback) in the event of process failure or a triggering event such as an out-of-bounds KPI. ▶ It enables secure, rapid, and reliable message routing between systems and processes and includes advanced systems integration capability in addition to basic Web services.
Rules and policy management	<ul style="list-style-type: none"> ▶ Decision or approval criteria and known process variation are abstracted out of manual processes and software code and into flexible business rules and policies that are expressed in business terms and controlled by business users. ▶ Processes can be changed more rapidly and with lower IT involvement. Dynamic process assembly capability allows processes to be made specific and optimized at run time based on transaction content and context (for example who, when, where), dramatically increasing flexibility and service and process reuse.
KPI and measures definition	<ul style="list-style-type: none"> ▶ KPIs and metrics can be designed by business analysts and LSS teams by using a simple checkbox approach or an expression builder with which more complex dashboard measures can be designed. ▶ Results can be imported back into the process models to facilitate the next cycle of improvement.
Web-based model access and review	<ul style="list-style-type: none"> ▶ With the Web publishing capability, proposed improvements can be shared remotely with those who are affected prior to coding and implementation, aiding change management and improvement buy-in while reducing risk and costs. ▶ Feedback and additional improvement ideas can be solicited through an embedded discussion forum. Existing process documentation can be published to encourage consistent execution and reduce training costs.
Business/IT collaboration tools	<ul style="list-style-type: none"> ▶ Business and IT analysts use the same process models to develop BPM solutions, switching between business and technical modeling modes as the project goes through requirements definition and design. ▶ Asset repositories facilitate the management and reuse of process and service components that can be browsed and quickly added to process models. ▶ This approach results in an improved understanding of solution requirements and helps close the business and IT communication gap while accelerating process design and implementation.
Process monitoring, control, and optimization (WebSphere Business Monitor, WebSphere Business Space)	<ul style="list-style-type: none"> ▶ KPIs are visible in Web-based dashboards in real time, and drill down capability reveals additional detail. Business users and process owners can add their own measures with limited IT involvement, speeding responsiveness and analysis. ▶ Event-triggered alerts are issued, warning of out-of-bounds, missed service-level agreements (SLAs), delays or other conditions that require action. Corrective action processes can be automatically started.

For real-world examples of these capabilities, see “Leading practices” on page 29.

Service-oriented architecture

From a technical perspective, a *service-oriented architecture* is an architectural style that describes a set of patterns and guidelines for creating loosely coupled, business-aligned services. These services are implemented by using a combination of technologies, products, application programming interfaces (APIs) and supporting infrastructure extensions. A *service* is a software resource (coded functionality) and description that is made available by a service provider for searching, binding, and invocation by a service consumer.

From a business perspective, an SOA represents new opportunity. An SOA is not a product but a collection of capabilities. It allows discrete bits of high-value business functionality to be packaged in software code, called *services*, and then used or shared over the Web or company intranet.

A common analogy is that of Lego-type building blocks. Rather than coding functionality into a large custom application as might have been done in the past, imagine a business process made up of different building blocks, each of which performs specific tasks or offers unique, targeted functionality. These service building blocks can take longer to design and code initially, but they are easier to test, easier to reuse, and cheaper to maintain over time. When new or improved functionality comes along, such as LSS improvement and design, simply replace one building block with another. This flexibility causes SOA to be almost universally embraced by IT shops around the world.

An AMR survey of 405 companies found that 53% had active SOA projects by the end of 2007 and the percentage is projected to grow rapidly.³ The reason is simple. When done right, SOA is business-focused, and business funds IT. Those companies that have been most successful have used SOA and BPM to build deeper relationships between the IT and business communities. These companies have enabled these communities to deliver measurable results more quickly through modular components that are quick to deploy and reuse.

New flexibility for process improvement and design

According to Forrester Research, one of the key principles of service orientation is “designing services within a business process context and aligning services with individual process steps.” In doing so, they argue that the organization “provides a more coherent story at the enterprise level between the enterprise architecture and the process architecture”.⁴ Figure 1 on page 6 shows how process steps relate directly to the services that implement the process.

³ Ian Finley, Jennifer Hackbush, *The SOA Spending Report, 2007-2008: Spending Reaches New Heights*, AMR Research, February 25, 2008: <http://www.amrresearch.com/Content/View.asp?pmillid=21154>

⁴ Andy Salunga, *What Process Experts Need To Know About SOA*, Forrester Research, April 2008: <http://www.forrester.com/Research/Document/0,7211,45534,00.html>

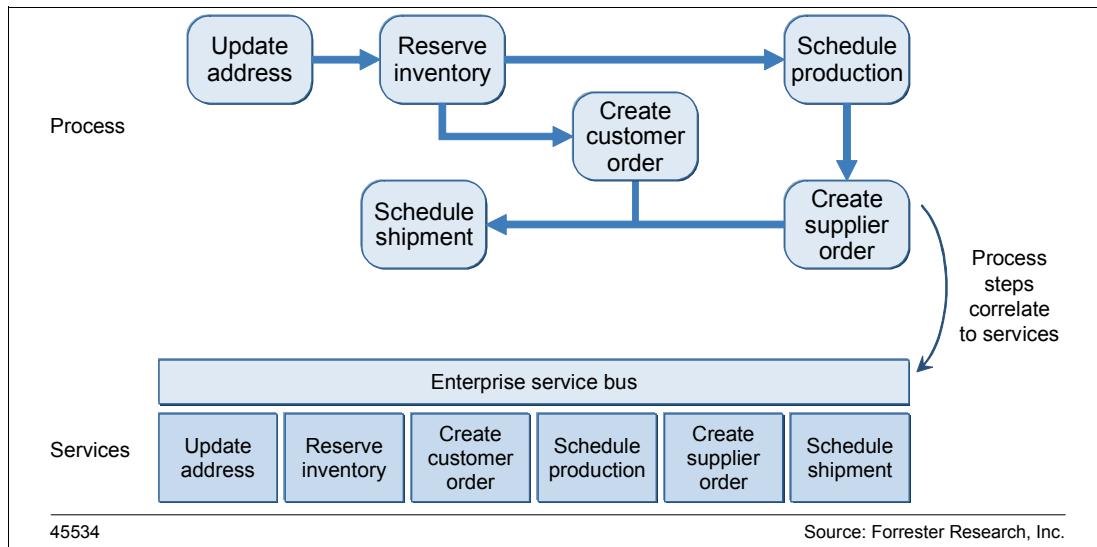


Figure 1 Process steps related to services that are implementing the process⁵

Imagine a capability that dynamically assembles these services at run time in different ways to meet specific needs. The same basic process is involved, but it is *self-configuring* to meet individual requirements. For example, perhaps you want to execute a subset of process steps for one customer type and a different but overlapping set of steps for another customer type. Or perhaps you want to test a new product or service offering but only to those online customers based in one geographic area and only for a limited time. WebSphere Dynamic Process Edition capabilities make this possible through flexible business policies that govern the selection of services.

Perhaps you want to outsource a non-core business process. It is more likely that a business partner makes the needed functionality available through plug-and-play services, for example credit checks. This capability opens up creative new alternatives to LSS teams that are looking for innovative ways to solve process problems or when designing new ones.

Services are standards-based with specific inputs (requests) and outputs (replies) that are clearly defined. They come in the following different shapes and sizes among others:

- ▶ Lower-level IT services whose role is primarily technical (for example “update this table in that database”)
- ▶ Higher-level business services that work with multiple lower-level services to accomplish a more complicated task
- ▶ Composite business services that group multiple services together with a graphical user interface (GUI), human-to-human workflow, business rules, or a measures dashboard to create an SOA application

Functionality from the existing applications can also be exposed as services, thereby enabling these new applications to use and reuse the older code.

Service reuse key to ROI

Breaking functionality down into smaller pieces makes sense provided that the piece or building block can be reassembled, rearranged, and reused easily. This often means that more time is spent up front in designing for reuse. However, a bigger payback waits downstream as time and budget are freed to focus on innovation, differentiation, and the overall return on investment (ROI).

⁵ Ibid.

However, traditional development paradigms might tempt programmers to code process variation and complexity into the service itself. In doing so, the programmers make it less and less reusable over time and more and more costly to maintain, putting your development team right back where they started. With WebSphere Dynamic Process Edition business rules and policies, complexity can be abstracted from the process and the services, maximizing reuse. Figure 2 shows how reuse and ROI build over time with an SOA approach to design.

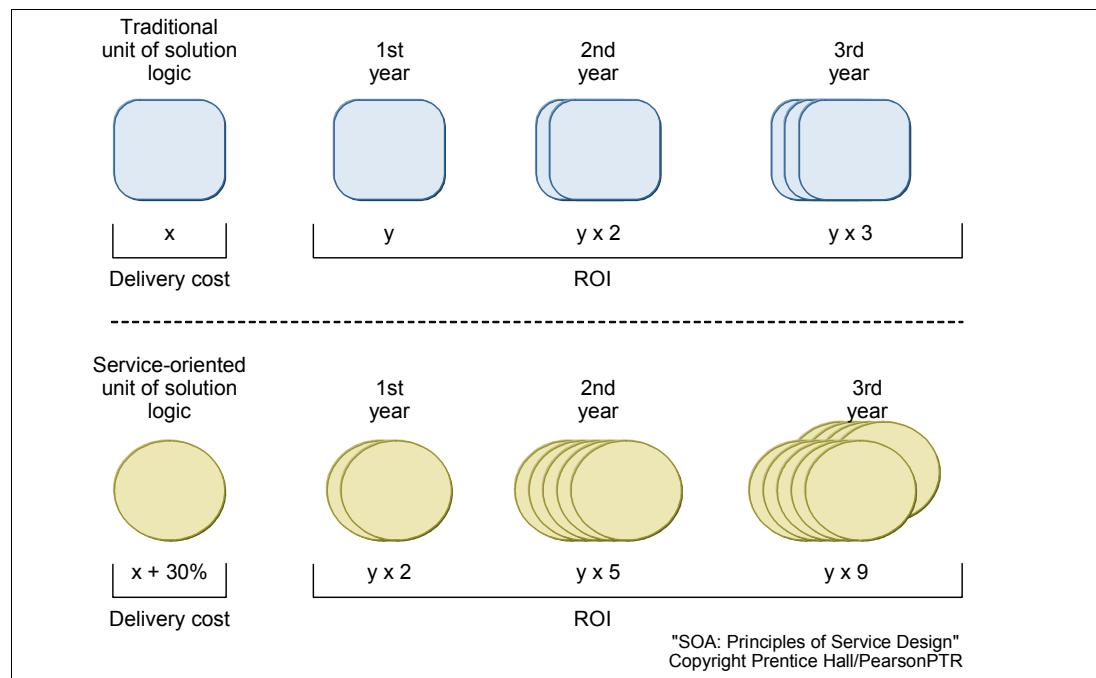


Figure 2 An example of types of formulas that are used to calculate ROI for SOA projects⁶

Duplicate functionality exists everywhere in the average enterprise. As processes are improved by using the new BPM technologies, expensive and inconsistent, yet essentially duplicate, functionality can be replaced with a single reusable service. Service registries and repositories, which are used to manage and govern service reuse, can be queried to determine whether an existing service is an appropriate candidate for saving time and money and speeding implementation. LSS teams are perfectly positioned to guide this as they work their improvement and design projects.

No longer will business process logic be deeply embedded in application code, where it is locked away and expensive to change. Instead, process logic will exist in the form of high value business services that are reusable. Processes that use these services will be much more flexible and cheaper to maintain over time. They will allow businesses to achieve dramatic results in responsiveness, cost effectiveness, and profitability.

Lean Six Sigma

Lean, which is a term coined by Womack,⁷ in the broadest sense, is a business transformation methodology that derived from the Toyota Production System (TPS). Within the Lean methodology, there is a relentless focus on increasing customer value by reducing

⁶ From Thomas Erl, *SOA: Principles of Service Design*, Prentice Hall PTR, First Edition, July 28, 2007, ISBN: 0132344823.

⁷ James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed the World: The Story of Lean Production – Toyota's Secret Weapon in the Global Car Wars That Is Now Revolutionizing World Industry*, Free Press, March 13, 2007, ISBN: 0743299795.

the cycle time of product or service delivery through the elimination of all forms of *muda* (a Japanese term for waste) and *mura* (a Japanese term unevenness in the workflow).

Six Sigma was a concept developed in 1985 by Bill Smith of Motorola, who is known as “the Father of Six Sigma.” This concept contributed directly to Motorola’s winning of the U.S. Malcolm Baldrige National Quality Award in 1988. Six Sigma is a business transformation methodology that maximizes profits and delivers value to customers by focusing on the reduction of variation and elimination of defects by using various statistical, data-based tools and techniques.

Both methodologies focus on business processes and process metrics while striving to increase customer satisfaction by providing quality, on time products and services. Lean takes a more holistic view. It uses tools such as value-stream mapping, balancing of workflow, or *kanban* pull signaling systems to trigger work, streamline and improve the efficiency of processes, and increase the speed of delivery. Six Sigma takes a more data-based and analytical approach by using tools to deliver error-free products and services, such as the following examples:

- ▶ Voice of the customer (VOC)
- ▶ Measurement systems analysis (MSA)
- ▶ Statistical hypothesis testing
- ▶ Design of experiments (DOE)
- ▶ Failure modes and effects analysis (FMEA)

Six Sigma uses an iterative five-phase method to improve existing processes. This method is known as *Define, Measure, Analyze, Improve, Control (DMAIC)*, and normally underpins LSS.

Over the last 10 to 15 years, an increased need for accelerating the rate of improvement for existing processes, products, and services has led to a combination of the two approaches. As shown in Figure 3, LSS combines the speed and efficiency of Lean with the effectiveness of Six Sigma to deliver a much faster transformation of the business.

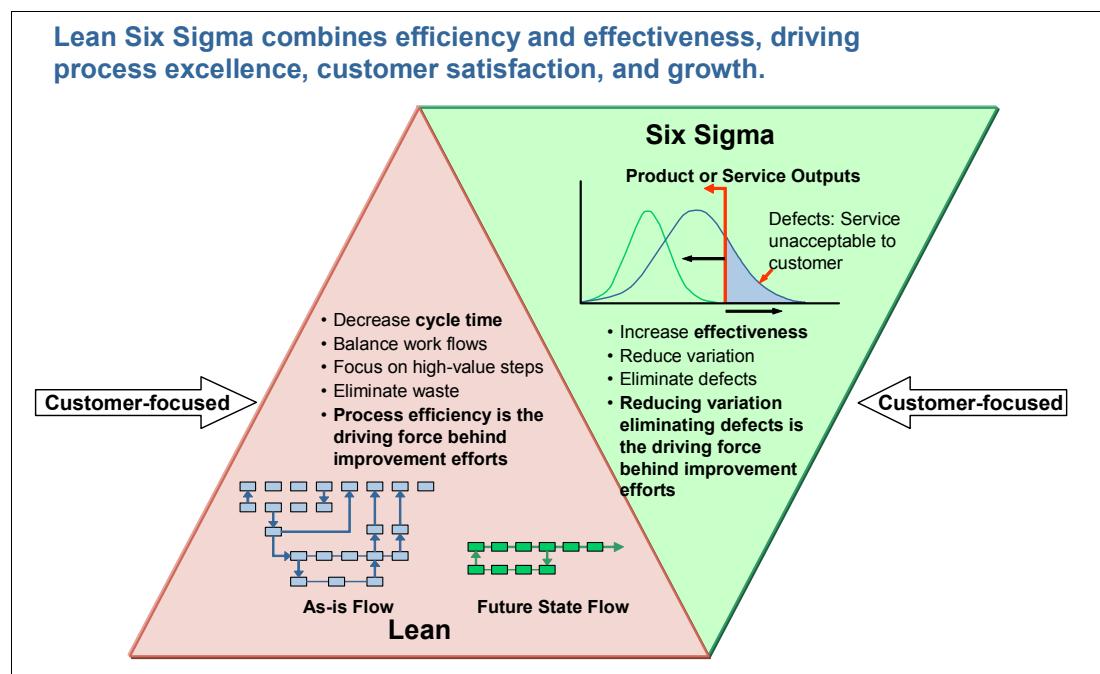


Figure 3 Lean Six Sigma

In recent years, LSS has also incorporated components of the systems-based approach to process improvement found in Goldratt's Theory of Constraints (TOC).⁸ The TOC views the business as a system of interconnected and interdependent processes where the inputs or outputs of any one step along the way can limit or constrain the performance of the whole. This is analogous to a linked chain where the performance of the chain is only as good as its weakest link. Therefore, the best way to improve overall performance is to achieve the following goals:

- ▶ Understand the whole chain, as opposed to just the isolated links.
- ▶ Identify the weakest link or barrier to overall system performance at any given time.
- ▶ Isolate and strengthen the performance of the weakest link to improve overall system performance.

All other parts of the system are then subordinated, and their local performance can even be *detuned* to strengthen the weakest link. This is where BPM can help. The steps in the business processes are the links in the business system chain. Through process modeling, simulation, and monitoring, you can understand the system and help isolate and elevate the performance-limiting constraint, which can be eliminated by applying the LSS approaches.

Designing new processes, products, and services

Companies such as General Electric developed the Define, Measure, Analyze, Develop, Verify (DMADV) roadmap to design and implement new products or services. Others such as PricewaterhouseCoopers consultant group (now part of IBM Global Business Services) developed Define, Measure, Explore, Develop, Implement (DMEDI) and still others used Conceive, Develop, Optimize, and Verify (CDOV) roadmaps for new product development. Most companies integrate these Design for Six Sigma (DFSS) approaches with their existing new product development stage gate processes.

Toyota also pioneered an improved system to develop new cars, which lead to the successful development of the Toyota Prius. This little known *Lean Product and Process Development* is a revolutionary but proven system.⁹ It can help reduce development time and resource consumption by as much as four times, reduce the risk of cost and schedule overruns and quality issues by as much as 10 times, increase innovation by as much as 10 times, and reduce capital costs. It uses such concepts as set-based concurrent engineering, cadence, pull and flow. It has also been adopted for the development of products and software.

Working technology and technique with LSS enabled by BPM

LSS achieves business transformation through the coordinated execution of multiple process improvement and design projects. There are three keys to success in this transformation:

- ▶ Selection of the right projects for improvement or design
- ▶ Execution of the projects by using methodologies embodied in LSS
- ▶ Continual management of processes to achieve business strategies and goals

The first and third components are strategic in nature, where the second component is tactical. BPM capabilities, including modeling, simulation, and real-time control over processes, can play a significant role in enabling all three areas. Project selection by using a BPM framework provides sustainable improvement and results in the achievement of both short- and long-term strategic objectives and business goals.

⁸ Eliyahu M. Goldratt and Jeff Cox, *The Goal: A Process of Ongoing Improvement*, North River Publishing Corporation; Third Edition, July 2004 ISBN: 0884271781.

⁹ Allen C. Ward, *Lean Product and Process Development*, Lean Enterprise Institute, Inc., 2007, ISBN 978-1-934109-13-7.

George Eckes, in *The Six Sigma Revolution: How General Electric and Others Turned Process into Profits*,¹⁰ describes how BPM can play a significant and strategic role in enabling Six Sigma. He proposes a BPM framework that addresses the strategic first and third components. We extend this framework into the LSS and BPM Deployment Framework shown in Figure 4. The elements of BPM are displayed in blue and integrated with LSS (in white).

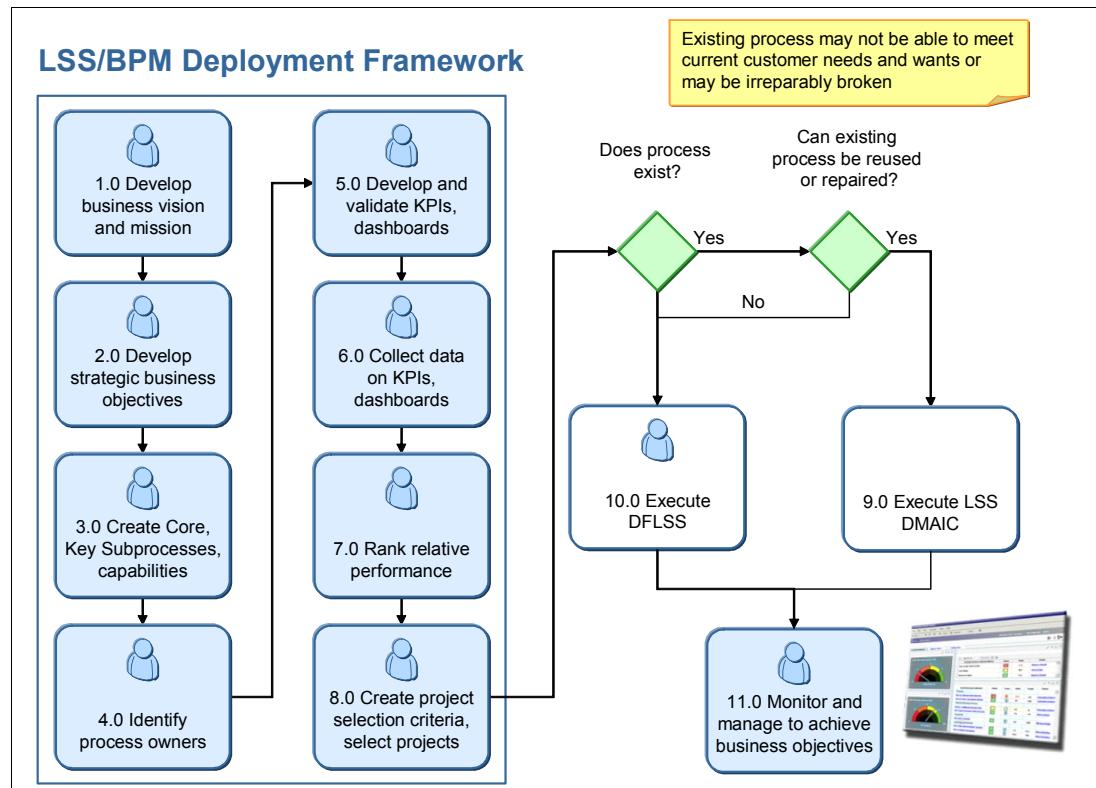


Figure 4 LSS and BPM Deployment Framework

When executed correctly, this BPM-based approach to LSS deployment ensures that projects are tied to strategic business goals and are targeted in areas that will yield the most benefit for resources deployed. Placing early emphasis on strategic capabilities, core and enabling business processes, process owners, and KPIs is critical.

Strategic capabilities are key to the abilities to be competitive, such as the ability to rapidly acquire new customers through innovative products and services. Core processes are key business assets that are the source of competitive differentiation. Eckes defines a core process as “a set of cross-functional activities or steps that have a profound impact on achieving strategic business objectives, either directly or indirectly”.¹¹

KPIs are quantifiable measures that provide insight into the health of the business system. Identifying and resolving problems and constraints at this level will deliver measurable business results more quickly. This phase of LSS is sometimes referred to as the *predefine* or *recognize* phase, and the key output from this step is a portfolio of clearly aligned, ready-to-assign projects.

¹⁰ George Eckes, *The Six Sigma Revolution: How General Electric and Others Turned Process into Profits*, John Wiley, First Edition, November 10, 2000, ISBN: 978-0-471-38822-7.

¹¹ Ibid, page 19.

As the core processes, key sub-processes, enabling processes, and strategic and core capabilities are identified and evaluated, an initial *heat map* can be developed. A heat map indicates the following information:

- ▶ Which processes are the most valuable and differentiating to the business
- ▶ Which are the poorest relative performers
- ▶ Where duplicate functionality and systems exist
- ▶ Which might be outsourced
- ▶ Which might be offered as outsourced services to other companies

A heat map also aids in the prioritization of KPI dashboard deployment with the dashboards providing needed real-time visibility into business system performance and improvement results.

During this exercise, it is common to find that the same business processes, process components, or functional capabilities exist in multiple divisions or departments. Eliminating this duplication can dramatically reduce costs, which is a task that BPM helps with.

One large U.S.-based company with dozens of business units used IBM SOA-based BPM technology to begin the process of transformation. Driven by the office of the CFO, a project team was formed to improve the order-to-cash process. The high level process was broken down into key sub-processes and capabilities. Performance data was gathered and compared to best-in-class benchmarks and key competitors.

WebSphere Business Modeler was used to model each division's version of the process and to highlight best practices. Best practices were then consolidated and consensus was reached on standardized order entry and collections processes to be shared to reduce costs and enable customers to seamlessly place, track, and pay for orders with multiple divisions. Fulfillment processes were then localized for each division and geography. Implemented as business services, much of the solution was reusable in other enterprise business processes, increasing organizational flexibility and further reducing costs.

Companies that work without a similar framework might use more traditional methods of project selection, such as *fire fighting*, which can produce limited results and benefits. Without an emphasis on core processes, there is the danger that LSS teams might be called upon to improve a portion of a process, for example, as it cuts across a single department without having the ability to consider the impact on the larger system. While the department can realize the benefit, this fire-fighting approach can sub-optimize the business system as a whole. It might also deliver limited benefits or require a significant number of projects and extended time before the higher-level business KPIs show improvement. This delay can result in a loss of customers, dissatisfaction with the pace of LSS improvement, and waste of critical resources.

By focusing on KPIs and gathering data across the business system first, and then simulating the core and key processes, improvements can be targeted with almost surgical precision. Results become immediately visible in the KPI dashboards and are immediately felt by customers.

WebSphere BPM solutions make project selection and ongoing process optimization much more manageable:

- ▶ WebSphere Business Monitor dashboards for improved visibility

Deployed strategically within the business system, Monitor dashboards give visibility to core process KPIs and provide insight into critical bottlenecks (constraints) in near real time. Rapid and ready access to this data, and to improvement results, improves project targeting and accelerates improvement and design cycles.

- ▶ WebSphere Business Modeler analysis and simulation capability

Simulation can be used to identify or confirm system bottlenecks or constraints, evaluate and compare improvement alternatives, and determine the impact of resource adjustments on throughput.
- ▶ Reusable services and process components

When designed correctly, services and process components can be shared across business units or in different business processes, with results in eliminating duplication, reducing operating costs, and increasing flexibility. By using asset repositories, components can be organized, reused, managed, and governed more effectively.

Selecting the right project

Project selection criteria should have a clear and direct linkage to stated executive management objectives such as increasing revenue by US\$50 million, increasing revenue from new products and services by US\$10 million, decreasing cost of sales by US\$10 million, and improving customer satisfaction or retention by 2%. Additional selection criteria relates to the value of the process to the business and its relative health. Alternatively, the criteria might guide selection toward the source of dissatisfaction or across functional process. Even when armed with a set of criteria and guiding principles, choosing the right project can be difficult.

Businesses most frequently organize and measure themselves by function, for example purchasing, sales, marketing, fulfillment, billing, collections, and so on. Traditionally LSS improvement projects have focused on increasing the effectiveness or efficiency of these functions, with teams working under the assumption that, if the functional area is improved, then the whole process will be too. Processes were assumed to be independent.

Early on, the primary goal of improvement efforts might be cost reduction. While this approach can be quite successful, customers rarely interact with just one function. Most frequently they move cross functionally. For example, they place an order, pay for it, receive it, and then interact with the company during use, all through (ideally) a smooth flowing process that is focused on their satisfaction and requirements.

As companies shift their focus to these end-to-end processes, attempting to reduce overall cycle times or increase overall throughput, project selection becomes more critical and more challenging. Unless project selection is focused on eliminating a key system constraint, immediate impact will not be visible, that is felt by the customer or the business system as a whole, as measured by increased revenue, growth, retention, or profit. Today corporate executives expect to see results in these areas and to see them quickly.

For this reason, LSS practitioners are incorporating Goldratt's Theory of Constraints into their own methodologies to aid in project selection and performance improvement. The TOC postulates that all systems are like chains or networks of chains and that, at any given time, only one constraint can limit the overall performance of that system.¹² Everything else, at that exact moment in time, is viewed to be a non-constraint. Eliminating the constraint will then measurably improve the performance of the entire system.

We illustrate how this works by using a simple lease approval process (a core process for a leasing company). In our illustration, the process is depicted as a chain with each sub-process or step represented as a link. While most business systems are much more complex, the concept of having only one constraint limiting the system performance at any given time is still applicable. In our example, the current market demand for leases is 15 per hour. We have a stated goal of increasing the throughput capacity of our process to 20 leases per hour, which is just above the market in anticipation of growth.

¹² See Note 8 on page 9.

While some of the steps in the current process (shown in Figure 5) are capable of meeting demand, others are constraining it. By using more traditional methods of project selection, step D might be incorrectly targeted as the initial LSS deployment project. This might occur for the following reasons:

- ▶ It is a painful step for a department manager, and room is in their budget to fund the improvement effort.
- ▶ It requires the least effort.
- ▶ Cost savings are associated with it.

The overall process, however, is still constrained by step K, and the overall throughput KPI remains unchanged at six per hour. Although the leasing firm saves money, it does not improve its ability to meet market demand even though project resources were expended on a solution. Executives looking at the throughput KPI dashboard see no change and might wonder what the improvement team had been doing for the last few months.

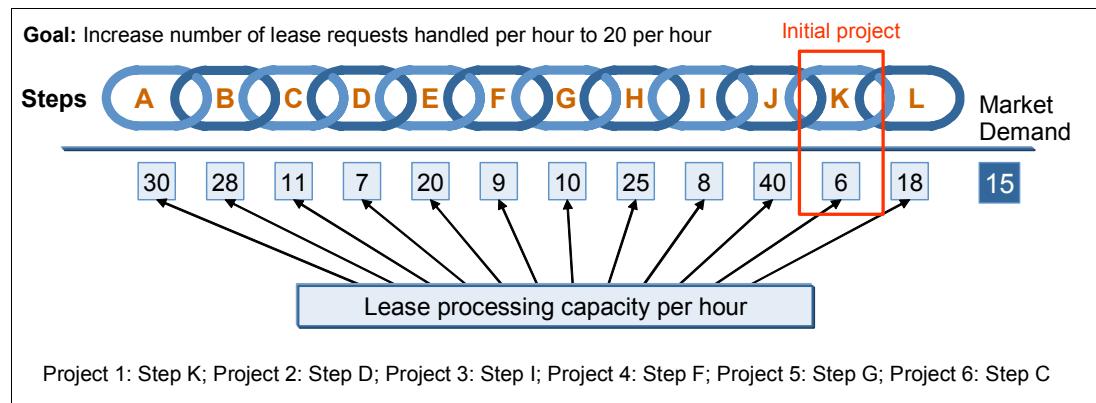


Figure 5 System-based approach to project selection - Initial project

By using the TOC approach, the first project selected is at step K, and the goal is to increase the throughput of this step to greater than 20 leases per hour. When complete, the overall throughput of the process increases to seven per hour, and the impact of the initial improvement effort is visible to executives and felt by customers. The next project improves the throughput of step D (which is currently at seven leases per hour), followed by step I, and so on. After all projects are completed (shown in Figure 6), market demand becomes the constraining factor. Then the next project is likely to involve marketing or new product or service development to increase demand beyond 15 and grow the business.

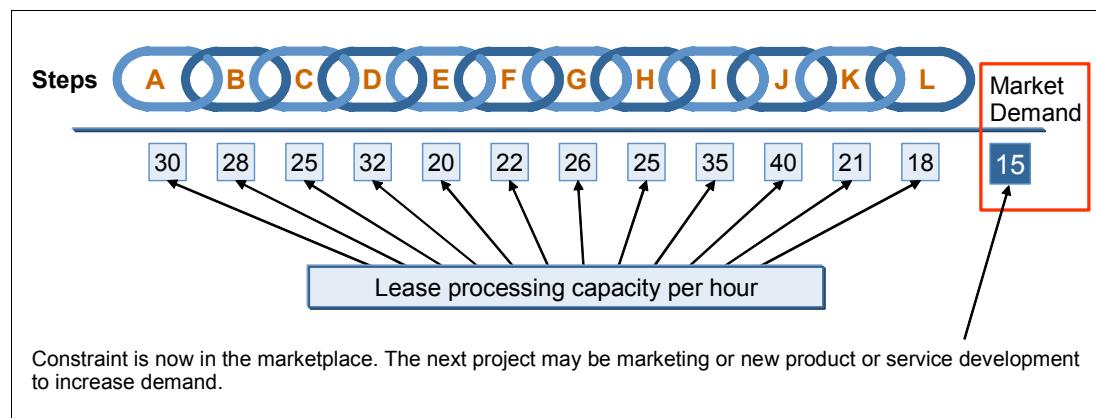


Figure 6 System-based approach to project selection - Project using the TOC approach

In this way, each of the seven projects in the improvement pipeline builds on the previous project and delivers measurable and visible improvement as quickly as possible. In fact, some steps can be detuned and their throughputs reduced to create a more balanced, overall flow. (A high throughput step might flood a constrained step, causing even more problems.) If executed correctly, this approach has proven to be highly successful.

In our lease example, it is easy to determine where the constraints are. Most transactional business systems are, however, much more complex and dynamic. They are a collection of interdependent and interrelated processes and components that act in concert to turn inputs into outputs that satisfy customer needs. Constraints in these systems are difficult to visualize without gathering data and simulating the system. Process monitoring of the business system is also critical to providing visibility to constraints and taking action. Obviously, in a more complex business, the number of projects in the pipeline and underway will be much higher, making management and coordination much more challenging.

Including service and process reuse in project selection criteria

Since most improvement projects today use technology to enable a change or to add an innovative twist to a new or improved process, it makes sense to factor process and service reuse into project selection criteria. When given two process steps or sub-processes that represent a roughly equal constraint, select the project that either will generate the highest number of reusable services or process components or that will use the highest number of existing services first.

This is a leverage play that yields greater benefit as the portfolio of reusable service components grows over time. As service reuse goes up, IT costs go down, and the business gets a more modular, flexible process that is easier and faster to change in the future. LSS teams that master reuse can deliver results more quickly and have more time to focus on innovative improvements.

Designing for reuse requires effort, discipline, and governance mechanisms, such as a *Center of Excellence*, and above all, executive support. A simple but effective way to start down the path of reuse is to track it with three basic project measures:

- ▶ Percent of the technical functionality from custom code
- ▶ Percent resulting in reusable service components
- ▶ Percent from reused services

The objective is to drive custom coding down and reuse up as quickly as reasonably possible. To start the project, ask project leads to track the needs for custom coding and reuse. We have even seen this approach successfully extended to include the reuse of modeling components, design documents, test plans, and other key project artifacts (Figure 7).

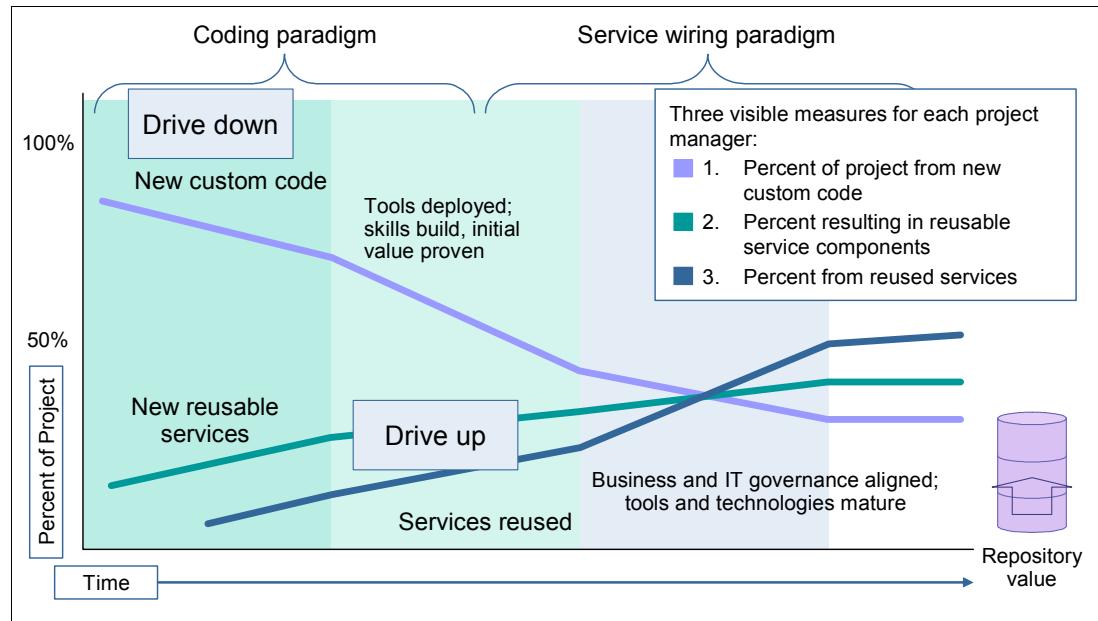


Figure 7 Reuse measurement

WebSphere BPM service registry, repositories, and governance manager fully support asset capture, management, and reuse. The registry allows both LSS teams and IT to effectively access and share services, models and modeling components, and other key assets from project to project, improving consistency, reducing costs, and accelerating implementation.

Supporting LSS improvement projects by using WebSphere BPM and SOA

DMAIC is the basic, iterative problem-solving cycle of the Six Sigma methodology that is used to improve existing work processes. LSS adopts this same methodology. It incorporates various Lean tools and techniques for the elimination of waste (*muda*) and unevenness in the workflow (*mura*) as a way to improve performance.

Figure 8 extends the DMAIC cycle to include two additional steps that are relevant to BPM-enabled improvement: *project selection* at the beginning of the cycle and *realization* at the end of the cycle.

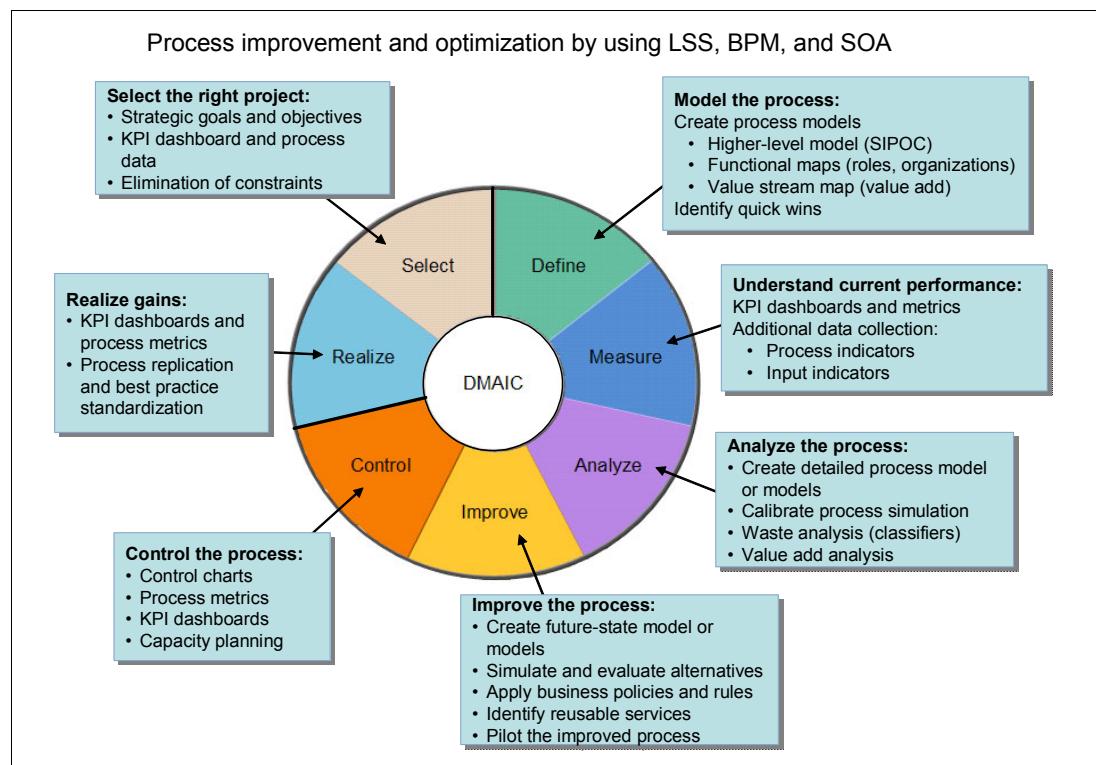


Figure 8 Process improvement and optimization using LSS, BPM, and SOA

The goal of the project selection and define phases is to clearly link projects to business priorities and to correctly scope and define the problem that must be solved to measurably improve performance or competitive positioning. The goal of the measure through control phases is problem resolution and improvement. The realize phase then integrates the solution or new process into day-to-day operation within the business system, producing a financial benefit.

New BPM capabilities support and enable LSS teams in virtually every phase of this cycle. We begin describing how BPM and SOA complement LSS at the define phase:

► Define phase

The goal of the define phase is to focus the improvement effort on the correct problem and to set scope and measurable improvement objectives. Here process customers are identified and segmented and various techniques are used to understand their critical requirements.

From a WebSphere BPM perspective, higher-level process diagrams aid in project scoping. Suppliers, inputs, process steps, outputs, and customers (SIPOC) all can be modeled by using WebSphere Business Modeler. The same model might then be viewed or edited in a functional *swimlane mode* to reveal all of the handoffs between the different roles and organizations that participate in the process enabling simplification. (Look for back and forth handoffs between roles and organizations.) Wait time and work time might also be captured in the model. Activities might be classified in a variety of different ways including value adding versus non-value adding (value stream mapping) and those impacted by or causing waste.

KPI dashboard data provides visibility and insight into current process performance and constraints. It also serves as the basis for initial comparison or best-in-class benchmarking, which helps bring clarity to the problem to be solved. This initial set of data is used during the define phase to build the high-level business case, opportunity statement, and goal statement.

Quick wins are also generally identified in the define phase. By having ready access to meaningful KPI data and the ability to rapidly classify the high-level business process by value add, waste, and in other ways, project teams can find those wins more quickly.

► Measure phase

The goal of the measure phase is to answer the question: How are we performing today? KPIs and knowledge of process variation are critical to this determination. BPM dashboards provide access to data in near real time. Process or activity durations, delays, escalations, or instances of a specific process being called or executed can all be tracked and used to better understand current performance and capability.

Dashboards work by capturing transaction or process-related events and displaying them individually or in aggregate. Results can be represented as gauges or line graphs that include upper and lower limits (as in a control chart). Line graphs provide visibility into both process performance and variation. The events that fall above or below the limits (variation) can also be set up to trigger immediate corrective action or alerts. Exceptions and automated alerts are tracked by WebSphere BPM and can be used in more detailed Pareto analysis. Event data is captured in a database by WebSphere BPM and can be mined to uncover additional patterns and relationships. Ready access to this data accelerates this phase of the improvement cycle.

► Analyze phase

The goal of the analyze phase is to determine what is wrong and what is causing unwanted process variation and exceptions. In this phase, additional detail is added to the current state process model to allow it to be simulated. The detailed model is further classified by, for example, value add/non-value add, waste, risk, regulatory controls (to make sure needed controls are in place), and other ways as needed to aid in root cause and improvement analysis.

By using process simulation, the LSS team can understand how much time, money, and effort is currently being spent on non-value adding versus value adding activities, dealing with waste, and so on. If exception paths are fully modeled, then the frequency, time, and cost of corrective actions can also be determined (effectively a weighted Pareto analysis). Fourteen different distributions (normal, weighted, Erlang, and so on) can be applied throughout the model (for example, to process inputs and processing times) to better calibrate simulation to real-world conditions.

Process exceptions and performance data from BPM dashboards can be exported into various statistical analysis tools for further evaluation as well.

► Improve phase

During the improve phase, solution alternatives are evaluated and tested to determine ROI potential, the best alternative is selected and piloted, and an implementation plan is designed. BPM plays a major role in this phase both in the evaluation of the alternatives and in the design of the solution itself.

Multiple future state models can be designed, evaluated, and compared from different perspectives including value add, waste, risk, reuse, and regulatory controls. Throughput, cycle time, and cost/benefit are calculated by using simulation, without having to run risky or costly experiments in the production environment. Bottlenecks and constraints are clearly visible during simulation.

Proposed improvements and process models can be published and shared with process workers by using a browser with embedded discussion capability. By using this discussion capability, feedback can be gathered, even remotely, prior to coding and piloting, which reduces risk and cost as well as facilitates buy-in and change management.

The improvement solution might include many powerful BPM components. For example, it might include automated workflows with built-in escalations and alerts and integration that automatically passes data from one participating application to another, eliminating re-keying and the associated errors. It might also include user-maintainable business rules that automate decisions and approvals and KPI dashboards that provide visibility into individual transactions and that make it easier to manage running process.

With WebSphere Dynamic Process Edition, greater flexibility can be built into the improved process, enabling it to respond to changing conditions either automatically or manually by allowing the process owner to modify business policies or rules through a browser interface. To incorporate this flexibility in an improved or new process, process variation, which is driven by differing customer segments, geographies, product categories, and so on, is identified. In addition, business policies and rules are defined in the process model. Rules and policies are expressed in business terms that are easy to understand and change with little or no IT involvement.

Figure 9 shows how a process can be improved by using BPM and SOA technologies.

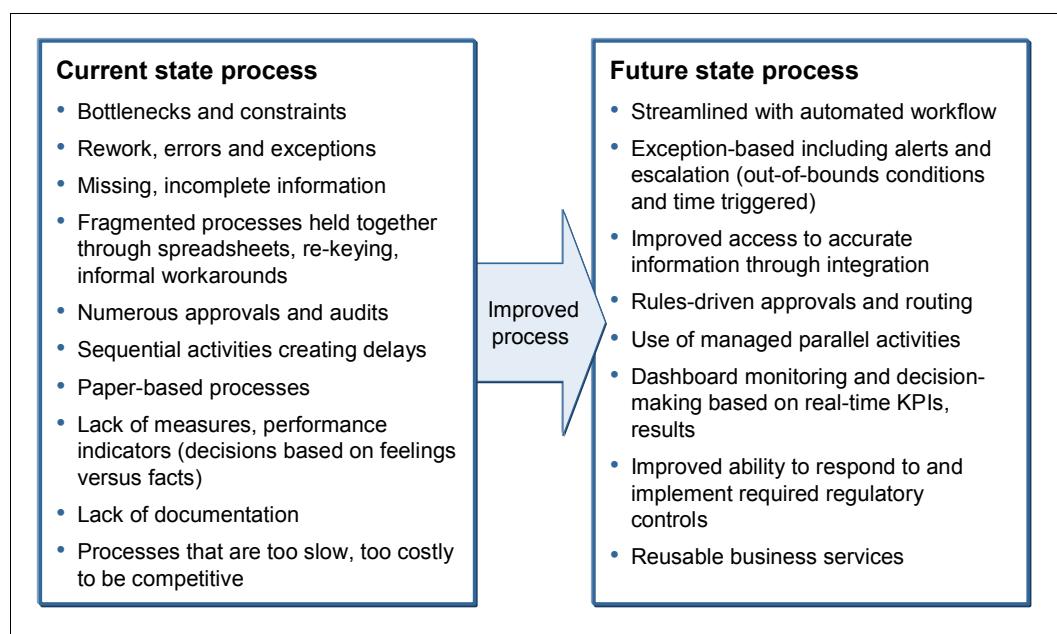


Figure 9 BPM- and SOA-enabled improvement

Measures and KPIs for the new process are designed by the LSS team by using a GUI and pre-designed metrics in WebSphere Business Modeler. Reusable services are easily added to the future state model from the service repository. (Service reuse accelerates implementation while reducing risk and cost.) Technical attributes can be added to the process model by making it immediately usable by IT. The model serves as a requirements *contract*. It is imported directly into the IT development environment, creating clarity and speeding deployment of a limited scope pilot and eventually production implementation.

KPI and measures dashboards are integrated into the solution user interface allowing all process components (applications, workflows, measures, alerts, and e-mail) to be

accessed from a single window or interface. This approach is commonly referred to as *integration at the glass* and eases the transition from the old process to the new process.

► Control phase

During the control phase, the improved process is readied for the production environment. Phase deliverables typically include implementation, training and communication plans, a cost-benefit analysis, an ownership transfer plan, and the measures needed to control the process and hold on to the gains. Larger projects might include multiple processes, sub-processes, implementation locations and geographies, and implementation teams.

Process models, which are accessible through a browser, serve as process documentation and aid in training. Simulation results can be incorporated into ROI calculations. Dashboards track the key process metrics and alert the process owners to out-of-control conditions, promoting rapid corrective action. New measures can also be created on the fly by business users enabling them to quickly tailor their dashboards to meet individual needs.

In a WebSphere BPM-enabled solution, process owners have the ability to monitor process transactions and can even redirect or reassign work in the event of a bottleneck or out-of-bounds condition as needed.

► Realize phase

The goal of the realize phase is to replicate and standardize successful solution implementations. *Replication* refers to the roll out of the solution to other business units, geographies, teams, or locations. Standardization is essentially the capturing and reuse of best practices, lessons learned, and process components in other processes. This is where an SOA-based BPM solution, such as WebSphere Dynamic Process Edition, stands out.

WebSphere Dynamic Process Edition facilitates a phased, controlled replication roll out. Business policies can be established for each geography, customer segment, or business unit, allowing the entire process or any combination of sub-processes to be piloted or turned on as teams are trained. In the event of problems, business policies and rules can be used to revert to some or all of the old process.

The modular nature of a SOA-based BPM solution facilitates standardization. Services are designed to be reused and, therefore, business processes composed of these services can also be reused. This results in a more flexible process that is easier and faster to change. This approach also lowers the cost of operation and maintenance over time.

WebSphere Dynamic Process Edition dramatically increases reuse and facilitates higher levels of standardization. Business policies are used to abstract complexity and variation out of the process and service code. This results in simplified services and processes, which can be more readily reused without customization. Business policies can be used to govern multiple processes, making change even easier, or new policies can be created to manage the new use. Policies are significantly easier to create, test, simulate, and change than software code, which lowers maintenance costs.

Reuse is limited when process complexity or variation (driven by things such as geography, customer segment, business unit, cost, revenue, or even time of day) is hard coded into the service itself. This variation is visible in the process model as a series of decision blocks, or can be added to a model when replicated or standardized. The worst form of service code reuse is copy and paste. Copy and paste often happens when a solution is replicated or standardized across business units. One IT department simply gives its code to another, which then owns it. While this might seem like an effective form of reuse, it results in *service sprawl*, which makes change difficult and greatly increases testing and maintenance costs.

New process design with WebSphere BPM and SOA

Businesses need new processes to reach out to new customer segments, enter new markets, expand to new geographies, or support the acquisition of new companies. Design for Six Sigma (DFSS) methodologies, such as DMADV and DMEDI, are used to design new processes so that they meet the needs of the business and the customer right from the start.

WebSphere Dynamic Process Edition not only supports these methodologies but can accelerate process implementation. LSS teams are able to rapidly simulate and test process alternatives, design KPI dashboards by using predefined metrics, add reusable services (building blocks) to process models, and pass the model off to IT for piloting, testing, and implementation. As the portfolio of services grows, less and less time is required to design and assemble a new process.

Business policies can be used to design flexibility into new processes, allowing the new process to be reconfigured dynamically and automatically to meet current or changing conditions. Policies also facilitate a phased roll-out of a new process, turning it on for one customer segment and then for another, or for one business unit and then another, and so on. Table 2 shows the linkage between DMEDI phases and BPM capabilities.

Table 2 DMEDI improvement phases, objectives, and WebSphere BPM capabilities

Phase	Objective	WebSphere BPM capabilities
Define	Understand customer needs and wants, validate the business opportunity, and identify constraints.	Existing process models and KPI dashboards provide context for the new processes that need to interact with them.
Measure	Agree on critical customer requirements, needed data, key process events, metrics, and KPIs.	Predefined metrics and KPI dashboard design guides accelerate measures design and implementation.
Explore	Evaluate high-level design alternatives, determine which best satisfy CCRs and business objectives.	<ul style="list-style-type: none">▶ Process alternatives can be modeled, simulated, and analyzed to determine which best meets customer and business requirements while minimizing risk.▶ Existing process and service component repositories can be queried during design, and the appropriate components can be selected and reused in the new process to speed implementation and increase ROI.
Develop	Develop an optimum solution design.	<p>WebSphere Dynamic Process Edition offers new BPM capabilities to LSS design teams including the following capabilities:</p> <ul style="list-style-type: none">▶ A robust, scalable process engine that manages human workflows and systems interactions including exception handling, escalation, and compensation (rollback) in the event of process failure▶ Built-in integration capability that allows existing application data and functionality to be securely accessed and used by process workflows▶ Flexible business rules and policies that are expressed in business terms and controlled by business users▶ Graphical KPI dashboards and process centric <i>business spaces</i> that can be customized to meet individual requirements

Phase	Objective	WebSphere BPM capabilities
Implement	Pilot the solution design, develop implementation and roll out plans.	<ul style="list-style-type: none"> ▶ In an integrated test environment, solutions can be fully tested and simulated iteratively by IT developers prior to pilot and implementation roll out. ▶ KPI dashboards provide immediate visibility into real-time performance. Additional measures can be quickly added by business users after the new process is implemented. ▶ Business policies can be used to phase implementation roll out by customer segment, geography, business unit, and so on with minimal risk.

WebSphere Business Modeler classifiers and simulation analysis

LSS teams typically work first to eliminate waste (cost) and non-value adding process steps and to balance workflows, shown in steps 1 and 2 in Figure 10. Then the teams use Six Sigma statistical methods to eliminate errors and variation, which further improves Six Sigma level performance and optimizes the process (step 3 in Figure 10). Changing customer requirements and competitor rates of improvement are also monitored, and efforts are adjusted accordingly.

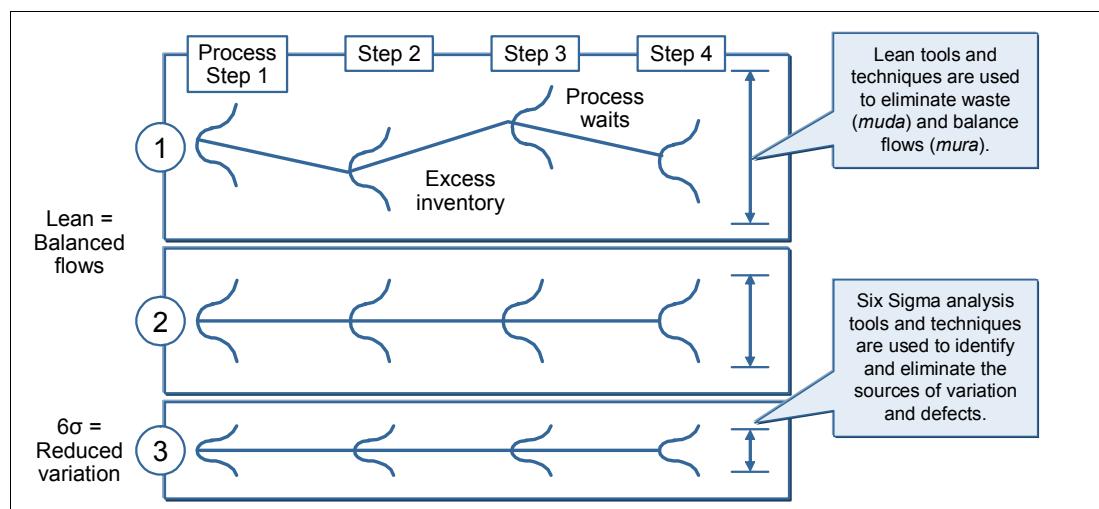


Figure 10 Combining the Lean and Six Sigma methods

This approach makes sense since the sources of waste are typically known, allowing the team to move more quickly. For example, Toyota recognizes seven sources of waste including overproduction, excess inventories, and wait times. The sources of exceptions and variation might be unknown, and the root causes are discovered through the use of more sophisticated analysis tools and statistical techniques that can take more time.

WebSphere Business Modeler classifiers support this approach, speed analysis, and improve communication. By using classifiers, a process model can be viewed from different perspectives. For example, imagine being able to color code activities or sub-processes from the perspective of value add. Those activities that are non-value adding are displayed in red, those that add business value are displayed in blue, and those that add customer value are displayed in green. Classifiers reveal detail through different perspectives.

Classifiers can be created for any perspective you choose: manufacturing waste, transactional waste, regulatory controls (for example, Sarbanes Oxley and HIPAA), risk, measures, services, some element of time (for example, Day 1 - 3 or Phase 1 - 3), complexity, and so on. Your model can then be colored by a classifier or displayed by using classifier

swimlanes, labels, or both simply by right-clicking and selecting that option to change the perspective. There is no need to spend time rebuilding the model.

Figure 11 is colored coded by classifier, in this case by Value Add, with roles displayed in swimlanes (Account Coordinator and Processing Clerk). The upper task label shows duration or elapsed time, and the lower shows task cost in addition to labor. In this way, it is possible to see how much time each participant spends performing non-value adding versus value adding tasks.

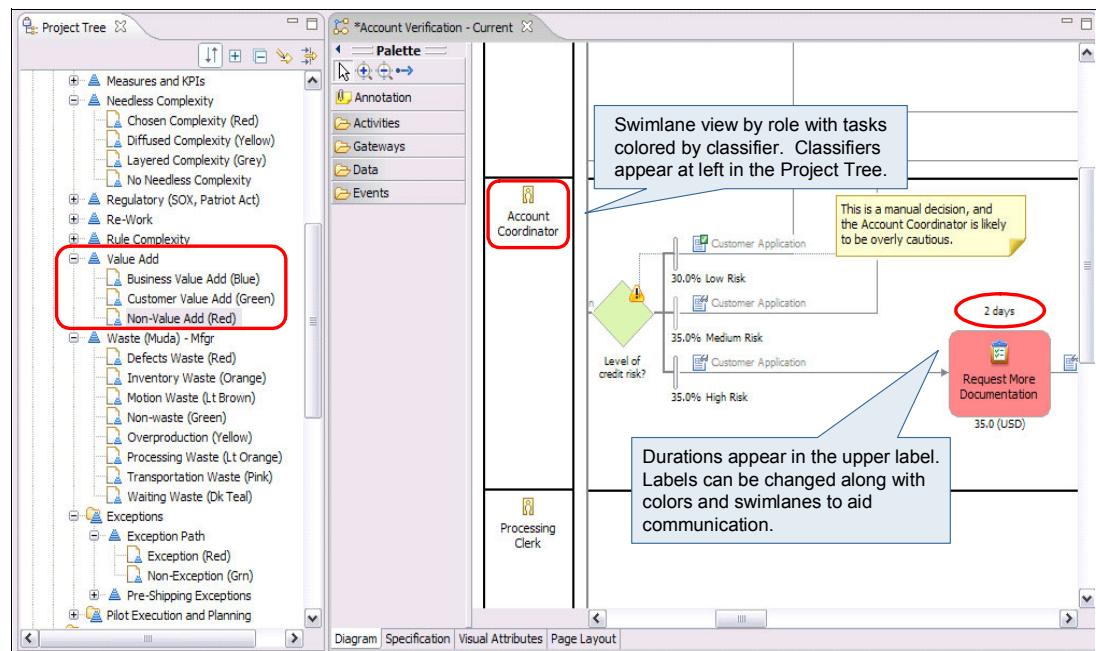


Figure 11 WebSphere Business Modeler classifiers

With the advanced simulation capability of WebSphere Business Modeler, LSS teams can effectively evaluate and test alternative process designs with minimal risk and at a lower cost than through physical experiments. During the analyze phase of DMAIC, the current state model is simulated and calibrated so that the model's performance and results mirror those in the production environment. Calibration allows the current state model to serve as the basis for comparison against future state alternatives.

During the improve phase of DMAIC, and the explore phase of DMEDI, alternative future state models are simulated and compared against each other to determine which best meets requirements from the perspective of throughput, cost, cycle time, and needed resources. Bottlenecks and constraints become quickly visible. Adjustments can be made to smooth the workflow. In DMAIC, future state models are also compared against the current state with time and cost savings and revenue projects incorporated into the business case. If the process generates revenue, revenue can be added to the final step in the process so that WebSphere Business Modeler can calculate the profit. In DMEDI, alternatives can be compared against appropriate best-in-class benchmarks.

Figure 12 shows a process that is simulated with constraints that are clearly visible just above the second step. Comparative reporting shows the difference between current and future state alternatives.

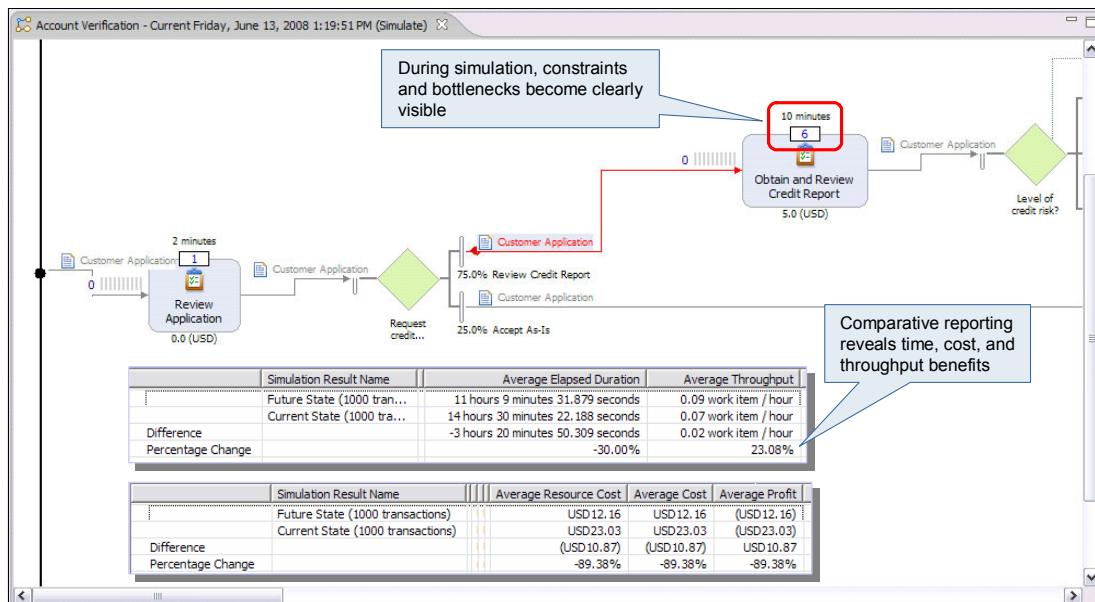


Figure 12 WebSphere Business Modeler simulation results

Fourteen different distributions (Normal, Weighted List, Erlang, and so on) can be added to a model to simulate variation and randomness. Distributions can be used to describe process inputs (number of inputs and the rate at which they are received), activity processing time, processing cost, startup cost, and revenue. The advanced modeling modes of WebSphere Business Modeler expose more simulation attributes and give more experienced LSS practitioners even greater control over results. Figure 13 shows the use of a Normal distribution applied to task duration.

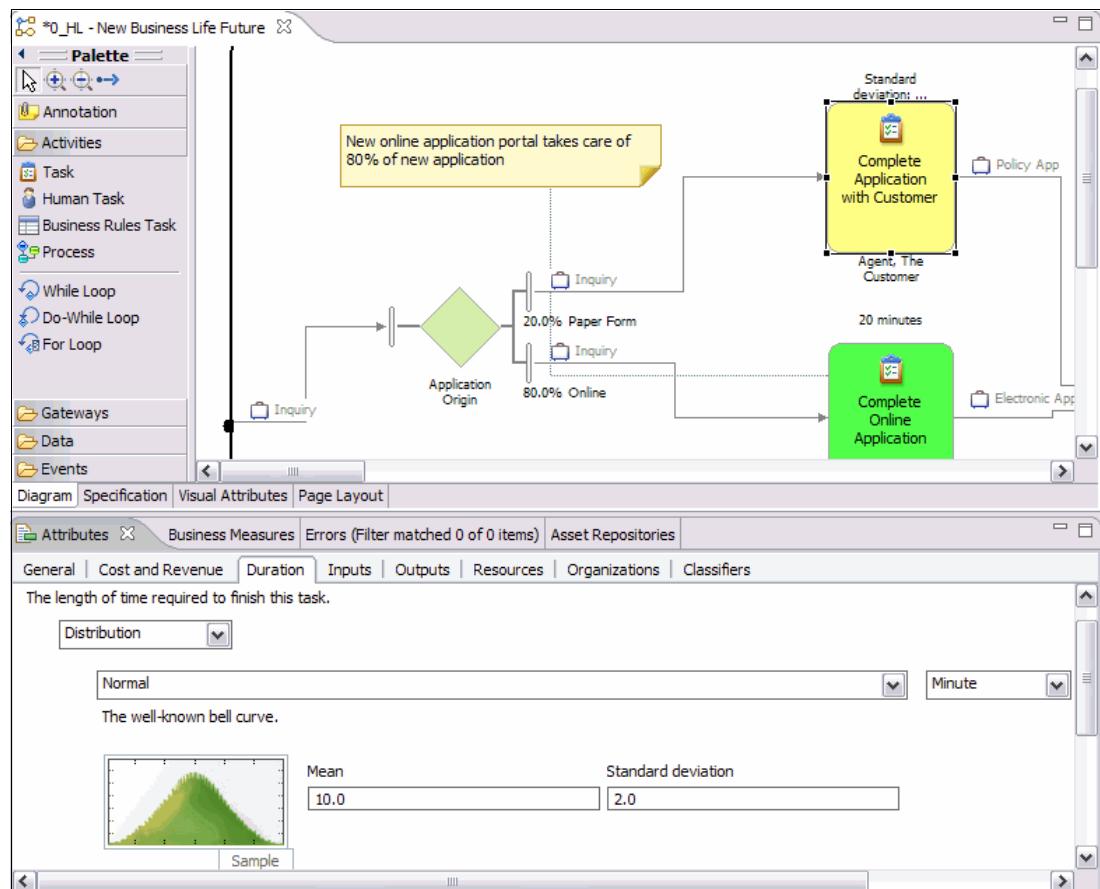


Figure 13 WebSphere Business Modeler Distributions used in simulation

Simulation requires that time and cost data be added to the model. The more data that is added, the more accurate the results are. Time data includes processing time and resource work time. For example, consider a paper form that sits in an inbox for 15 minutes before an administrator picks it up and works on it for two minutes. Cost data includes resource pay (per hour, per year, overtime) plus any additional costs that are incurred when completing an activity or sub-process. In addition, resources can be assigned to work schedules or time tables so that the effects of a day-to-evening shift change can be understood.

The importance of measures and monitoring

Measures drive understanding, action, and change. An Aberdeen Group study of 160 companies in 2006 found that those companies that had implemented BPM were achieving an average of 9% improvement in revenues, a 12% decrease in process-related expenses, and an 18% ROI.¹³

¹³ Peter S. Kastner, *The Business Process Management Benchmark Report*, Aberdeen Group, 2006: http://www.aberdeen.com/summary/report/benchmark/RA_BPM_PK_3385.asp

Measures and specialized tools, such as control charts, enable process workers and owners to see and judge the health of a business process and to take corrective action when events move outside acceptable thresholds. The IBM BPM platform allows events to be monitored in real time and automated alerts, which are triggered by out-of-bounds events, to speed corrective action and reduce risk, cost, and the impact of the event itself.

Measures are sometimes viewed differently by LSS and IT project teams. LSS teams are trained to consider process measures early in the improvement and design cycles. During the define and measure phases of the DMAIC cycle, they look for and use data to better understand the problem to be solved. In the later phases, they define the measures that will allow them to verify that the changed process is under control.

IT typically focuses on solution functionality first and can leave measures and anything but basic reporting until the later phases of technical solution implementation. This impacts the control phase of the DMAIC improvement cycle, forcing the improvement team to rely on manual methods or spreadsheet data collection techniques that can delay responsiveness and corrective action as well.

In addition, real-time access to data in the form of Web-based dashboards is relatively new. Therefore, it might be difficult for project owners and workers to know how best to use them. However, it is possible to build alerts and escalations into the technical solution and to trigger a corrective action process automatically if certain criteria (rules) are met. It is also important to make sure process owners and workers know what to do when they receive an alert. Figure 14 shows a simple control chart and special cause variation that can trigger a BPM-enabled alert.

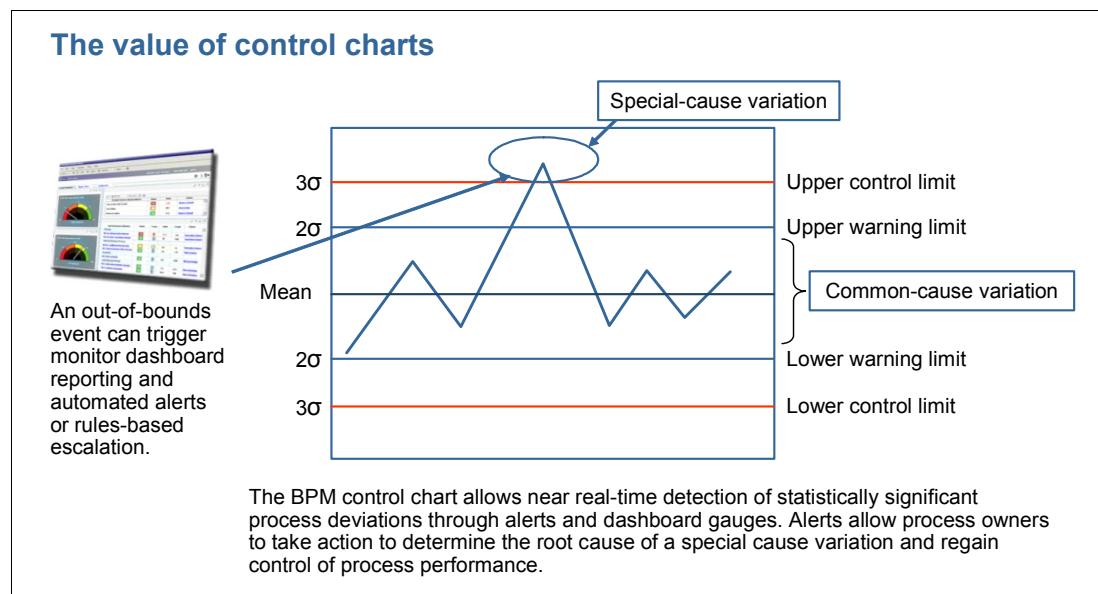


Figure 14 Control chart and special cause variation that can trigger a BPM-enabled alert

Often “fires” break out in one department because there is little visibility into building bottlenecks and problems. Well-designed measures and KPI dashboards can change this by providing visibility into the process, predicting the problem before it occurs, or alerting process owners and workers the moment it does so that corrective action can be taken immediately. Business users can deployed WebSphere Business Process Monitor to create new KPIs on their own with minimal or no IT involvement.

IBM is working on a project currently where KPI dashboards are deployed lengthwise, along a process with measures on both sides of departmental and external business partner

boundaries. The WebSphere Business Monitor listens for events and detects exceptions. When exceptions appear, human task workflows can be quickly deployed to manage and track corrective action. Data from these corrective action workflows, along with constraint data is then used to target improvement efforts to eliminate the cause of the exceptions and improve the KPIs. Eventually the exception workflow itself will be eliminated. Prior to this action, the customer was planning to use “fire and forget” e-mail notices with no resolution tracking.

Common success inhibitors

Common BPM and LSS success inhibitors include organizational structure, IT backlogs and budget constraints, and a general lack of awareness and understanding.

Structural inhibitors

According to the Goldratt Institute, the core constraint of virtually every organization is that organizations are “structured, measured, and managed in parts, rather than as a whole.”¹⁴ Competitive strategy guru, Michael Porter, in his *Harvard Business Review* article “What is Strategy?” says that “a company outperforms (its) rivals only if it can establish a difference that it can preserve. Ultimately, all difference between companies derives from the hundreds of activities required to create, produce, sell, and deliver products and services”. He goes on to say that “strategy involves a whole system of activities, not just a collection of parts...competitive advantage comes from the way...activities fit and reinforce one another”.¹⁵

Fitting all of the pieces together is no easy task, especially when many large organizations are divided into multiple business units each with their own sales, delivery, and billing departments, processes and systems. This duplication can lead to higher than necessary costs and inconsistent customer experiences across the divisions.

Organizations with rigid department-level boundaries also run risks. Processes that cut across departments can be measured and managed by the department, but not as a whole, or can be stitched together with excessive approvals and data re-keying. If an organization is not careful, improvement efforts that focus on a departmental process or sub-process have the potential to sub-optimize processes upstream and downstream in other departments.

Best practice recommendation

Knowing which processes are the sources of differentiation and how they fit into the business system is critical to remaining competitive. Therefore, it is necessary to view the enterprise as a value producing whole and to recognize where organizational structure either gets in the way or adds unnecessary costs. Look closely at business processes as they cross organizational boundaries, and use simulation to test for the impact of improvements upstream and downstream. Establish KPIs that measure the system (versus the department or function alone). Deploy KPI dashboards early on to provide needed system-level visibility and alert process owners to changing conditions and problems.

¹⁴ *Theory of Constraints and its Thinking Processes*, AGI Goldratt Institute:

<http://www.goldratt.com/toctpwhtpaper.pdf>

¹⁵ Michael Porter, “What is Strategy?”, *Harvard Business Review*, November 1996:

http://www.hbsp.harvard.edu/hbsp/hbr/articles/article.jsp?articleID=96608&ml_action=get-article&print=true

IT backlogs and budget constraints

A major healthcare insurance provider with millions of subscribers and a broad portfolio of products and services is required to comply with various healthcare and regulatory requirements such as Sarbanes Oxley and HIPAA. Executive management feels that it needs to change its products more frequently as well as introduce new products and surrounding services to maintain their competitive position.

The IT organization is understaffed and is faced with a large backlog of projects with the demand for new projects increasing. IT is struggling to maintain its current systems and agreed-upon service levels, while top management grows frustrated with the size of the IT investment and slowness of development. Technology requirements, including changes to complex applications, are thrown over the wall to IT and are listed as high priority. These requirements push those that are already in the project backlog further down the list. They cause IT to abandon the notion of reuse and instead just “crank out code” with minimal documentation impacting costs and responsiveness in the future.

Does this sound familiar to you? This scenario is not normally found in a smoothly running, value-producing business that is focused on customers and shareholders. However, it describes the way that many firms work today as they struggle to deal with economic downturns, mergers and acquisitions, global expansion, and lightning fast competitors.

Business processes and technology are tightly linked. According to Randy Heffner of Forrester Research, “The reality of the digital age is that your business is embodied in your technology, and your business can change only as fast as your technology can.”¹⁶ In today’s economy, IT budgets are being cut. As in this scenario, some corporate leaders have become wary of IT investments to the point where they question every request to invest in something new. It is common to find CEOs willing to fund only smaller trial projects that do not prove or validate the worth of any technology much less an SOA and BPM.

A recent study by McKinsey on managing IT in a downturn suggests that “when business and IT executives jointly take an end-to-end look at business processes, the resulting investments can have up to ten times the impact of traditional IT cost reduction efforts.”¹⁷ Rather than cutting IT budgets, they recommend taking a close look at “outdated processes, manual steps, redundancies, and bottlenecks” and access to data and information as a way to improve and increase employee productivity, optimize processes, and maximize revenues during tough economic times.

BPM can demonstrate and deliver a rapid ROI. A 2006 Aberdeen Group study of 160 companies found that those that had implemented BPM achieved an average 9% improvement in revenue, a 12% decrease in process-related expenses, and an 18% ROI.¹⁸

Best practice recommendation

Apply lean techniques to IT application development to eliminate waste, smooth workflow, and free up the budget to invest in BPM. Consulting firm McKinsey & Company states that “companies can reduce application development and maintenance costs by up to 40%” and that application development productivity can be improved “by up to 50%” by removing the classic sources of waste. These include designers reworking their specifications, coders waiting for specifications to stabilize, and testers overproducing as their testing environments have to be set up repeatedly, resulting in unmet requirements piling up in a large backlog.¹⁹

¹⁶ Randy Heffner, “Digital Business Architecture: Harnessing IT for Business Flexibility”, Forrester Research November 7, 2005: <http://www.forrester.com/Research/Document/Excerpt/0,7211,38032,00.html>

¹⁷ “Managing IT in a downturn: Beyond cost cutting,” *The McKinsey Quarterly*, Fall 2008: http://www.mckinseyquarterly.com/Information_Technology/Managing_IT_in_a_downturn_Beyond_cost_cutting_2196_abstract

¹⁸ See Note 13 on page 24.

Have business and IT executives jointly look at end-to-end core and key supporting processes to determine how technology can be applied to eliminate constraints and improve performance. Use WebSphere Business Monitor to provide visibility into process performance early on, and use this to target and evaluate end-to-end process improvement efforts.

Lack of awareness and understanding

Perhaps the biggest inhibitor is a lack of awareness or understanding, especially between IT and LSS teams. Highly trained and specialized, they each have their own tools and techniques and often speak their own languages (for example, VSM, SPC, DOE, FMEA, DMAIC and DFSS versus UML, SOA, ESB, BPMN, POJO and JSR 168). It is important, however, that they learn how to communicate and actively work together, which requires time and effort. Technically savvy LSS practitioners are better able to leverage new SOA and BPM capabilities to not only drive, but accelerate, improvement and innovation.

The problem is that, without a deeper understanding of the current technical environment, including systems, data structures and capacities, and without knowledge of new technical capabilities, such as BPM and SOA, LSS teams can take a more traditional approach to improvement than they might otherwise do with IT guidance. They might ask whether the application be changed to perform a particular function instead of questioning the creation of a new reusable business service that unlocks the needed functionality.

LSS teams frequently do not have the technical knowledge that is required to correctly align the enabling technologies with the new process. This situation means that opportunity is left on the table or gain is minimized. Additionally, something that, on the surface, might seem technically simple can be costly or time consuming to implement. If the improvement requirements are simply thrown over the departmental wall to IT for implementation, the risk of sub-optimizing IT performance, disrupting work, and adding to existing backlogs also increases.

In the April 2008 article “What process experts need to know about SOA,”²⁰ Forrester Research Analyst Andy Salunga states that, while the technical tools used by process improvement professionals have come a long way, they still fall short in regard to the following areas:

- ▶ Linking processes with their respective digital architectures
- ▶ Translating design into execution
- ▶ Providing an efficient, reliable repository for process artifacts
- ▶ Supporting real-time continuous optimization

IBM recently completed a pilot project at a major retailer. The LSS team designed an improved process (with no IT involvement) that transformed a paper-based process into one that relied on e-mail to move the needed information. The process had a cycle time requirement of two weeks, except during peak holiday periods when it was required to complete in two days. With e-mail, there is no visibility into the process and no way to measure it in an effort free way. We went back to the team and described a BPM-based workflow that showed each transaction as it moved through the approval queues. We helped them understand the value of reusable services, modeled the process for IT hand-off, and built a simple KPI dashboard to track cycle times and issue alerts when thresholds were neared.

The pilot took less than one month to build. Obviously further testing is needed to get the pilot BPM solution ready for the production environment. However, the LSS team now has a much

¹⁹ See Note 1 on page 1.

²⁰ See Note 4 on page 5.

better understanding of what BPM can do for them and how quickly they can move with IT involvement and help.

Best practice recommendation

The business analyst role is typically that of liaison between the business and IT organizations. For the most part, a business analyst has specialized in either the business or technical domains. However, the April 2008 Forrester Research study, *The New Business Analyst: Business Technology Analysts Become the CIO's Most Valuable Business Ally*,²¹ indicates that two new liaison roles are emerging that can “accelerate cross-silo collaboration” by “translating business policy directly into technology change:”

- ▶ The *business technology analyst* is responsible for “measuring and improving business operations by implementing changes in the software that automates them.” This individual is familiar with “technologies for building dynamic business applications.”
- ▶ The *business architect* has responsibility for facilitating communication across initiatives and projects. This individual has “in-depth understanding of the states of the business and IT as well as their intersection points.”

Work with LSS teams to select the right project and engage business technology analysts and business architects in the early stages.

Leading practices

In this section, we highlight BPM success stories for IBM and the results from a number of leading companies.

Business process modeling, analysis, and simulation

Business process modeling, simulation, and analysis are used throughout the DMAIC cycle. During the define phase, high-level process models of the *as is* are used to understand current performance, clarify project boundaries and scope, and identify an initial set of *quick wins*. Here, the high-level model can be classified by value add, waste, or complexity to uncover inefficiencies, bottlenecks, and constraints.²² Additional detail is added to the model during the analyze phase. In addition, simulation is calibrated to verify the bottlenecks, determine the cost of handling exceptions, and allow accurate comparison with future state alternatives that are developed during the improve phase. Measures can be added to the selected alternative, and the model can be passed to IT to serve as a requirements contract during the improve pilot and control implementation. WebSphere Business Monitor data can be imported into WebSphere Business Modeler to set up the next improvement cycle.

By using process modeling, LSS teams can readily experiment with changes to the process, such as changing resource allocations, working shifts, and transportation routes. They can also evaluate the effects of these changes on the process in terms of cost and time. Attempting such experiments on the production process can be time consuming and risky. Performing such experiments within a modeling and simulation tool is not only quick and easy but allows for the exploration of radical changes, sometimes with surprising results.

²¹ Carey Schwaber and Rob Karel, “The New Business Analyst,” Forrester Research, April 8, 2008:
<http://www.forrester.com/Research/Document/Excerpt/0,7211,43178,00.html>

²² David Singer and Sara Moulton Reger, “The Many Aspects of Complexity,” IBM Research:
http://domino.research.ibm.com/comm/wwwr_thinkresearch.nsf/pages/20041130_think.shtml

A large, U.S.-based hospital put LSS methodologies to work, including data-driven modeling and simulation, to reduce delays in their in-patient admission and discharge processes. The following goals were set by the hospital:

- ▶ Relieve congestion in the emergency department (ED), operating room (OR), post operative care unit (PACU), and procedure labs by starting discharge processes earlier in the day.
- ▶ Decrease the time to discharge a patient by 85 minutes or 30%.
- ▶ Increase bed availability by four beds throughout the day.
- ▶ Decrease the time to admit a patient by 70 minutes or 31%.

IBM Business Consulting Services was engaged to assist with the improvement effort. The IBM team created models of the hospital's existing admission and discharge processes, identified non-value adding activities, and analyzed root cause problems as needed. The team used simulation to evaluate alternative process designs that enabled them to increase process throughput.

By moving discharge times earlier in the day and beginning the activities (such as medication reconciliation, core measures, discharge teaching and arranging home care) that are associated with discharge earlier, the hospital achieved considerable improvement in patient flow. For example, when a discharge order is received, the medication reconciliation process is documented by nurses and ready for sign-off by physicians. By incrementally implementing standard discharge times and moving care coordination activities to begin at admission, the hospital can reap real and significant return.

In addition to the process changes, the IBM team also suggested changes that are related to people and technology. Reorganization of the patient placement department was recommended to clarify and delineate the roles and responsibilities of the clinicians and support staff, with the goal of increasing operational efficiency and streamlining interdepartmental communications. This department employs registered nurses who work with the emergency department and patient admissions to place the patient in the right bed the first time.

One of the key benefits of experimenting with simulation is analyzing the effects of resource redistribution. An example of this is when the IBM team discovered that one of the bottlenecks in the discharge process was that the discharge forms were only completed by registered nurses. The IBM team recommended that unit secretaries also perform this function. This single recommendation greatly expedited the discharge process.

Human interaction and collaboration

Human interaction and collaboration capability is needed in situations where business process automation cannot be used due to process complexity. This refers to those cases where the knowledge and experience of an employee is required to move the business process forward. These situations can be quite dynamic considering that work is often reassigned on the fly to different individuals or teams or additional steps are taken. WebSphere Dynamic Process Edition can manage these complex, human-centric processes. It does this by using business rules and policies, managed workflows, ad-hoc human task assignment, and alerts and escalations that are all brought together in a powerful user environment called *WebSphere Business Space*.

In WebSphere Business Space, business users work on tasks that are assigned to them, create new tasks, collaborate with co-workers, and create new business processes that can be executed immediately without IT. They have the ability to view process documentation and process KPIs, drilling into detail as needed. The LSS teams can use these capabilities during

the improve phase when designing the improved process. The flexibility offered by WebSphere Dynamic Process Edition with WebSphere Business Space provides the LSS team with design freedom to focus on the core solution functionality that business users fine-tune as needed.

A leading retailer in China was facing increased competition from foreign firms that were both more efficient and flexible. To maintain its leadership position, the retailer realized that it had to optimize its supply chain processes and improve its ability to collaborate with more than 1,800 local and international suppliers. Like most of its local competitor, the retailer's existing processes were paper-based and held together with telephone and fax.

With the help of the IBM China Research Lab and a key IBM Business Partner, the retailer launched an initiative to streamline the 30-plus manual processes that made up its supply chain and improve two-way communication with its suppliers. The resulting process-driven SOA-based Supply Chain Management platform, an industry-first in China, includes the following features:

- ▶ Automated workflows that integrate systems and human interactions so that users can issue purchase orders, check inventory, and manage other processes from a single browser-based interface
- ▶ Status updates that include shipping notifications that are pushed to users through mobile messaging along with alerts in the event of processing delays
- ▶ Real-time monitoring of process KPIs, for example order acceptance rate and on-time delivery rate, through a business dashboard that greatly improves decision making
- ▶ Collaboration utilities, such as mobile short message services, that are used to find the right person to solve process problems

Collaboration with suppliers is encouraged by giving them online access to key data such as customer buying behavior, sales trends, and process information, enabling them to adjust and optimize their own operations to satisfy market demand. The retailer is also using supplier performance data to segment its suppliers based on profitability, monthly selling trends, and level of activity. As a result, the retailer can come up with a new, value-based pricing model that gives preferential treatment to those vendors that are most efficient and profitable.

Since the solution was based on an SOA, it is much easier to change than the older applications and manual processes of the past and can even be extended to the supplier systems and processes.

This solution includes the following benefits:

- ▶ A reduction in order lead time from 2.5 days to 4.5 hours, driving down inventory costs
- ▶ Improved order acknowledgement rate from 80% to 99%
- ▶ A reduced order error rate from 9% to 1%
- ▶ Reduced operating risks resulting from improved supplier profitability and error rates information

ROI was achieved in nine months.

Business process automation

Business process automation is accomplished through the use of a process engine that choreographs and manages process steps without human involvement. WebSphere Dynamic Process Edition uses the following features:

- ▶ Business rules and policies to guide automated decision making
- ▶ Built-in integration capability and an enterprise service bus (ESB) to move data between existing IT systems
- ▶ Automated process flows to interact with different systems and speed transaction processing

If a process falls outside of stated rules or acceptable limits, the process engine can start new processes or alert process owners and workers to take action. These capabilities can be used by LSS teams during the improve phase when designing the improved process.

Consider the example of a large insurance firm that was looking for ways to distinguish the value of its services in an increasingly competitive market by managing claims more quickly and efficiently. A new SOA-based claims platform was designed to streamline this process and handle the high transaction volumes. The new claims platform delivered the following key functions:

- ▶ External service partners (repair shops) can participate in the integrated claims process with data exchanges happening in real time (for example checking estimates and verifying invoices).
- ▶ Existing insurance and back-end systems are componentized to operate within the SOA and are integrated with the claims platform.
- ▶ Automated processes and data streams can be adapted easily to meet business changes, for example, replacing existing service partners with new ones.
- ▶ Incoming documents, particularly invoices, appraisals, and cost estimates, are proactively scanned to check for reduction potential and fraud in accordance with defined rule sets.
- ▶ Elaborate reports can be generated easily by using an integrated reporting application and multidimensional analysis features.
- ▶ Staff can track operations throughout the entire platform through the real-time, business-oriented process monitoring.

The solution includes the following benefits:

- ▶ A dramatic cost savings within a few months after deployment
- ▶ Improved efficiency due to the automated business processes
- ▶ A reduction of fraud and ineligible claims through improved visibility and data access

In this case, WebSphere Business Modeler was used to model the current and future state claims processes, and WebSphere Dynamic Process Edition was the runtime process engine.

Business activity monitoring and analysis

Numerous studies show that up to 70% of the gains that result from an improvement project are lost in the first three to six months following the implementation.²³ Process change can be similar to stretching a rubber band. As you introduce change, there is always that tendency to snap back into the old ways of doing things. Process monitoring and analysis is, therefore, critical to sustaining the initial gains by providing visibility into real-time process performance and alerting owners to exceptions and conditions that require their attention as they occur.

During the control phase, the LSS team develops metrics, measures, and KPIs by using WebSphere Business Modeler. By using the graphical measures editor, the team can perform the following tasks:

- ▶ Select from predefined cycle time measures
- ▶ Indicate data to be captured by using simple check boxes
- ▶ Set target values, ranges, upper and lower limits, and timeframes (repeating, for a specified time only, or rolling)
- ▶ Specify alerts
- ▶ Define the dashboard interface itself (for example, gauge, bar chart, and line chart)

During the define phase, monitor data provide the basis for problem definition at the start of the improvement cycle. In fact, a number of leading companies have deployed WebSphere Business Monitor as a first step in the improvement cycle to provide needed visibility and capture needed data.

For example, a large financial company wanted to decrease the time required to process a home loan through their customer service centers. The first step in their improvement cycle was to determine the amount of time their customer service representatives (CSRs) were currently spending with customers processing a loan. To do this, they chose to start with WebSphere Business Monitor.

The systems that the CSRs used to process a loan were event enabled, and system interactions (event triggers) were tracked to determine, for example, average time to completion and the number of tasks completed by the CSR team. The results were then displayed on WebSphere Business Monitor dashboards for the CSRs to see where they actually were spending their time and how much time they were spending. By this visibility alone, team leads began shifting some behaviors.

²³ Thomas McCarty, Lorrene Daniels, Michael Bremer, Praveen Gupta, *The Six Sigma Black Belt Handbook*, McGraw-Hill, First Edition, November 2004, ISBN: 0071443290.

Figure 15 shows the Process Monitor that was used to track average task handling time by employee and the number of milliseconds required to issue a refund.

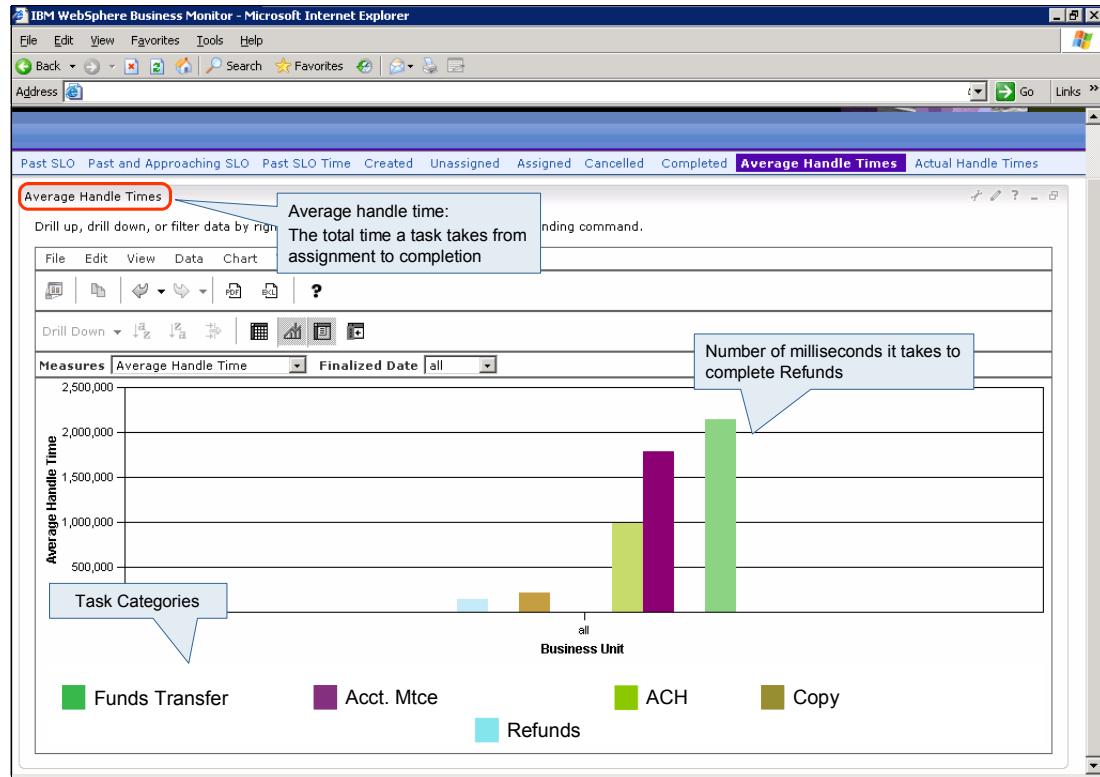


Figure 15 Process Monitor used to track current performance

The Process Monitor (Figure 16) shows the tasks that exceeded their target completion date and time. The team leads use this information to re-assign tasks to balance team workload.

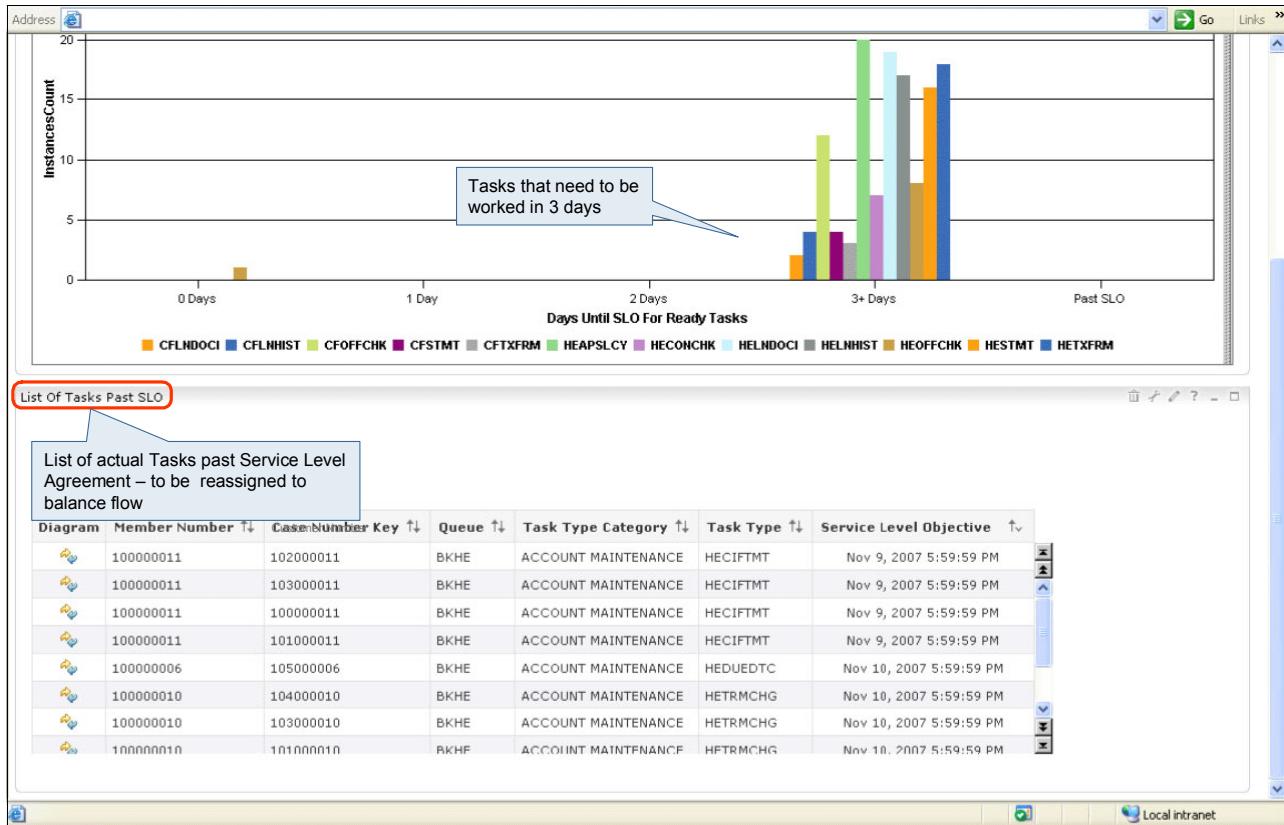


Figure 16 Using the Process Monitor to smooth workload by reassigning tasks

Process models were then created and the WebSphere Business Monitor data was analyzed to identify waste (*muda*) and non-value adding activities. KPIs were defined, and improvement targets were set. (Up to this point, raw data was simply gathered and displayed.) An initial set of alerts was also established. For example, if a certain task is not complete after four hours, an alert is issued to the team lead who can then move backlogged tasks to another CSR with a lighter workload. By doing this, the team leads and service center managers can smooth and balance workflows (*mura*). Data is also used to assess the skills that are needed to successfully process a loan and identify where gaps might exist with additional training required.

Visibility into process performance can yield benefits quickly. In life insurance underwriting, many companies outsource the medical testing process, but do not track the time it takes to receive the results. The company found that simply by tracking the time it takes to receive results from the medical testing company, they were able to adjust their processes and reduce the time to provide a life insurance policy by 5 to 7 days.

In this example, WebSphere Business Monitor was used as the first step in the define phase to achieve the following goals:

- ▶ Provide visibility into service center process activities
- ▶ Gain an understanding of current performance by monitoring human tasks through system interactions
- ▶ Establish initial service levels for the existing process
- ▶ Set goals for improvement

Process Monitors were rolled out to other service centers and call centers to standardize the approach.

Best practice recommendation

Begin by monitoring customer-facing processes. Use Process Monitor to determine how the process is currently performing. As exceptions are identified, deploy BPM Human Task workflows to manage and track corrective action. Use this data, along with constraint data, to target and prioritize improvements. Eliminate the corrective action workflows as the process is brought under control.

Dynamic business processes

With WebSphere Dynamic Process Edition, LSS teams can design new and improved processes that are disciplined, yet flexible and responsive, to the dynamic nature of today's business environment. Instead of designing processes that rely on e-mail forms and attachments, LSS teams can take advantage of event-driven business policies and rules that enable the process engine to dynamically assemble the workflow by adding, skipping, or recombining tasks, or alerting people to take action as needed.

Consider an insurance claims process where one region requires that claims be paid within 60 days, another requires payment within 30 days or fines are levied, and other regions have no imposed limit. Business policies can be established so that tier one customers who currently must pay within 30 days instead must pay within a 10-day limit, tier two customers must pay within 20 days, and all other customers must pay within 30 days.

Customer facing processes become more personalized as business policies work to match tasks and services to needs and preferences automatically. In addition, the following benefits are realized:

- ▶ Automatically generated work lists are distributed to process workers who in turn can reassign them or break them into subtasks while the process engine continues to manage escalations and track SLAs.
- ▶ Out-of-bounds conditions automatically trigger corrective action and alert process owners and LSS team leads as needed. This is useful in the first six months after deployment to ensure control.
- ▶ With bottlenecks clearly visible, process owners can take action to smooth the workflow by re-routing activities or starting and stopping running processes.
- ▶ In the event of failure, the process engine uses compensation rules to back out transactions and system updates automatically.

Adding discipline to dynamic processes frees time to focus on value adding work or to work on an e-mail backlog.

Many insurance companies operate through networks of independent insurance agents. The loyalty of these agents is critical to remaining competitive. For example, consider a large U.S.-based property and casualty company who found itself in an increasingly competitive environment where the price, product, and commission were not enough to ensure loyalty. Increasingly higher levels of service, support, and responsiveness are also required to attract and retain the best of the independent agents to grow market share and revenue.

This company was looking for ways to improve agent service levels while decreasing its costs through improved efficiencies and streamlined processes. Specifically they sought to achieve the following goals:

- ▶ Lower operating costs by automating agent transactions, providing machine-to-machine straight through processing and direct access to billing and policy transactions.
- ▶ Fully use existing systems and increase IT asset reuse to lower maintenance and administration costs while increasing flexibility.
- ▶ Improve visibility and reporting across all transactions for both agents and company stakeholders.
- ▶ Use standards-based ACORD specifications

The company selected WebSphere Dynamic Process Edition with an ACORD-compliant insurance add-on, Industry Pack. It included starter templates for key service functionality ranging from basic inquiries on billing and claims, to more complex transactions, such as rate-quote-issue and endorsements. By using the Industry Pack, the company was able to jumpstart their implementation and deployment.

In this example, the company used business policies to select and access the correct back-end systems based on policy and agent information. The agent triggers the process from within their own desktop application, sending a request through to the company, which then processes the request and replies with the needed information. In the past, the agent had to leave their own agency management system and use the telephone or a browser to get the information from the carrier.

Agents also have the ability to log in to an agent portal, which is individually configured based upon agent profiles, to access additional functionality and new product information. Business policies are used to customize service delivery on an agent-by-agent basis, with the best, higher value agents receiving priority. Dashboards monitor agent transactions and provide increased visibility into the performance of the independent agent network.

Another interesting example of dynamic business processes involves a leading provider of outsourced human resources services. The company felt that it might be able to achieve a unique competitive position by allowing its corporate customers to assemble and maintain their own service delivery processes, tailored to their own needs and wants. However, the company knew that this self-configuration had to be accomplished with minimal IT involvement or it might be too complex and cost prohibitive to do. While not deployed at the time of this writing, the WebSphere Dynamic Process Edition pilot solution delivered this capability.

In this example, process steps are implemented as business services that are identified through a client profile and guided by business policies. By using a graphical portal interface, the company's customers can select which steps they want to include in their personalized process and in what sequence so that they can effectively select activities to meet their own needs. Then when a customer accesses the process through a login panel, WebSphere Dynamic Process Edition dynamically assembles the needed steps (the services) in the desired sequence per the pre-established profile. If the customer wants to change the sequence or add new services, they do so through a graphical administrative interface. The customer portal interface can also be used by the company to present new offers (through new business services) and provide direct access to customer service.

Business event processing

Events occur throughout every business system. A customer browses your Web site, chooses items, places them in a shopping cart, and checks out. Each of these steps is a business event that, when considered together, forms an event pattern and hopefully one that is repeated again and again. It is an expected pattern that exists in the events cloud that surrounds the business system.

Other patterns exist in the cloud that are unexpected or suspected but not confirmed. Credit card companies, for example, use this functionality to detect fraud through the frequent use of a card at different locations within a short time interval, or through sudden changes in spending patterns. Business event processing is an advanced sense-and-respond capability that is driven by these patterns.

WebSphere Business Events work with WebSphere Dynamic Process Edition to detect event patterns in processes, correlate them, and enable the business to take appropriate action if they occur. After patterns are detected, the process engine can issue alerts, create a work item on a work list, or start a new business process. More creative LSS teams are often well positioned to take advantage of this capability when designing new or improved processes because their background and training teaches them to look for, and uncover, patterns in data. A simple GUI is used to build the information blocks that are used in pattern detection.

In this example, a company in the healthcare industry used the business event processing capabilities that are in IBM WebSphere Business Events. The company had an idea for a healthcare solution for patients who need injections for their chronic conditions. The company wanted to engage thousands of clinics to deliver the therapy, but they needed complex event processing software to confirm all of the arrangements automatically. Among the conditions that had to be arranged or confirmed were the clinic's availability, the facility's certification and training, the delivery of the drug from the specialty pharmacy, and the agreement of the insurance company to pay.

The entire application was built on IBM WebSphere Business Events. Aside from the event processing application, the company created applications for locating clinics, detailing the patient's insurance plan, and configuring the resources at the clinic. The intuitive GUI of IBM WebSphere Business Events provides drop-down menus to program the logic of the events that must take place so that you can see the event dependencies.

This solution offers the following benefits:

- ▶ It takes 99% less time to develop automatic monitoring of arrangements.
- ▶ Patient care with injection therapy is 90% less cost.
- ▶ Almost US\$10 million in revenue was gained during the second year of operation.

Delivering business results for LSS enabled by BPM

For years, Lean Six Sigma projects have squeezed waste and variation out of business processes to save both time and money. Studies of leading Six Sigma and LSS organizations indicate that savings as a percentage of revenue can range from 1.2% to 4.5%. This means that, conservatively, US\$6 million are saved for a US\$500 million company, which is not an insignificant amount especially in today's economy.²⁴

²⁴ Charles Wexer, "Six Sigma Costs and Savings," i Six Sigma:
<http://www.isixsigma.com/library/content/c020729a.asp>

LSS projects also result in increased revenue, innovation, or business model changes. In a July 2008 interview with *Fortune* magazine, Gary Reiner, General Electric CIO and head of its LSS initiative since 1996, stated:²⁵

“In our GE Money business, we offer private-label finance to retailers. We are the financing behind jewelry stores and pharmacies and the like. Sad to say, it was taking 63 days from when a retailer contacted us saying it wanted to consider using us as a private-label financier until it could conduct the first transaction with our financing. No one had calculated this before we went on this journey.

We did a number of what we call “lean workouts,” where we get everybody in the room to map out the process, and they got it down from 63 days to one day. The leader of that business was able to go out and have as his marketing campaign *Enroll today. Transact tomorrow*. When we did that, sales doubled. And there are 30 examples of that throughout the company.”

LSS tools and techniques are even being applied to corporate social responsibility issues, such as *Green* where the conservation efforts of IBM have resulted in 4.6 billion kWh of electricity and US\$310 million in savings, and avoided over three million metric tons of CO₂ emissions since 1990. The IBM Green Sigma consulting offering now helps customers that achieve similar results. It includes a BPM element in the form of a Carbon and Water Management dashboard system that monitors key performance indicators, analyzes performance data, and uses event triggers to initiate processes such as carbon trading.

This ability to provide near real-time visibility into current process performance and measures through process monitoring and to trigger action is a key component of BPM. As mentioned in the Aberdeen Group study, companies that had implemented BPM were achieving an average of 9% improvement in revenues, a 12% decrease in process-related expenses, and an 18% ROI.²⁶

BPM also fills another gap, between software applications. In a May 2007 Aberdeen study of 150 companies, *Aligning IT to Business Processes: How BPM is Complementing ERP and Custom Applications*, over 50% of all companies have applications that force them to resort to manual processes and “only 15% of (survey) respondents have applications that afford them the desired flexibility...they need today.”²⁷

Flexible, SOA-based BPM platforms that offer integration capability, in addition to process choreography and business policies and rules, replace manual re-keying with automated system-to-system handoffs. At the same time, they allow the process to be monitored as it crosses departmental, application and workflow boundaries. They do this instead of increasing the complexity of the applications with additional custom code.

Choosing a BPM platform that is based on SOA is critical to success because it compounds benefits through higher levels of process and service component reuse and by allowing these components to be readily swapped in and out of the business processes. According to Andy Baer, CIO of Comcast, “The big savings is time to market. For example, in the provisioning process, the ability for us to create a new product or a new flow in the provisioning engine is measured in days and weeks rather than in months, which is how long it takes in our non-SOA-compliant application.”²⁸

²⁵ Geoff Colvin, “Information worth billions,” *Fortune* magazine, July 2008:
http://money.cnn.com/magazines/fortune/fortune_archive/2008/07/21/105711270/index.htm?postversion=2008071010

²⁶ See 13 on page 24.

²⁷ Perry Donham, *Aligning IT to Business Processes: How BPM is Complementing ERP and Custom Applications*, Aberdeen Group, May 2007: <http://www.aberdeen.com/summary/report/benchmark/4097-RA-Align-Business.aspx>

²⁸ Christopher Koch, “Reaping the Big Business Benefits of SOA,” *CIO Magazine*, July 02, 2007:
http://www.cio.com/article/121952/Reaping_the_Big_Business_Benefits_of_SOA

IBM firmly believes that combining LSS with SOA-based BPM can increase the rate of improvement while freeing time and resources to focus on new opportunities, innovation, and growth (Figure 17).

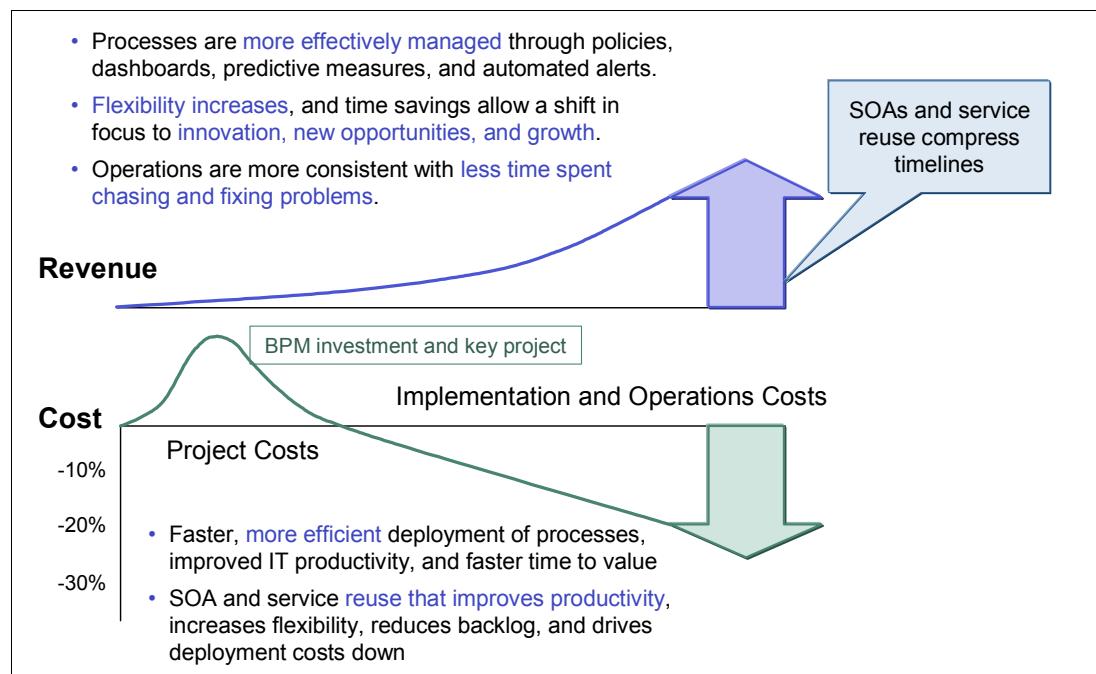


Figure 17 LSS with SOA-based BPM

Combining LSS with SOA-based BPM is accomplished by bringing together LSS and IT teams early in the improvement or design projects to collaborate, including the following components:

- The problem-solving and analysis skills of the trained LSS professionals
- The technical knowledge of IT architects and developers
- The powerful new technical functionality in the BPM platform
- The portfolio of reusable assets (service components, test and simulation environments, and so on)

Through this combination, greater overall benefits are achieved in a shorter period of time with an increased focus on projects that produce clear and measurable business results:

- Proven problem-solving tools and techniques speed analysis and technical requirements definition.
- Process simulation allows alternatives to be more thoroughly evaluated and tested with limited risk and without more costly real-world experiments.
- Reusable process and service components become business focused and, as a result, reuse increases over time, further accelerating improvements and innovation.
- New improvement options such as business policies, rules, workflow, and process monitoring result in more innovative and flexible improvement and design alternatives and solutions.
- Process measures are more predictive, results are focused, and included escalations and alerts are designed to head off problems before they grow.

The project backlog is likely to go down and not up because priorities are driven by business strategy versus reactive fire fighting. Without this linkage, there is a risk that valuable and limited IT resources are being channeled to projects with uncertain or limited return. The

backlog builds as the next hot project comes along and work is disrupted as priorities shift and churn.

Calculating benefit

To gain funding for a BPM investment, it is necessary to clearly estimate and project future benefits and ROI. In this section, we discuss a framework for calculating the benefit of BPM projects and look at some of the details behind it.

Since 2002, IBM has helped hundreds of customers develop detailed business cases with an engagement that we call a *Business Value Assessment* (BVA). Today the BVA uses a proven financial model that compares a customer's current cost and revenue environment to one or more future state alternatives that are enabled by LSS, BPM, and SOA.

We have learned that IT organizations tend to focus on cost comparisons, searching for the lowest total cost of ownership (TCO). We have also learned that business unit executives focus on reducing the costs of their processes and operations and on the additional revenue and profit that is generated by the investment and improvement. While it might be easier to understand and calculate costs, it is just as important to consider the direct and indirect benefits when calculating the return on a BPM investment (ROI). In fact, a Nucleus Research study found that, on average, indirect benefits account for half of technology ROI.²⁹

The direct benefits are those that can be directly associated with an improvement, such as a decrease in the number of process exceptions and the corresponding time saved working corrective actions. A direct benefit is included at 100% in the business case. If a benefit cannot be directly observed, such as the benefits associated with a reduction in the improvement project backlog, we classify that benefit as indirect and count only a portion of its estimated impact, which is typically 40%.

Figure 18 on page 42 highlights the areas that we normally consider when quantifying the benefits of a BPM project.

²⁹ "Indirect Benefits: The Invisible ROI Drivers," Nucleus Research, Report E19, March 2004:
<http://nucleusresearch.com/research/notes-and-reports/indirect-benefits-the-invisible-roi-drivers/>

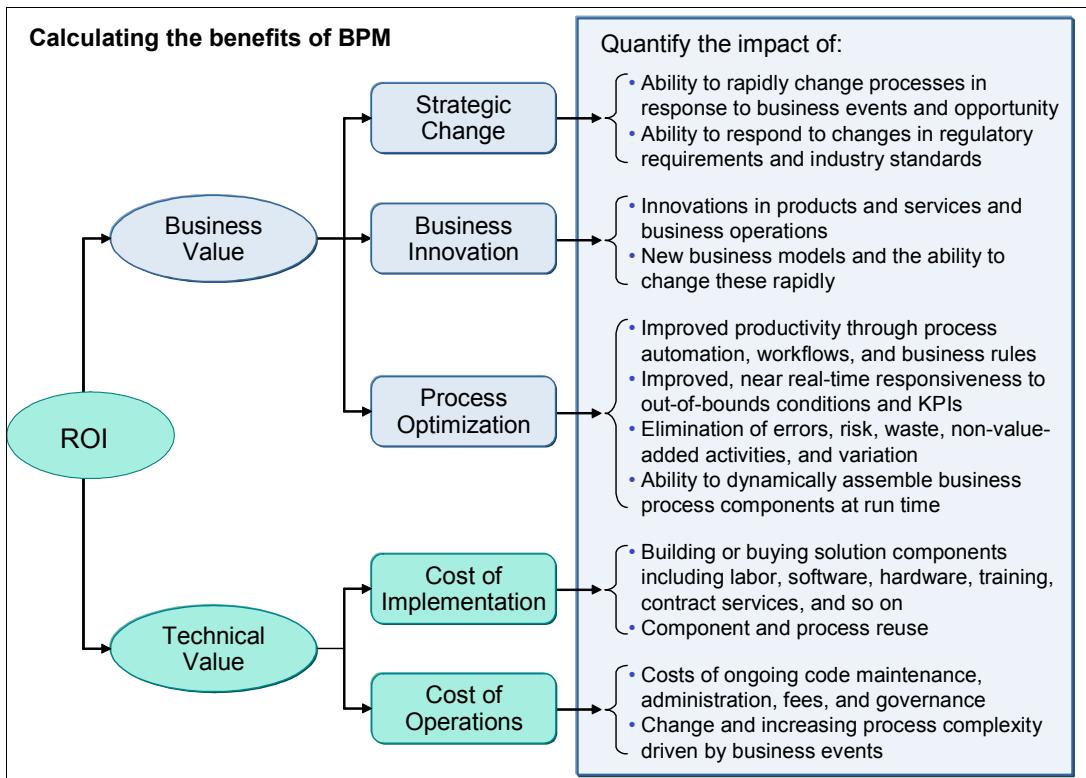


Figure 18 Calculating the benefits of BPM

Business value is found in the following areas:

- ▶ Strategic change

SOAs are designed to improve organizational flexibility and responsiveness. This approach is accomplished by breaking functionality into reusable building blocks (services) that can be built and tested independently, and then assembled in (Lego-type fashion) building blocks. Business processes that are made up of these services can typically be changed more rapidly than traditional software applications by replacing the building blocks or by modifying a building block and testing it independently. It is common to have a growing backlog of change requests when older, complex applications must be modified and thoroughly tested.

Various business events force change on business processes and BPM solutions including mergers and acquisitions, expansion into new markets, new business units coming on board, changes in regulatory requirements, and so on. If the enabling technology allows you to respond to the change event sooner, then estimate and incorporate the revenue that is associated with that ability into the business case as an indirect benefit.

IBM offers a unique capability when dealing with change. Process complexity (needed variation driven by differences in geography, customer type (for example, Silver, Gold, and Platinum levels), product category, and so on) is often addressed in the software code. As complexity increases, through the addition of new geographies, customer types, categories, business units, and so on, the time required to implement and test the change goes up and reusability goes down dramatically. Older existing applications are sometimes difficult and risky to change that change and opportunity are minimized or avoided.

By using WebSphere Dynamic Process Edition, you can abstract this variation from software code into flexible business policies. Policies are expressed in business terms and can even be controlled and changed by the business unit with minimal IT involvement, improving responsiveness. We have learned that it is easier and faster to change these

business policies than it is to change software code that is embedded in customized applications or in the service components.

The ability to change processes rapidly can become the source of competitive advantage and first-mover profit. A flexible business and technical architecture based on business policies can be incorporated into the improvement strategy developed by LSS practitioners. Doing this requires the active involvement of IT in the improvement and design projects and in discussions of where best to use change as a differentiator.

Our best practice recommendation is to determine the linkage between process change and variation and the project's key high-level measures, critical customer requirements, and operational objectives (*big Y* and *little Y*). Work with IT to determine how business policies and dynamic process assembly can be used to manage the required variation and accelerate ongoing improvement. Include the time and cost savings of a policy-driven approach and the revenue and productivity gained for the baseline project in the business case as direct and indirect benefits.

► Business innovation

The criteria for selecting recipients of the Malcolm Baldrige National Quality Award includes demonstrating innovation processes and measures associated with the rate of innovation (for example revenue from new products or services).³⁰ If the business process that is selected as the basis of the business case results in new products or services, innovative operational practices, or lays the foundation for innovation in the structure or financial model of the business, we attempt to quantify the initial value. Then we extrapolate this value out into the future and treat it as an indirect benefit.

► Process optimization

BPM technologies contribute to process optimization by supporting process execution, monitoring, learning, and the improvement cycles. Time is saved by eliminating the non-value adding activities in the process (identified during process modeling and analysis using BPM tools) and replacing the following parts:

- Manual activities with automated human task workflows
- Re-keying of data into multiple applications with system-to-system integration
- Manual approvals and workflows with business rules

Escalation rules can be used to trigger automated escalation processes as well as e-mail alerts and text messages in the event of out-of-bounds conditions and process delays. Not only can this lower costs, but accelerated response can prevent a small problem from growing into a larger problem without anyone knowing it. Escalation event data can also be captured for further analysis, adding new insights into process behavior.

The WebSphere BPM platform Dynamic Assembly capability and event-driven process monitoring play a role in optimization. With Dynamic Assembly, process services and functionality are assembled at run time based upon context and content. For example, if a customer is in the gold tier, then provide the fastest response. Monitor data enables real-time response and data can be imported back into the simulation engine to set up the next improvement cycle.

All of these improvements result in faster processes, higher throughput and productivity, and fewer errors, reducing the time that is spent on corrective action. Process simulation aids in quantifying the time saved, which is included in the business case as a direct benefit.

Our best practice recommendation is to use process simulation to compare current process cycle times and costs to one or more alternatives. Do this from multiple perspectives, such as value add time and cost, or the time spent handling process exceptions, include alerts, escalations, and automated corrective action processes in the design. Attempt to quantify the value of rapid response.

³⁰ <http://www.quality.nist.gov>

Technical value is found in the following areas:

- ▶ Implementation costs

Implementation costs for an initial BPM improvement or design project can include hardware, software, training and education, contract services and consulting, and the labor time that is needed to design, build, and test the software code. SOAs can dramatically reduce labor costs over time through component reuse, provided that the components themselves were designed to be reused and that good governance mechanisms are in place.

- ▶ Operations costs

From an IT perspective, operations costs include the administration of the technical environment, basic software code maintenance, software and hardware application upgrades,³¹ and ongoing training and education. Typically operations costs begin after the roll out of the first improvement phase and continue into the future, until the solution is changed or improved again or sunset at the end of its life cycle. If this occurs within the scope of the business case, remember to show that these cash flows decline or disappear.

Our best practice recommendation is that the use of business rules and business policies can improve IT and business productivity and reduce operations costs. Process owners and business managers can adjust them with minimal IT involvement. When designing the improved process, consider the increased flexibility that business rules and policies provide.

Linking the continued benefits of the BPM software investment to additional projects is critical, because it is best to view this as an enterprise platform that will be used downstream. Similar to the investment in LSS, the returns build over time through reuse, improved process visibility, and increased flexibility. Some organizations require that a software investment be justified by a single project. While this is certainly possible to do, including projected benefits for years two through five in your business case can avoid the “first-project-on-the-bus-buys-the-bus” barrier.

Getting started with Lean Six Sigma enabled by business process management

BPM and SOAs complement and accelerate LSS improvement and results. BPM technologies offer new capabilities that enable LSS teams to be more creative in the design of both improved and new processes and to deliver results to the business more quickly. The biggest benefits come from the following sources:

- ▶ KPI dashboards that improve near real-time visibility into current performance and improvement results
- ▶ Reusable services that allow processes to be modeled and assembled from building blocks, speeding implementation, increasing flexibility, and lowering operating costs
- ▶ Automated workflows that rely on powerful process engines to manage human and system interactions and that alert process owners to exceptions as they occur
- ▶ Business rules and policies that replace manual decisions with automated selections and allow required business functionality to be dynamically assembled at run time
- ▶ Process modeling and simulation capability that minimizes the need to run risky and costly experiments in the production environment while providing visibility into bottlenecks and constraints

³¹ If the business process was improved through system integration, you might want to include software and hardware application upgrade costs.

The LSS and BPM Deployment Framework (Figure 4 on page 10) and the DMAIC walkthrough that follows it describe how these technologies and techniques work together in great detail. We offer the following additional best practices that we gained from our customers to help you get started:

- ▶ Deploy basic WebSphere Business Monitor KPI dashboards early on to provide immediate visibility into the performance of a core process or key subprocess. Use these dashboards to identify constraints, target improvements, and verify results. An Aberdeen study found that a majority of companies surveyed prioritized customer-facing business processes for early monitor implementation.³² Add human workflow processes and business rules to address exceptions. Measure the time it takes to correct the exceptions. This data can then be used to aid project selection, and the workflows represent quick wins.
- ▶ Plan for a pilot and assemble the right team. Since we want this to be the first of many successful projects, we typically recommend selecting people who have the following attributes:
 - Are respected by their peers
 - Have a natural willingness to share with others
 - Embody best practices

These people will, by their nature, encourage and enable others to adopt and use LSS methodologies and techniques along with BPM and SOA tools and capabilities. Recognize and reward their accomplishments, and other people will duplicate what they do. Seed later projects with these individuals as mentors. Provide early training in BPM, SOA, and LSS to accelerate the learning and adoption curves.

- ▶ Choose the right process for your first combined BPM, SOA, and LSS project. Select a meaningful customer-facing process or key sub-process that makes a difference to business executives or is the source of customer dissatisfaction. Use simulation or other LSS techniques to uncover the core constraint and focus there to immediately improve the KPIs.
- ▶ Do not get trapped by departmental boundaries. Processes usually break at the edges, when data or responsibilities are transferred. Think systemically and look for measures and KPIs that provide visibility into the larger process, across the boundary, and from the perspective of the customer, not just the department.
- ▶ Make sure the target process lends itself to BPM-enabled improvement (see Figure 9 on page 18). Use BPM technologies to enforce process rules and policies and enable workers to focus on handling exceptions. Use such BPM capabilities as human-to-human workflow, system-to-system integration, business rules and policies, automated alerts and escalations, and predictive measures to manage the process and bridge the gaps between existing applications.
- ▶ Start simple. Use Lean techniques to eliminate waste and smooth workflow. Identify those steps that can be eliminated, simplified, and automated to bring about improvement.
- ▶ Actively look for reusable services and track reuse by project.

³² *Business Process Management Benchmark Report: Achieving Real Results through Monitoring and Performance Measurement*, Aberdeen Group, August 2006:

http://www.aberdeen.com/c/report/benchmark/sponsored/RA_BPM_PK_3385.pdf

Figure 19 illustrates how to use combined technologies and techniques to first reduce costs by targeting low hanging opportunities and then to move upward toward innovation and optimization.

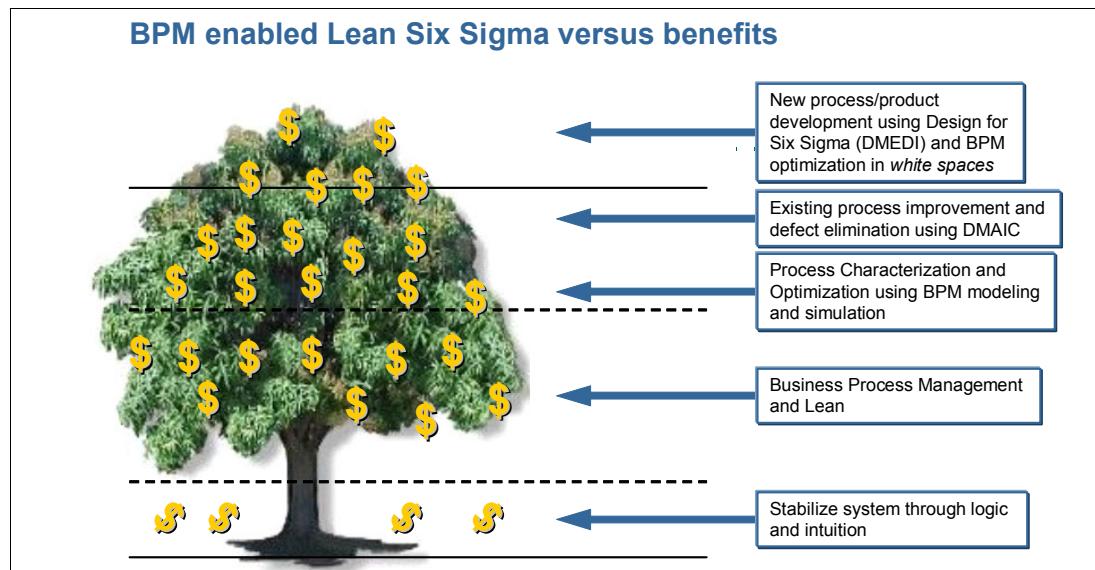


Figure 19 BPM-enabled LSS versus benefits

Leading companies have successfully combined LSS, BPM, and SOA to drive their costs down more quickly while dramatically increasing flexibility and overall ROI. The message in Figure 19 encourages you to begin by laying a solid BPM foundation (KPI monitoring and process modeling to aid project selection) and working to eliminate wasteful, non-value adding activities from your processes. From there, build on this experience and foundation to optimize core and key process performance. Finally, drive innovation into the business through building block processes that are dynamically assembled at run time in response to changing conditions and event patterns. Think reuse, standardization, and replication to further results.

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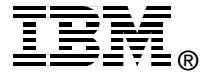
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