BPM and SOA require robust and scalable information systems

Smart work in the smart enterprise

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Management Summary

In today's rapidly changing environment, much is being said about the need for business agility, integration and optimization. Yet agile change at the cost of business integrity and operational excellence is a fragile value proposition at best. While business agility is critical for excellence in managing change, business performance and business integrity are critical for excellence in business execution. From a business process perspective, operational excellence is based on:

- Process integrity
- Process resilience
- Process scalability

Process integrity will protect against things like incomplete transactions and information inconsistencies. Process resilience will ensure that processes keep running under adverse conditions and despite information systems failures. Finally process scalability will ensure manageability, appropriate response times and adequate throughput. IBM believes that in order to succeed, BPM and SOA need to be based on robust and scalable information systems that provide these three key capabilities, all of which must be properly addressed to ensure business excellence throughout the enterprise.

It is important to realize that when BPM and SOA are properly combined from an information systems perspective, then excellence in business execution brought by BPM relies heavily on the horizontal transaction processing and scaling brought by SOA. The net effect of exploiting this natural synergy is a trusted, consistent and managed network of interacting and interdependent people, processes, services and information sources.

This white paper describes the principles for the convergence of BPM and SOA from an information system perspective. The primary audiences are IT leaders and architects that need to understand how to effectively combine BPM and SOA in support of business integrity and operational excellence.

1. BPM and SOA are dependent on transactional strength

In today's rapidly changing environment, the discussion is intense on how to achieve business agility, integration and optimization. In BPM and SOA – why, it is described from a business perspective why synergistically applying both Business Process Management (BPM) and Service-oriented Architecture (SOA) will help break the restraints of siloed processes and rigid IT systems, ultimately enhancing collaboration and accelerating the process of change.

Yet working smarter is not just about change itself. Working smarter is about embracing change while retaining the classical virtues of well-managed enterprises. BPM and SOA – why introduces the notion of business agility, business performance and business integrity as the three key differentiators for today's enterprises. IBM believes that in order to succeed, BPM and SOA need to be based on robust and scalable information systems that ensure business performance and business integrity. If not, then business execution will inevitably suffer.

The notion of transactional strength in information systems—the ability to execute and manage large numbers of concurrent transactions both consistently and efficiently—has been around much longer than the concepts of BPM and SOA. Yet what does transactional strength in a combined BPM and SOA environment truly mean? How do we mirror vertical enterprise solution characteristics in the horizontal business integration domain? And in what way does that impact the synergy and interaction between BPM and SOA from an information systems perspective? It is IBM's opinion that this aspect of the BPM and SOA story is both understated and undervalued.

As described in BPM and SOA – why, BPM and SOA are naturally synergistic and best when done together. Only, that synergy is not limited to the achievement of business and IT agility, optimization and alignment. Rather, it extends to the way SOA provides transactional strength to a BPM initiative. When properly combined, the business execution of BPM relies on the scaling characteristics of a robust and flexible SOA approach and infrastructure, as illustrated in the figure below.
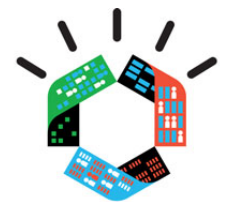

Business execution

Horizontal transaction
processing and scaling
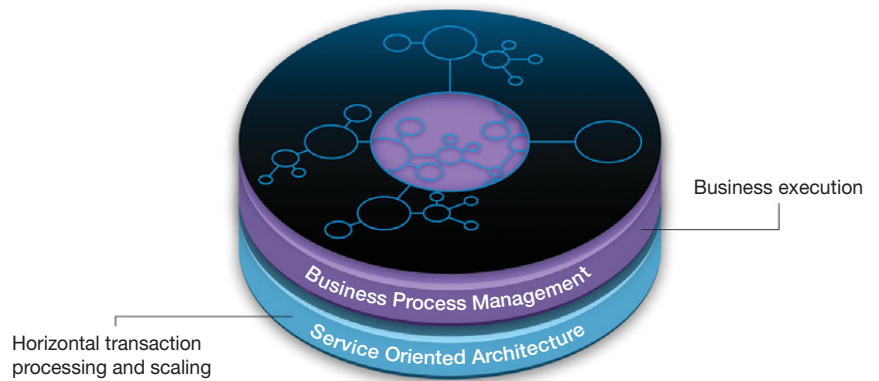
BPM and SOA are best when done together.

Note that a valuable side effect of doing BPM and SOA together is enhanced infor-mation system flexibility and cohesion. The separation of process logic and service logic increases cohesion and tolerance to change at a system level, while intelligent and policy controlled business services increase the flexibility and potential reuse of the enterprise service library. This combination of dynamic BPM and proper service-oriented design is an important business agility enabler.

2. Working smarter

For decades transactional integrity and resiliency to failures have been at the heart of operational excellence in the IT industry. In the context of BPM and SOA, we simply need to extend that operational excellence to the horizontal business processes that are a key component of working smarter:

Smart work is about transforming our organizations to take advantage of the capabilities of a smarter planet—so people can make more informed decisions, build deeper relationships and work with more agile and efficient business processes.


Smart work

There are three distinct aspects to the operational excellence of business process execution, and in order to be (business) "enterprise ready," information systems need to support all three under both normal and adverse conditions:

- Process integrity
- Process resilience
- Process scalability

Process integrity will protect against things like incomplete transactions and information inconsistencies. Process resilience will ensure that processes keep running under adverse conditions and despite information systems failures. Finally process scalability will ensure manageability, appropriate response times and adequate throughput under conditions of constantly increasing numbers of process instances and users. All of these are, in fact, needed in order to support business operational excellence, and they can not be achieved without the proper information systems characteristics.

Process integrity is the ability to conduct reliable business activities with seamless synchronization between human tasks, services and information—an ability that must extend across the entire dynamic enterprise network, including those parts that reach beyond the boundaries of the enterprise itself. Process integrity includes automated and predictable compensation and recovery when failures occur, whether those failures are in the process itself or in the information systems that the process depends on. This leads to a deep dependency on, not only the integrity characteristics of the process execution environment, but rather the integrity characteristics of the information systems environment in general, as illustrated in the figure below:
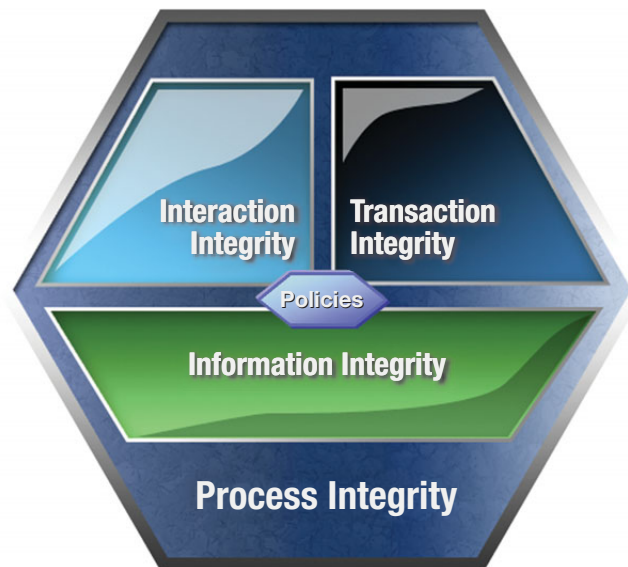
Process integrity with BPM and SOA

Policies must guide and govern operational behavior. Information must be reliable, complete and manageable. Transactions must execute consistently with the ability to recover as required. Users must be provided with up-to-date and secure access to human tasks, information and content. These concerns are important not only to IT, but also to the line of business. Without a transparent, reliable and manageable

environment—operational characteristics that all rely on the infrastructural strength of an enterprise class SOA foundation—business execution becomes opaque and uncoordinated.

Process resilience is the ability to protect against systems failures, ensuring that either business operations continue without error despite such failures, or alternatively that they are recoverable once normal processing resumes. Events, work and data must not be lost under any circumstances, and operational processes must eventually complete. Furthermore, operational policies must govern automated compensation and recovery, a capability that is strongly related to dynamic runtime service selection and mediation. Similar to what we saw with process integrity, process resilience also has a deep dependency on, not only the resilience characteristics of the process execution environment, but rather the resilience characteristics of the information systems environment in general.

Finally, process scalability is the ability to scale with increased use, both from a manageability and from a performance perspective. Responses and interactions must always be prompt and within agreed upon policies. Consumption of resources must be managed and stay within agreed upon limits. And the operational environment must remain manageable with growing numbers of concurrently active processes. Again, process scalability has a deep dependency on, not only the scalability characteristics of the process execution environment, but rather the scalability characteristics of the information systems environment in general. A particular point of interest from a scalability perspective is the computational overhead that results from policy enablement and service selection. If these critical capabilities do not scale effectively, there will inevitably be an upper limit to the manageable size of a loosely coupled environment.

The desire to dynamically build composite solutions from reusable building blocks is as old as the IT industry. With the transactional strength of SOA supporting dynamic BPM solutions, that desire is finally a practical reality. The IBM SOA reference model first defined in SOA Foundation calls out a set of foundational SOA technology components that from a technology perspective must specifically cater

to requirements derived from the need for process integrity, process resilience and process scalability, thereby leading to an integrated, scalable and robust foundation for business execution. For example Enterprise Service Bus (ESB) mediation must preserve message integrity and scale seamlessly with the number of providers and consumers. The service registry must be manageable and governable with thousands of services registered. Information must be exposed through managed information services that maintain information integrity. The process server hosting business process execution must be scalable and must be able to compensate dynamically for process or service failures, as well as must provide visibility to the monitoring of business process instances and human tasks. And all of these technology components need to work together in a synergistic fashion in order to provide the appropriate horizontal transaction processing capabilities. More detail on the technology foundation for business execution excellence can be found in BPM and SOA – how.

3. Interdependent processes, services and information

Classically in the context of BPM and SOA, we talk about "processes running on services," where (automated) activities in orchestrated processes consume services as part of their execution. Yet as described above, from an operational excellence perspective there is a more complex relationship between process integrity, information integrity, transaction integrity and interaction integrity, a relationship that we need to investigate and understand in some detail.

Information integrity provides consistency of information consumed or produced by business processes. We need reliable, complete and manageable information regardless of delivery channel. What is important to realize is that most horizontal business processes touch upon information with different semantic contexts, formats and lineage, hence the information infrastructure must be able to deliver trusted information in a consistent fashion independently of source platform. That is exactly where the meld of SOA and information management is strong, with the concept of Information as a Service leveraging SOA principles for the delivery and management of information in a federated environment.

Transaction integrity provides consistency of execution across any number of information system components (such as processes, services and information sources) and technology components (such as process servers, ESBs and service runtimes) that are involved in a given transaction. Transaction integrity must be an integral part of every business process that updates critical business resources, ensuring that activities update such resources in a single unit of work, with all updates completing successfully, or alternatively being rolled back consistently. Note that while business activities can be long running, lasting days or even months, each activity must still nevertheless be managed as a single unit of work—from a business perspective there can be no doubt or fuzziness about its outcome.

Interaction integrity enables people to be productive when participating in business processes. We need the ability to ensure that elements of people's interactions with information systems are intact wherever and whenever those interactions occur, thereby making people an integral part of the process execution environment. This is somewhat similar to the notion of transaction integrity, only focused on the many distinct and independent user interactions within an activity rather than on the activity as a whole. While transaction integrity deals with the holistic consistency of end-to-end process execution, interaction integrity ensures that each and every user interaction in isolation is both consistent and perceived as such, leading ultimately to enhanced trust in the system and overall enhanced effectiveness.

The net effect of having information, transaction and interaction integrity is a trusted, consistent and managed network of interacting and interdependent people, processes, services and information sources. As a simple analogy, think of a railroad network with a collection of trains (end-to-end processes) that collaborate on transporting people between destinations (business objectives). Each train is composed of wagons (business services) with flexible links (interfaces) between them. And each wagon in turn may have its own internal people, processes, services and information sources, providing a recursive structure to the network. Information integrity ensures that trains are routed based on correct information. Transaction integrity ensures that people get all the way to their destination. And finally interaction integrity ensures that, for instance, boarding a train happens in an orderly fashion.

In contrast, let us briefly consider what would typically happen if we were missing out on any one of these three key aspects of process integrity:

If we do not have information integrity then:
- Users can not trust the information that is provided (e.g., train schedules are not trustworthy).
- Information is not necessarily consistent and complete (e.g., trains may collide due to faulty traffic control).
- Users must integrate information from different sources manually (e.g., trip planning is completely manual).

If we do not have transaction integrity then:
- Failures can lead to inconsistencies due to lack of compensation (e.g., payment has been received, but no ticket issued).
- Work can not be rolled back in case of failure or change of mind (e.g., no refunds and no change of destination).
- There is no guarantee that a business activity will ever complete (e.g., no guarantee that passengers ever arrive at their destination).

Finally if we do not have interaction integrity then:
- Users may have to do the same work twice (e.g., reservation process needs to be repeated).
- Users may not know whether they have completed a task or not (e.g., uncertainty whether a reservation is confirmed or not).
- Users may not know what the next relevant task is (e.g., how do I actually get the ticket I paid for?).

While clearly, all of these are important concerns for any enterprise, they are absolutely critical for BPM and SOA environments that by definition are highly distributed and federated. IBM strongly suggests that when embarking on a BPM and SOA journey, an enterprise needs to ensure that such information-system related questions are being asked.

4. Conclusion

While much is being said in the market place about the need for business agility, integration and optimization, the complementary need for business integrity and business performance is often understated and undervalued. Yet agile change at the cost of operational excellence is a fragile value proposition at best. In order to ensure success, BPM and SOA need to be based on robust and scalable information systems. If not, then business execution will inevitably suffer.

Transactional strength is not a new concept, only we need to mirror the vertical enterprise solution characteristics in the horizontal business integration domain. By leveraging the natural synergies between BPM and SOA we can get the best of two worlds—business flexibility and agility as well as transactional integrity and scalability. Through explicit focus on process integrity, process resilience and process scalability we can assess and govern the operational environment that provides the foundation for agile business processes. From a technology perspective this requires a robust and scalable SOA foundation. And from an information systems perspective we need information integrity, transaction integrity and interaction integrity in order to ultimately ensure a predictable and consistent outcome of the execution of business processes.

Effectively supporting BPM and SOA with high-performance horizontal transaction processing will be a key differentiator for successful enterprises in their drive toward business agility. And to that end, IBM's scalable integrated tools and infrastructure are explicitly built to support transaction processing fundamentals, hence provide a good starting point and a solid foundation for the future. After all, providing enterprise-ready transactional strength is what IBM has been doing for 35 years!

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