

# SETLabs Briefings

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BUSINESS INNOVATION through TECHNOLOGY

## BUSINESS PROCESS ■ MANAGEMENT ■



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# Analyzing the Process Centric Enterprise

In the ongoing debate about the hows of organizing companies, CXOs have hardly been fence-sitters and have actively subscribed to one or the other school of thought. As a result enterprises have moved away from functional and organizational silos towards value chains or business processes. Of fairly mature vintage now, business process management (BPM) has positioned itself to latch on to these trends as one of the foremost contenders for the CXO's mind share.

Process-centric enterprises differ from most traditional organizations in their primary emphasis on maximizing the efficiency of processes, as distinct from maximizing the efficiency of departmental or functional units. Hence the core business processes are managed as discrete entities, and functions are evaluated on their contributions to successful processes. It is becoming apparent now with the emergence of the process-centric enterprise, that the design and management of business processes, the skills of people operating those processes, and the IT infrastructure supporting them are becoming a very important determinant of business performance.

In this issue, we try to put a thread around some of the issues of this emerging technology paradigm, and look at how it is set to evolve over the next couple of years. In an exclusive feature, analysts from Forrester Research add their perspective on how BPM can transform an organization. The role of standards in helping the technology realize its promise of enhancing IT-business alignment has been examined in detail. Committed to walk the talk on strategic technology management issues, we have sought to augment the treatise with experiential insights from Infosys practitioners.



Sumanta Deb  
Deputy Editor

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*"As businesses evolve, its processes will have to provide for acquisition of new lines of businesses, introduction of new technology, optimization exercises, outsourcing decisions, and adoption of industry standards."*

**Khushnood Naqvi**

Senior Technical Architect

Software Engineering and Technology Labs

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*"As information technology gets increasingly integrated with business operations, BPM can be viewed as a natural progression of software development. Over the next few years, the increasing sophistication of BPM technology will result in more system-generated code and less custom coding. This will happen as graphical modeling tools based on BPEL and other Web Services standards become increasingly capable of generating code and abstracting much of the complexity from the user."*

**Ken Vollmer**

Principal Analyst

Forrester Research

# It is Time for IT to Talk Business

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*By NS Nagaraj, Srinivas Thonse, & Khushnood Naqvi*

*The design, management, and supporting infrastructure of business processes are a critical competitive differentiator*

Achievement of business objectives in the context of an enterprise requires the articulation of the responsibilities of individuals and information systems at a task level. These tasks need to be performed in a coordinated manner to achieve the objectives. Work performed in this fashion brings in an element of predictability in the entire scenario. A business objective may be realized through multiple business processes, which is essentially the sequence of tasks and activities that help an enterprise attain its end goal.

Business processes are akin to the DNA of an enterprise. They form the core assets for organizational excellence and differentiation. It is possible to find enterprises with similar roles, systems, and activities; but their combination is most likely to be unique. This uniqueness of processes in an enterprise, if it enables the enterprise to survive the natural process of selection in the business ecosystem, becomes the source of its competitive advantage. The design of business processes, the skills of people operating the processes, and the IT infrastructure

supporting the processes directly influence business performance.

Any business process in an enterprise cannot remain static. As the enterprise evolves in response to the environment, its business processes too need to change. As the business evolves, its processes will have to provide for acquisition of new lines of business, introduction of new technology, optimization exercises, outsourcing decisions, adoption of industry standards, and so on. These changes in business processes require associated changes along people and technology dimensions. Unless these are properly managed, they have the potential of hindering the implementation of the process. Thus a business process has a lifecycle through which it has to be managed.

## **PROCESS MANAGEMENT REQUIREMENTS OF VARIOUS STAKEHOLDERS**

Various stakeholders in a business process include the participants who perform activities, process owners who are responsible for the

KEY STAKEHOLDERS	PROCESS MANAGEMENT REQUIREMENTS
Participants	Explicit definition, automation, integrated portal view of tasks
Process owners	Control, flexibility, process analysis
Senior management	Process monitoring, quick roll-out at least cost, easier change management
Customers	Process visibility, real-time response, quality of products and services
IT department	Automation, user acceptance of systems, easier maintenance of systems, partners coordination, standards based collaboration
Regulatory agencies	Visibility, audit mechanism

**Table 1:** Key stakeholders manage various business process requirements

**Source:** Infosys Research

ultimate outcome of the process, senior management who may want to monitor the performance of the processes, customers who may need visibility into the status of certain processes, the IT department that needs to automate the processes, partners with whom the enterprise needs to coordinate, and regulators who need to monitor the compliance of the processes with legal norms.

In running the enterprise, or interacting with it, several stakeholders are essentially managing different business process requirements (Table 1).

The Enterprise Architecture i.e., the blueprint on which the enterprise systems are built, should facilitate the management of processes by different stakeholders.

#### CURRENT PROCESS MANAGEMENT ISSUES

Today, firms are faced with various process management issues, that are internally and externally driven.

Internally, firms are undertaking various process redesign initiatives. Pressure on cutting operational costs demands optimization and improvement of business processes in near real-time. Companies are interested in leveraging

the Internet and adapting their business processes suitably. They are also consolidating their investments and trying to rationalize their internal processes. The recession has also brought back the focus on improving operational efficiency by redesigning processes. Consolidation in various industries and globalization of companies has resulted in companies working on harmonizing their processes across various component entities.

Externally, there is pressure to define processes explicitly. The Sarbanes-Oxley Act, USFDA's Part 11 of 21CFR, HIPAA, and Basel II are some regulatory acts that impact companies' processes and have necessitated compliance efforts in recent years. Compliance with any regulation involves explicit definition of the process and ways to scrutinize adherence to it. There is also an increasing recognition of the importance of process patents. Several companies, on recognizing the value of their processes, have patented their core processes. For example, Dell has many patents on its 'Build-to-Order' manufacturing process. The trend towards large scale outsourcing of business processes also requires that processes are documented unambiguously.

Firms today need to have innovative processes to maintain their competitive edge. Agile firms, especially in some industries like financial services and logistics, are looking for technology options that will give them the flexibility to configure their processes and be responsive to changing business dynamics. Traditional architecture does not facilitate monitoring processes that are currently being executed, modifying processes based on circumstances, and deploying new processes quickly.

Business users are intent on playing a more active role in the creation and maintenance of systems for their business processes. They are also keen on exploring the various options available for addressing the business-IT divide. Currently, a business user's abstraction of business process is completely lost after it is implemented as an IT system. This creates a major gap between various stakeholders that results in loss of flexibility for changes and increased learning effort for process users, engineers, and managers. Such issues cannot be addressed satisfactorily with existing systems and architectures.

## **BUSINESS PROCESS MANAGEMENT DEFINED**

Enterprises need a conceptual basis for approaching these issues and require technological support to address these requirements. Business Process Management (BPM) is emerging as a business and technology discipline that can address such issues.

BPM is a systematic way of defining, automating, and operating business processes within and across the enterprise. BPM can be a solution for addressing various issues like regulatory compliance, collaboration with partners, process improvement, quality

improvement, performance management, bridging of the business-IT, divide and software development.

BPM brings in many fundamental paradigm changes. BPM requires that business processes be viewed as variables with a distinct lifecycle. Some of the key aspects of this paradigm change are discussed:

### **Explicit, machine-interpretable business processes**

Explicit process modeling associated with quality initiatives has been in vogue for some time. BPM makes it essential to define processes explicitly. The business process cannot reside only in the minds of people. BPM reinforces this need to document processes and emphasizes the need to communicate processes unambiguously.

### **Seamless specification and implementation of processes across business experts and IT experts**

The business-IT divide is still a primary concern area for CIOs. One of the key reasons behind this phenomena is that the people involved in defining business requirements and the people involved in the implementation of the same using information technology implementation are different. In addition, the languages used by business and IT departments are different. BPM tries to address these two issues by providing business users with greater control in the design and maintenance of business processes and by creating a language that is business-user friendly, and at the same time rich enough to capture details that are required for developing the systems. Managing the transition to a 'process-centric enterprise' has many dimensions - ensuring a harmonious coexistence of the business and the IT aspects of an organization is the key.

### **Business users controlling the process design and implementation as opposed to IT users**

Changes to business processes traditionally required many changes to software systems. Business users would typically communicate the revised requirements to the IT department and the changes were handled through the software development lifecycle. With BPM, business users will be able to make changes to the processes with little or no help from the IT department. The involvement of business users will reduce the time required to realize the changes and hence enable faster response to the environment.

### **Process-driven integration with real-time computing ability**

Business processes span departments, roles, and systems. The need for efficiency and speed are demanding greater integration of systems for real-time response. Traditional notions of data-based integration or application integration are being substituted for process-based integration. This leads to improved flexibility and maintainability of integrated applications.

### **An integrated industry-neutral platform supporting the business process life cycle**

Traditionally, application development environments have been disconnected across the lifecycle stages of requirements, user interface design, architecture, design, build, and testing. BPM is leading the way towards an integrated platform where processes can be defined, implemented, executed, and optimized across life cycle stages. It removes the gap between life cycle stages, leading to a seamless concept-to-code paradigm.

### **Moving from monolithic packages to preconfigured solution applications**

ERP vendors have embedded industry standard

processes and practices in their proprietary platforms. These systems provide limited flexibility in adapting the processes and integrating the processes with best-of-breed products. This, in some cases, has resulted in the replacement of unique processes that are a source of competitive advantage by commodity processes. BPM defines a generic approach to use, to model the enterprise processes explicitly, thereby providing increased flexibility.

### **Application layer provides a declarative style of programming**

A declarative style of programming involves formal specification of "what" is required, without an indication of "how" to implement it. In the imperative style that is followed in most programming languages, specific instructions are given to execute a requirement.

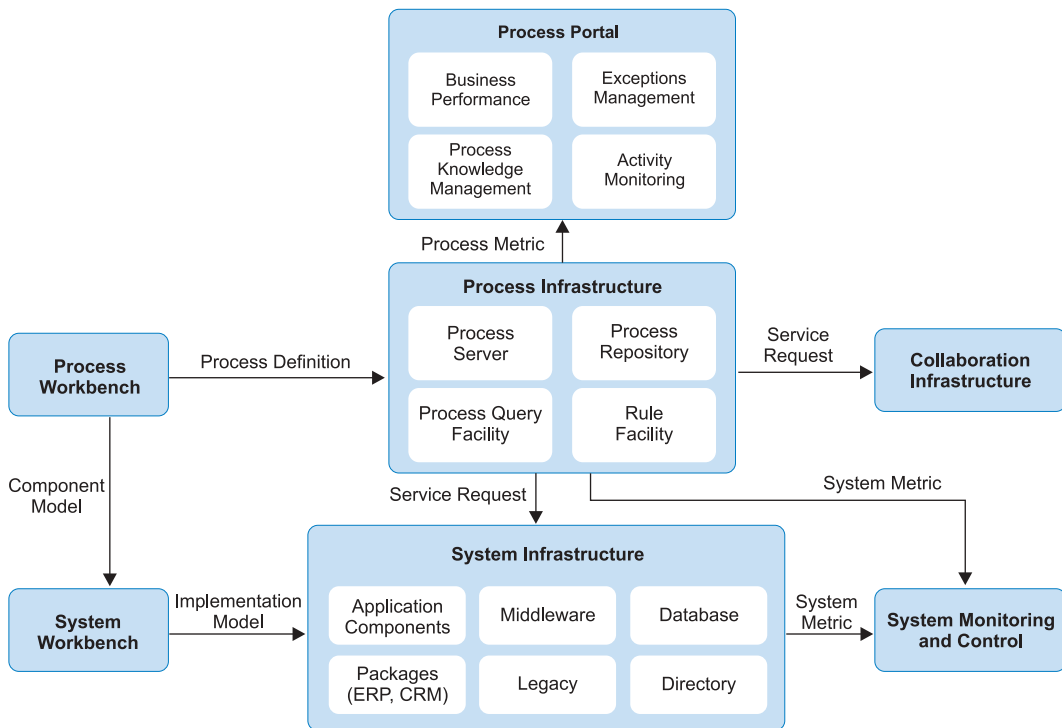
Processes in BPM interact with the application layer through an exchange of messages and invocation of services. These interactions are XML based and decouple the implementation from the process. Decoupling provides the flexibility to replace the implementation without impacting the overall business process.

## **BPM CONCEPTUAL ARCHITECTURE**

BPM provides process, modelling, management, configurability, collaboration, and improvement framework in an enterprise. The conceptual architecture is illustrated in Figure 1. The key components are:

### **Process Workbench**

The workbench is used to design and analyze processes. It provides business analysts with a mechanism to model the process using a standard representation. It enables analysis of the dynamic behavior of the process. It provides for analysis



**Figure 1:** BPM conceptual architecture consists of several components **Source:** Infosys Research

of the static properties of the process based on process design heuristics.

### Process Infrastructure

The process infrastructure manages the execution of the process. It comprises:

The **process server** executes the process specification by interpreting the XML-based process definition provided by the process workbench. The process server manages the process and activity instances and their lifecycle. The activities may interact with applications based on message interactions specified in the process definitions.

**The Process repository** manages the deployment of processes. The repository maintains process definitions. The repository also maintains process metrics used in process

monitoring and control, process intelligence, and business performance facilities.

**The Rule facility** stores domain specific business rules. Business rules get executed in the context of execution of a process. Business rules can potentially be modeled using Domain Specific Rules Language (DSRL), which will provide an XML-based language to capture rules.

**The Process query facility** component allows queries to be made on the process repository, on the process state, or the process specification. This facility could be used to find systems invoked by a process, or roles in the company that take part in a process. The process query facility is based on query specifications such as Business Process Query Language (BPQL), which is being developed by Business Process Management Initiative (BPMI).

### **Collaboration Infrastructure**

The collaboration infrastructure enables a process-based integration of the internal operations and the collaboration with other systems. It supports interoperability of internal business systems with the trading partners' business systems. The collaboration infrastructure also supports dynamic determination of trading partners and service agreements; and integration with multiple trading partners, buyers, suppliers, resellers, marketplaces, and portals. Pre-built industry collaboration standards such as RosettaNet and ebXML and vertical specific collaboration models enable faster collaboration design.

process variations, and to optimize processes.

**The Business performance** component that is used to associate the process's performance with the business objectives of the organization. The business performance facility also provides the basis for process design and helps to track process performance. The business performance facility is based on techniques such as Balanced Scorecard (BSC). The BSC metrics are inputs for process design. During process operation, the process metrics are compared against the process objectives set in the BSC.

### **Exceptions Management**

A business process usually involves exceptions that

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***Business Process Management is a potent tool in the hands of the enterprise architect - enabling the modeling, execution and control of business processes***

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### **Process Portal**

The process portal sub-system comprises the following components:

**Activity monitoring facility** that enables a real-time view of process performance. The process metrics are monitored during process operation. This brings real-time visibility into the behavior of the process, enabling faster corrective action when there are process deviations. Two techniques that are used for process monitoring and control are Process Metrics Monitoring (PMM) and Statistical Process Control (SPC). PMM provides a real-time view of process metrics. These process metrics are analyzed using SPC to determine if the process is performing within control limits, to reduce

require manual intervention. These exceptions usually have to be handled within predefined time limits. The Process Server routes these exceptions to the Exceptions Management component. This component assigns the exceptions to a designated user who then takes action on the exception. The Exception Management component then notifies the Process Server to continue executing the process. This component also manages allocation and escalation of exceptions.

### **Process Knowledge Management**

With time, significant operational knowledge is accumulated as tasks are executed in a process. For example, rules to approve loans, handle exceptions, settle claims, and manage outages.

The process knowledge base acts as a repository of such knowledge. This knowledge can be used to educate new users on the business, enable faster learning, improve task execution consistency, and deskill certain tasks.

**The System workbench** provides an environment to design and deploy components. The components are designed for services required by activities in the business processes. Standard Unified Modeling Language (UML) design tools can be used. Key standards to define the component model are XML Metadata Interchange Format (XMI) based on OMG's Model Driven Architecture (MDA). XMI is an XML-based language that is used to represent UML design models. The designed components are translated to the implementation model and deployed on the system infrastructure.

**System infrastructure** comprises the traditional elements of applications such as databases, directories, middleware, application components, and enterprise packages such as ERP and CRM. These implement the traditional data storage, data processing, and computational functions required by the business process. The Process Server invokes the services of these components by using open protocols such as Simple Object Access Protocol (SOAP), Java Messaging Service (JMS), Lightweight Directory Access Protocol (LDAP) and SQL, when orchestrating the process.

**System monitoring and control facility** monitors the process and system infrastructure. Monitoring and control is based on the system metrics generated by the system infrastructure. System monitoring tools involve traditional system management tools such as IBM Tivoli and Computer Associates Unicenter. System performance tools such as Windows Performance Monitor belong to this category.

## TECHNOLOGY BASICS

Enterprise business processes could be required to run for days or months, so an important characteristic of a BPM Server (BPMS) is its ability to run long-running processes. This requires persistent storage for process state in a BPMS.

*Compensation* is another important concept to consider in BPM. A business process may have to be aborted midway by a BPMS. Consider an Order Fulfillment process where an order request from the customer is received and the activities "Charge Customer" and "Ship Product" are completed. Subsequently if the customer sends an order cancellation request, a compensatory process that involves activities for "Do Refund" and "Recall Product" has to be performed to negate the results of the completed activities. Compensation can be a rollback in database ACID transactions. A rollback in database transactions tends to undo all data entry and deletion operations from the beginning. Similarly, compensation also negates all actions that are already performed by the BPMS. There are a few differences, however. In an RDBMS transaction-rollback, the undo operation is localized to the RDBMS tables; in a BPMS it typically results in a set of compensatory actions being activated.

In BPM, the business processes are defined using a process modeler also known as BPM workbench. The processes drawn by using a process modeler are captured in a Business Process Modeling Language. These languages have theoretical foundations in pi-calculus. Typical examples of these languages are BPML or BPEL4WS. These languages are executed by a Business Process Management Server (BPMS). BPMS promises to do to processes what RDBMS did for data.

A BPM language captures an enterprise process and its interactions with enterprise

applications. Instructions to BPMS include variable assignments, expression evaluations, and instructions for message passing with enterprise application to execute application services. The external applications that take part in the execution of a process are called "participants" to the BPM process.

In BPM, business processes are captured in the context of software development. This could be developing a new application, integrating a set of applications, or setting up a collaboration infrastructure between two different enterprises.

BPM technologies automate a business process in whole or in part. The various participants in a business process are applications and persons. Every process has some kind of interaction between applications and persons. Based on this interaction, BPM applications can be classified into the following categories:

- Application to Application (A2A): The business process is typically fully automated and involves a series of applications that participate in the Business Process. BPM applied to Enterprise Application Integration (EAI) will typically fall in this area.
- Person to Person (P2P): The business process will involve the exchange of documents between humans and workflow involving various roles in a company. Typically this will be a single "workflow" application, which automates a business process.
- Person to Application (P2A): This is a business process that involves various applications and humans as participants.

## CONCLUSION

BPM is a new technology paradigm that enables a business to model, execute, and control its business processes. IT projects based on BPM will start with modeling the business process first. These business processes are machine interpretable and run on a BPMS.

To implement the business processes fully would mean integrating them with humans, other enterprise applications, and other business processes. Integration with enterprise applications, both existing and new, is performed by using integration technologies like Web Services. The conceptual BPM architecture that is discussed earlier will help to understand the BPM Technology and also to provide an incremental path to adopting BPM in an enterprise.

BPM provides a good mechanism to address the current business process issues in enterprises such as, integration of application silos to implement end-to-end business processes, compliance of processes to regulatory laws or, optimizing the process for efficiency and cost.

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# Semantic Interoperability for Collaborative Business Processes

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*By Srinivas Padmanabhuni*

*Participants in a collaborative business process need a common understanding of the content and the context of messages that are exchanged*

In today's competitive business environment, enterprises are forced to collaborate with multiple business partners, suppliers, vendors, and customers. Business processes, therefore, spanning multiple enterprises are the norm rather than the exception. Collaborative business processes typically involve the exchange of services, information and/or products from one business to another. These complex business processes make it imperative for the participants to share a common understanding of the business processes, artifacts, and other documents. This requirement is termed *semantic interoperability*. Although technology is made out to be the biggest impediment to effective collaboration, the problem of semantic interoperability is usually the root cause. Semantic interoperability is achieved in collaborative business processes primarily through three approaches:

- Vertical domain-centered business vocabularies
- Horizontal canonical cross-vertical frameworks like ebXML, UBL, etc.
- Semantic web-based ontological frameworks.

Each vertical domain of application has various types of peculiarities specific to the domain the warrants development of a specialized vocabulary of business processes and documents.

At the same time, various types of business concepts and data types are common across multiple verticals necessitating the development of cross-domain vocabularies and processes so that they can be captured in a domain-independent manner. Common artifacts falling into this category are:

- Business concepts, data and documents like purchase orders, shipping handles, etc.
- Process, workflow, choreography, etc. including exception handling
- Contracts, trust, roles, permissions, etc.

The third category of business processes fall under the dynamic category. Dynamic business processes operate on the "publish-find-bind" principle, where business processes may dynamically invoke business partners and associated applications. The recent service-oriented paradigm of computing further endorses the notion of dynamic business processes. The problem of semantic interoperability is far more acute in such dynamic business processes due to the lack of prior business relationships between enterprises. The solution could lie in devising comprehensive and open ontologies to address the issue of semantic interoperability for dynamic business processes.

In this article we shall summarize all three categories of approaches to semantic interoperability in business processes. A common thread in the three approaches is the usage of Extensible Markup Language (XML) as the format of the languages. XML provides a format for representing data, a schema for describing data structures, and a mechanism for extending and annotating with semantic information. XML, being an extensible language, provides a framework within which interested groups can work out agreements on the vocabularies and data structures that are to be used in a given domain. XML and associated tools support the creation and implementation of such agreements. The ability of user communities to develop their own data formats has also lowered cost of various types of collaboration. Most vertical approaches have depended on XML as the solution for achieving

semantic interoperability. The same principle applies in the case of canonical as well as dynamic approaches.

### **VERTICAL DOMAIN SPECIFIC SEMANTIC VOCABULARIES**

Different industry bodies in vertical domains have realized the utility of XML as the underlying language for standardization of business artifacts. Each vertical industry has spawned bodies that dish out XML standards for the specific vertical. The basic idea is to fix the contract, trust, process, workflow, message, and other data semantics in terms of XML nodes and attributes for the nodes. These XML vocabularies are then published as a generalized Document Type Definition (DTD) or XML Schema for consumption by members of that vertical industry. Since all members follow the same DTD or schema, semantic interoperability is achieved.

Owing to many inhibiting factors, the large turnaround times of the standardization process itself being a major one, it is sometimes debated whether these vertical business domain XML standardization initiatives will take off in a big way. It is our belief that a few prominent domains that initiated the standardization process, even prior to XML, that will be relatively more successful in implementing XML-based standards. In many other domains, it might be possible that the standardization process itself will take a long time, leading to a possible loss of the business benefit that the use of XML entails.

The OASIS website (<http://www.oasis-open.org>) or the XML Coverpages site<sup>1</sup> provide a comprehensive list of XML vocabularies. Some of the prominent vertical vocabularies are ACORD for insurance, XBRL for accounting, OTA for travel, FIXML for financial securities trading, GovML for Government, FpML for financial derivatives, HL7 for healthcare domain, STPML

for financial straight-through processing, and so on. In addition to these prominent vertical-wide domain vocabularies, there are several instances where small groups of related businesses have come together and defined unique and customized XML-based vocabularies.

#### **CANONICAL APPROACHES TO SEMANTICS**

The central idea of the canonical approach is to share generic, common concepts alongside a context to apply the generalized concept to a particular situation, be it a specific vertical application or a specific business message.

It is very rare today when a company contacts business within one industry vertical only. For example, an automotive company may

of cross-domain vocabularies and processes so that they can be captured in a domain-independent manner. However, in order to achieve meaningful reuse of canonical frameworks it is essential that vertical industries should be able to specialize the information by including additional constraints and terminology. Hence it is necessary to provide a mechanism in which an industry vertical's terminology can be applied in an appropriate context to the canonical framework. The context could be the product classification, vertical industry, geographical specifics, and other such factors.

**Electronic Data Interchange (EDI):** In the days of EDI, two initiatives to develop cross-sector EDI standards gained momentum with time. The

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### *Cross-vertical reuse of business artifacts has resulted in canonical business languages and frameworks*

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send a business document like a purchase order to an energy company, a spare parts company, an office supplies company, and others. In each case, the basic structure of the purchase order may be the same even though it is being sent to industries in different verticals. In this example, the automotive company should be able to use one purchase order to communicate with all the companies; the content will be different but the XML structure should be the same.

Such cross-vertical reuse of business artifacts has resulted in canonical business languages and frameworks. These frameworks are based on the idea that common business concepts and data types can be shared across multiple verticals necessitating the development

American National Standards Institute (ANSI) X12 committee developed standardized transaction sets (or messages) that were primarily intended to meet North American needs. On the other hand, the standards developed under the auspices of the United Nations, called UN/EDIFACT (United Nations/EDI for Administration, Commerce and Transport), were aimed at international trade. Both X12 and EDIFACT have evolved over the years to include more and more business artifacts under various transaction codes.

Barring minor variations, both the approaches to EDI broadly advocate a message structure consisting of four components: *transaction set standards, a data element dictionary, segment directory, and transmission control standards.*

The transmission control standards provide for the overall electronic envelope in which one or more messages are carried from sender to receiver(s). Each transmission consists of one or more "transaction sets", each transaction set being roughly equivalent to a generic business artifact such as Purchase Order. Each type of transaction set, in turn is made up of a series of "segments", each roughly equivalent to a "block" of related data on a paper form. At the detailed level, a data element dictionary provides definitions for the individual atoms of data that are assembled to compose each segment of information in the electronic transaction.

At a semantic level, X12 or EDIFACT standards allow the particular businesses or business domains to define their own sets of data dictionaries, segment directories, and transaction set tables.

Many approaches have been put forward to enhance EDI using XML. These XML frameworks range from the earliest XML/EDI framework, through xCBL (XML Common Business Library) to Open Applications Group's Business Object Documents (OAGIS BODs). Ultimately all these approaches tend to converge on the broad and generic framework of ebXML, thereby highlighting the role of ebXML as a key architecture stack for B2B.

**XML/EDI:** XML/EDI proposed a system that allowed each trading partner to quickly synchronize its systems by exchanging not just the old structures of EDI data, but also process control templates and business rules. XML/EDI provides a standard framework to exchange different types of data (e.g. purchase order) with provisions for searching, decoding, and manipulating the data. XML/EDI resolves the deficiency of EDI by adding three additional key components:

- Business Rule Templates traveling alongside a message that can be

interpreted and executed dynamically

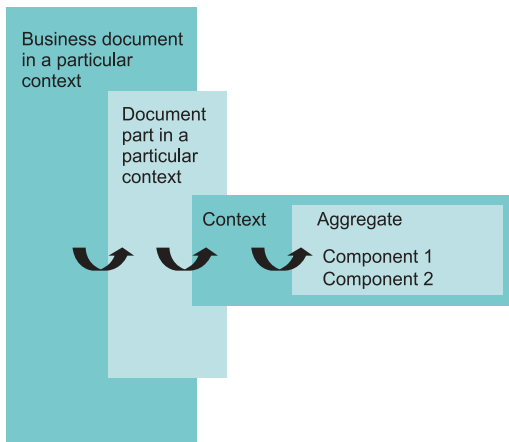
- Agents, which are pieces of software that act on the rules
- Global Internet Directories that enable agents to search the rule templates so that an appropriate template is attached to a job.

**xCBL:** The XML Common Business Library (xCBL) is a set of XML building blocks and a document framework that allows the creation of reusable XML documents for e-commerce. xCBL is the result of a collaboration between Commerce One® and the leading XML standards bodies. Quite a few enterprises are already leveraging xCBL develop and deliver business-to-business solutions.

xCBL has its roots in an early XML schema language called SOX (Schema for Object-Oriented XML) developed by Veo Systems, which was acquired by Commerce One®. The language was slowly evolved to make it interoperable with EDI and gave companies using EDI a way to transform older EDI applications to XML. xCBL in its latest version can encode any e-commerce standard and allows users to build customized documents from standard horizontal components. Commerce One® has announced its intent to converge xCBL to the ebXML framework.

**OAGIS BODs:** The Open Applications Group (OAG)<sup>7</sup> is a non-profit consortium that develops business processes based on XML for eBusiness. The group has published XML-based documents called BODs (Business Object Documents) for a variety of business-to-business and application-to-application integration scenarios. The architecture from OAGIS enables the provision of requirements for horizontal as well as vertical industries in a single specification.

The repertoire of BODs from OAGIS covers a range of verticals including supply chain.



**Figure 1:** *ebXML Core Components have a layered approach in a business document*

**Source :** *ebXML Core Components specifications*

BODs are in use in many commercial implementations of supply chain. According to an official announcement from OAGIS, a convergence of the OAGIS BODs work and ebXML core components is in the offing.

**ebXML:** ebXML<sup>5</sup> is an end-to-end stack proposed under the aegis of the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS), aimed at standardizing B2B collaborations. The stack of ebXML derives its fundamentals from EDI, the existing de-facto technology for conducting e-business between multiple business partners. It is envisioned to enable enterprises of any size and in any location to find each other electronically and conduct business by exchanging XML messages.

ebXML offers an open XMLbased framework for enterprises to use to conduct business electronically with other enterprises or with customers. In effect it is a collection of standards for conducting e-business. The runtime view shows the typical sequence of actions in an ebXML based B2B scenario (Figure

1). An enterprise discovers the business profile of a partner from a registry, then carries out conversations to reach a trading agreement, after which the actual business transaction takes place. The semantics in the ebXML stack are handled at two levels: Core Components at the data dictionary level, and UBL for standardized business documents level.

A *Core Component (CC)* is a generic term referring to a semantic data item that is used as a basis for constructing electronic business messages. The Core Components specification addresses the need for capturing data items that are common across multiple businesses and domains. A layered approach is taken with the provision of specialization of components based on *context* (Context refers to the environment in which the data item is used).

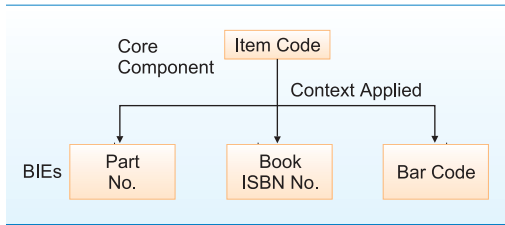
There are two basic types of Core Components:

1. Basic Core Component - A simple, singular Core Component that has a non-divisible semantic meaning like an item code, an ID, etc.
2. Aggregate Core Component - A collective or packaged Core Component like an address.

Any core component is considered to be context-free and is reusable across multiple business instances. When a specific context is used to constrain a core component, it is called a *Business Information Entity (BIE)*.

A core component-like item code refers to three different things in different contexts (Figure 2). In a shop floor context, it refers to the part number of a spare part, in a library it refers to a book ISBN number, and in a supermarket it refers to the barcode on a grocery item. A large number of different context drivers have been identified for use in core components including region, industry, business purpose, and so on.

Core Components Specs contains a set of guidelines for assembling Core Components into



**Figure 2:** Core Components are context-specific

*Source: Infosys Experience*

Business Information Entities (BIEs) and applying a context to each component. One of the key deliverables of the ebXML Core Components team is the core component dictionary of components submitted and analyzed by domain experts.

**UBL:** Universal Business Language (UBL)<sup>6</sup> is an ongoing effort at OASIS to address the development of reusable semantic business documents for interoperability across multiple businesses and verticals. Core Components specifies two broad categories of elements, the Core Components and the BIEs. UBL is concerned only with the BIEs (both Basic and Aggregate BIEs).

UBL addresses the need for semantic interoperability at the level of business documents. It has been observed that 20% of documents and business objects are actually used by 80% of electronic business partners. UBL concerns itself with the development of a library of reusable BIEs representing reusable business documents specified in XML schema to address interoperability concerns. A context methodology has been specified for specializing BIEs based on special context drivers.

A purchase order can serve as a good example of a UBL business document. Though different purchase orders are sent by the same company to different partners, or to a utility company, the core structure of the document remains the same. In this context a purchase order

would be an ideal candidate to be captured by UBL.

Again, the specialization of BIEs according to the context is broadly driven by similar drivers as in the Core Components. These include Business process, Industry, Product classification, Geopolitical region, and so on.

### SEMANTIC WEB-BASED ONTOLOGICAL FRAMEWORKS

Semantic web-based standards from W3C like Darpa Agent Markup Language (DAML)<sup>4</sup>, Resource Description Framework (RDF)<sup>2</sup>, and Ontology Working Language (OWL)<sup>3</sup> are useful in providing semantic foundations for dynamic B2C situations involving dynamic discovery of businesses and services.

The World Wide Web has been a success in terms of wide acceptance of HTML as a universal language for content dissemination. It falls short, however, of being a medium for making the content machine-understandable. In this context, semantic web extends the Web to provide better comprehension of information between humans and computers. This is primarily achieved through use of ontologies, which are explicit mechanisms for expressing shared understanding and concepts. Ontologies may typically involve sets of concepts in a hierarchy along with associated links and descriptions.

A prime formalism in semantic web is that of Resource Description Format (RDF), which is a formal specification for describing and exchanging metadata. RDF is the basis for interoperability among diverse metadata, and is considered the cornerstone of semantic web efforts.

In the context of dynamic collaborative business situations, business partners as well as applications can dynamically join or leave business

processes, manifested primarily in applications of Web Services. Current specifications for dynamic discovery of Web Services rely on syntactic descriptions, thereby leading to lack of semantic interoperability. Practitioners of Web Services are trying to reinvent concepts in semantic web to provide semantics to Web Services, thereby facilitating dynamic business processes.

DAML-S is built on top of the existing Web Services standards of semantic web standards. It provides an upper ontology for providing properties and capabilities of Web Services, alongside ontologies for service types and execution characteristics of Web Services. The reliance on semantic web concepts ensures semantic interoperability.

## CONCLUSION

The ultimate purpose of these vertical XML standardization efforts is to forge a semantic understanding between different enterprises within the same vertical space. The effectiveness of these efforts, however, towards achieving the semantic interoperability is still in doubt because of the following factors:

- In some cases these standards turn out to be cumbersome, involving hundreds of XML nodes
- The standardization effort itself takes a long time to evolve due to involvement of numerous industries, each with their hidden agenda
- The Document Type Definitions (DTDs)/ Schema are rigid and sometimes pose a challenge to modeling dynamic behavior and context-sensitive information
- A lot of effort has to be put in before anything meaningful can be achieved
- Implementation issues pose considerable challenges especially because new investment is required from enterprises.


Hence, the answer to semantic operability for verticals may be a few dominant vertical vocabularies.

In many business situations, it is rare that an enterprise does business within a specified vertical, for example, an automotive company may send a business document like a purchase order to an energy company, an office supplies company and others. In each case, the basic structure of the purchase order may be the same even though it is being sent to industries in different verticals. Likewise, within the purchase order, the common notion of filling an ID or item code for an item exists, though details of ID itself may be different for different partners. Canonical Horizontal Business frameworks provide a middle ground by not relying on full standardization but instead, specifying standardization to an extent coupled with context-based customization.

An analysis of the trends in convergence of the canonical horizontal standards for semantics of business processes in the B2B space indicates the increased role of ebXML in addressing the semantic requirements of the B2B scenario. All the XML-based initiatives mentioned in the canonical XML/EDI section of the document except BizTalk, have all announced support for ebXML Core Components at the most basic level. In fact the UN/CEFACT discontinued the work of XML/EDI in favor of ebXML. Likewise, at the business document level, there are signs of convergence to UBL, mainly because it was derived from a standard like xCBL originally.

Hence, the crucial role of semantic web-based standards from W3C like DAML, RDF, and OWL is invisible in providing semantic foundations for dynamic B2C situations that involve the dynamic discovery of businesses and services.

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# Can Universal Languages Reduce Interoperability Issues?

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*By Krishnendu Kunti & Senthil Kumar*

*Divergent XML-based formalisms address the requirements of BPM to varying extents, highlighting the need for convergence to a universal language*

**B**usiness Process Management (BPM) is an emerging trend in the area of business process automation and system design. BPM helps organizations to formalize specifications for business processes and enable their analysis, monitoring, and execution. It helps in streamlining the information flow amongst the IT systems carrying out business operations and increases the organization's agility that is manifested in faster responses to customers, markets, and strategic requirements<sup>1</sup>.

Typically, workflow management systems are able to capture business process flows with the implicit assumption that the order of the execution of the processes in the workflow is predefined with intermediate manual steps. But as business processes evolve from enterprise-centric structures to collaborative structures in order to facilitate business process outsourcing, where there is a

need for dynamic configuration of business processes, traditional workflow management systems prove to be inadequate.

BPM systems on the other hand allow for dynamic process configuration, satisfying the core need for supporting dynamic business processes. BPM systems also address the need for functionalities like monitoring a process, logging, and taking compensatory actions when some process' actions need to be undone. Further, BPM provides a low-cost integration layer for coordinating the actions of isolated IT systems - such as CRM, SCM, and ERP. BPM's ability to reuse common integration components such as data objects as well as business rules provides a 'mix and match' approach to application integration<sup>2</sup>. BPM can be used as a tool by a business analyst to model business processes and determine the best technology combination<sup>3</sup>.

BPM, coupled with recent technology trends of XML and Web Services, facilitates a new breed of software that enables automation of business processes, both within an enterprise and outside it. On one hand, XML has found universal acceptance as a medium for communicating data and program information owing to the ease of representation, flexibility, extensibility, interoperability, and platform and language independence. The ease of representation has prompted different business verticals to define universal XML-based vocabularies for their domain. On the other hand, the loose coupling between applications encouraged by web service interfaces, and the universal support for core web

- Enterprises sharing a common process often implement the process using disparate technologies/platforms, leading to interoperability issues and inefficiency
- Reuse of processes and patterns across applications will become difficult
- Vendors may come up with proprietary extensions of Web Services and XML standards, leading to vendor lock-in
- Evolution of best-of-breed modeling and execution tools will be hindered.

Standardization helps in reducing interoperability issues across applications and promotes faster adoption of technology. There

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*Standards are the key - they enable processes to be modeled, deployed, executed and managed without interoperability concerns*

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service standards are the key facilitators for Web Services as the technology of choice for integrating applications. These factors, coupled with the business driver of organizations' increasing agility to respond to market, customer, and strategic requirements, has resulted in the evolution of BPM systems and formalisms based on XML and Web Services.

#### **BPM STANDARDIZATION**

BPM standards are essential as they will enable processes to be modeled, deployed, executed, and managed by using software developed by various vendors without interoperability concerns. The following points emphasize the need for standards:

have been several standardization efforts for BPM based on XML and Web Services.

Over the years standardization efforts have resulted in numerous standards, some of which are complementary and address totally orthogonal concepts. Key features of a standard BPM language are presented and a feature-wise comparison of leading BPM standards is provided in the following sections.

Business Process Management Initiative (BPML.org) released BPML1.0<sup>4</sup> in August 2002. BPML1.0 contains several constructs for defining complex processes in addition to the support for transactions, exception handling, and compensation. A similar standard called Web Service Choreography Interface (WSCI) mainly

addresses application-to-application integration. Both have the same conceptual model and BPML leverages WSCI to define abstract and executable processes.

Workflow Management Coalition (WfMC) released XML Process Definition Language (XPDL)<sup>6</sup>, a specification for importing and exporting process definitions.

XLANG is a web service orchestration standard developed by Microsoft that is supported by BizTalk servers. It specifies the message exchanges between Web Services. Web Services Flow Language (WSFL) is an IBM standard that specifies Web Services flow orchestrations.

Microsoft, IBM, and BEA together defined the Business Process Execution Language for Web Services (BPEL/BPEL4WS) that combined the features of XLANG and WSFL in August 2002.

The ebXML organization and Organization for the Advancement of Structured Information Standards (OASIS) defined Business Process Specification Schema (BPSS) that supports definition of business processes between trading partners who perform different roles in a process.

The most recent standard - WS-CDL - from W3C defines peer-to-peer collaborations of web service participants, it is suitable for mapping message exchanges between processes in different organizations (B2B scenarios). Standard, however, is beyond the scope of this study.

The evolution of various standards has made it difficult to select the right BPM solution. This paper provides a feature-wise comparison of the prominent BPM standards: WSCI, BPML, XPDL, BPSS, and BPEL.

## **BPM LANGUAGE FEATURES**

Here we explain some of the key features of BPM. We will then compare BPM languages on the basis of these features.

**Orchestration:** It defines how participants in a process work together to execute a process from start to finish. It is sometimes referred to as workflow; however, the term workflow is typically used to define processes involving manual steps. Orchestration clearly identifies the role of each of the participants and sketches the execution flow of a process. An execution flow can consist of sub-processes, running parallel sub-processes, conditional processes that invoke other processes.

**Collaboration-Based Process Models:** Processes are described as a set of collaborations between the participants both in B2B and intra-organizational contexts. Participants can play various functionalities in a process. Roles are used for abstracting the participants into model descriptions. The entire process is defined as a set of interactions between these roles. In this paper, collaboration refers to interaction between roles both within and outside an organization.

**Transaction Management:** Unlike conventional transactions, in BPM some transactions are short-lived while others may exist as long as a month. Complex business processes use transactions as building blocks. Conventional ACID mechanisms do not work for Long Running Transactions (LRT). To handle LRTs, ACID restrictions are relaxed and the notion of compensation is used. Transaction Management in BPM deals with compensation actions. If a sub-process is successfully completed, while the top level process fails, then necessary compensation actions need to be undertaken to undo the actions of the sub-process. Long-running transactions and compensations are a very important feature of BPM.

**Exception Management:** Exceptions can occur at any point during the execution of a business process. A mechanism should be provided by the BPM system to handle the

## FEATURE-WISE COMPARISON OF BPM LANGUAGES

✓ - Present    ✗ - Not Present	WSCI	XPDL	BPSS	BPML	BPEL
<b>Collaboration-Based Process Models</b>					
Portable	✗	✓	✗	✗	✓
Collaboration of roles	✗	✗	✓	✓	✓
<b>Orchestration</b>					
Sub processes	✓	✓	✓	✓	✓
Sequences	✓	✓	✓	✓	✓
Correlation between messages	✓	✓	✓	✓	✓
Parallel and conditional execution	✓	✓	✓	✓	✓
<b>Transaction Management</b>					
Long running transactions	✓	✗	✓	✓	✓
Maintaining state of transactions	✗	✗	✓	✓	✓
Compensations	✓	✗	✗	✓	✓
Explicit support for how data flows - protocol info	✓	✗	✗	✗	✓
<b>Exception Management</b>					
Control exception	✓	✗	✓	✓	✓
Business exception	✗	✗	✓	✗	✓
Fault handling	✓	✗	✓	✓	✗
Termination	✗	✗	✗	✓	✓
<b>QoS</b>					
Authentication	✗	✗	✓	✗	✗
Digital signatures	✗	✗	✓	✗	✗
Non-repudiation	✗	✗	✓	✗	✗
Timeouts	✗	✗	✓	✓	✓
Acknowledgements	✗	✗	✓	✗	✗
<b>Web Service Support</b>					
Leverages WSDL	✓	✗	✓	✓	✓
Service link	✗	✗	✗	✗	✓
Runtime resolving Web Services	✓	✗	✗	✗	✓
Service interface	✓	✗	✓	✗	✗
<b>Logging</b>					
Audit trails	✗	✗	✓	✗	✗
<b>Agreements</b>					
Business agreement/ contracts	✗	✗	✓	✗	✗
<b>Process Boundary</b>					
Public	✓	✗	✓	✗	✓
Private	✗	✗	✗	✓	✓
Abstract/executable	✗	✗	✓	✗	✓
Partners/service link	✗	✗	✗	✗	✓

**Table 1:** A comparison of BPM languages highlights several common features

Source: Infosys Experience

exceptions so that the process does not stop abruptly. Exception management can vary from just handling the exception and aborting the process, to passing the exception elegantly up the hierarchy and mapping the underlying technical exceptions to the business exceptions for better process management and monitoring.

**Quality of Service (QoS):** QoS refers to support for additional but important non-functional features in a process. It includes features like authentication, acknowledgements of messages, digital signatures, non-repudiation, timeouts, security and reliability, and so on.

**Web Service Support:** As discussed earlier, Web Services technology is a major catalyst for the evolution of BPM. When participating applications in BPM are exposed using web service interfaces, dynamic invocation of processes and exchange of messaging between processes can be achieved very easily. BPM based on Web Services is the solution to enable process-centered dynamic and agile IT applications.

**Logging:** Logging is very important in a B2B process scenario. When important transactions are at stake, storing an audit can be useful both for legal as well as management purposes. Logging also helps achieve the non-repudiation requirement of QoS.

**Agreements:** Agreement is also more specific to B2B processes, where there can be mutual agreements between participating partners in the form of a contract for carrying out specific functions.

**Process Boundary:** Normally business processes that span multiple enterprises consist of public and private processes. Public processes are those that define the flow of information across enterprises while the private process defines the flow within an enterprise. A complete definition of the business process will describe both the private and the public processes fully.

In some cases the public process can in turn be a web service created by the aggregation of the private Web Services. A process can be defined as public, or private process to show or hide implementation details and hence determine the process boundary. The implementation of a private process is not meant to be seen by external users and is generally available as an executable process. A public process is in turn created out of interactions among private processes and is generally abstract in nature.

We have analyzed these languages and come up with a comparison summary of the support that is available for the aforementioned features, making it easy to select the appropriate BPM language for a chosen business process scenario (Table 1).

**Orchestration:** Orchestration is the basic functionality of any BPM language. There can be both a graphical as well as a structural method to capture the workflow of a process. Each language comes with a unique method of implementing this feature.

In BPSS, orchestration can be defined as sequencing of business activities within a binary collaboration. A number of constructors are defined in the language like *start*, *stop*, *fork*, *synchronized*; orchestration is marked by the transition of roles between these states. These states are used to model sequential, parallel, and conditional execution of business activities.

In BPEL and BPML, a process is represented in block-structured expressions with begin and end blocks. Each step in a process is called an activity. There are a collection of primitive constructs like *invoke*, *receive*, *reply*, for contact with any other service, *throw* and *terminate* for exception handling, and structural constructs like *sequence*, *switch*, *while*, *pick*, *flow*, which can be further used to

define sequential, parallel, and conditional execution of business processes.

In XPDL, a workflow process consists of workflow process activities. An activity in turn can be an atomic unit or act as a container for other activities. Activities are carried out by a resource participant or by a computer application. XPDL provides a very rich syntax for execution of activities like providing functionalities of automatic execution, predetermined start times, lag and lead time between two activities, grouping of activities to form blocks, looping, and conditional selection. Activities are related to one another via transition information and data that is relevant to the workflow is used to pass persistent data between applications.

Essentially, XPDL represents a workflow as a network of activities carried out in a specific sequence and provides a very rich syntax for execution control. This form of process-definition language is ideal for granular execution of activities within an organization. For example, sequencing and scheduling of activities across multiple resources in a shop floor scenario.

BPML is very similar to BPEL with respect to the orchestration feature. It provides comprehensive dataflow and control flow constructs that can be used to define all complex business processes.

WSCI can only define a subset of the workflow, which, at the most encapsulates the processes of one business entity; where a business entity refers to an organization that is responsible for executing a distinct role in a business process. WSCI defines macro-level activities carried out by the business entity and the message exchange format with which to carry out such an activity.

**Collaboration-Based Process Model:** This feature is supported by BPSS, BPML, and BPEL. XPDL and WSCI do not support this feature.

In BPSS there can be binary or multiparty collaboration. A binary collaboration has two roles, one of them acting as an initiating role and the other as a responding role. A set business activity is carried out between these two roles, which can be transaction or collaboration. A multiparty collaboration is composed of one or more sets of binary collaboration.

BPML and BPEL are very similar in implementing this feature. They also describe the business processes as an interaction between roles. BPEL goes a step further by providing a construct called partners. It is similar to roles but the processes are identified as interactions between the *partners* with the clear specification of what each partner does.

The present WSCI standard 1.0 is not a full fledged process modeling language; it only supports orchestration of operations in a WSDL to create a process, which in turn is asserted as a message exchange between the Web Services and an external client. Hence, collaboration in the traditional sense (involving multiple roles) is not supported.

**Transaction Management:** This feature is supported by all languages except XPDL.

In BPSS, a transaction is defined as an atomic unit of business activity performed by the trading partners. In a transaction there is a requesting activity/ role and a receiving activity/ role. The transaction is carried out by bidirectional or unidirectional flow of documents depending on request-response or just notification activity. However BPSS does not have any compensation support as it does not specify any construct in the language to define any remedy actions that need to be taken when the transaction fails.

BPML and BPEL are similar in the way they provide support for transactions. BPEL provides constructs for defining long and short running

transactions, maintaining the state of transactions, and defining compensations if the transaction fails. They also specify the protocol information that is required for message exchange across transactions. BPML provides the basic functionalities of long and short transactions and compensations.

In WSCI, a transaction is defined as the activities performed within the interface. It can be atomic or open-nested. Features like roll-back are beyond the scope of WSCI. A set of compensations can also be declared along with the transactions which enumerate the steps to be taken if the transactions need to be undone.

**Exception Management:** This is again an important feature that is supported by all languages except XPD. As mentioned earlier

also supports compensations and fault handlers. It provides a means to associate certain transactions as terminating activities so that, if an exception occurs while these activities are processed, they can be terminated without any further consultation.

In WSCI, exception handling is associated with activities in a context. One or more event handlers need to be specified in the exception handler. The event handlers define the event and activities to be performed, should the exception occur.

**QoS:** This feature is implemented in varying degrees across languages. Like previous features, this too is not supported by XPD.

BPSS has complete support for all the factors related to QoS. It has constructs for the

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## *Support for generic workflow, interservice orchestration and B2B processes are the three orthogonal dimensions for the use of process languages*

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exception handling can vary from a simple try-catch mechanism (as in Java) to handling sophisticated business exceptions.

In BPSS, two types of exception handling features are provided: Control Exceptions dealing with the mechanism of message exchange, and Business Protocol Exceptions dealing with errors in business activities.

BPEL has exception handling built into the language via the *try* and *catch* constructs. Fault-handling is supported recursively in BPEL using the notion of scope.

BPML supports this feature by embedding the exception handling in the language itself. It

support of authentication of messages exchanged between processes, digital signatures for security of messages, timeouts for non-responding transactions, and also supports non-repudiation by providing a mechanism for creating an audit of a transaction.

BPEL does not provide these features. It only supports mentioning timeouts with respect to a transaction. The language by itself does not address the issues of secure and reliable message exchange between processes. They suggest leveraging functionalities from WS-Security standards<sup>9</sup> for secure and reliable message exchanges.

Similarly BPML also does not provide any adequate support for message reliability.

WSCI, being a service interface definition language, does not explicitly support these features but can leverage the security features from WS-Security.

**Web Service Support:** A popular feature in BPM languages today is to include Web Services in process definitions.

BPSS defines a Service Interface for each role. It is defined in terms of asynchronous exchange of business documents, signals, and exception messages between these roles. The implementation of the interface is the responsibility of the implementation party. A WSDL interface can be easily mapped to a BPSS interface definition, though at present there is no standard way of doing so.

BPEL defines a process as a new web service composed of a set of existing services. The interface of the composite service is described as a collection of WSDL portTypes, like any other web service. BPEL relies heavily on the WSDL description of the involved services in order to refer to the messages being exchanged, the operation being invoked and the port types that these operations belong to.

BPML leverages WSDL definitions and also defines processes where a given process can access some other processes, which are thrown as Web Services.

WSCI supports creation of long-running processes by coordinating stand-alone Web Services, managing the message flow between these services and asserting the message interaction pattern for any one who wants to interact with such a process.

XPDL does not have support for any service interface in its language specification.

**Logging:** This feature, even though important with respect to process management,

is not supported widely by the languages. Since there are standard logging tools available, BPM languages can leverage the functionality from these tools.

BPSS is the only language that supports logging functionality to the fullest. It also allows the creation of audit of transactions that provide additional support for the non-repudiation properties of QoS.

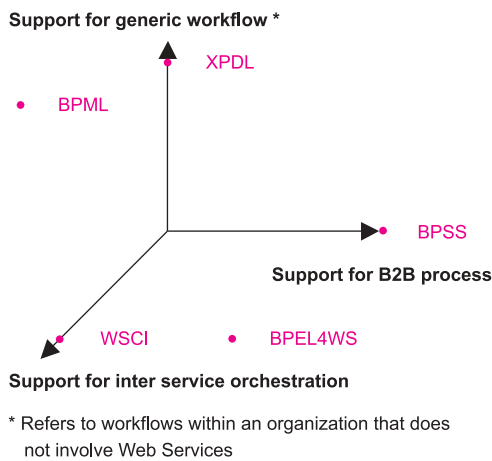
**Agreements:** This feature that is applicable to a B2B process is also supported only by BPSS, by providing functionality for creating legally binding contracts where the partners of the business process clarify their stand in carrying out the specific functions in the public business process.

**Process Boundary:** Execution of processes happens in different ways. There are processes in an enterprise that participate in a public business process and, in turn, invoke private processes of the enterprise. There are also processes which are considered to be abstract as their exact implementation and execution are not known *a priori*.

BPSS was proposed to describe the interface only for public business processes. BPSS can therefore work in conjunction with BPML, which supports only private processes. In addition, BPSS supports abstract and executable business processes.

BPEL has complete support for the definition of public, private, abstract and executable processes. It defines the concepts of *partners* as any service/ process that gets invoked from a given process. It also provides the construct of *service link* using which, a third party declaration of a relationship between two or more services can be represented.

WSCI, being an interface definition language, provides natural support for process or services to be thrown as public processes.



**Figure 1:** Usage scenarios of BPM languages show web service orchestration and support for workflows

**Source:** Infosys Research

XPDL is also capable of defining meta processes, which are top level process descriptions or abstract processes.

### BPM LANGUAGE USAGE SCENARIOS

Here we provide an overview of languages based on the usage dimensions of the process languages. We found three orthogonal dimensions for use of process languages, support for generic workflow, support for inter service orchestration and support for B2B processes. A view of BPM language usage scenarios shows that BPSS, WSCI and XPDL are meant to be used for B2B process, inter web service orchestration, and support for general workflow respectively (Figure 1). BPSS is meant for "organized" B2B where participants are pre-defined with contracts and so on; WSCI is more for "ad-hoc" B2B where participants are not predefined, for example, ticket-and-hotel booking orchestration. BPEL4WS ranks high on inter-web service orchestration but it is ranked lower than BPSS in the support for B2B process as it does not provide support for security features. BPEL4WS proposes the WS

Security standard to be used along with it to provide security features. BPML is a general workflow language that has Web Services support too; hence it is ranked high on both general workflow and inter-web service orchestration quadrants. It can be used in conjunction with BPSS to support enterprise workflow, where BPML supports internal processes and BPSS support B2B processes.


From the observations it can be inferred that multiple BPM languages can be used to complement each other for reliable and secure orchestrations of private processes as public processes. Such a complementary usage of BPM languages can be visualized, for example in a scenario involving private processes defined in BPML that are exposed as public web services using WSCI. This can, in turn, participate in a public process in a B2B scenario in BPSS.

### CONCLUSION

In our analysis we find that only BPML, BPEL, and BPSS provide a wider set of functionalities and can be used in conjunction or in a standalone manner. While WSCI and XPDL are interface - and workflow-definition languages respectively, they can be used along with the other languages to enrich Business Process Management. Even BPML, BPSS, and BPEL differ in the degree of support for the various features of the BPM language. Although we provide some scenarios where these languages are best suited, the proliferation of various BPM standards is a cause for concern and this study is an attempt in the direction of pushing the need for a universal BPM language.

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# Applying BPM in Banking

*By Srinivas Thonse, Khushnood Naqvi, & Seshu Kumar Adiraju*

## *Creating Configurable Business Processes around a Banking Product*

The financial services sector that includes sub sectors such as Banking, Insurance, and Securities are hot favorites for BPM. The reason behind this is that these services demand high flexibility and configurability in processes and systems. Besides, they employ several best-of-breed systems and demand real-time response to customer requests. While BPM can be applied to financial services in general, for the purpose of this discussion we will restrict it to a case study that demonstrates the usage of Business Process Management (BPM) in banking.

### THE CONTEXT

The case in point is Finacle, a banking product from Infosys that provides full automation in areas of core banking, e-Banking, CRM, and treasury. Finacle has been used in many banks in India, the Middle East, Latin America, Caribbean countries, and Africa.

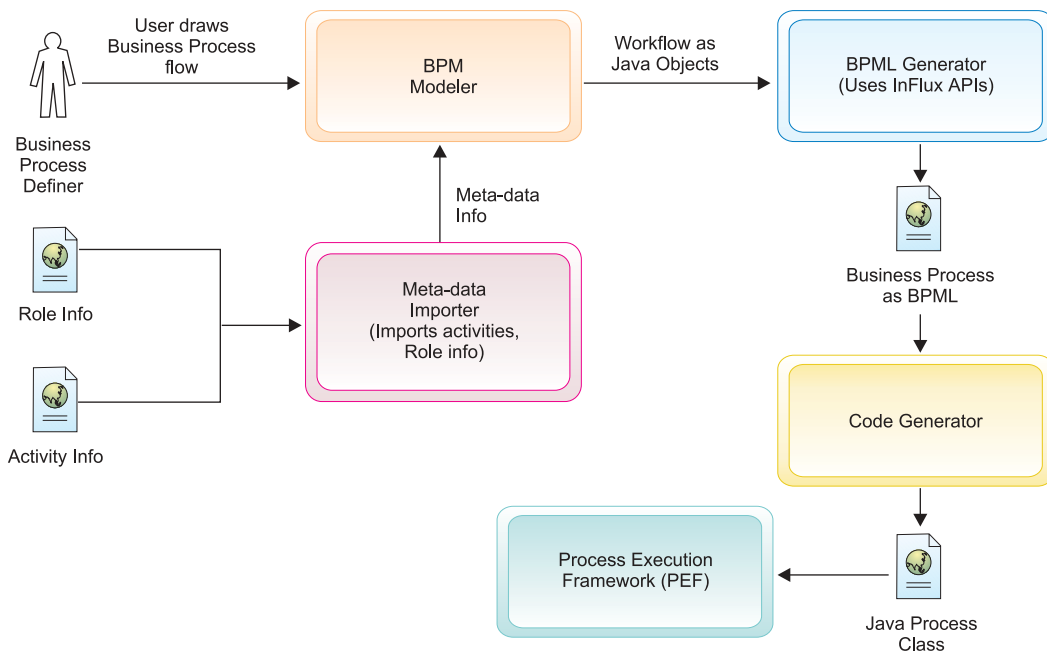
A banking product that gets used in a global context needs to address the high variability in banking processes that differ across geographies. Banking practices are governed by country-specific regulations. The processes also vary depending on the business model and

operations of the bank. For example the degree of empowerment of staff, the risk appetite, and so on. Multi-country operations impose additional variability requirements. Such variation requires that a banking product be highly configurable.

A banking product also needs to address integration with many associated systems. Most banking processes involve participation from multiple systems such as treasury, payment systems, CRM, and loans. The processes and systems vary from bank to bank.

Some Banking Processes are illustrated by using the following examples:

- **Opening an account:** processes beginning with filling out an application form to issuing ATM and debit cards.
- **Clearing cycle:** Processes for clearing checks presented to the bank.
- **Stock prices and security value updates:** Processes triggered by fluctuation in stock prices that check the customer's outstanding loan amount with the value of stock/security that is mortgaged with the bank.
- **Communication between front-office and**



**Figure 1:** Key components of BPM Architecture are BPM Modeler and Process Execution Framework

Source: Infosys Research

**the treasury department:** Processes integrating the activities pertaining to front-office transactions with the activities (transactions) that happen in the Treasury.

BPM-based architecture is suited to address the above requirements. This paper will see how. The salient features of the architecture are described below.

### BPM-BASED ARCHITECTURE

BPM architecture is envisaged for this product to address two areas, namely process-based integration across banking systems non-invasively and configurability of front-office processes with reduced code change.

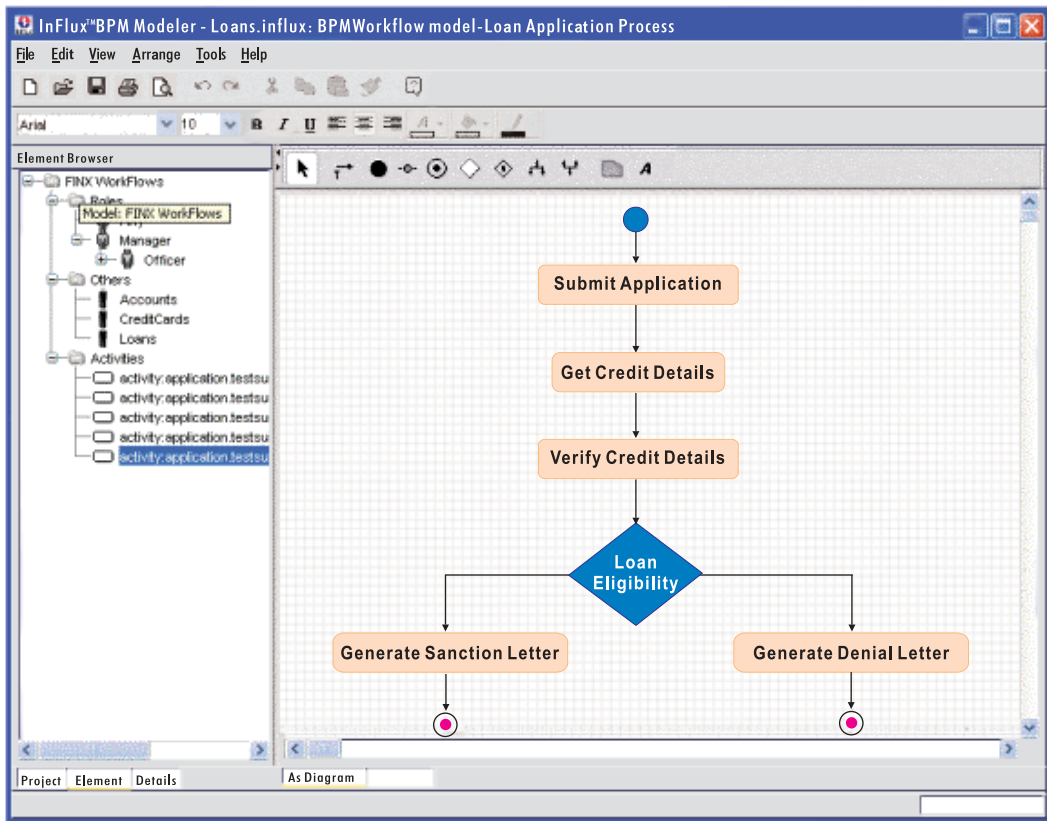
The BPM-based architecture has the following highlights:

- **Visual notation** to model the business processes. This allows users to easily

understand and define their business processes.

- **Standards-based format for persisting business processes.** The business processes are persisted in an open format – BPML (Business Process Modeling Language) developed by an industry-standards body - BPMI.org There are many BPM engine products that support these representations to execute the business processes. Use of a standards-based format leads to portability across products.
- **Java binding for BPML activities:** Typically activities in BPML processes are bound to Web Services using protocols such as SOAP and WSDL.

Participants in banking processes, however, are Java components and classes belonging to the Finacle product. The BPM-based architecture in Finacle introduces an



**Figure 2:** Loan Application Process in BPM Modeler

**Source:** Infosys Research

in-process Java binding to the Finacle components.

- **Generation of Java code from BPML:** Many BPM engines interpret a BPML process at runtime and then execute the process. In Finacle, a generation approach is adopted, whereby Java classes are generated from BPML. This generation approach saves on interpretation time. Additionally, calling the services of Java components occurs through local invocation.
- **Framework to execute Java code:** A Java framework provides run-time facilities for the generated Java code, such as state

persistence and logging. By not relying on interpretation of BPML, this approach can provide performance level that is close to that of handwritten Java code.

Two key components in BPM-based architecture for the banking solution are BPM Modeler and Process Execution Framework.

The business user defines or modifies Business Process Models visually in the BPM Modeler (Figure 1). The modified process definition is stored as BPML. Code generation techniques are then used to dynamically generate the execution code in Java for the process. Process execution framework of the banking application

then dynamically picks up the new code for the modified business process and executes it. The process change is thus automatically effected in the banking software through its Process Execution Framework.

The components of BPM-based architecture are:

- **Meta-data Importer**, which imports the Meta-data (roles, activities) into the repository of the BPM Modeler. This meta-data is derived from the interfaces provided by Finacle Java components.
- **BPM Modeler**, which allows users to visually model business processes. This modeler is implemented as an extension to InFlux™ workbench. InFlux™ is a business process-centric methodology developed by Infosys for translating business objectives into IT solutions.
- **BPML Generator**, which generates the modeled workflow as BPML.
- **Java code generator**, which converts the generated BPML into a Java class that can be executed in the Process Execution Framework.
- **Process Execution Framework**, which provides run-time facilities to execute the generated process code.

The elements used to construct the workflow (activities and roles) are imported from domain specific meta-data and made available on the explorer. The user drags and drops the elements on the canvas to draw a workflow (Figure 2).

The features available are:


- Mapping activity output data to the next activity's inputs.
- Building condition expressions (for

example, rules) using the activity outputs. The conditions allow the user to model conditional branching in a workflow.

- Modeling of parallel flows (parallel execution of activities).

## BENEFITS

As we have seen, BPM provides for visual modeling and standard representation of banking processes. This enables business processes to be configurable by users and provides the following benefits:

1. **Productivity improvement:** When implementing a business process change banks benefit substantially as BPM allows a user to modify the business process by using the modeler and thus reducing the need for developers to manually change the code.
2. **Quality improvement:** The process captured by a business user directly results in an executable process component. This technique removes the possibility of coding defects being introduced into the system.
3. **Visual modeling:** Visual modeling of business processes enables users to configure or refine business processes directly with reduced involvement of IT.
4. **Effective integration of systems:** BPM envisages systems as participants in a business process. The point-to-point inter-system dependencies are replaced by flow of system activities in business processes. Integration of systems hence becomes non-invasive and loosely-coupled. 

# "The demand for BPM systems will expand exponentially during the next two years."

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*CONNIE MOORE, Vice President and Research Leader, Forrester's Information Delivery research group and KEN VOLLMER, Principal Analyst in Forrester's Enterprise Applications research group, tell SETLabs Briefings how BPM can transform an organization*

## **Why should enterprises take BPM seriously?**

Ken: The absolute number one reason is that BPM (if implemented effectively) can transform an organization. Specifically, BPM supports:

- Higher levels of process efficiency through automation of many tasks.
- Shorter cycle times through enablement of parallel processing of tasks.
- Improved communications of outsourcing requirements by use of process modeling tools to accurately define the "as is" process and the desired process.
- Improved productivity as fewer people are needed to perform the same level of work.
- Improved accuracy due to the

minimization of human errors (more decisions are automated).

- Improved management control via increased levels of automation. This helps to control unauthorized manipulation of information. This is particularly important in light of Sarbanes Oxley and Basel II requirements.
- Improved customer service. All of the above enable organizations to provide their customers with what they want, sooner and better.

**BPM is increasingly being viewed in the perspective of executable BPM languages. Many stakeholders also include process improvement**

**and organizational change management as part of BPM. How would you define the scope of BPM?**

Connie: The term "BPM" is somewhat ironic. Given that the acronym means "Business Process Management," the technology should focus primarily on helping executives and managers actually manage their business processes and resources. But if one looks at the evolution of BPM, the workflow vendors concentrated on automation rather than business activity monitoring and the EAI-oriented BPM vendors focused primarily on integration. As the BPM market matures, more attention will be given to the management dimension of BPM. This includes, but is not limited to, supporting balanced scorecards, providing goal management tools that align the business strategy with the BPM system and the creation of more business process frameworks for specific industries.

The implementation of BPM systems should involve a culture shift in which the organization becomes more process-centric. This means structuring, measuring, and managing the business from a process perspective. For example, organizations should identify a process owner that has total responsibility for a process and coordinates with functional heads to manage cross-functional business processes. But shifting the organization to a process-centric focus is quite challenging because companies often do not have the understanding of what it means to be a process-centric organization, do not have the time or resources to make the shift, or instead focus on the BPM tools rather than the context for implementing BPM systems.

Organizational change management is also critical, and starts with a fundamental understanding of the national culture, corporate culture, and the company's practices for managing the workforce. A mismatch between

the corporate culture, or work practices and the BPM tool selected, can cause problems. For example, using a highly structured BPM tool to automate knowledge work processes for professionals will lead to user dissatisfaction because the tool will not be suited to the work practices and needs of knowledge workers.

From a process improvement perspective, more organizations now focus on automating a business process and improving it incrementally over time. This is a much less risky approach than attempting to totally revamp a business process from start to finish in a "big bang" implementation. The problem with "big bang" approaches is the amount of time required and complexity of changing a business process from start to finish in one project. The advantages of initial automation followed by incremental improvements are that the company quickly gets the productivity and work improvement benefits from the initial implementation, and the company can better understand what changes are needed to make further improvements. It also focuses the company on continuous improvement of business processes, which helps the organization to think in terms of being a process-based enterprise.

**How important is the transition to a "process-managed enterprise"?**

Connie: Shifting organizations from a functional focus to a business process focus is a long term business trend that will not happen overnight. The shift will be gradual and on-going, and will require a fundamental change in business strategy, corporate culture, and management practices. Moving to a process-centric enterprise should be an on-going initiative, not a project. In this sense, becoming a process-managed enterprise is a long-term commitment similar to the way that companies move to knowledge sharing cultures or an on-going commitment to quality.

Also, it is not easy to become a process-managed enterprise. To be successful, companies must approach business processes from a top-down perspective. The internal focus should be on people and transitioning employees to a process culture. The business processes should be driven by the customer perspective, not an internal view of how processes should occur within departments. This takes time and effort and a long-term commitment by senior management.

**As a technology discipline that is still evolving, what areas, in your opinion, should BPM address to become a business-critical technology?**

it before attempting to implement BPM. BPM efforts must be business-driven, with IT in a supporting role. IT units should not attempt to lead BPM efforts. Secondly, prepare the organization. BPM efforts will directly attack the silo architecture of applications and the business units that they were built for. Senior management must take aggressive efforts to inform the organization that this is a necessary process and must be supported by all levels of management.

Thirdly, set up a BPM support unit. In those cases where BPM will be implemented across several business units, a separate BPM support group should be created outside of IT. The purpose of this group will be to share learned knowledge

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*Business Process Management can be viewed as a natural progression of software development. Over the next few years, the increasing sophistication of the technology will result in more system generated code and less custom coding*

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Ken: In order to maximize the effectiveness of BPM efforts, the tool set must be integrated and robust. Functional capability from earlier EAI and BPI systems must also be incorporated. Most of the pure-play BPM vendors understand this and are trying to move in this direction.

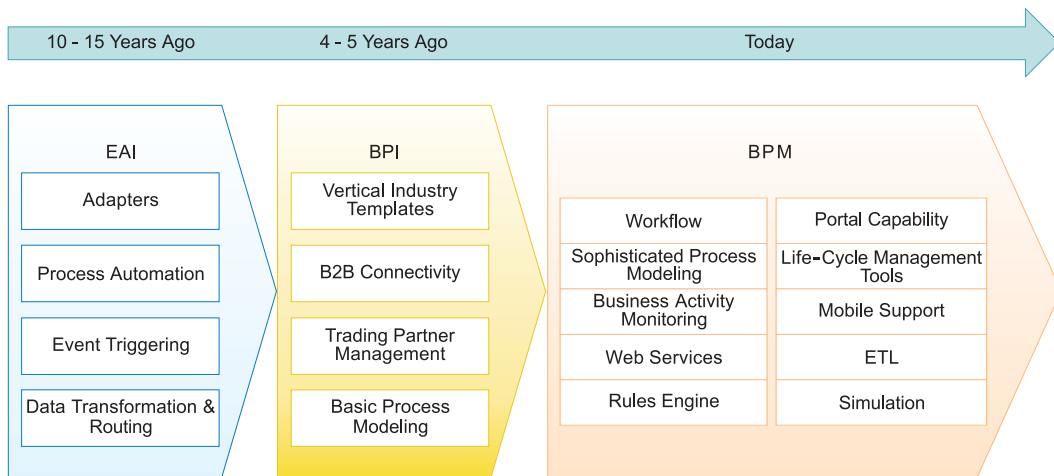
**CIOs have often worried about bridging the Business-IT divide; an area BPM holds out promises. What should enterprises do to become "BPM ready"?**

Ken: The first thing to do is to build a strong IT - business unit relationship. Many organizations already have this, but those that do not must build

between business units and guide the implementation efforts. In many ways the BPM support group would be similar to the IT-based integration competency center, with the exception that it is staffed by business, not IT personnel. Lastly, implement a comprehensive BPM tool set. A robust tool set that includes combined EAI and BPM functionality will be needed to support the joint actions of the EAI and business unit personnel.

**What is the likely timeframe for BPM adoption?**

Ken: BPM systems have already been adopted and we see the demand increasing exponentially during the next two years.



**Figure 1:** The evolution of BPM

**Source:** Forrester Research

**In our understanding, standards are at the core of BPM. How do you see the current plethora of "standards" in the BPM space? Where will these converge? Is there any likelihood of a major impact on packaged software products as a result?**

Ken: Over time, the situation relative to conflicting BPM standards will be resolved. For example, we expect that BPML-based products will have to migrate towards supporting BPEL instead as it will become (if it hasn't already) the standard.

The maturing of the applicable standards will drive commoditization from the bottom of the BPM technology stack all the way to the top by the 2008 - 2010 timeframe.

This will put increasing levels of financial pressure on the packaged integration software vendors, who will be forced to maintain a rapid pace of new functionality in order to remain ahead of standardization efforts. Not all of them will be able to sustain this level of activity and we anticipate ongoing vendor consolidation in this space for some time to come.

**Can you comment on the BPM vendor landscape?**

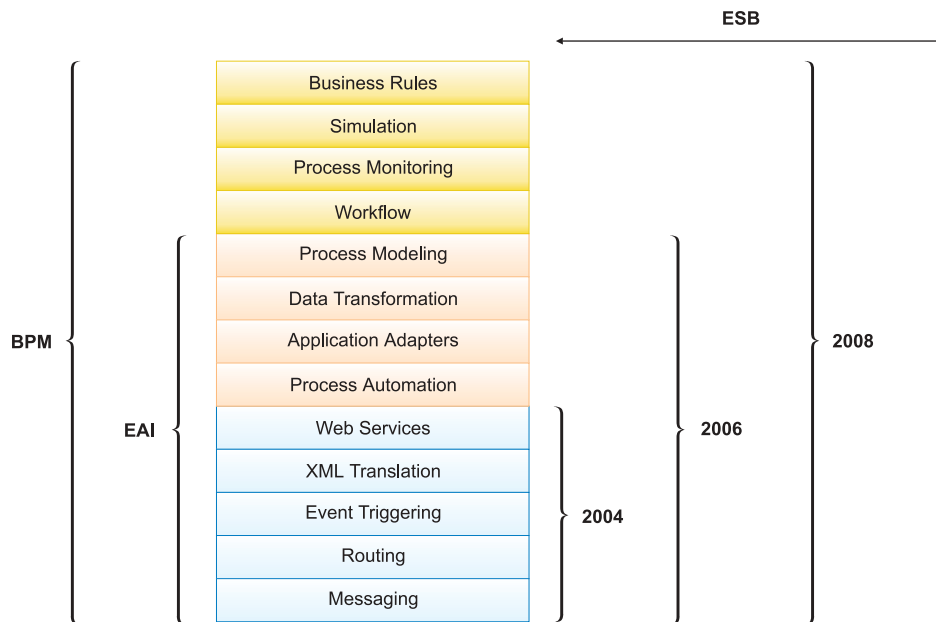
Ken: This is a very complex area. Not only do

you have BPM pure-plays such as Savvion, Intalio, Lombardi and FileNet, there are several other categories of vendors that also provide varying levels of BPM functionality.

The most robust BPM functionality comes from the group of vendors we refer to as application integration vendors. Their primary strength in this area comes from the fact that each has a solid stack of EAI technology underneath their BPM features and since BPM can involve both human and system level interactions, these vendors are better suited to provide this end-to-end functionality. These vendors are also best suited for integrating heterogeneous environments that have a number of diverse business applications from multiple vendors. The leading vendors here are TIBCO, SeeBeyond, webMethods and CommerceQuest.

Application platform vendors such as IBM, BEA, Microsoft and Sybase also have solid BPM offerings but none of them are currently at the level of the application integration vendors. These solutions, however, can be particularly well suited for situations requiring custom development efforts.

Enterprise application vendors like SAP and Oracle are involved in major efforts to



**Figure 2:** The relation between ESB, EAI and BPM

**Source:** Forrester Research

expand their BPM functionality and they have made significant progress. However, they still lag behind the previous two groups. These solutions will be most appealing to organizations that already have a large investment in business solutions from these vendors. In this case, it would make sense to consider their built-in integration functionality for at least a portion of the organization's overall integration needs.

And finally, the enterprise content management (ECM) vendors can provide a combination of document imaging, document management, web content management, digital asset management and/or team collaboration solutions and have historically offered workflow to automate and manage the document authoring process. These capabilities can be extended beyond the authoring process to automate document-centric business processes that primarily involve the review and approval of unstructured information and automating human-

centric activities required as a result of reviewing unstructured content. FileNet has been the most successful of these vendors, transitioning itself beyond enterprise content management to also address the pure-play BPM market. Other vendors, such as Documentum, Hummingbird, Red Dot, Interwoven, Open Text, Vignette and Xerox can manage business processes within the confines of the ECM solution by automating human activities, routing content and integrating with external applications.

**With Information Technology increasingly getting integrated with business operations, do you see BPM as a natural progression to the approaches adopted for software development?**

Ken: Yes, BPM can be viewed as a natural progression of software development. Over the next few years, the increasing sophistication of BPM technology will result in more system generated code and less custom coding. This will happen as

graphical modeling tools based on BPEL and other Web Services standards become increasingly capable of generating code and abstract much of the complexity of coding from the user.

Power end users and business analysts will begin to take on more responsibility for defining new application functionality, leaving less to be done by the IT programming staff. This change will impact organizations that have adopted a packaged application strategy the most, while shops that have a custom developed approach will be impacted to a lesser degree. However, in both cases, there will be less emphasis on low-level coding and more emphasis on higher-level process design.

**and manage business processes. What, in your opinion should be the "must-have" features of a BPM-based architecture or Process-Oriented Architecture?**

Ken: From the business perspective, the key features would be:

- Sophisticated process modeling tools: Modeling capability such as that provided by IDS Scheer's Aris product will become the minimum acceptable level of process modeling functionality. This component is key to enabling effective process implementation and monitoring.
- Business Activity Monitoring: The ability to have a real-time view of the status of

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*In absence of requisite process analysis and inhouse technical skills, involvement of system integrators is a must-it is a best practice*

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In many situations, the level to which business users accept this new responsibility will determine whether or not IT organizations have to become more directly involved in the modeling process. Some business personnel will resist increased involvement in the development process and in those cases, the IT staff will have to be trained to perform the "business unit function" in the process modeling area. However, we expect that the business units in the larger firms will eagerly pursue the new capabilities that they will be given.

**BPM comes with the promise of endowing businesses with the ability to model, execute,**

defined business processes. This will normally take the form of dashboards that can be customized to provide individual users with the specific information they need to perform their job. Consequently, dashboards should not be restricted to management personnel only.

- Support for Business Rules: End users should be able to change specified business rules on the fly, without having to involve IT.

**How will the BPM technology discipline connect with process design disciplines, process improvement (BPI) methods, process frameworks such as Six Sigma and SCOR, BI, and BAM?**

Connie: BPM system vendors have already made great strides in incorporating BI and BAM technologies into their products and the emphasis on improving the reporting and monitoring capabilities in BPM tools will increase over time. In fact, this is one of the key areas in which vendors can differentiate their products. The development of business process frameworks, such as the Supply Chain Council's SCOR Framework, will significantly enhance the ability of organizations to move to a process-centric focus. Several business process modeling vendors now offer SCOR tools and some BPM system vendors have described their applications in SCOR terms. Over time, more frameworks will be developed for specific processes or industries and these will ultimately be reflected in products.

**No discussion on BPM is complete without a reference to Web Services. As business processes can be composed of any number of activities composed as Web Services, "interoperability" with complementary technologies will be a critical factor in its adoption. How do you see Web Services interoperating with BPM?**

Ken: Web Services are an increasingly popular way of implementing a service-oriented architecture, which has wide applicability for all types of application and infrastructure software, including BPM tools.

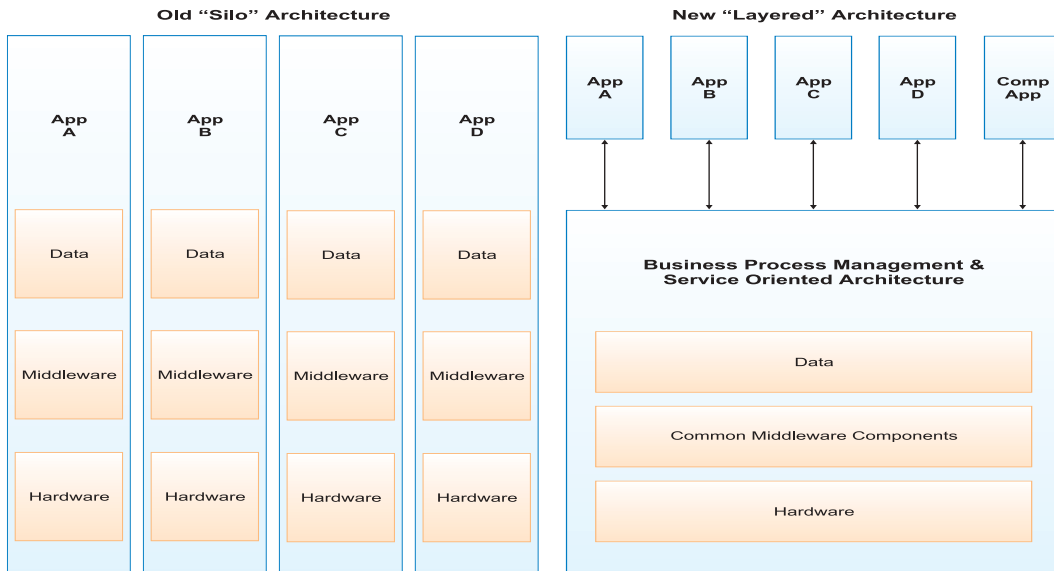
The cost and complexity of BPM projects can be significantly reduced through the use of a service-oriented architecture (SOA). Such architecture also promotes other objectives, such as greater flexibility to enable faster response to change and acceleration of development projects that reuse existing services. SOA also contributes to greater unification of integration and development activities within a single consistent approach and runtime infrastructure. Moving forward, the availability of new standards and

the maturation of implementations of existing and new standards will further enhance the value proposition of SOA, both in the broader context and in the more specific context of integration.

**How should BPM projects be executed? How should enterprises choose SI vendors in this space?**

Connie: System Integrators (SI) are critical in the success of BPM projects because few organizations have the process analysis skills and technical skills in-house to implement BPM systems. In fact, involving a systems integrator is a best practice in the implementation of BPM systems. However, it is critical that the SI have in-depth experience in the organization's industry sector and have deep implementation experience with the specific BPM system being implemented. Some of the crucial areas to examine are: how long has the SI been involved in BPM implementations, how many staff have been trained and certified in the particular BPM tool involved, how long has the SI been implementing the BPM tool being installed, what methodology does the SI use for analyzing business processes, and how strong is the SI in organizational change management.

Financing BPM projects is a challenge because IT projects that implement a BPM system as an infrastructure tool for the entire organization typically fail, yet the first business unit to implement a BPM project should not carry the full burden of all the infrastructure costs. One important factor to consider is that the costs are not only for the BPM tool itself and the professional services fees from SIs, but also BPM projects typically require an investment in the IT infrastructure that supports the BPM system. For example, many companies have identified the underlying infrastructure as a critical issue to be addressed during BPM implementations. These



**Figure 3:** Siloed applications will be reengineered into service-oriented applications


**Source:** Forrester Research

organizations initially thought they had performance problems with the BPM product only to later discover that the networks, servers, databases, and other IT infrastructure components were not sufficiently upgraded to support the BPM implementation. Allocating costs should be a balancing act between having the business pay for the BPM system and having IT pay for the infrastructure costs.

### ANALYST PROFILES

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# Can Service-Oriented Architectures Increase Flexibility of IT Systems?

By Neeraj Kulkarni

*Many enterprises are now focusing on business processes and their integration - SOA is ideally positioned to be the architecture choice*

**B**usiness Process Management (BPM) is process-centric and responsive to change in business requirements and objectives. Businesses are defined through dynamic processes that change almost constantly. The Workflow Management Coalition Terminology and Glossary provides the following definition of a business process:

- As being associated with operational objectives and business relationships such as claims process
- As having a defined triggering (initiation) condition for each new process instance (e.g., the arrival of a claim) and defined outputs at its completion
- May involve formal or informal interactions between participants; its durations may vary widely
- May consist of automated activities that

are capable of workflow management and/or manual activities that lie outside the scope of workflow management.

Processes in a typical enterprise evolve constantly and interact with each other.

## **DATA-CENTRIC VERSUS PROCESS-DRIVEN APPLICATIONS**

The IT applications defined and implemented before the advent of Service-Oriented Architecture (SOA) are mostly data-centric; geared towards data capture, storage, and retrieval. The architecture was mostly technology-driven and not process-centric. This resulted in the applications being less adaptable to changes in business process, or being more expensive to maintain and keep up with changes in the business process. Often business processes were modeled to fit the applications (to save on the

cost of modifying them later), thereby making them ineffective and inefficient. Dr. Michael Hammer, the process reengineering guru, in his famous book *Reengineering the Corporation* said, "Rip it out and start over". Reengineering enabled better process definition in a given framework, but it did not provide a dynamic and agile architecture. (More recently Dr. Hammer said, "I was wrong").

For an enterprise to be effective and responsive to changes in the business process, therefore, the approach for enterprise architecture should be to:

- Externalize processes, separating them from applications and providing tools to simplify process design, implementation and, changes
- Design applications in the form of services that are a part of the end-to-end process and have them access external data that the process needs.

This approach allows business processes to interact with and coordinate the services' behavior for the execution and completion of the process, and interaction with other processes. This is a paradigm shift from applications to processes; making processes the centerpiece of Enterprise Architecture (EA).

### ENTERPRISE ARCHITECTURE

ANSI/IEEE Std 1741-2000 defines architecture as: "The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution."

Enterprise Architecture (EA) is a conceptual tool that assists organizations with the understanding of their own structure and the way they work. It provides a map for the enterprise and is a

route planner for business and technology change.

Normally, EA takes the form of a comprehensive set of cohesive models that describe the structure and the functions of an enterprise. The most commonly used perspectives of EA are business, application, information, and technology perspectives.

### SERVICE-ORIENTED ARCHITECTURE (SOA)

Although SOA is often equated to Web Services, the two are quite distinct. SOA is an architecture style that promotes business process orchestration of enterprise-level business services. The three major elements of SOA are:

- **Services:** SOA models the enterprise as a collection of business services, which can be accessed across the enterprise. Services are self-contained in the sense that they perform specific functions and can be invoked using a standard protocol.
- **Processes:** Business processes orchestrate the execution of these enterprise services to fulfill the required business functionality. Enterprise-wide processes essentially define enterprise operations.
- **Organization:** Organization owns all the SOA artifacts and governs their creation, usage, access, and maintenance.

A service is defined and exposed to the outside world in terms of its interface. The service interface consists of a service name and set of methods that the service supports. Each interface is defined by a set of parameters (that define the data required for interaction with the service) and communication protocol that is used for data transfer and actual service invocation. The methods in the service interface are grouped together based on the service's business functionality requirements.

Services provide the business logic as well as the state management relevant to the business functionality. The service encapsulates the logic and data associated with a real-world process, similar to Object-Oriented (OO) encapsulation. Since services are called across a network, the services should wrap a substantial body of application logic thereby justifying the latency cost of network requests. A service should enable the performance of a complete function through a single request and fewer interfaces, rather than exposing many interfaces that manipulate small amounts of data.

business services that do not change often.

Business Activity Monitoring (BAM), the real-time monitoring of business events and transactions, becomes easier by separating the functionality and applications. BAM delivers real-time intelligence about the integrated enterprise to the management. BAM is typically integrated into the execution of business processes.

Before even thinking about designing and implementing business functionality, it is very essential to create a model of the business that identifies the fundamental entities and the business processes. Tools like UML can be used

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*Service-Oriented Architecture is an architecture style that promotes business process orchestration of enterprise-level business services*

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#### **SOA FOR ENTERPRISE ARCHITECTURE**

Let us analyze the impact of SOA on all four perspectives of Enterprise Architecture.

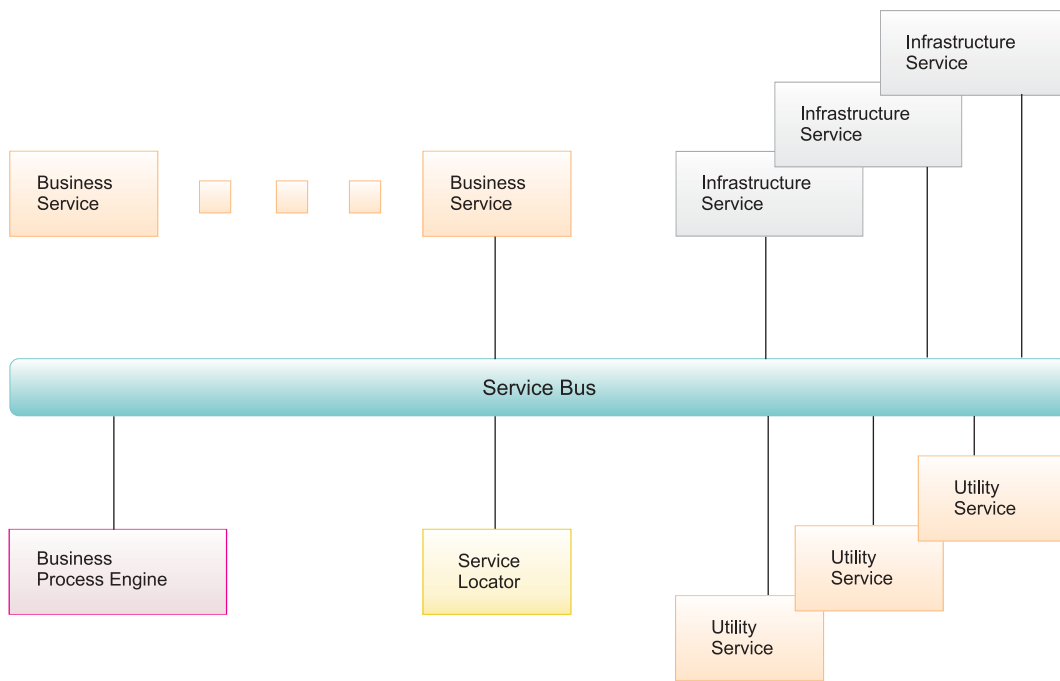
##### **Business Perspective**

By using SOA it is possible to decompose business functionality into more manageable, reusable parts that can be independently designed, developed, and maintained. SOA enables the definition of enterprise functionality in terms of services and processes. The business and application perspectives can be aligned better in the sense that it is easier to trace the application perspective back to the business perspective and thereby easier to implement the functionality changes required. This facilitates the separation of processes, i.e. the fast changing entities of a business model, from

effectively to model the business, the business process, and entities. UML enables the complete end-to-end modeling of a business, from business process to implementation entities. During business process modeling, services and interfaces for every process are identified.

In an ideal case, an enterprise architect would like to engineer the business process and the applications from scratch. But that is not realistic. An important activity is to map the required services on to an existing application. If an application that supports a required functionality exists, then the functionality needs to be wrapped to provide interfaces that can be exposed and used outside the application.

Service implementation will typically delegate execution to one or more existing applications and supplement it with new code.



**Figure 1:** A typical SOA is comprised of disparate services communicating over the service bus

Source: Infosys Research

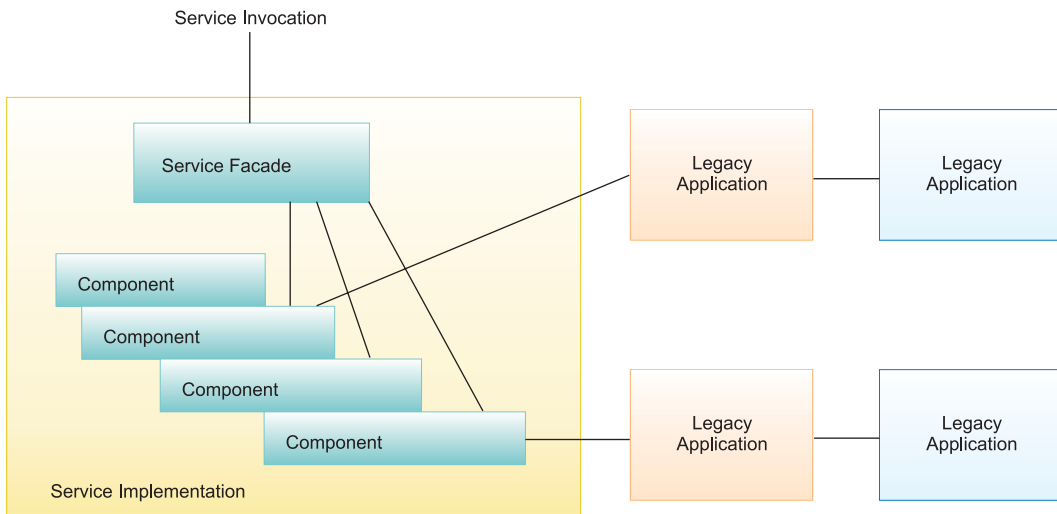
### Application Perspective

Every service can be independently designed, constructed, and maintained. Hence services provide a loosely coupled system landscape. The use of services makes the application portfolio easy to maintain. A typical application architecture is comprised of disparate services communicating with one another over the service bus (Figure 1). The salient features of this architecture are:

- Business Process Engine that allows for externalizing the business process. Introduction of separate business process engines provides separation of business process definition and execution from service implementation, allowing for loose coupling in the application architecture.
- Service Locator that allows for externalization of the service location that supports service location transparency.

- Business Services encapsulating the actual business functionality.
- Utility Services that are special kinds of business services that do not belong to a firm's core business but can still be accessed by any client.
- Common Infrastructure Services that providing system and infrastructure support for business services.

Business process modeling followed by design, development, deployment, and maintenance of a robust service-oriented application infrastructure often results in upfront investment as compared to stand-alone application development. The maintenance, however, of point-to-point communication between stand-alone applications results in higher maintenance costs.



**Figure 2:** A typical service implementation does not expose the functionality directly

**Source:** Infosys Research

### Information Perspective

The SOA implementation introduces two data repositories:

- Data models to support service implementation(s)
- Data dictionary for service messages, defining message semantics of the SOA.

This separation of the information perspective simplifies the enterprise's data and information strategy. In an SOA implementation, the data model exposed by the enterprise application portfolio and used by internal and external processes is actually the messaging data dictionary. So there is a decoupling from the data model used by the services. Hence the services can, in fact, use completely different internal data models as long as the data semantics that they are exposing adhere to the semantic data dictionary of the enterprise.

The messaging data dictionary is often much simpler than the internal data models used by the services. So integrating services through

messages becomes significantly easier.

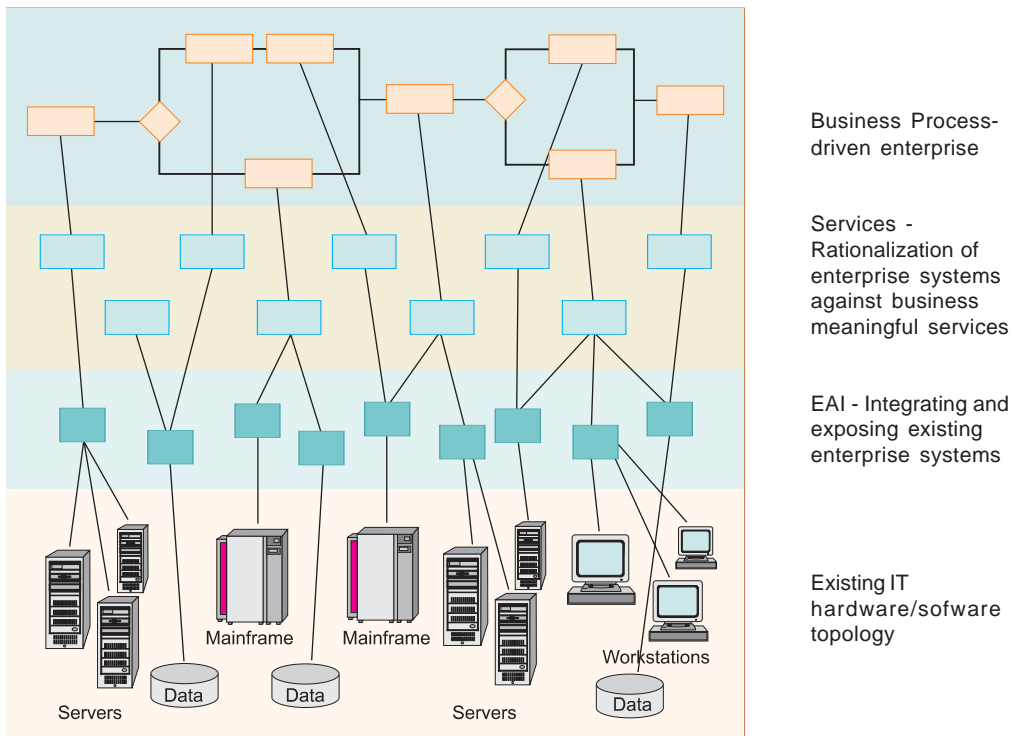
### Technology Perspective

This is the most important perspective as it forms the foundation for building enterprise-scale services. It provides the framework for development and maintenance of services. SOA requires developing an infrastructure that can be shared by many services delivering against diverse functional requirements.

It is almost impossible to throw away existing IT services and start on a clean state. In reality, services are created by integrating and extending existing applications. Components are aggregated to wrap existing applications into services.

A typical service implementation exposes existing legacy system functionality (Figure 2). Like a typical EAI implementation, this implementation does not expose the functionality directly, but encapsulates the functionality in its own implementation. This enables:

- Extending the legacy system functionality



**Figure 3:** Enterprise SOA introduces a layer of abstraction

**Source:** Infosys Research

without modifying the existing legacy systems

- Making the service more granular by combining the functionality of multiple legacy systems (or multiple interfaces of the same legacy system) and implementing additional functionality.

The SOA approach differs from traditional EAI initiatives. Most EAI initiatives are driven by IT and tend more towards point-to-point connectivity of enterprise application portfolio. SOA encapsulates existing applications into services, thereby facilitating the convergence of IT with business. Such an approach typically leads to an Enterprise Architecture blueprint for an organization that is aligned to business objectives without overhauling existing applications. It is

always possible to create a business process through EAI using existing applications. But this leads to making the applications a part of the business process. A service such as that described above introduces a layer of abstraction between existing applications and processes (Figure 3).

### ORCHESTRATING SERVICE INTERACTION

The goal of an enterprise SOA is to build a flexible, durable infrastructure that makes it easy to integrate any set of applications at any time to solve business challenges. The SOA must make it possible to dynamically add and reconfigure services on-the-fly and to alter the logical flow between services as processes change.

It must also be possible to use multiple interaction models between services. For example, it should be possible to use messaging

semantics such as 'publish-subscribe' to collect logging data from several sources, while using BPM style orchestration to implement long-running automated business processes. In an event-driven SOA, a service is not aware of these interactions; it simply consumes and emits messages that represent events.

Enterprise Service Bus (ESB) provides the necessary unified middleware and the framework for hosting commercial and custom services. ESBs use message-oriented middleware (MOM) as a primary means of communication. In an ideal ESB, the messaging capabilities can be used without the services having to include messaging logic in their code. The messaging capabilities are configured outside the applications.

ESBs also include intelligent routing capabilities through content-based routing. Most ESBs also come with service-oriented process engines that support complex, stateful orchestrations. In its 2003 Predictions Series, industry analyst firm Gartner Inc., said:

*A new category of integration middleware called the Enterprise Service Bus (ESB) has emerged to support the proliferation of service-oriented interactions between enterprise applications. An ESB is a standards-based integration backbone that combines messaging, Web Services, transformation and intelligent routing to reliably connect and coordinate the interaction of hundreds of application endpoints spanning a global organization.*

In the same report, Gartner predicts that a majority of large enterprises will have an ESB running by the year 2005.

Data transformation occurs in several different places across an SOA. Data is normalized into a canonical form as it enters the SOA and manipulated via transformation as it is routed between applications and services. The normalized data format across an SOA is mostly XML. All ESBs support XML transformation

through a configurable XSLT based service.

Tracking, auditing, and logging are very important functions in an SOA. This is commonly referred to as Business Activity Monitoring. Auditing data as it flows within and between organizations is a legal requirement for an increasing number of processes. ESBs can provide several service-oriented capabilities and frameworks for tracking, auditing, and logging.

An enterprise SOA shares data and business logic between departments within an organization and across organizations. It creates automated processes that span multiple security and administrative domains. Several issues surrounding security arise while implementing SOA. Most organizations and departments within an organization have their own schemes for authentication and authorization of users. Similarly, there may be different encryption requirements either at the data or the data channel level. The SOA infrastructure must be able to route data across multiple security domains and support various security schemes.

## SOA, EAI, AND WEB SERVICES

What is the difference between EAI and SOA? EAI designates a set of integration solutions, while SOA serves as an intermediary between well-integrated IT-systems and well-defined business processes. SOA encourages the definition and deployment of generalized business functions i.e. a top-down approach driven by business needs, rather than point-to-point connections between legacy systems, i.e. a bottom-up approach for solving tactical integration issues.

Is SOA another name for Web Services? SOA is an architectural style, while Web Services represents a set of standards that enables various architectures, including SOA. Web Services can be used to create inefficient point-to-point

integration code. With widespread support for Web Services and most development environments providing built-in support for easy creation and deployment of Web Services, it can be argued that it has become quite easy now to write poorly designed code.

The key principle behind an SOA is defining and exposing loosely coupled, normalized, and coarse-grained business functionality in a manner that is independent of the underlying implementation. Executed properly, SOAs are well-suited to application integration scenarios because they expose applications as a series of APIs that can be assembled with other APIs to construct a consolidated end-to-end solution.


The ultimate objective in defining an SOA should be to improve an organization's ability to respond to changing business models. Well-abstracted services provide a set of normalized business functions aligned with an enterprise roadmap of core strategic business processes.

## CONCLUSION

SOA bridges the gap between diverse

applications and addresses the increasing need for the flexibility of BPM. The services layer, introduced by SOA, allows for direct mapping of business artifacts into an existing application portfolio. If implemented correctly, SOA can provide a highly effective approach to equip an enterprise with a set of appropriately abstracted and normalized business services. The combination of these elements makes SOA a model for enterprises that seek to increase business flexibility.

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# Using Business Process Modeling to Improve the Operational Efficiencies of a Leading Grocery Retailer

*By Sandeep Dham, Abhijit Upadhye, & Subhankar Bhattacharya*

*Business Process Modeling delivered significant improvements in the order-delivery process*

**B**usiness processes are complex, dynamic and intertwined throughout an organization extending to its partners and customers. Automating and managing cross-functional processes effectively requires a new approach and supporting tools that reflect this reality.

BPM is based on business process modeling leading seamlessly to system implementation. Process modeling reveals opportunities for process optimization and automation, leading to improved efficiencies. InFlux™ is one such proprietary methodology for translating business objectives to IT solutions based on BPM concepts.

This case study describes how BPM concepts in InFlux™ helped in streamlining the complicated produce ordering and delivery

process for a grocery retailer. The detailed approach helped in not only meeting the desired objective of reducing lead time, but also in improving the forecast accuracy and reducing inventory levels.

## **CONTEXT**

The company is a leading US-based grocery retailer. The firm has around 120 retail stores and its supply chain operations are supported by three company-owned, company-operated distribution centers and a trucking company. The products sold are broadly classified under the following categories: Meat, Seafood, Bakery, Deli, Dry Grocery, Produce, and Pharmacy.

The retailer faced a major problem in meeting customer demand in the produce

category because of longer lead times. Lead time in this context is defined as the time when an order is placed by the stores till the time goods are received by the store. Currently the lead time for the Produce category is 36 hours.

The objective was to conduct a detailed study of the current processes for the Produce category and identify key areas of opportunity to reduce the lead time.

## APPROACH

The following methodology was adopted to arrive at the solution:

- Identify focus areas for improvement
- Understand current business processes, issues, and exceptions
- Analysis of the findings
- Identify key areas of opportunities
- Recommend changes in business process
- Derive an implementation roadmap

## BACKGROUND

All retail outlets are serviced by company-operated Distribution Centers (DCs). Buyers place orders directly with the vendors, the DC receives/stocks the products, and the company-owned trucking company delivers these products to the store based on their orders. Customer satisfaction is the most important goal for the retailer and they aim at maintaining high service levels for all the products with the highest quality standards.

Managing the 'perishables category', where a few products have a shelf life that could be as low as 10 days, is extremely challenging. Because of a shorter shelf life, limited supply and unpredictable demand pattern, stores and DCs find it extremely difficult to forecast stocks and inventory. There are frequent instances when the DC does not have enough stock to supply according to the store's orders. In order to meet

the stores' demand, buyers have to rely on the wholesale market to supply the quantity that the DCs cannot service.

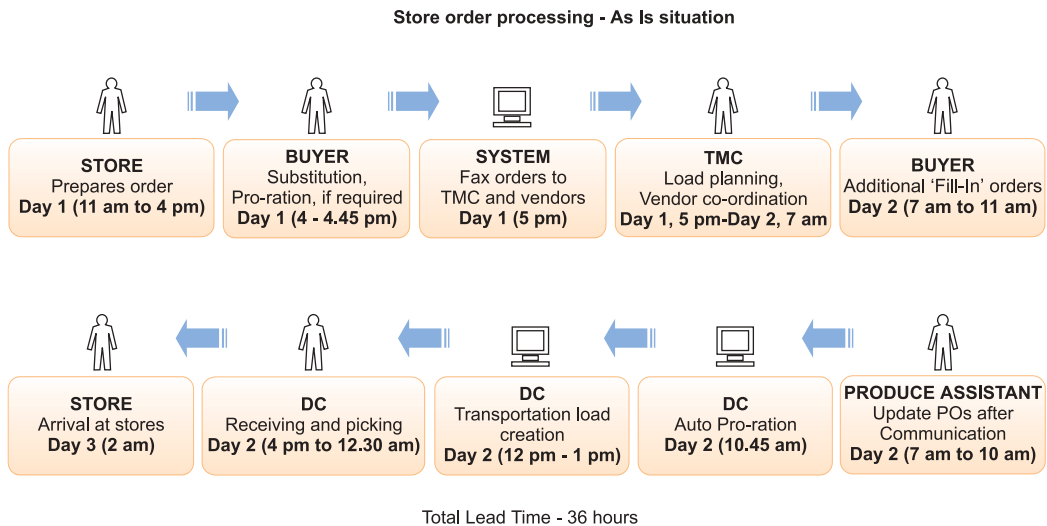
The wholesale market has close to 50 produce vendors. If the orders are more than the stocks available at the DC, or a few of the planned deliveries have not arrived at the DC, then the additional purchases are made in the wholesale market. The price is generally 10% higher than the other vendors from where planned purchases are made. Currently the total purchases from the wholesale market represent 14% of the total purchase value and 13% of the total quantity.

These orders are handled by a Market Coordinator whose main task is to collect orders from buyers, liaise with the vendors, and plan for trucks to deliver the orders to the respective DCs. One of the key pain points of these purchases is that the price approval, on a transaction level, is not done by the buyers. Due to supply constraints any price quoted by the vendor gets accepted.

The additional purchase cost incurred by the retailer to procure produce from the Terminal Market is around USD 3.6 million per annum. There are additional issues of increased transportation costs (approximately USD 0.9 million) and longer delivery times.

## UNDERSTANDING THE CURRENT BUSINESS PROCESSES AND ISSUES

InFlux™ was used to draw up a detailed organizational model to understand the various roles involved in the process. The collaboration model helped in gaining an appreciation of the interaction between various roles, systems, and the information flow in the complete process. The detailed workflow processes finally helped to capture the activities performed by various participants. These various diagrams highlighted problems and issues associated in the existing process and also helped in arriving at an optimum solution (Figure 1).



**Figure 1:** Store Order Processing involves various issues and dynamics amongst various participants **Source:** Infosys Experience

The details and issues of the store ordering delivery process are:

#### Order creation by the store

Only the Produce Manager or the Assistant Produce Manager is authorized to prepare the order. The store associates are provided with a handheld RF device that is used to enter the stocks, generate store orders, and send the order to the buyers.

The store starts the order generation process on Day 1 at 11 am in the morning. A store associate who is in charge of closing, updates the stocks inventory between 9 and 10 pm the previous night.

Based on the past sales pattern (3 weeks / 8 weeks / 10 weeks) the handheld RF device provides suggestions for future orders. The order processing screen also provides information on the inventory at the beginning of the day, stocks received during the day, and the current stock status.

The orders are sent by all stores to the Buyer on Day 1 by 4 pm.

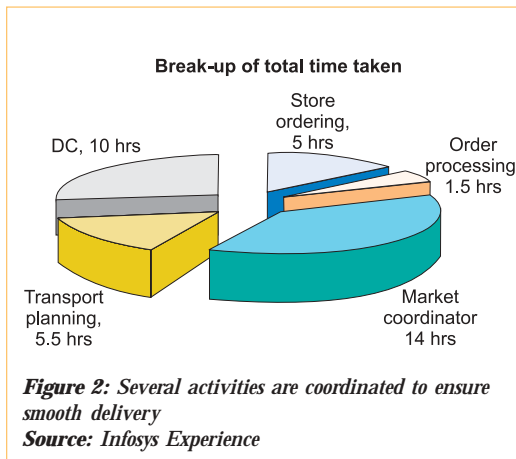
Some of the problems observed in this scenario were:

- The current store order does not factor the peak sales which takes place between 3 pm and 7 pm.
- While placing the next order the stores have not received stocks for the earlier order placed. This phenomenon is called blind ordering.
- The total order generation process takes almost 5 hours.

#### Order consolidation by buyer

After the stores have sent their orders to the corporate office, the produce buyer becomes involved in the process.

On Day 1, between 4 pm and 4.45 pm, the buyer analyzes the orders received from the stores. The deficit of all products is calculated based on the inventory available at the DC.



In some cases, the buyer initiates item substitution, i.e. where similar items are substituted for the items which have a deficit. This helps in preventing sales loss at the stores and also helps in keeping the inventory costs under control.

For items where a substitution has not been done, the buyer places an order with the wholesale market vendors. He has the authority to change the quantities to meet the Minimum Order Quantity norms of the vendor.

Once substitution and order consolidation is complete, the Purchase Order (PO) ordering system generates a single PO, combined for all the stores. This represents the total quantity that needs to be supplied by the wholesale market.

- The PO is faxed automatically to the market coordinator and the primary vendors by 5 pm on Day 1.

Some of the problems in the current process are:

- The buyer has the authority to increase/decrease the store orders without informing the store.
- The buyer raises a single PO and hence the market coordinator has no indication of individual store requirements.

### Order processing by the Market Coordinator

The Market Coordinator (MC) starts making phone calls to the relevant vendors after receiving the orders and, if required, switches orders between different vendors to get the best quality and price. The MC also starts estimating the number of trucks that are required to deliver the total quantity.

While the vendors accept all the orders, they do not have any stock available with them. The stocks arrive only on Day 2 between 1 - 3 am in the morning. After the stocks are received, the vendor starts picking and packing between 3 am and 5 am.

- Any new shortfall that results because of scheduled deliveries that do not arrive at the DC or stocks that get rejected at the DC also need to be communicated to the Wholesale Market. These orders are termed as "Fill In" orders and are communicated by the buyer on Day 2 by 9 am.
- The trucks leave the wholesale market by 10.30 am on Day 2, after taking into consideration the 'fill in' orders as well.

Based on the information received from the wholesale market vendors, the produce assistant updates the PO information with the quantity and the price.

Some of the problems in the process are:

- Vendors confirm orders before they receive stocks
- There is no visibility on the stocks finally dispatched from the wholesale market
- The procurement price is not approved by the buyer
- The trucks are not dispatched till the 'Fill In' orders are received by the market.

### Receiving and Transportation

- The trucks reach by 12.30 pm on Day 2.

### REFERENCE CASE STUDY: A LEADING EUROPEAN GROCERY RETAILER

The European operations of this retailer were analyzed to understand some of the best practices being followed.

Instead of one single time for receiving store orders, three separate time windows were created for receiving orders. These were 9 - 10 am in morning, 1 - 2 pm in afternoon and 5 - 6 pm in the evening. Each store was given only one specific time. After the store orders were received, processing was done immediately for each batch of orders. For example in the first batch of orders that are placed from 9 to 10 am, the picking was started within an hour. At 11 am after the orders were received, the buyers coordinated with the market to fill for the next order. By 12 pm the first truck left the warehouse and by 2 pm stocks were received by the store. The trucks made multiple stops on the way.

One key advantage was that the stock was delivered before the next order. The evening orders were delivered before the next day's orders, thus avoiding blind orders. Three batches were used to optimize the warehouse performance. On an average 97% to 99% of the ordered quantities were delivered.

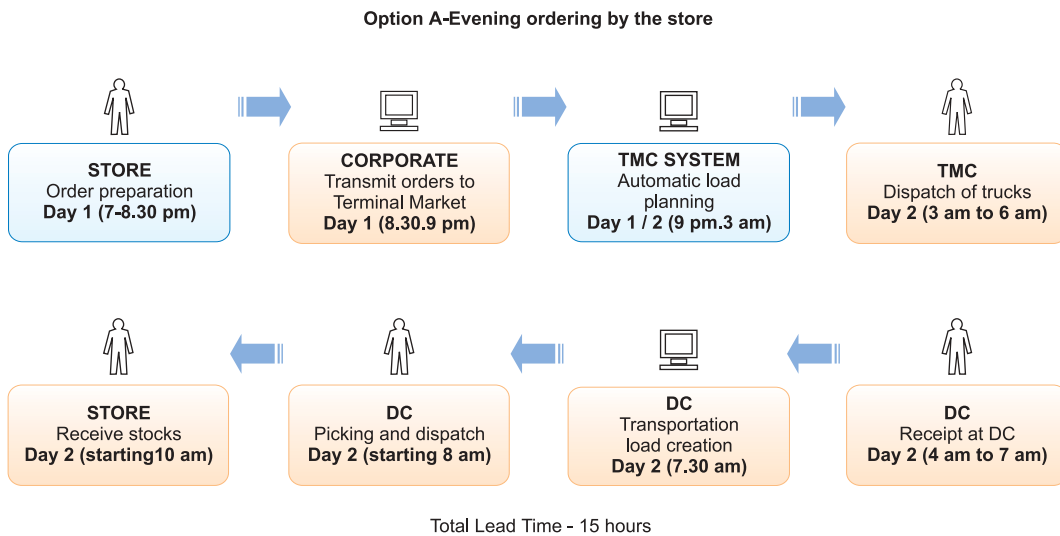
- The DC's activities of receiving, unloading, put-away, etc. are started only after all the orders are received. After these activities, picking, loading, and dispatch activities are carried out. The dispatch starts from 4 pm on Day 2 till 12.30 am on Day 3.
- The stores receive stocks against the orders sent by them on Day 1 by 4 pm, on Day 3 after 1 am.
- A Single PO is split across loads making it difficult to match the PO with the deliveries.
- High administration cost for the wholesale market transactions, which requires a dedicated associate at the corporate level.
- For weekend orders the shelf life received is very low because the wholesale market is closed on Sundays. With higher amount of sales on weekends, ordering errors increase because of blind orders.

Some of the problems in the process are:

- DC waits for all the orders to arrive before starting their respective activities
- Before placing their next order, stores have no information on the quantity that will be received against the previous order.
- The handheld used by the stores to place the orders is neither linked to POs for accurate sales information nor does it provide total inventory details.
- There is no single point of communication with the Wholesale Market. The buyer as well as the market coordinator talk to the primary vendors directly, leading to errors.

### KEY AREAS OF CONCERN

- No visibility about the product loaded in various trucks being dispatched from the Terminal Market.



**Figure 3:** The new, recommended process results in reduction in lead time

*Source: Infosys Experience*

- Quality of produce supplied by the wholesale market is always suspect. This is because, many a times, the consignments rejected by the DC get sold in the wholesale market. This same product may find its way back to the DC, in case of shortfall, at a higher price and with lesser shelf life.

### THE SOLUTION

The break-up of the total time taken is as depicted in the pie-chart (Figure 2).

On detailed analysis it was quite apparent that in order to reduce the lead time, the focus should be on the wholesale market activities and the DC activities, while for improving the ordering accuracy the focus should be on the store ordering pattern.

In order to benchmark the produce ordering process, the European operations of the retailer were also studied.

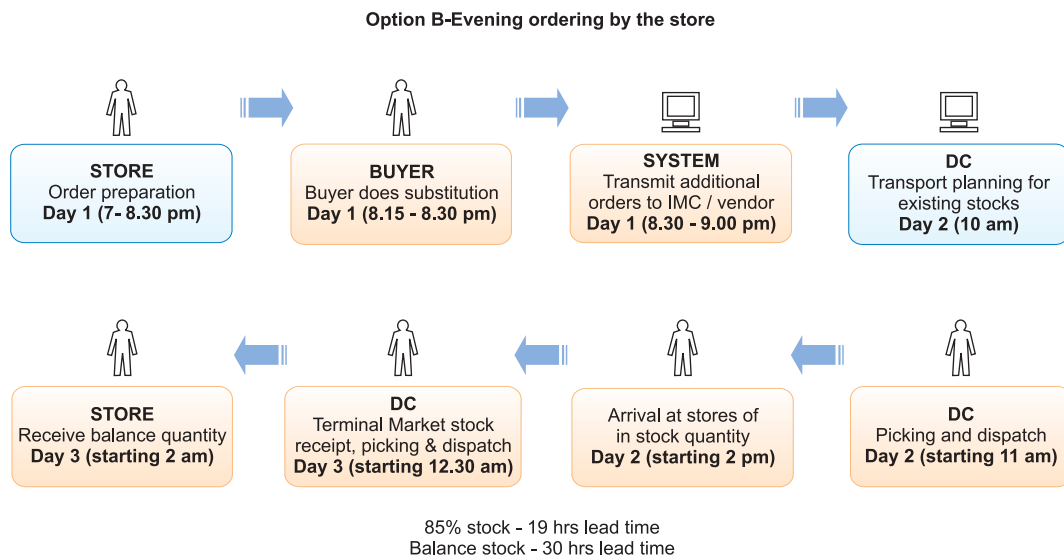
Some of the unique European practices

like dividing the stores into clusters could not be implemented because of longer distances in the US; however, the concept of avoiding blind orders was definitely considered.

The following are the different options recommended to reduce the lead time for produce deliveries:

#### **Option A: Change in store-ordering time and faster transportation from the wholesale market.**

The business process modeling approach coupled with detailed analysis helped in identifying the potential areas for lead time reduction. It was possible to delay the store ordering by a few hours as there was no value-added activity performed at the wholesale market till stocks were received by various vendors. Also, the current ordering process did not include the peak sales. One possible solution was to start the ordering process after the peak sales were over. This would improve the forecast accuracy and would also not have



**Figure 4:** A second recommended option results in lead time reduction as well as freshness of stocks

**Source:** Infosys Experience

any impact on the wholesale market operations ( Figure 3).

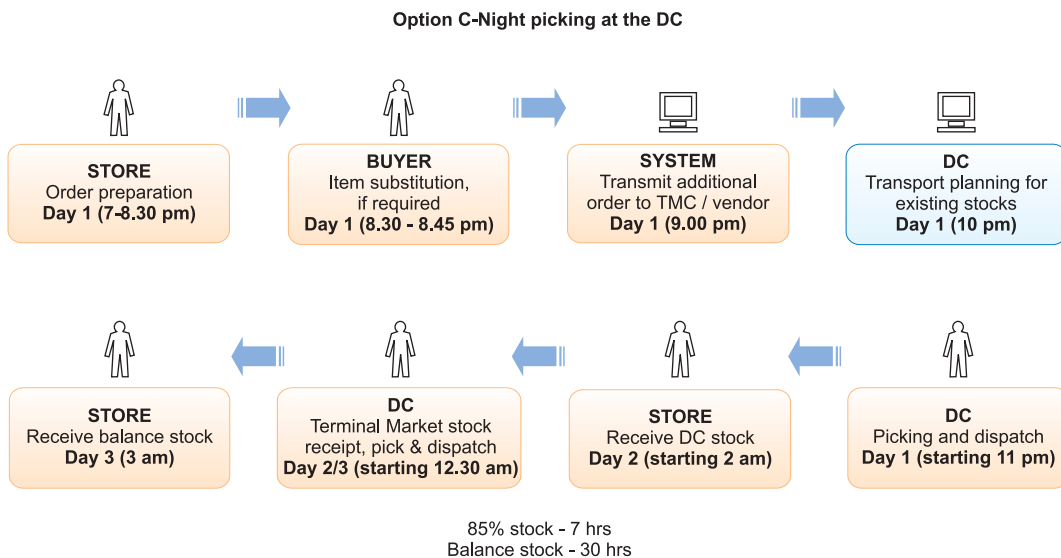
The recommended changes in the process are:

- Stores to send orders after the peak sales period, viz. on Day 1 after 7 pm.
- The changed process would be supported by an automated load planning application at the wholesale market. This load planning application would reduce the time spent in manual correction and improve load planning accuracy. The vendor and the market coordinator would be required to update the quantity and availability information on this system on a real-time basis.
- Another change recommended as a step towards optimization was immediate dispatch of the trucks from the wholesale market. The trucks do not wait for the 'fill in' orders to be completed.

With these changes the consignment would reach the store on Day 2 after 10 am. The total lead time for this option is only 15 hours. This is more than 60% reduction in the lead time. This also helps address the problem of weekend sales because of faster replenishment. The 'fill in' orders placed by the buyer however are not supplied along with these orders.

**Option B: Change in the order processing pattern by the DC**

Another area of improvement identified was reducing the time taken for order processing by the Distribution Centre. Further analysis revealed that the wholesale market contributed to only 15% of the store's total requirement. This meant that though the DC had 85% of the quantity in stock, it would wait for the balance quantity from the wholesale market to service the store with 100% of the order. This was identified as a



**Figure 5:** Option C reduces the lead time by almost 80% **Source:** Infosys Experience

major opportunity for reducing the lead time (Figure 4).

The changes recommended are:

- Like the previous option, the stores would continue to order in the evening after the peak sales period is over.
- The DC would immediately dispatch available stock against this store order. This quantity (85% of the order) would reach the store within 19 hours (as against the existing 36 hours), while the balance quantity would be supplied to the store separately as per the current cycle of 36 hours lead time.
- To ensure that the stores adjust their future orders it is essential to provide them with inventory visibility, for example, quantity received against ordered, in-transit, etc.

Apart from the benefit of reduced lead

time, immediate replenishment will also help in improving the freshness of the stock that is sold to the customer.

**Option C: Change in the pick-up time at the DC**

Currently, it was observed that the DC pick-up operation was carried out only in the morning. This was another area that presented an opportunity to reduce the lead time. Over and above all the changes recommended in Option B, it was suggested that the DC should switch to night picking (Figure 5). The recommended changes are:

- The stores send their order in the evening after peak sales are over. The consolidated orders are sent to the DC and the wholesale market.
- Instead of the planning and the pick-up operation being carried out the next day, the DC starts this activity in the evening after orders are received.
- The produce is dispatched to the stores

BENEFIT	METRICS
More accurate store ordering	Stock-out %
Lower inventory levels at stores	Shrink % at stores, average inventory levels
More accurate DC forecasts	Inventory level, shrink %
Increased service level from DC to stores	Number of DC stock-outs, frequency of pro-ration, forced allocation
More accurate DC buying	Frequency and % share of buying at higher costs
Improved service levels from stores to consumers	Frequency of stock out at stores
Fresher product to the customer and increased shelf life available to the store	Shrink % at stores, customer feedback
Lower DC shrink	Shrink levels at DC

**Table 1:** Lead time reduction results in benefits to the retailer

**Source:** Infosys Experience

starting 11 pm in the night. The stores receive the stocks against their order within 7 hours. This takes care of 85% of their requirement. The balance 15% of the stock is supplied from the wholesale market as per the current cycle of 36 hours lead time.

This helps to reduce the lead time by almost 80%. For this option to succeed, it is important for both the DC and the store to have visibility of stocks in the supply chain.


Reduction in the lead time results in multiple benefits accruing to the retailer (Table 1).

## CONCLUSION

The case study demonstrates that by following the structured approach of Business Process Management it was possible to achieve high level of efficiencies in the process. Such large improvement would contribute directly to both Revenue and Net Margin. This change was possible only because the entire problem was broken down into small manageable problems with the help of Business Process Management Tools. As demonstrated in this case study, it is important that companies should not only focus solely on their internal processes but also venture outside and look for opportunities in the entire value chain. It is important to involve all the trading partners, viz suppliers, transportation

companies, wholesalers, etc., in the initiative to maximize the benefits that can be obtained. Business Process Modeling coupled with IT investments to automate the process will help organizations in creating the much needed competitive advantage.

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# Regulatory Compliance and Business Process Transformation

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By Pradeep Sanyal & Ravikant Karra

*Organizations ought to look beyond mere compliance and treat this as an opportunity to significantly improve business practices and processes*

The past few years have seen a host of regulations being thrust upon the corporate world. Non-compliance is not an option and overseeing compliance efforts has been on the agenda of the Chief Officers year-on-year. The list of compliance regulations is expanding, from HIPAA in 1996, to the more recent Sarbanes-Oxley Act and there is promise of more such regulations to come.

Most organizations tend to view compliance efforts as a "cost of staying in business". Organizations ought to look beyond mere compliance and treat this as an opportunity to significantly improve business practices and processes, achieve overall organizational effectiveness, and mitigate operational risks to achieve sustainable strategic benefits.

Keeping track of the mandated requirements of the various regulations and ensuring compliance is one of the key challenges that many companies face today. Improved risk management, operational transparency, and corporate accountability are now as important, if

not more, than financial reporting. Regulatory Compliance is an imperative for companies across industries and nations, with stringent penalties for those that fail to measure up.

Different regulations have come into existence at different points in time, some being specific to an industry and others applicable across industries. However, a common thread of better governance, improved risk management, greater accountability, and enhanced control runs through all of these regulations. They mandate that businesses understand, manage, and control business processes to a greater extent than they have previously. And this, in turn, can translate into common business themes for compliance.

The impact of the regulations on the IT department of an enterprise is immense. Information Technology can and will play a significant supporting and enabling role in addressing the compliance and governance issues. Even a partial list of the regulations shows their varying requirements (Table 1).

Year and Regulation	Rationale	Industry	Requirements	Translates into need for
Aug, 1996 HIPAA	Protect privacy	Healthcare	Privacy and security of all patient information; individuals can demand accountability for disclosures other than treatment, payment and healthcare purposes	Information security and an audit trail enabled disclosure process of usage
Aug, 1997 CFR 21 Part 11	Electronic records storage	Food and Drugs industry	Requirements for electronic storage and retrieval of electronic signatures used to document and acknowledge conditions in stages of the manufacturing process	Information life cycle management solutions, non-repudiation of electronic signatures
1999 Gramm-Leach-Bliley	Protect customer privacy	Financial Institutions	Limited usage of customer financial information, safeguards of data collected and prohibition of "pretexting"	Processes to ensure information security and privacy
1999 Basel II Capital Accord	Capital framework for risk management	Financial Institutions	Operational risk management, process control and reporting	Process mapping and risk identification, auditable documentation and reporting capability
Oct, 2001 USA PATRIOT Act	Help prevent terrorism	Generic	Beefed up know-your-customer rules ; restrictions on foreign fund transfers ; providing information on customers when demanded	Data mining and analytical capabilities, analyzing transactions
July, 2002 Sarbanes-Oxley Act	Investor protection and accounting reform	Generic - all Listed companies in the USA	Process mapping and issuance of internal control report; rapid and current disclosures and accelerated filing; retention of records	Process documentation, analytical capabilities for exception reporting, consolidation mechanisms for real-time disclosures

**Table 1:** Various compliance regulations have varying requirements and interpretations **Source:** Infosys Research

## INTEGRATED APPROACH TO COMPLIANCE

The Sarbanes-Oxley Act is one of the more recent regulations and has significant ramifications due to its wide ranging nature. It affects the various stakeholders in a business, ranging from executives to board members to auditors to business process owners. It has brought drastic

changes to the way companies look at accountability, governance, and internal controls. It requires a company's senior management to certify the establishment and maintenance of an adequate internal control structure and procedures for financial reporting. Auditors are now required to attest

the above certification and hence attest the processes that produce the financial statements, in addition to the statements themselves. The auditors will need a mechanism to take a closer look at these financial processes to understand them, and judge that they have been executed without discrepancy. The need for near real-time disclosure of material events adds a new dimension to the compliance challenge.

Compliance programs in companies inevitably have a narrow focus on an immediate need, hampered as they are by a lack of visibility into an upcoming regulation. This also means that the compliance efforts end up addressing each regulation mandate in its own silo, making the possible reuse of compliance frameworks or technology sub-optimal.

Even within Sarbanes-Oxley, there is no clear definition of what "rapid and current disclosure" will entail. But a technology solution which goes beyond the mere mapping of processes, to real time capture of deviations from pre-set tolerance limits for each of the process steps will enable the business to reuse current solutions.

The authors believe that compliance to any regulation must be viewed as an ongoing process. Ideally, companies should look at using a scalable, sustainable compliance methodology to future-proof their compliance efforts.

## **COMMON THEMES IN COMPLIANCE REQUIREMENTS**

The compliance requirements can be classified into three common themes:

1. Focus on process mapping, internal controls, and risk management as in Sarbanes-Oxley and Basel II
2. Information security and audit trails, for privacy and accountability, as in Sarbanes-

Oxley, HIPAA and Gramm-Leach

3. Information storage, analysis and retrieval as in TREAD, Patriot Act.

Exercising and monitoring internal controls is best enabled by detailing out the existing processes, identifying risks associated with them, ensuring controls are in place to mitigate the same, and monitoring the effectiveness of the controls on a continuous basis.

The rest of this paper will focus on the means of managing compliance requirements.

## **BUSINESS PROCESSES AND INTERNAL CONTROLS**

Compliance efforts typically focus on two types of processes:

- Transactional processes
- Enabling processes

Transactional processes are typically high-volume, routine processes, for example, processing of sales invoices daily. Enabling processes, as the name suggests, provide the right enablers to achieve business objectives, for example, IT systems with their added security dimension.

The biggest challenge faced by companies today, in the wake of the various regulations, is to ensure that the transactional and enabling processes operate as desired, while ensuring the enforcement of necessary internal controls. They also have to ensure that controls have been well designed and are operational so that the accounting hygiene of financial reporting is of the highest standard.

Companies need to ensure that financial processes are followed, monitored, and auditable. They have to document their processes, have them synchronized with actual practice, and audit them regularly for compliance to regulations. More companies are looking to

automate their business processes and to actively manage preventive controls through transaction processing.

### **BPM FOR REGULATORY COMPLIANCE**

BPM gives the business a framework for managing complex processes, while ensuring that process changes can be made in accordance with various regulations. It can also help in enabling analytical capabilities by providing inputs for continuous process improvement.

Companies can evolve compliance programs that involve the following steps:

- Process modeling, which enables a graphical representation of all the steps in fulfillment, exceptions, and error handling. This, in turn, facilitates risk identification and internal controls designed to address risks. Process modeling will ensure the accuracy and consistency in understanding among all stakeholders (auditors, process owners). This will also ensure audit-ability of processes if they change, and hence, accountability.
- Process automation (deploying and execution) through workflow can be developed for enhanced process execution compliance. Manual intervention may be necessary for handling certain exceptions. Workflow collaboration and approval are the key features that ensure automated controls, accountability, traceability, and visibility. The collaborative workflow technologies aid process design by mapping workflow to internal controls.
- Managing and monitoring the processes on an ongoing basis. This activity shows process status and provides better visibility to the management on compliance status. It also helps improve reporting and monitoring efficiency and facilitates

streamlining of end-to-end cross-functional workflows. Customizable checkpoints can be defined for monitoring and reporting financial information, and also enforcement of documented control processes.

- Process analysis leading to process optimization to weed out inefficiencies and remove redundant steps in a process.
- Integrating the processes with disparate systems for real-time information exchange through appropriate interfaces, seamlessly. The workflow technologies allow integration of control processes across multiple systems and applications.

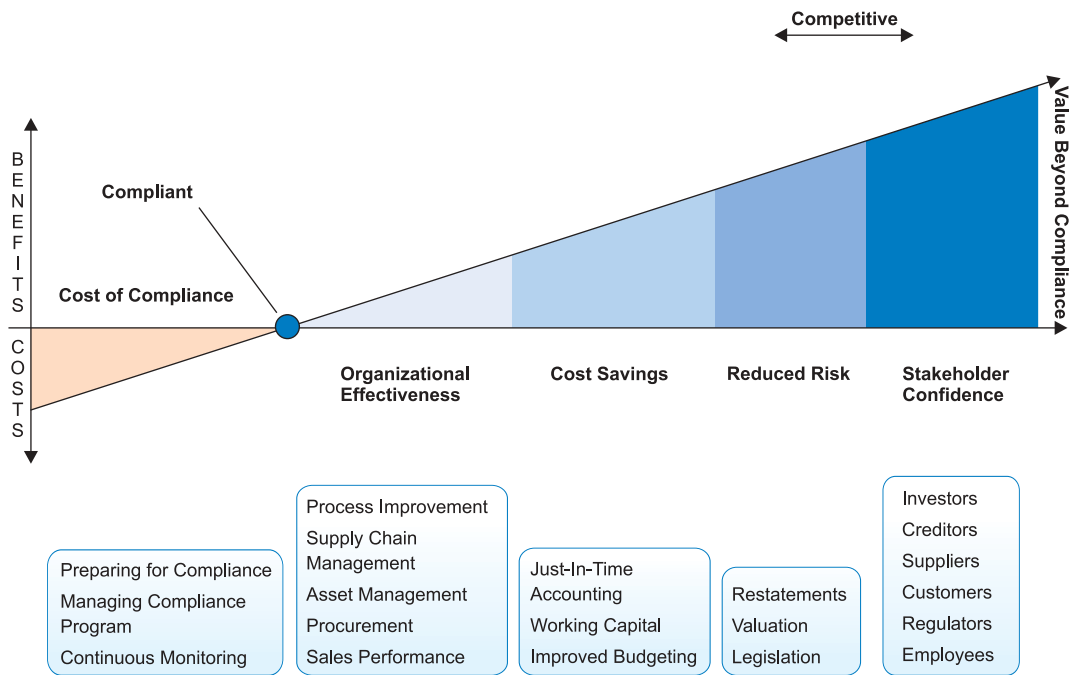
BPM can help design the control process and parameters, and integrate this with any risk management framework. Regulators expect to see auditable processes, which the BPM solution can easily provide. Auditors can monitor compliance by looking into financial evidence, review policies, procedures, internal controls, and view financial reports to identify gaps in compliance.

Integration of information, people systems, and applications can ensure a truly comprehensive enterprise-wide compliance framework.

### **COST OF COMPLIANCE**

Today, companies do not have much choice over the decision for compliance because the legal risk of failing to comply is high. Businesses should take this opportunity to look at leveraging the compliance spending, and ways of offsetting the cost of compliance with the other benefits that a business can achieve.

The most obvious benefits from BPM implementation include increased efficiency, lower costs, improved customer service, and quicker time to market. Companies ought to look



**Figure 1:** Compliance spending reduces organizational risks. **Source:** Infosys Research

at BPM as a means to achieve overall organizational effectiveness and reduce operational risk. Compliance spending should help organizations become more flexible, agile, and competitive entities. Smart businesses should look at regulations as an opportunity to transform their processes to achieve more permanent strategic benefits (Figure1).


## CONCLUSION

Businesses may find complying with regulations daunting because of the wide reaching impact areas and implications. Companies need to design comprehensive regulatory programs that can address the mandates of various existing regulations. The compliance program should be flexible

so that it accommodates any future regulations.

Technology, specifically BPM, will play a significant enabling role in the future for the regulatory compliance initiatives in enterprises. Businesses can use BPM technology to build sound governance policies and procedures, optimal collaborative processes, efficient internal controls, and responsible financial reporting structures. Moreover, the technologies supporting the compliance objectives can be leveraged to gain sustainable benefits and competitive advantage by optimizing their capabilities. Compliance spending should be looked at as a long term strategic investment, and not as a cost.

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# Reengineering a Hotel's Purchasing Process

*By Subhankar Bhattacharya, Abhijit Upadhye & Sandeep Dham*

*Chipping away at the purchasing function can have significant bottomline pay-offs*

**G**lobally, the hotel industry is characterized by customer-centricity, a decentralized mode of operation and barring the cost of labor, a relatively lower focus on the cost of operation. The industry, however, has suffered a major setback post 9/11 and with slow economic recovery through 2002-04, it is becoming increasingly important to control operational costs. The US \$103 billion hotel industry in the United States alone spends around US \$15 billion on direct purchases. A saving of around 7% (estimated potential) on this direct purchase can add more than US \$1 billion directly to the bottom-line of this industry.

Capitalizing on this potential is, however, restricted by several challenges - the structure of the industry (franchised, owned, management contract, etc.), the current purchasing process (non standardized, ad hoc, inaccurate demand forecasts), a non-integrated application system environment, and many such issues.

## **SCOPE**

This paper attempts to analyze the buyers' supply chain for the hotel industry. The analysis identifies potential areas from where benefits may arise, the challenges to achieve them, and the approach to overcome these problems.

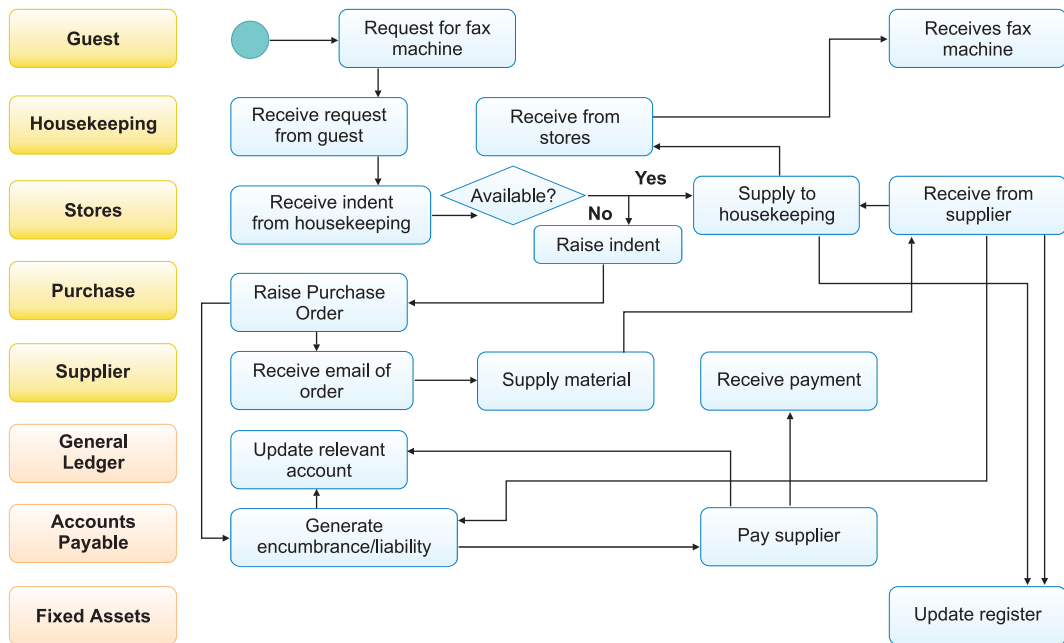
Before arriving at any possible solution we provide a context for operations in the hotel industry, which in many ways determines the cost structure of its supply chain.

The recommended solutions will try to overcome the inherent structural difficulty that has prevented the hotel industry from improving its supply chain cost structure for decades.

## **ANALYZING THE HOTEL SUPPLY CHAIN**

Supply chain in the hotel industry, like any other supply chain, has three distinct cost elements to optimize:

- Cost of Transaction
- Cost of Product



**Figure 1:** The procurement process in hotels is manual or semi-automatic **Source:** Infosys Experience

■ Cost of Inventory

In the following sections we discuss the relevance of these cost components in detail.

**COST OF TRANSACTION**

Approximately 30-50% of the products in the hotel industry belong to the low-value, high-volume category. In Full Service hotels, many products like vegetables and fruits have a short shelf life and require repeat purchases. These products increase the transaction cost.

Ideally, a situation like this would demand standardization/rationalization of the product portfolio, as well as automation in the supply chain process. On the contrary, hotels generally have a decentralized application environment with moderate levels of automation and a very high degree of non-standardization.

Non-standardization has a significant impact on the cost structure of hotel supply

chains, because even the organizations that are open to the idea are unable to migrate towards collaboration or consolidation frameworks.

The cost of quality control is minimal when an organization deals with a small number of suppliers. The cost of quality control goes down even further when the supplier relationships are strategic in nature. The hotel industry is characterized by large number of non-strategic suppliers, thereby increasing the cost of quality control.

Individual hotels also tend to work as silos. Hence, even if there are multiple hotels of a particular chain operating in the same city, the inventory is generally not optimized among them. It is quite possible that one hotel might have excess stock while the other may be out-of-stock for a particular product. Instead of transferring stocks, however, each hotel will order fresh stocks, thus initiating a longer chain of events resulting in increased transaction cost.

The indenting process in many hotels is manual, or at best semi-automatic, requiring manual consolidation (Figure 1). For example, if the same product is required by four departments, either paper indents are created or the system does not have the facility to consolidate the requests. This is usually true for items that get indented separately by each department in a hotel.

Hotels can potentially save an estimated 8-20% on the cost of transaction, depending on the level of automation and unplanned activities that are present in the system.

#### **COST OF PURCHASED PRODUCTS**

Cost of purchase in a hotel can range from 15-30% of sales, depending on the type of hotel. Historically the cost of purchase in the hotel industry has remained substantially higher than other industries because of the following reasons:

- Hotels have a tendency to purchase too many Stock-Keeping Units (SKUs) for the same purpose. This includes alternate brands, pack sizes or substitutes. This has a direct negative impact on consolidation benefit, increase in supplier base, and a consequent increase in overall cost structure of the supply chain.
- It is a very common occurrence for two hotels belonging to the same group in a city to purchase the same product at different prices from the same or alternate supplier.
- The level of consolidation among hotels belonging to the same chain is often non-existent. These units lose the benefit of bulk purchase that consolidation can provide.
- In cases where a central purchasing organization monitors and releases central contracts, the adherence to the same is extremely poor. Contract leakage is a common phenomenon in hotels.

- There is also a tendency to use a large supplier base but not develop a strategic relationship with any one of them. As a result, concepts like product value re-engineering, joint cost improvement initiatives, and so on, which are the prevalent modes of cost reduction in the manufacturing industry, are rarely in practice.

All these factors contribute heavily towards the increase in the unit price of products in the hotel supply chain. Hotels today may be losing an estimated 8-10% on products purchased.

#### **COST OF INVENTORY**

Forecasting the material consumption based on forecasted occupancy is usually not very well managed. The lack of an interface with the sales and purchasing system and the complex association of purchase and physical occupancy can be cited as two major reasons for poor forecasting.

The vendor-supplier relationship in the industry is also far from being perfect. As a result, concepts like vendor-managed inventory or just-in-time inventory that have been deployed by many industries to reduce inventory costs are generally out of context for many hotels.

In addition, a large number of SKUs and lack of standardization often lead to a waste of valuable shelf space. This can be significant for most hotels as they are generally located in high value real estate areas.

Engineering spares and operating supplies form the most significant part of physical inventory in the hotel inventory cost.

Usually these numbers are well reflected in the balance sheet of many hotels where expensive inventory like wines may have significantly high inventory. Engineering spares can have an inventory turn of almost one year.

## **HOTEL INDUSTRY CHARACTERISTICS AFFECTING SUPPLY CHAIN COSTS**

Before we recommend a solution to reduce the cost in the supply chain, it is important to understand the genesis of the operating style of hotels. This analysis highlights the constraints under which a hotel operates and hence helps suggest a viable solution.

The traditional operating style of hotels can be attributed to the following four reasons:

- The customer centricity of the industry
- The structure of the hotel industry
- Status of the purchasing department
- Poorly integrated application systems

## **CUSTOMER CENTRICITY**

The excessive customer centricity of the hotel industry over the years has given rise to a plethora of products in the service line. Some of them may have outlived their utility but they continue to be part of the offering by the hotel. When a product class consists of a large pool of individual products, it results in the following:

- It reduces the possibility of bulk purchase and consequently pushes up the cost per product unit
- It becomes difficult to maintain quality and consistency of the product, because the number of products and suppliers that must be controlled are far too many
- Large number of SKUs and suppliers increase the number of overall transactions.

While customer centricity is unavoidable in the service industry, it may be worthwhile to understand which products may bring value to the customer and which do not. It is also important to appreciate the fact that customer centricity does not necessarily mean that the industry adopt ad hoc methods in the purchasing process.

## **STRUCTURE OF THE HOTEL INDUSTRY**

Globally the hotel industry follows four different kinds of business models that are outlined below.

### **Franchise model**

In this model a hotel chain lends its construction, operational insight, as well as brand name to a franchised outfit owning one or more hotels. The physical ownership and operation of the hotel stays with the owner. However, the brand owning company on a corporate level provides the distribution network, purchasing system, and loyalty program to the franchised entity. This is a predominant mode of operation in the industry.

### **Operating Contract model**

In this model the hotel chain takes the onus of operation of a hotel. The ownership status stays with the local owner. The owning chain generally shares a part of the profit with the physical owner of the hotel, or is paid a fixed sum by the owner. This is the second most prevalent form of structure in the industry.

### **Ownership model**

Every large hotel chain in the world has some part of their portfolio exclusively owned. This model is self explanatory.

### **Branding**

In this model the hotel chain lends its brand to a hotel. Along with the brand, generally, the loyalty program and reservation network is extended.

The implication of these different operating structures on the purchasing function is immense. For example, in a franchised or operating contract model, two hotels in a city possessing the same brand name may be owned by two different owners, each having a different agreement with the brand

	CRS	CIS	PMS	POS	MMS	AP	AR	FA	GL	HRIS	Payroll	CM	Loaylty
CRS	Full Interface	Full Interface	Partial Interface	Interface Not Required	Interface Not Required	Interface Not Required	Interface Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required
CIS	Interface Not Required	Full Interface	Partial Interface	Interface Not Required	Interface Not Required	Interface Not Required	Interface Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Partial Interface
PMS	Interface Not Required	Interface Not Required	Full Interface	Partial Interface	Interface Required	Interface Not Required	Full Interface	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Partial Interface
POS	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Required	Interface Not Required	Interface Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Partial Interface
MMS	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Required	Interface Not Required	Interface Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required
AP	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Required	Interface Required	Full Interface	Interface Not Required	Interface Not Required	Interface Required	Interface Not Required
AR	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Not Required	Interface Required	Interface Not Required	Interface Not Required	Interface Required	Interface Not Required
FA	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required
GL	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Not Required	Interface Required	Interface Required	Interface Not Required
HRIS	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface	Interface Required	Interface Not Required	Interface Not Required
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Loaylty	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Interface Not Required	Full Interface

Full Interface
  Partial Interface
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**Figure 2:** A typical application landscape shows poorly integrated processes **Source:** Infosys Experience

owner. This makes consolidated purchasing a difficult proposition. Also, from a legal point of view, inventory sharing may give rise to tax complications.

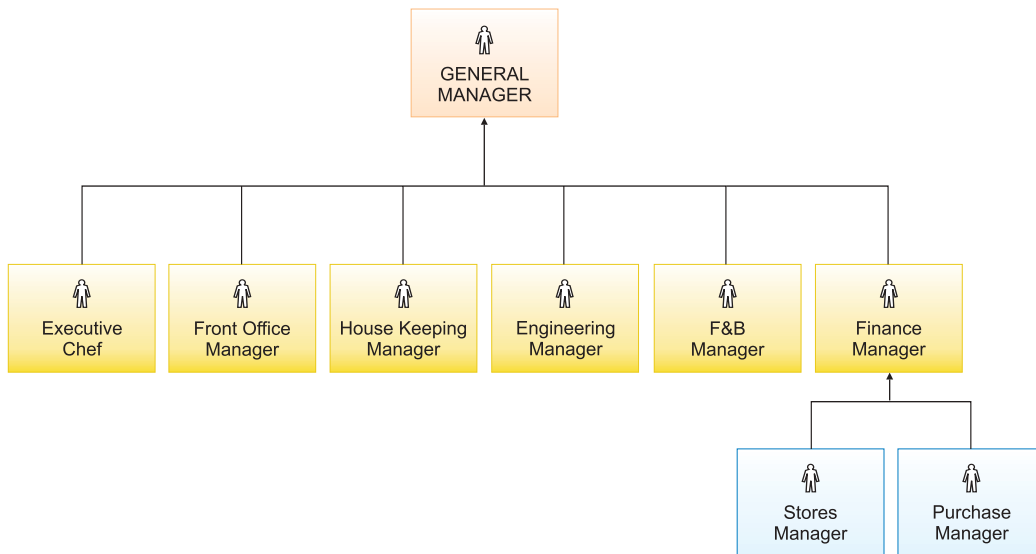
**STATUS OF THE PURCHASING DEPARTMENT**

A customer has a unique place in the service industry and more so in the hotel industry.

Unlike most industries where 90-95% customer satisfaction is an accepted norm, in the hotel industry the target is always to reach 100% customer satisfaction.

This level of customer centricity usually leads to greater importance to customer facing functions and a lesser emphasis on back-end functions like purchase. As a result, the purchase manager in a hotel is placed lower in the hierarchy and the main function of this manager is to satisfy internal customer needs. This lopsided structure invariably results in the purchase manger maintaining higher buffers in the inventory or in the supply line resulting in an increase in overall cost in supply chain.

Excessive customer centricity coupled with high service level expectation has also given



**Figure 3:** The purchase manager's authority needs to be strengthened *Source: Infosys Experience*

rise to a bloated supplier base for the hotel industry. Often, a product that has a general lead time of six days must be brought in six hours. The purchase manager has no option but to use multiple suppliers for such emergencies.

**POORLY INTEGRATED PROCESSES APPLICATION SYSTEMS**

A typical application landscape in the hotel industry will show customer-facing applications and back-office applications that do not interface with each other (Figure 2). The obvious gap between sales systems and procurement systems hampers forecasting. The lack of integration between purchasing/inventory and accounts payable systems results in multiple data entry points, in turn pushing up transaction costs.

One of the main reasons behind the poor integration among hotels in a chain is the absence of a uniform product and supplier identity across hotels. Unlike a manufacturing organization that has complete control over the identification of

products through specifications, a hotel may buy many commodities that lack global specification standards. For example, a particular quality of fish may have a different attribute association in different countries, or even in different cities within the country. Hotels also have an unusually large number of suppliers, many of them who are location-specific, which quite often comes in the way of global definition.

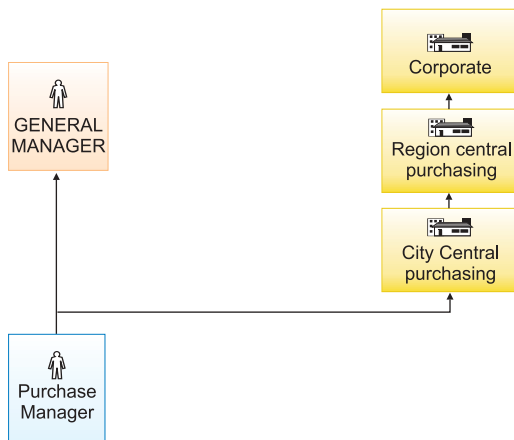
Distributed technical architecture also results in very poorly developed management information systems. As a result, benchmarking of prices, products, or suppliers becomes a laborious exercise.

The fact that virtually no technology vendor in the hotel space today offers an integrated solution does not improve the situation.

**THE SOLUTION APPROACH**

**Restructure the Purchasing Organization**

For any improvement in the supply chain cost,



**Figure 4:** The strengthened position of a purchase manager will leverage the supply chain

*Source: Infosys Experience*

the first thing that must be addressed is the structure of the purchasing organization (Figure 3). While it is obvious that several benefits would accrue by consolidating various purchasing processes for multiple hotel units, the operation of such process change desires a different purchasing organization structure with a different level of authority.

The purpose of such a structure would be mainly two-fold. Firstly, it will strengthen the position of the purchase manager in the organization; secondly it will enable a neutral central body that can co-ordinate and consolidate the disparate hotel purchasing operations. The changed purchasing organization should push up the purchase manager to the same level as the other departmental heads who report directly to the general manager of the hotel. Then, a central purchasing body that has the overall responsibility of providing a uniform technology and process architecture to all hotels operating under it, needs to be formed.

The headquarter of a hotel chain is ideally suited for such a role. This can form part of the value-added service that a hotel chain would like

to provide to the hotel running under its brand name.

For owned and operating hotels, apart from providing structure, this organization can represent the corporate body of the purchasing organization as well.

While all large hotel chains have a central body of authority covering areas such as reservation and loyalty applications, the purchasing function still continues to be an advisory function for the chains. If the hotel chains need to gain the maximum benefit out of its supply chain, a far more active role that is in line with the reservation function will be necessary.

In the second tier an operational body needs to come into force. This body can take decisions about the products that will be part of the central purchase pool. Apart from deciding which products must be handled collectively, it will also handle the added responsibility for product value re-engineering. While such a corporate body can be country-specific and have administrative direct reporting from the owned and managed hotels, it will need to play an advisory role in franchised and branded hotels.

### **Redefine Processes and Systems; Item and Supplier Data Management**

Any centralized or integrated application system requires a unique item and supplier master creation process. The hotel industry purchases a wide array of products with different country and region-centric specifications. As a result, it becomes difficult for hotels to maintain a unique supplier or product nomenclature and identification process. Much work has already been done in the retail and consumer goods industry to address this pain point; the hotel industry can adopt a similar approach instead of reinventing the wheel. For example, the use of single master data repositories, automating the

item lifecycle management processes through the use of workflow management tools, and external data synchronization with trading partners by using trading exchanges can be utilized effectively in the hotel's procurement process.

The central purchasing function can also take ownership for reducing the number of suppliers in a particular region to make the entire purchasing exercise far more manageable. Overall, a process may be developed in which a group of products can be managed centrally and the others at a local level.

#### **Supplier Performance Benchmarking**

Supplier performance benchmarking is absolutely critical for the purchasing organization. In many cases contract leakage is used as an excuse for poor service delivery by contract suppliers.

It must be kept in mind that in this changed organization, the entire purchasing hierarchy should take on the responsibility of satisfying internal customer needs. Many times the mismatch in expectation of supplier performance may result in a supplier being dropped or a product class in a hotel, especially if it is contracted by a central body. Hence, all stakeholders need to take special responsibility in ensuring that the service standards are maintained.

#### **Vendor Development Process**

The hotel industry needs to take the vendor relationship to a strategic level. A strategic relation will have many obvious benefits in terms of product value re-engineering or introducing concepts like vendor managed inventory. In fact a successful vendor managed inventory initiative can vindicate the presence of a central controlled purchasing organization to a large extent.

This can eliminate many issues related to service and quality related that are typically associated with communication breakdowns in the overall purchasing processes. Moreover, in a highly customer-centric organization, a vendor-managed inventory can be much better than a forecast-based self-controlled inventory management system.

#### **Changing Application System Environment**

The disjointed application system environment in hotels has many evils including higher transaction costs, underdeveloped decision support systems, and so on. It is therefore critical that hotels develop intelligent interfaces that remove all duplication of data entry. Changes in the purchasing and inventory system are also required to manage a central and regional application interface with hotel centric applications.

#### **Develop a Sound Decision Support System**

Managing a purchasing organization in this centralized environment is more effective with reactive and proactive monitoring and consultation rather than through control. Because customer satisfaction is of paramount importance, any form of strict control may result in a drop in service quality developed over a long period of time. Hence the success of hotel purchase process re-engineering essentially depends on the availability of a strong decision support system.

The decision support system will help identify A category items on a continuous basis which can be centrally purchased to get bulk discounts. For non-centrally contracted B and C category items, the decision support system can provide information on price, suppliers, payment terms, discounts, and so on across hotel properties. This information can help individual hotels immensely in saving time

on supplier discovery, price benchmarking for negotiation and easier identification of alternate products.

Decision support systems will be essential for identification of products that require value-re-engineering, or suppliers who can be trusted for strategic relationship.

### CONCLUSION

Re-engineering hotel purchasing processes, though a recent phenomenon, has gained prominence over the last couple of years. Many large hotel chains are increasing their purchasing service in their franchised output. Many chains have also collaborated in developing purchasing marketplaces to reduce cost in their supply chain.

However, even today, the level of such development for most chains is far from desired levels. Most organizations have identified this area as a potential money spinner that has the

potential to add 8-10% straight to the bottom-line, even though it is commonly understood that the process to get there is painstaking and will not happen overnight.

Whichever organization will emerge as the front-runner in this supply chain integration will definitely add a very potent value added service to its armor, which will make them more desired as franchiser, thus enhancing their brand value.

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# SETLabs Briefings

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# NOTES

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