

A REPORT BY CSC'S RESEARCH SERVICES

The Emergence of Business Process Management

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The research in this report is based in part upon information collected at the Business Process Management Summit held on 27 September 2001, by NetMarkets Europe and CSC's Research Services, and supported by BPML.org. At this conference, 93 delegates from Fortune 500 companies used networked laptops to respond in real time to the presentations about Business Process Management and to participate in workshops, and to answer specific questions posed by researchers.

CSC co-chairs the BPML.org with Intalio and participated in the development of BPML with other leading companies.

Introduction



Book Review

James Champy and Michael Hammer are back with new insights into how process thinking can reduce cost and create value in the digital economy.

In tough times, process thinking moves to the top of the business and IT agenda. In the early 1990's, Michael Hammer and James Champy's *Reengineering the Corporation* showed how the fundamental rethinking and radical redesign of business processes achieved dramatic improvements in cost, quality and service and speed. Now both Hammer and Champy have produced new books that update and reinterpret the key messages of reengineering.

The key message of Hammer's *The Agenda – What Every Business Must Do to Dominate the Decade* is "Put Processes First". He advocates extending process thinking across the value chain, and makes a strong case for metrics-based business process management.

Champy's *X-Engineering the Corporation* shows how all processes must be designed around customer pull, then pushed out to the rest of the supply chain. It provides concrete suggestions for tackling business process and technology issues within your company and across your value chain. This book will convince your management that they should consider business process management.

The new books share three themes. First, your processes exist to deliver value – lower prices, better quality, faster speed and better service – to your customers. Second, your processes must, therefore, be designed with your customers' needs in mind. Third, competitive advantage comes not from your strategy but from your ability to execute the business processes that carry out your strategy. If you are beginning a process management initiative, read both books. Each author provides a unique point of view, compelling case studies and a useful overview of how your business must change to thrive in a process-based economy.

Most changes in technology have only an incremental effect on the way we do business, but once in a while a new technology creates a fundamental change. The Internet (and in particular email and the world wide web) was one. We believe that BPM is another.

The drivers for BPM are not technological but economic. The two dominant economic trends today are globalisation and commoditisation. Information about products and prices are available instantly and globally; trade barriers between nations and regions are being dismantled; niche markets are disappearing. The response of the business world is to focus on productivity, and to seek partnerships.

An alliance strategy is an efficient and effective way of acquiring the skills and assets needed to compete in the new, frictionless world markets. To succeed in such a strategy, a business must make itself appealing to potential business partners. As well as the obvious factors – products, brands and prices, market access, financial muscle, good people, track record – an increasingly important question is what it will be like to work with you. Can you demonstrate you will be a dependable partner? Is your way of doing business going to be compatible with and comfortable for your prospective partners?

The way to answer these questions is by revealing your processes to an extent commensurate with your desire for collaboration. This requires a codified universal descriptor language for process – a method of stating how processes are enacted that is as exact and unambiguous as a computer programming language. Without it, we would have to set up a different, customised shop window to attract every potential partner. It would be as though every company spoke only its own language, and each new partnership had to address the process of translation issue anew. Yet how can your company and mine collaborate successfully if you cannot communicate with my supply and customer chain, nor I with yours? In a world where cooperation and virtual companies are the norm, we would have an n-dimensional problem with answers generated only in one dimension.

Thus the market will demand a process descriptor language. There is a precedent. Thirty years ago, every computer manufacturer had its own operating system, which gave its products a unique character. Yet businesses were not prepared to accept a situation in which staff experienced on one system had to be completely retrained to use another. Now, a single operating system is almost universal.

As the twin processes of globalisation and commoditisation gather momentum, and the old-fashioned go-it-alone corporation is left for dead, the ownership of a universal process descriptor language will become an essential passport to success. At present, BPML is the most viable candidate for providing such a process description language.

David Butler, CSC's Research Services

Section

1

Understanding

BPM

New Process Management technologies will enable companies to manage the core activities of their business more readily than using traditional software applications alone.

This section reviews the challenges and opportunities of business processes, business process management, business process management systems, and business process modelling languages.





Business processes are complex, dynamic, widely distributed and customised across different systems and business units

A 'business process' means a complete co-ordinated thread of all the serial and parallel activities needed to deliver value to your customers. Real business processes are characteristically:

- Large and complex, involving the flow of materials, information and business commitments
- Very dynamic, responding to demands from customers and to changing market conditions
- Widely distributed and customised across boundaries within and between businesses, often spanning multiple applications with very different technology platforms
- Long running – a single instance of a process such as order to cash may run for months or even years
- Automated – at least in part. Routine activities should be performed by computers where possible, for the sake of speed and reliability
- Dependent on the intelligence and judgement of humans. People perform tasks that are too unstructured to delegate to a computer or that require personal interaction with customers. People also make sense of the rich information flowing through your value chain – solving problems before they irritate your customers and devising strategies to take advantage of new markets
- Difficult to make visible. In many companies the processes are not conscious or explicit, but undocumented and implicit, embedded in the history of the organisation.

Technology has not been able to cope with the reality of business processes – until now

Business software has long been used to support business processes. Until the early 1990's, this support was typically provided by software applications – many of which are today's 'legacy' applications, although a large number of businesses still use them to perform key components of their processes such as shop floor process control, inventory management and transaction processing. These applications are reliable, but they do not meet the new requirements for flexibility, agility, and transparency. A business with hundreds of such legacy systems cannot easily change a business process because the process cannot be untangled from the logic of the legacy applications that support it. Nor can stovepipes be easily integrated into co-ordinated flows, let alone customised.

In the late 1990's *ERP packages* such as SAP, Peoplesoft and Oracle Financials were sold at the Board of Director level on promises by Davenport¹ and others that these software packages would support "many, even most aspects of a company's information needs." ERP systems promised reliability, flexibility, agility, and transparency. They were indeed more flexible and agile than legacy systems and they supported complex and interrelated processes within the business. However, by December 2000, the Conference Board² reported that few businesses believed they had realised the business benefits expected from

1. Thomas H. Davenport, *Mission Critical*, Harvard Business School Press, 2000.

2. A Conference Board Study of 117 firms in 17 countries that implemented ERP found that only 34 percent were very satisfied with the results. Some companies reported a productivity drop for up to a year after implementing ERP. *ERP Post Implementation Issues and Best Practices*, December 2000.



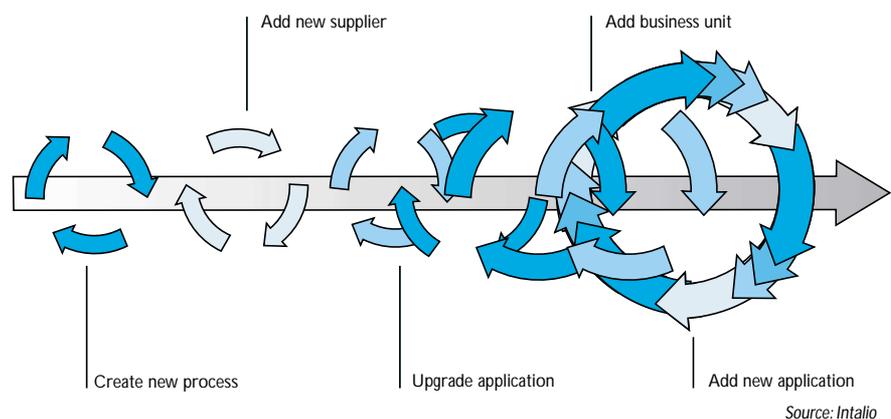
their ERP projects, and even the leading implementers of ERP were putting future ERP projects on hold. In practice, ERP systems delivered neither the transparency nor the agility promised. In addition, their functionality stopped at the business boundary because of the expensive and complex middleware required to integrate different ERP applications.

Workflow systems were another promising yet partial solution. They are based on document lifecycles and forms-based information processing, so generally they support well-defined, static, 'clerical' processes. They provide transparency, since business processes are clearly articulated in the software, and they are agile because they produce definitions that are fast to deploy and change. Their major limitation is integration: they are not good at providing people with access to information stored in computer systems, or at connecting such systems together. Also, workflow implementations are closely tied to the businesses in which they are deployed, and cannot be reliably extended to customers, suppliers and other partners.

Today, leading companies use a combination of *integration techniques* to implement their end to end business processes. Typically these include a messaging backbone, integration brokers, Enterprise Application Integration, object request brokers and transaction monitors. But it is both difficult and time-consuming to manage all this middleware and to develop the necessary application adapters. Middleware companies are aware of this and their products are improving all the time, but point-to-point solutions are still being deployed and create complex and unmanageable topologies. What started as a neat top down design becomes increasingly convoluted and when the business process changes, costs escalate out of control.

Today's businesses are seeking new levels of efficiency. The last round of efficiency gains came from breaking down barriers between functional stovepipes and reengineering inside the enterprise. The challenge is to repeat this success across the interfaces between business partners, but the middleware integration approach is already proving inadequate to the task. The disconnected activities of application integration and B2B integration are not geared to supporting the end to end process design and deployment that will be required in the future.

Businesses need technologies for the management of business processes that are genuinely usable, very flexible and capable of integrating systems across all kinds of business and technology barriers.



With current technologies, integration costs spiral out of control when processes change



CASE STUDY

Bertrand Petit, COO Europe, Elemica

The chemical industry is unusual in that it supplies 95% of all the other industries. It is also unusually circular – a lot of its trade is with others in the same industry. Chemical industry players all have multiple partners, each with their own, usually incompatible, ERP systems. (Contrast this with, say, the automotive industry, where suppliers and dealers are often tied to one of the big manufacturers; the manufacturers find it easy to impose their EDI standards on their business partners.)

A year ago, some chemical companies had established computer-to-computer links, but any company would find it impossibly expensive and slow to build links to all its business partners. Instead, although internal processes had been automated and optimised, links between companies still depended on telephone and fax. These very complicated working processes carried the high price tag of an average of 90 days' working capital. Twenty-two chemical companies recognised that a chemical industry network linking the individual companies' ERP implementations could reduce transaction and supply chain costs, and eliminate duplicate technology spends. The founder companies invested \$140 million to form Elemica to build the network.

Like many netmarkets or e-hubs, Elemica focuses mostly on connectivity and data integration. It quickly recognised

that chemical companies were not going to change their ERP systems to fit in with an industry standard. Instead, it adopted the slogan: *Connect to one, connect to all*. Each partner retains its own systems and communications standards, but any system connected to the Elemica network can communicate with any other; the network does all the translation. So, your customer's ERP sends you order information through Elemica; you store and process all your in-house manufacturing information in your own ERP; and through Elemica you pass information about the order fulfilment to your suppliers' and your customer's ERPs. Note, though, that in order to connect to the hub, your business processes must be completely clear. In particular, the interfaces with the outside world have to be mapped – in many cases for the first time, because they depend on a lot of human interpretation of procedures.

The connectivity alone delivers huge savings in increased efficiency, but Elemica realised it could build on its value proposition by offering process management capabilities to its customers. Once connected, the way to supply chain integration and optimisation is open.

The chemical industry may be unusual, but most other industries could benefit similarly from the advantages of increased connectivity and process management.



Business process management is about taking control of complete processes, all the way to the customer

Business Process Management is the capability to discover, design, deploy, execute, interact with, operate, optimise and analyse end to end processes, and to do it at the level of business design, not technical implementation. It is equally concerned with the reliable completion of simple one-off business transactions and with complex sequences that may continue for weeks, months or even years.

- **Discovery** means becoming explicitly aware of how things are actually done, as opposed to what is said to be done. This involves capturing – manually or automatically – the business processes (event flow, message flow and control flow) from the perspective of all participants, including the computer systems that implement parts of the process, and any sub-processes that it may make use of.

Discovery develops a clear picture of how the business processes work internally and externally. It synchronises understandings of systems and activities across the enterprise, and brings customers, suppliers and partners into the process design activity. Automated discovery of system logic will be a key feature of new business process management systems.

- **Design** means explicitly modelling, designing, simulating and redesigning the process as the organisation learns what is possible.

Business analysts need to restructure processes quickly in response to competitive pressure or business opportunity. Process composition and decomposition will be a key feature, as systems and business interfaces are reengineered internally or with partners. The process repository must support reuse, generalisation and specialisation of process elements. Some organisations will begin to develop repositories of industry best practices and patterns.

- **Deployment** means rolling out new processes to all the participants, including people, applications and other processes.

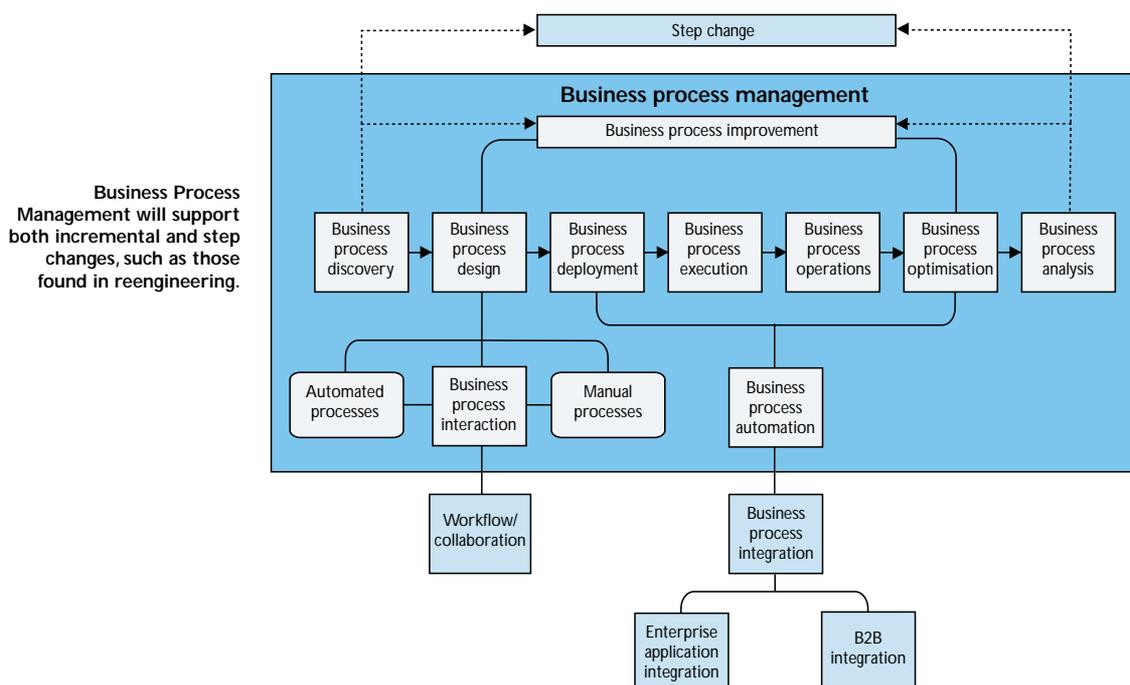
Good process management systems will make it easy to deploy new processes, so change will be accomplished with little or no programming. Application components will be integrated in advance, using a projection of the processes ingrained in the application business logic. Processes will be mapped to standard public interfaces between organisations. It will be possible to distribute processes at will across process participants and computing resources. Fine-grained change management and customisation of processes will be not only possible but mandatory.

- **Execution** means ensuring that the new process is carried out by all participants – people, other organisations, systems and other processes. It involves managing distributed transactions using new and legacy systems across complex nested processes, and interweaving existing applications as process components of larger processes. The execution state must be protected from disturbance from underlying technologies or the behaviour of applications.

As far as possible, the execution environment should be de-coupled from the distributed computing middleware layers, so that distributed processes can operate in a mixed technology environment.



- Interaction** means allowing humans to manage the interface between automated and manual processes.
 For example, the workflow user interface is itself a process, lying between the automated and manual domains. Process management requires the definition of workflow processes and their interaction with both automated and manual activities. Systems will include facilities for interacting with the workflow processes, for example to enter data as quickly and reliably as possible, and to ascertain what workflow steps have been allocated to a particular user. User interfaces to processes should as far as possible be generated automatically from the process definitions and some vendors will extend the traditional interface with expressive capabilities that support natural interactions with executing processes.
- Operating and maintaining** is particularly concerned with intervening to resolve exceptions. Other management tasks include moving the boundary between private implementation of the process in the enterprise and the public interface to partners; upgrading processes on the fly at the level of sub-processes; adding, removing and changing participants in the process; and re-allocating the process steps between business entities.
- Optimisation** means process improvement, which should be an ongoing activity. It closes the loop between process design and process maintenance. The domain of optimisation will need to expand beyond the organisation's walls. The system should automatically detect bottlenecks, deadlocks and other inconsistencies in processes across whole extended enterprise – that is everyone and everything involved in delivering value to the customer.
- Analysis** means measuring process performance and devising improvement strategies. Analysis provides a wide-angle view of the time and resources consumed by enterprise-wide processes. Analytical tools guide process improvement and deployment.





For the foreseeable future, no one company will supply systems able to do it all, although we are already seeing effective products that provide the core deployment, execution, operation and optimisation capabilities and these can be combined with other technologies, such as workflow, ERP etc, to provide a process-managed IT infrastructure.

Process management systems must integrate metrics at all levels, allowing end users to monitor processes and build management consoles that enable process improvement. Users also need tools to carry out periodic reviews of end to end processes to identify new opportunities to create entirely new processes, services and products. Simulation plays a key role.

Such an enterprise process map will open up new possibilities for measuring, monitoring, analysing, optimising and transforming the business. It will take years before the industry finally develops all the tools required, but one thing is certain, without the foundation of BPML and process management systems, none of this is possible using a traditional software architecture approach.

Business process management is top down and model driven

Process management products unify the disparate capabilities of middleware. Each element acts as a distributed computing service supporting the process management system, and communication between them is based on the processes that drive their use, not on the connections between, or the configuration of, lower level services. The advantages of this are:

- Process design is independent of technical deployment
- Process models developed in different parts of the enterprise, or by partners, can be composed (or decomposed) and related to each other
- Deployed processes can be incrementally refined
- Process improvements achieved in one part of the business can be exported to other parts of the business, with adaptation as required
- High level models of the business can be refined by further modelling
- Abstract models can act as blueprints for subsequent concrete models, ensuring that all business activities fall within the agreed strategies
- High level business models expressed by the CEO or other senior managers can be codified and used to drive further modelling.

The result is that a business can consciously deploy exactly the process model that it has designed and that model will drive the integration and automation activities right across the extended enterprise. Rules and constraints are respected and enforced at every level by the process management system, and changes are propagated across all the systems that participate in the process.



This top down approach does not imply that everything has to be done at once, nor does it imply there must be a single enterprise process model – which clearly is impractical. Rather, it implies the ability to model at all levels simultaneously, to combine models yet retain their meaning, and to use process design patterns to constrain the behaviour of sub-processes.

This top down approach will often be used in conjunction with bottom up integration and aggregation of web services.

This approach is very different from the traditional software engineering cycle, where business strategies are translated to business requirements, then to business objects and finally to software code. Process management is straight through – there is no translation to executable code. The live system can be tuned live. What is more, it becomes possible to measure process improvements, and justify investments in IT.

Process Management is not a silver bullet. There is more to business management than processes.

A comprehensive BPM solution might support a large proportion of the enterprise architecture, for example as described in the *Zachman Framework* (<http://www.zifa.com>). Today's solutions have lesser capabilities, but the trend is clear. Once processes become explicit, well designed and easily manageable, they will become the key concept of the future business.

But beware: processes may describe the core activities of a business, but many aspects of business management will never be covered by BPM technology. For example, process management is not a substitute for the development of business strategy, and it is independent of the technical infrastructure and the organisational structure of the business. In addition, some process designs may be as complex as developing applications and demand similar disciplines. But building on the BPML foundation, it may become possible to derive higher and higher level tools that work reliably and translate business requirements to the required process models.

Ultimately, process management may be a commonly used desktop tool, available to all employees through a process portal and able to support the business in a non-intrusive way as it seeks to incrementally improve its business processes.



The technology that businesses need will have three key features: a *process definition* that is extracted into an explicit model, *integration of existing application fragments* and *tools* for human collaboration.

We need to be able to model business processes at the business level, independent of the computing environment. We could then manage processes in a logically centralised environment (which makes it easier to manage change), and manage participants in a centralised directory (which streamlines process deployment).

We need to break applications up into fine-grained independent components, then describe and pre-integrate them with the process management system using its own process meta-model. (This means legacy systems can be included within the process management environment.)

The technology will have to include all the capabilities of modern workflow systems to support collaborative human processes, including voting, agreements, issue identification, escalation and resolution. It will need to support networks of commitments and decision optimisation among employees, partners and customers. Most of all it will have to offer people a clear picture of their role in processes and associated work items, keeping them involved in the process and ensuring that they remain amenable to changes in work patterns. Process changes must be evolutionary, with sub-processes changed independently of supervisory processes, and with sufficiently fine-grained management to retain control.

Process management crosses organisational boundaries, so process management systems must provide adequate safeguards. We need business process firewalls to make collaboration secure at the level of the business process, and partners must be able to select and adjust the degree to which they monitor each other's performance and provide visibility into their internal processes. All participants need tools to manage exceptions.



Follow this checklist to close the gap between where you are today and what you need for a successful business process management initiative.

Capabilities Checklist

1. Focus on customer value – one customer or customer segment at a time

- Design processes from the point of view of distinct customers or customer segments
- Manage many mass customised processes, not a uniform best customer practice
- Manage processes end to end across corporate boundaries – reaching out to serve the customer's customer
- Orchestrate many technologies through standards – do not specify uniform technologies since the extended enterprise will always be heterogeneous

2. Automate systems, empower people: customers, suppliers, other partners

- Integrate systems at the level of business processes, so that information, activities and business commitments flow quickly, but securely, through the value chain
- Support automation of IT systems and human activities
- Support process monitoring – every transaction should be visible and reversible (at least by a compensation action) under defined business rules
- Support collaboration – provide people with the tools, information and collaborative environment to work together
- Plan for decision support databases and tools – make sure that you and your trading partners can make sense of the rich information flowing through your value chain

3. Don't leave success to chance – actively manage business processes to achieve your business objectives

- Use business process discovery and design tools that support process analysis
- Make business processes transparent and explicit to your customers, suppliers and other business partners
- Expect and prepare for both linear and step changes in the environment and in customer requirements – agility requires frequent flexing
- Expose the capabilities of existing and package systems at a fine level of granularity so that they may be reassembled to meet new process requirements
- Provide a business process simulation lab so stakeholders can evaluate process designs before they are deployed
- Create a business process repository so that effective business process designs can be accessed and reused
- Integrate business process design and discovery tools with process deployment technologies to reduce the errors resulting from current sequential design and deployment procedures, and the time they take

4. Develop information systems to support both continuous improvement and radical change

- Deploy business process monitoring and optimisation technologies when business processes are deployed
- Plan and budget for concurrent deployment of business process operations (transactions and collaboration) and decision support
- Leverage existing legacy systems by connecting databases, legacy systems and best of breed packages



All roads are converging on the Business Process Management System as the core business system of the future

A new generation of systems is emerging whose primary purpose is to coordinate the work of others, be they systems or people.

Some vendors call it the fourth layer of IT architecture. Others refer to new composite applications, the next generation of workflow, the new platform for applications or simply smarter middleware. Whatever it is called, the key element is the process virtual machine: a single, unified modelling and execution environment that can be applied to the support of any business process. We call it the Business Process Management System.

Business Process Management Systems aim to:

- Integrate systems – they will leverage existing IT investments by connecting databases, legacy systems and best of breed package solutions into flexible end to end business processes
- Automate routine activities – they will execute and optimise automated business processes, interface with the processes of partners and harness legacy business objects to process activities
- Manage all phases of processes – they will help discover, design, deploy, operate and analyse business processes, within an integrated environment that supports the needs of managers, process engineers, functional departments and employees as well as IT implementers
- Deploy processes seamlessly – they will allow processes to be designed on-line by business users and process engineers together and then deployed on a reliable, scalable IT infrastructure, and operated thereafter by the business. Deployment will follow directly from process design with no intervening steps
- Provide end to end visibility and control – they will enable processes to be conceived, deployed, optimised and analysed end to end, across multiple applications and multiple business partners. They will provide global visibility and control of the extended enterprise.

Integration efforts within the business (inside-out) are now meeting and reinforcing collaboration (outside-in) efforts across the extended enterprise

When netmarkets attempted to create value in the space between businesses, and the brick and mortar companies fought back by creating consortia exchanges, EDI, Internet commerce, e-business and B2B were all strategies for creating networked businesses from the outside in. At the same time, internal EAI (Enterprise Application Integration) technologies that address the problem from the inside-out have matured and can now integrate applications that were never designed to work together, let alone to work with applications in other companies.

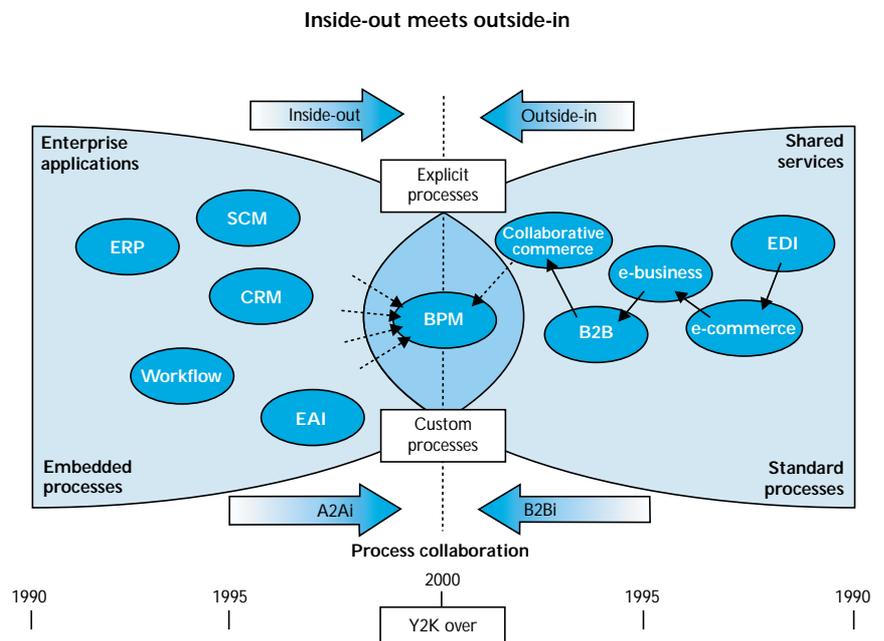
However, neither EAI nor B2B technologies provide a complete solution.



Key industry trends are converging on the new paradigm of business process management

Five key trends signal the birth of the process management industry:

- **Convergence of application servers, EAI, B2B and workflow.** Technology mergers and acquisitions are creating powerful new software solutions that support process integration and automation
- **Emergence of new Business Process Management architectures.** Start-ups offer promising new architectures that leverage existing standards and middleware yet focus on higher-level process management objectives
- **Radical changes to application architecture.** The process server is replacing the application server as the basis for applications that operate upon and across end to end business processes
- **Top down process design complements bottom up technical integration.** It is becoming possible to define and deploy process improvement strategies top down, focusing on the realisation of business objectives, such as time, cost, resource utilisation or deployment of best practice
- **Componentisation.** Increasingly, software packages and bespoke systems provide access to finer and finer grained chunks of capability instead of the earlier monolithic approach. These fine-grained capabilities can be orchestrated in new ways to provide new business capabilities.



INSIDE-OUT

The inside-out view is characterised by applications in which processes are embedded and so cannot be managed explicitly

EAI and Application to Application integration technologies focus on component integration, not partner collaboration

OUTSIDE-IN

The outside-in view is largely characterised by standard processes and shared services

Business to Business integration technologies focus on the boundary between business partners

Businesses today need to be able to participate in each other's processes and to create services across organisational boundaries. Business process management lies at the intersection of the inside and the outside. It does not distinguish between process management within the business and between partners. We have to stop thinking of the inside and outside of the company as separate concerns – and stop buying software that treats these two worlds differently.

Process management products enable a business to design and deploy end to end processes, not by imposing a common process but by enabling co-ordination and co-operation among distinct processes at many levels: applications, systems, business units, the individual corporation and the extended enterprise.



CASE STUDY

Head of Business Integration, a global FMCG (Fast Moving Consumer Goods) company

The company operates in over 150 diverse end markets, with significant variation in IT infrastructures and business models. It has taken a best-of-breed approach to IT applications, so uses SAP, Sage CS/3, Siebel, i2 and MatrixOne as well as many and varied local and home-grown applications. The strategy is to combine best of breed application components with process management and integration capabilities.

As the foundation for BPM, the company is building a global messaging backbone that will provide a common messaging infrastructure within and between end markets and so support visibility and control across the business. The 'e-business backbone' will enable the local operations to continue to run their own applications yet allow the corporation to implement global processes, both internally and to support interactions with customers and suppliers. The company aims to use BPM to orchestrate the new messaging infrastructure and leverage investment in enterprise applications by implementing value-adding processes.

The company is considering joining BPMI in order to gain a better understanding of the new technology, and also to help BPMI evolve to serve similar organisations and partners. The company is convinced that it needs a standard business processing modelling language in order to integrate its architecture. At present however, the company is unsure whether BPM will emerge as a BPMS – the equivalent of the DBMS – or as BPML compliance in many products and applications.

Some global initiatives within the company are evaluating BPM solutions in advance of the corporate BPM backbone. At some point these islands of BPM will have to be integrated into a BPM backbone service – and managing this will be a challenge. The company sees BPM as a way of delivering increased business agility, which has produced new interest in BP modelling and a reawakening of the BP skill set. Within the business there is a desire for convergence of processes, data and systems. Senior management have underwritten the concept following a recent joint business-IT strategy renewal. There is also a push for greater alignment of business and technology, with Process providing the link between business intent and technology delivery.

The company is now establishing a strategic capability. A core team will champion the move and lead the way, using 'business blueprinting' – leveraging best practice by putting together a set of assets (business process, applications and technical infrastructure) that can be used to spread a capability throughout the organisation. BPM is seen as a way of enabling 'joined-up business': with the infrastructure to support it and a blueprinting environment, they hope to be able to align business objectives, business processes, applications and technology, and leverage that ability across the enterprise and with partners.

However, the company believes it is some way from using BPM to replace major parts of its existing IT investments. But it does recognise clear opportunities (with associated challenges) to leverage 'new' BPM technology alongside existing IT investments.



Technologies are converging and overcoming their individual weaknesses

Individual technologies are proving incapable of responding to the demands of modern business. The component technologies of process management no longer operate in isolation. Vendors are forging alliances or have already merged. But will these new relationships create effective integrated products?

- Early **Workflow** systems centred on document management and work item routing. The process model was built around the flow of human responsibility; but today's requirement is for end to end integration between automated and manual processes in the distributed environment.

Workflow must and is re-inventing itself, but it will play a key role: bridging the gap between automated and manual processes by delivering information to users and allowing teams to collaborate to resolve exceptions, innovate to solve problems and improve processes. Do not let past disappointments put you off using the new generation of workflow products.

- **Enterprise Application Integration** tools used to focus on event flow. They were infrastructure-centric, imposed a rigid implementation and were inefficient at supporting point-to-point communication. Recently they have matured considerably and vendors are now adding sophisticated process design tools.

However, many low level middleware products are good at connecting systems but not at allowing them to collaborate. They support systems and application convergence rather than flexible business relationships.

- **Transaction Processing Monitors** (today called Application Servers) are also infrastructure-centric. They are targeted at discrete object level management and have no understanding of higher-level business processes. Again, vendors in this category are adding powerful support for process management.
- **B2B Integration products** primarily support data exchange in a public network environment. They provide little support for application integration, and support standard commerce protocols rather than strategic enterprise processes. Many do not recognise that business processes are end to end, and integrate processes only at business boundaries. They treat business partners as if they are applications, with no way of recognising that business partners have complex behaviours and their own autonomous processes. They often force a distinction between private processes and public processes during modelling. Such products cannot model and execute processes that extend across the enterprise. Thus they do not deliver the agility that businesses seek from the ability to modify processes.
- **Web services** have recently emerged as a powerful abstraction of the application component interface and business service definition. Web services will probably become the preferred architecture for exposing application capabilities as reusable services and structuring service directories and repositories. However, services are not processes and they clearly do not extend end to end all the way to the customer. To get the full value of web services we need business process management systems to orchestrate them in support of the needs of the customer.

Enterprise Resource Planning (ERP) and Process Management

ERP and application vendors who never thought they would need to work together are finding ways to do so, using various composite application strategies. Companies now know that no one vendor offers a complete solution. End users and vendors are integrating ERP components at the level of business processes to achieve process customisation and end to end integration. Using this process management approach, the vendors can now expose ingrained processes as explicit process objects.

Process management systems are not a replacement for ERP, but may herald a supra-architecture within which application components are integrated and managed within end to end processes.

ERP environments are already often supplemented with proprietary process management tools. Tomorrow's ERP solutions will be fully process-aware and built upon a standards based process management foundation.



The increase in the number of vendors is keeping pace with the rise in interest in business process management

In reviewing the vendors in the business process space it is helpful to make several distinctions. First, note which of the business process capabilities (Discovery, Design, Deployment, Execution, Interaction, Operation, Optimisation, and Analysis) are supported by the product. Products will typically focus on a subset of these capabilities. Second, the products may focus on process integration, as opposed to process automation and may not provide a full management environment. The third distinction has to do with the kinds of technologies that the products support or are derived from such as EAI, business rules, or web services. Lastly, we note which vendors would be interesting to visit on a study tour.

When looking at the products on the market, ask which of the business process capabilities (Discovery, Design, Deployment, Execution, Interaction, Operation, Optimisation, and Analysis) are supported – most products focus on a subset of these. Ask also whether they provide business process integration, business process automation, and/or business process management. Look, too, at the kinds of technologies that the products support or are derived from (such as EAI, business rules, or web services).

As new technologies emerge, businesses are becoming more ambitious for process collaboration.

CSC's research indicates businesses are now aware of the potential to link processes across organisational boundaries. Although there is still some debate about the best technical architecture to achieve this and the most appropriate standards to use, a clear set of needs is being expressed. Businesses want to be able to:

- Describe the services they need from partners in service level agreements that can be measured and enforced
- Allow specialist firms to execute certain steps in processes (a credit check, for example)
- Buy in services from partners and service providers as integrated elements of end to end business processes
- Outsource parts of a process to other businesses yet retain control over and monitor the outsourced sub-processes
- Expose world-class internal capabilities as new services so they can be seamlessly integrated into the processes of potential customers
- Allow consulting partners to oversee and improve processes
- Build more sustainable partnerships by asking potential partners to demonstrate their proposed processes to check that they will be feasible and cost effective
- Compare their costs with industry peers by providing benchmarking companies with information about process performance.



Key to Vendor Map

Vendors innovating with processes

The following is a list of technology companies innovating in the area of business process management. The table can be used to draw up a subset of vendors for further study. The table does not compare solutions on a feature by feature basis. Instead, it indicates the direction and focus of the vendor in providing its current or forthcoming solutions that support the management of business processes. Where possible the heritage of the technology is indicated.

The information provided has been gathered through interaction with the companies and/or publicly available information. The table is available as an Excel spreadsheet at the following address: <http://www.fairdene.com/processes/report/vendors.xls>.

As is evident from the table, virtually no vendor provides a 'complete' business process management solution. Exceptions include:

- Consulting companies that are integrating best of breed process technologies from several vendors in order to provide an evolving enterprise architecture that can be customised to meet the needs of individual customers. An example is Computer Sciences Corporation.
- Large vendors who are re-engineering existing own brand products and integrating these with missing elements, e.g. Process Design tools, which they are acquiring or sourcing. The result is a process management suite. An example is IBM.
- Specialised BPM vendors who focus exclusively on process management and who rely on other vendors to supply more conventional components such as application servers, transaction servers, application communication, etc. There are a wide variety of vendors in this category. Solutions vary considerably in approach, features, scalability and adherence to standards.



Key to Vendor Map

Tour	Indicates a vendor we recommend would be in a comprehensive tour of the process management space. The vendor may be particularly strong in process management, or it may be that the solution has unique features or a unique approach
P2P	Vendor solution relies on peer-to-peer concepts
Web services	Vendor stresses web services are an important feature of their platform
Modelling	Vendor has strength in process modelling
Agents	Vendor stresses agent-based aspect of its platform
Rules	Vendor has a heritage in business rules technology
Application	Vendor provides an environment in which it is possible to develop or host applications Vendor may supply application server or transaction server technology
EAI	Vendor has a heritage in the software category Enterprise Application Integration
Workflow	Vendor has a heritage in workflow, possibly including document or image management
B2B	Vendor focuses on business to business integration (outside the firewall) or has a heritage in B2Bi software, possibly including EDI
BP Integration, Automation	See table for distinctions
BP Improvement	Vendor focuses on improvement of processes, or is strong in process optimisation or analysis
Discovery, Design, Deployment, Execution, Maintenance, Optimisation, Analysis	See table for distinctions

Notes:

Information about vendors who are developing a BPML BPMS, innovating with BPML or who are building their products on a BPMS platform will be covered in a future revision of this report. Requests for information about this should be addressed to the BPML.org.

ERP and SCM vendors have not been included in this list, as the strategies of those companies with respect to process management are not yet clear. We expect future ERP and SCM products to initially leverage third party process integration products and later to include a BPM foundation platform. This will let ERP and SCM products provide more effective enterprise process management.



Vendor Map

Company	URL	Tour	P2P	Web services	Modelling	Agents	Rules	Application	EAI	Workflow	B2B	BP integration	BP automation	BP improvement	Discovery	Design	Deployment	Execution	Maintenance	Interaction	Optimisation	Analysis	
Abilizer	www.abilizer.com																						
Accelio	www.accelio.com	★																					
Acelare	www.ancelare.com																						
Acta Technology	www.acta.com																						
Action Technologies	www.actiontech.com	★																					
Actional	www.actional.com	★																					
Agentis Software	www.agentissoftware.com	★																					
Agital	www.agital.net																						
Allegis	www.allegis.com																						
AlphaBlox	www.alphablox.com																						
Altaworks	www.altaworks.com																						
Aonix	www.aonix.com																						
Apexon	www.apexon.com	★																					
Asera	www.asera.com	★																					
Aspear	www.aspear.com																						
Atlas Commerce	www.atlascommerce.com																						
Attivo	www.attivo.com																						
Attunity	www.attunity.com	★																					
bConnected Software	www.bconnected.com	★																					
BEA Systems	www.beasys.com	★																					
Black Pearl	www.blackpearl.com	★																					
BOC Adonis	www.boc-eu.com																						
Bowstreet	www.bowstreet.com	★																					
BSoftB	www.bsoftb.com	★																					
bTrade	www.btrade.com																						
Business Rules Solutions	www.brsolutions.com																						
BusinessThreads	www.businessthreads.com	★																					
Canyon Blue	www.canyonblue.com																						
Cape Clear Software	www.capeclear.com																						
Cape Visions	www.capevisions.com																						
Casewise	www.casewise.com	★																					
Cel Corp	www.celware.com	★																					
Centegy	www.centegy.com	★																					
Century 24 solutions	www.c24solutions.com																						
Changepoint	www.changepoint.com	★																					
Clear Technology	www.clear-technology.com	★																					
Coagent	www.coagent.com																						
CommerceQuest	www.commercequest.com																						
CommerceRoute	www.commerceroute.com	★																					
Compuware Corp	www.compuware.com																						
Concentus Technology	www.concentus-tech.com	★																					
Consilient	www.consilient.com	★																					
Contivo	www.contivo.com	★																					
CovaSoft	www.covasoft.com																						
Crossweave	www.crossweave.com																						
Crossworlds Software	www.crossworlds.com	★																					
CrystalDecisions	www.crystaldecisions.net																						
CSC	www.csc.com	★																					
Cyclone Commerce	www.cyclonecommerce.com																						



Company	URL	Tour	P2P	Web services	Modelling	Agents	Rules	Application	EAI	Workflow	B2B	BP integration	BP automation	BP improvement	Discovery	Design	Deployment	Execution	Maintenance	Interaction	Optimisation	Analysis
Dataconcert	www.dataconcert.com																					
DST systems	www.dstsystems.com	★																				
ec*tone	www.ectone.com																					
EcoNovo	www.econovo.com																					
Elagent Corporation	www.elagentcorp.com	★																				
Engenia Software	www.engenia.com	★																				
Enosys Markets	www.enosysmarkets.com																					
Enterworks	www.enterworks.com																					
Entrada Software	www.entradasoftware.com																					
Epiance	www.epiacle.com	★																				
ePropose	www.eppropose.com																					
Eqos	www.eqos.com	★																				
Everest	www.everest.com																					
Every Net Works	www.everynetworks.com																					
Evidian	www.evidian.com																					
Excelon Corp.	www.exceloncorp.com	★																				
FileNet	www.filenet.com	★																				
Fiorano	www.fiorano.com	★																				
Fuego Technologies	www.fuegotech.com	★																				
Fujitsu I-flow	www.i-flow.com	★																				
GEIS GX	www.geis.com																					
Genient	www.genient.com	★																				
HandySoft	www.handysoft.com	★																				
HNC Software	www.blazesoftware.com																					
Holosofx	www.holosofx.com	★																				
HP	www.hp.com	★																				
Hubspan	www.hubspan.com																					
i2	www.i2.com																					
IBM	www.ibm.com	★																				
IDS Scheer	www.ids-scheer.com	★																				
iLog	www.ilog.com	★																				
Insession Technologies	www.insession.com																					
insevo	www.insevo.com	★																				
Instantis	www.instantis.com																					
Intalio	www.intalio.com	★																				
Intelliun	www.intelliun.com	★																				
Interfacing	www.interfacing.com																					
International Performance Group	www.ipgl.com																					
IONA	www.iona.com																					
iPlanet	www.iplanet.com	★																				
IPNet Solutions	www.ipnetsolutions.com																					
iSpheres	www.ispheres.com																					
iWay software	www.iwayssoftware.com																					
iworksoftware	www.iworksoftware.com																					
Jacada	www.jacada.com	★																				
Kabira	www.kabira.com	★																				
Kintana	www.kintana.com	★																				
Knowledge Technologies International	www.ktiworld.com	★																				
Kovair	www.kovair.com																					



Company	URL	Tour	P2P	Web services	Modelling	Agents	Rules	Application	EAI	Workflow	B2B	BP integration	BP automation	BP improvement	Discovery	Design	Deployment	Execution	Maintenance	Interaction	Optimisation	Analysis
Lanner	www.lanner.com	★																				
Level8	www.level8.com	★																				
Logility	www.logility.com																					
Lombardi Software	www.lombardisoftware.com	★																				
MEGA International	www.mega.com	★																				
Mercator	www.mercator.com	★																				
MetalIntegration	www.metaintegration.com																					
Metaserver	www.metaserver.com	★																				
Metastorm	www.metastorm.com	★																				
Microsoft	www.microsoft.com	★																				
Model N	www.modeln.com																					
NEON Systems	www.neonsys.com																					
NextSet Software	www.nextset.com																					
Nimble	www.nimble.com																					
NimbusPartners	www.nimbuspartners.com																					
Nisus Inc	www.nisusinc.com																					
Nobilis	www.nobilis.com	★																				
Open Latitude	www.openlatitude.com	★																				
Opendesign	www.opendesign.com																					
Optika	www.optika.com	★																				
Oracle	www.oracle.com																					
Orsus	www.orsus.com																					
osm.net	www.osm.net																					
Pacemetrics	www.pacemetrics.com	★																				
Paladyne	www.paladyne.com																					
Pegasystems	www.pegasystems.com																					
Peregrine	www.peregrine.com	★																				
Pfn	www.pfn.com																					
Phios	www.phios.com																					
Popkin Software	www.popkin.com	★																				
Proactivity	www.proactivityinc.com	★																				
Procaveo	www.procaveo.com																					
Procession	www.procession.com	★																				
ProcessModel	www.processmodel.com																					
Procomsoft	www.procomsoft.com																					
Proforma	www.proformacorp.com	★																				
Progress Software Corp	www.progress.com																					
Ptech	www.ptechinc.com																					
Qlink Technologies	www.qlinktech.com	★																				
Rational	www.rational.com																					
RevX	www.rev.net																					
Rule Machines	www.rulemachines.com																					
Saltare	www.saltare.com																					
Savvion	www.savvion.com	★																				
SeeBeyond	www.seebeyond.com	★																				
SeeCommerce	www.seecommerce.com																					
SilverStream	www.silverstream.com																					
Silvon	www.silvon.com																					
Skyva International	www.skyva.com																					
Softco	www.softco.com																					
Software AG	www.softwareag.com																					

Understanding BPM



Company	URL	Tour	P2P	Web services	Modelling	Agents	Rules	Application	EAI	Workflow	B2B	BP integration	BP automation	BP improvement	Discovery	Design	Deployment	Execution	Maintenance	Interaction	Optimisation	Analysis
spiritsoft	www.spirit-soft.com																					
Staffware	www.staffware.com	★																				
Sterling Commerce	www.sterlingcommerce.com	★																				
Striva Technology	www.striva.com																					
Sun (also see iPlanet)	www.sun.com	★																				
Sungard Business Integration	www.integration.sungard.com																					
Suplicity	www.suplicity.com																					
Sybase	www.sybase.com	★																				
Systar	www.systar.com	★																				
TalkingBlocks	www.talkingblocks.com																					
Taviz Technology Inc.	www.taviz.com																					
Tempest Software	www.tempest.com																					
TIBCO	www.tibco.com	★																				
Tidal Software	www.tidalsoft.com																					
Tilion	www.tilion.com	★																				
Timogen Systems	www.timogen.com																					
Venetica	www.venetica.com																					
Verano	www.verano.com	★																				
Versata	www.versata.com																					
Vertex Interactive	www.vertexindustries.com																					
VerticalNet Solutions	www.verticalnetsolutions.com																					
Viacore	www.viacore.net																					
Viewlocity	www.viewlocity.com	★																				
Vigilance	www.vigilance.com																					
Vitria	www.vitria.com	★																				
WebMethods	www.webmethods.com	★																				
WebPutty	www.webputty.com																					
WRQ	www.wrq.com																					
Xaware	www.xaware.com																					
Yellowshirt	www.yellowshirt.com																					
zenaptix	www.zenaptix.com																					



A business process modelling language is the key to collaboration among companies, applications and software products

The ability to collaborate with other businesses is a key requirement of Business Process Management, but for the foreseeable future no single vendor will provide all the capabilities that even a single company needs. What's required is a language that is capable of describing complex business processes, sharing that definition across a heterogeneous business and technology environment, and making it responsive to demands for modification. The Business Process Management Initiative (BPML.org) has defined such a language: Business Process Modelling Language (BPML). By itself, this is not enough however. The IT industry must come forward with effective implementations of the formalism, such as occurred with the development of RDBMS (relational database management systems). The first such products are now available.

In order for BPML to support the definition and execution of any business process by a BPMS, BPML must be semantically rich enough to represent material flows, information flows and business commitments. It must also be able to support the different process paradigms in common use across different industries and be able to unify the various distributed computing models that underpin existing and emerging middleware. Moreover, it must be a meta-language able to model industry-specific process modelling languages.

A process modelling language must support and unify three kinds of processes

	MATERIAL PROCESSES (THINGS)	INFORMATION PROCESSES (DATA)	BUSINESS PROCESSES (RELATIONSHIPS)
PURPOSE	Transform and assemble raw materials and components into other components and finished products, using resources	Store, retrieve, manipulate, display and communicate structured and unstructured data and knowledge	Articulate and complete conditions of satisfaction in interactions between customers and performers
CHARACTERISTICS	Based on the traditions of industrial engineering	Based on the traditions of computer science and software engineering	Based on structures of human communication and coordination found in all languages and cultures
VERBS	Assemble, Transform, Transport, Store, Inspect	Send, Transact, Invoke, Save, Forward, Query	Request, Promise, Offer, Decline, Propose, Cancel, Measure



Requirements for a business process modelling language

- Express the manner in which participants work together to achieve a common business goal
- Provide rich semantics for expressing the business logic, rules and information flows
- Place restrictions on data exchanged, time spans, and availability of services
- Support deeply nested business transactions and business exceptions
- Expose processes ingrained in software as explicit processes
- Compose existing process components into new value-added processes
- Enable process analysis, prediction, simulation and monitoring
- Enable processes to react to events and adapt to changing requirements in real time

BPML unifies the semantics of process definition, making it possible to develop a single engine that could execute any business process

The role of the process model is analogous to that of the relational data model

RELATIONAL DATA MODEL SCHEMA	EMERGING PROCESS MODEL SCHEMA
<ul style="list-style-type: none"> • Supports any enterprise data model • Supports sophisticated data management operations • Supports many data management and analysis tools • Supports an infinite variety of transactional business applications • Theory of relational data model is difficult to understand • Benefits of data management system and data query language are easy to understand 	<ul style="list-style-type: none"> • Supports any enterprise process model • Supports sophisticated process management operations • Supports many process management and analysis tools • Supports an infinite variety of end to end process-ware applications • Theory of process model is difficult to understand • Benefits of process management system and process query language are easy to understand

The BPMI.org claims that BPML offers:

- The possibility of reliable, logically centralised process management of end to end business processes in a heterogeneous distributed environment
- Interoperability between applications, process management systems and emerging process tools; this will leverage the process management platform
- A platform upon which vendors can develop process management systems and process-ware applications
- Consistency and coherence across a wide range of process applications, including process design, deployment, execution, operation, optimisation and analysis.

BPML models business processes in terms that business analysts understand, and these models can be directly executed by a process management system. The process management system is integrated with the middleware environment of the enterprise, so it can call upon the services of existing software components as if they were explicit processes. This means that business users are able to discover, design, deploy, execute, interact with, operate, optimise and analyse their end to end processes. The result is enhanced business agility and integration, and reduced time to design and deploy complex business processes.

BPML is not a solution by itself. It depends on Business Process Management Systems (BPMSs) that are fit for purpose, scalable and reliable like any other software product. However, the BPMI.org believes that products that implement the BPML specification correctly will gain from the power of the underlying semantics. Processes will be interoperable, directly deployable on the IT infrastructure and subsequently executed, operated and optimised.



CASE STUDY

Adrian Apthorp, Principal Architect, DHL Systems

DHL's business and systems architectures have developed in line with the principles of BPM, even in advance of commercial solutions, and much can be learnt from its experiences. DHL has increasingly used process modelling, over the last ten years, to document, communicate and design its business processes. As a communication tool process maps have been key to enabling agreement on strategic initiatives. But as well as a process model, DHL has recognised the importance of modelling different views of the business in order to engineer improvements in the business process. This includes the need to identify roles, resources and key performance indicators to understand what each process is there for, who enacts it, and what incentivises them. You also need a business glossary of terms as basic as 'shipment' and 'service area' to ensure everyone is speaking a common language.

Like most service companies, DHL's core product is a process and it differentiates itself by how well it executes that process. Information is key. DHL needs information both to manage and to improve its internal processes; and to feed to its customers, enabling them to manage their processes. Its customers increasingly manage their processes around DHL's processes because DHL is handling shipments at multiple places in their supply chains.

DHL is exploring how commercial BPM products could help integrate its services into the services provided by other organisations. It already produces customer-specific offerings based on configurations of its basic services – for example, some customers offer a 'return and repair' service that is managed by DHL.

Yet process management can be in conflict with DHL's operations. Key questions include:

- Where should responsibility for processes and sub-processes be delegated? It is impossible to manage everything centrally, especially in remote locations where communications are poor. DHL tries to strike a balance: to identify and instrument key process steps, yet beware of micro-management and information overload at the centre

- At what level should processes be standardised? Local decision making has been critical to DHL's success, for steps in the process vary with locality – clearing customs, for example. Balancing support for localisation with a common core process is a critical design decision
- How do you overcome the functional thinking that leads to 'stovepipe' applications owned by the business functions, and move people to process thinking and an end to end view?

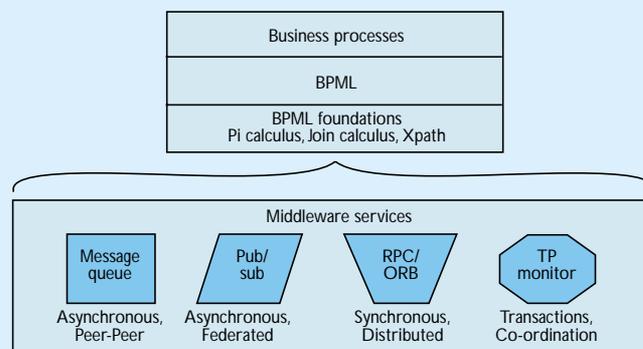
At DHL, although vertical applications support specific functions, core systems are oriented around the management of the core process. The function-specific applications are loosely coupled by a message-based infrastructure that moves information between them. However, as customers demand a global view of DHL, the organisation has been evolving an architecture in which shared information services support the vertical task specific applications. DHL has found that process interfaces are critical to enabling a separation of concerns in the design and implementation of business processes in a complex environment; this is as true with DHL's internal processes as those that integrate with its customers. Indeed DHL is committed to enabling such interfaces through open standards, such as those developed by OAG, RosettaNet and BPMI.org.

Current areas of interest include ways to synchronise and trigger process flow not just through messages but by capturing physical actions (for example that a plane has landed); and mechanisms to manage the introduction of new processes. The ultimate aim is to integrate process design, deployment, measurement and management – and feedback to refine and improve the process in a continuous loop. DHL does not know of any single technology that embodies this and scales in such a large and diverse environment.



Key features of Business Process Modelling Language (BPML)

- BPML is a meta-language for the modelling of business processes, just as XML is a meta-language for the modelling of business data. It provides an abstracted execution model for collaborative and transactional business processes based on the concept of a transactional finite-state machine
- BPML processes span multiple applications and business partners, behind the firewall and over the Internet
- BPML brings together middleware capabilities that developed separately, such as Teleprocessing Monitors, Remote Procedure Calls/Object Request Brokers, Publish and Subscribe, and Message Queues
- BPML can handle participants of different kinds – back-office systems (such as a database management systems), software components (such as an EJB component), users (such as a Purchase Manager) and partners (such as suppliers and customers)
- BPML can define both business transactions (such as the fulfilment of a purchase order) and system transactions (such as might be processed on a database table) by a process. Business transactions usually involve two or more parties (a sale, for example), while system transactions can involve multiple back-office systems (distributed transactions)
- The unification of the dual notions of business process and technical process was a key goal in the definition of BPML.



Process management unifies the different middleware paradigms into a single model of distributed computing driven top down by a process meta-language



BPML is a foundation for other process standards

BPML is a meta-language that offers a generic execution model for business processes that can be translated into specific languages applying to vertical applications. Examples of Industry process templates that we expect to be expressed in BPML and adapted by end users for strategic advantage include:

Retail – Collaborative, Planning, Forecasting and Replenishment (CPFR)

Securities trading – FpML

Finance – Complying to the T+1 SEC Regulations – Straight-Through-Processing (STP)

Telecoms – Service Provisioning and Management (TMFORUM)

Manufacturing – Managing Product Lifecycles (STEP)

Hi-Tech – Reducing Inventory Levels (RosettaNet, SCOR)

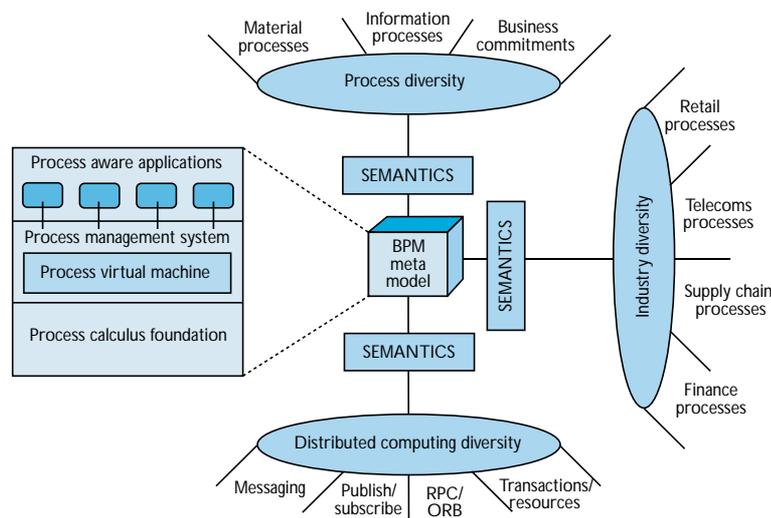
Insurance – Supporting the HIPAA Regulation (ACORD)

BPML is a machine language and not primarily intended to be read by humans

The theories behind formalisms for data and transaction management are sophisticated. They are generic but certainly not simple. The semantics are expressed in data management languages such as SQL and formal transaction definitions, but toolsets usually provide a more intuitive interface for creating definitions and enquiries.

In the same way, BPMSs will create and share BPML definitions of processes but provide users with tools to support notations and terms familiar in their industry, shielding them from the difficulties of reading and writing it directly.

Just as SQL provides a management interface to a database system, the Business Process Query Language (BPQL) will supply a management interface to a business process management infrastructure, enabling the gathering of metrics and decision support.



BPML semantics reflects process, industry and middleware diversity



BPML supports public interfaces and private implementations

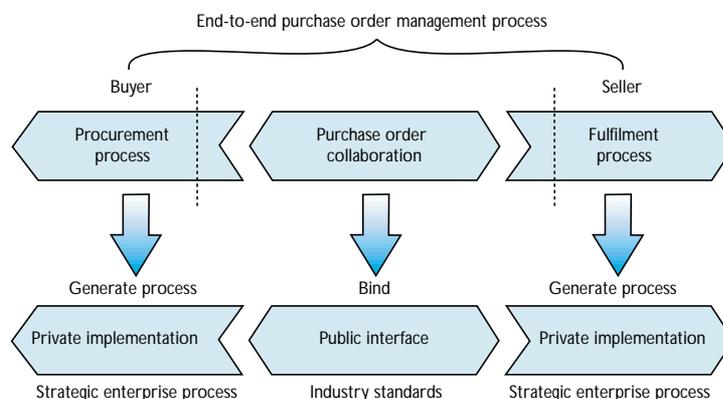
A process deployed by a company on its BPMS usually instantiates the private implementation of a larger e-business process that involves business partners. Partners participate by interacting through a public interface, usually defined jointly by both sides.

For example, in a collaborative purchase order management process, the enterprise's private implementation can be described as a procurement process, while the supplier's private implementation of the same e-business process can be described as a fulfilment process. The enterprise's procurement process and the supplier's fulfilment process are two private implementations of the same e-business process, which interact with each other through a common public interface.

Do not confuse the private implementations and the public interface of an e-business process with the notions of 'private processes' and 'public processes'. The approach advocated by BPML.org accommodates the notion of a private process, but only as a particular case of a business process that does not involve any other partner than the enterprise itself (that is, it is an internal business process, as opposed to an e-business process).

Moreover, the notion of public process makes sense only if a specific entity is responsible for its execution – for example, an EDI Value Added Network (VAN), netmarket or process service provider (e-hub). Even in that case, BPML.org would not see a VAN operator as the entity responsible for the execution of an imaginary public process, but rather as a business participant in the overall end-to-end e-business process.

Thus BPML.org adopts an enterprise system centric view of process management. As a consequence, the private implementations of an e-business process are the only parts of a business process that have to be executed, while its public interface is nothing more than a vector for the collaborative execution of the e-business process by its participants. Such a public interface is not executed by itself but rather implemented by the respective private implementations of the e-business process.



Private process implementation – public interface standards



The formal roots of BPML lie in mobile distributed agents, concurrent computing, Functional Nets, PetriNets and the formalisms of process calculus (Pi-Calculus and Join-Calculus)

BPML has a formal and mathematical foundation for the following reasons:

- Collaborative commerce is a complex many to many enterprise integration problem in at least three dimensions (multiple back-office applications, multiple business processes, and through multiple B2B channels). Without a strong foundation, forthcoming Business Process Management Systems would be unable to provide the high integrity that leading companies demand in their e-business infrastructures.
- Strategic business processes span everything from short-lived real time transactional systems to long-lived extended collaborations. This creates demanding requirements for transactional integrity, resilience and scalability in the extended enterprise. A BPMS must be able to support advanced transaction management, including distributed coordinated transactions, open nested transactions ('sagas') and backward and forward recovery.
- It is expected that BPML will be used to publish and advertise process-based services, as well as automate those services. Therefore, BPML must be a formally defined computer readable language.
- An extended enterprise is a complex distributed and concurrent system. Numerous parallel processes span multiple applications and partners. Process topologies are dynamic and participants frequently change roles. Processes cannot be deployed in such an environment – nor running processes managed or maintained – without a sufficient foundation for ensuring the manageability of the entire system. In addition, the new Business Process Management Systems now provide the opportunity to modify (optimise) processes in real time. The state of the overall system must be known at all times.
- Associated with both processes and applications will be business rules that express deeper business semantics, conditional logic, calculations, predicates, negation as failure and priorities. Such rules must be formally defined if we are to rely on their results and to use these within processes to provide reliable behaviour and decision control.
- BPML will be used to model mission critical processes, enterprise constraints and the utilisation of resources and services. A formal foundation is mandatory to be able to layer analysis tools into such environments and to be confident the enterprise can forecast and plan.
- Business Process Management Systems herald the potential of process analysis and simulation both within the enterprise and throughout the extended enterprise. These value-added possibilities were considered at the outset of the design of BPML and are only possible if the analysis and simulation tools can reason about both the design of the processes and the state of the process execution environment.

Section 2

Implementing BPM



Your business needs a cost effective way to manage processes. The good news is that the market place has produced some useful technologies and that you can quickly and cost effectively gain some experience with these technologies. In many cases, these technologies will work with rather than replace your existing application infrastructure – which means you can deploy these technologies without disrupting the application portfolio of your business, your customers or your trading partners. In many cases, they can be installed and tried out within weeks or even days. One approach is to ask a software vendor to do a proof of concept in your environment, or stage a 'Bake-off' where different vendors demonstrate their ability to perform in specified time and cost parameters.

The next step is to deploy these technologies to solve the specific needs of your business. We know from our experience with prior technology programmes (such as ERP) that businesses have adopted the same new technologies (and even used the same consultants) and achieved widely different business results. To use the new BPM technologies effectively you need particular competencies. We suggest a three step programme for building those competencies and choosing the right deployment programme for your business.



Implementing Business Process Management can deliver immediate value to your business

BPM technology is not enough. Building a BPM competency requires understanding, targets and skills

Implementing BPM technology will not make your business process competent. Like any business competency, process competency requires three things: a sound understanding amongst senior managers of its importance and potential for the business; clear targets from strategists defining precisely how it is going to be exploited; and a rich set of skills amongst the implementers which enables them to do the job effectively and efficiently. These three things interact and reinforce each other, so they have to be developed together. You need to create a virtuous circle in which understanding, targets and skills feed into each other and gather support by demonstrating real value in the business. You need to make sure that the business and its customers, suppliers and other partners fully understand and exploit the power of BPM technologies; and that you consciously nurture the capabilities that you learn through using and evaluating the technologies. You also need to align your adoption plan for BPM with the specific issues and opportunities facing your business. We suggest a three-step programme:

Step 1: educate your executive team

In a less competitive economy, your business could simply watch and wait for early adopters to experiment with leading edge technology. You could then develop your action plans and business case for action by extrapolating from the results they achieve. But BPM technologies leverage your investment in existing technologies. In many cases these are very large investments that have not delivered major benefits and will not in themselves equip the business for its new role in the networked enterprise. It therefore seems sensible to take a more proactive approach to the development of a BPM competency that is rooted in the business issues facing your business and the current capabilities of your business, your customers, your suppliers and your other partners.

- 1. Expect scepticism.** The business and technical press are touting Business Process Management as the next 'new new thing' and people are very sceptical. This was certainly the case at the BPM Summit (See Appendix 1). Most of the delegates liked what they heard, but they wanted to see BPM in action in real businesses before committing significant resources. Expect your business and IT leadership to demand the same.
- 2. Focus on extending available strategies.** The best remedy for scepticism is an active education programme for business and IT together. Given the complexity and confusion about the capabilities of emerging business process technologies, the education programme will probably be most effectively developed under the leadership of the CIO with a focus on how BPM can expand or extend the strategies available to the business. The initial focus will be the emerging technologies themselves: their capacities, where they have been used, and the business benefits achieved. For example, products vary widely and some are not suitable for modelling all types of processes in your industry. Some support transactional processes and some are designed for enterprise scale, others for workgroups or departments.



BPMI.org is a neutral body encompassing vendors and users.

Joining it would give your technical staff an opportunity to talk directly with vendors who are developing products and standards to ensure the needs and interest of your business are met. Introduce BPM at your own industry forums. Establish links between industry specific XML standards groups and BPMI.org.

You could also encourage the development of industry specific applications, develop and promote industry specific best practice for implanting BPM, collect industry benchmarks for effective processes and develop an open repository of illustrative process designs targeted at specific customers or market segments.

- 3. Join (or create) a user organisation.** Traditional sources of information – the technology research community, the financial analysts that cover technology vendors and the vendors themselves – are not likely to provide the full range of information that you need to make informed technology selection and implementation decisions. Join or create user organisations to monitor the developing technologies proactively, and work with users groups to develop industry-specific technologies.
- 4. Use workshops to encourage process thinking in new areas.** Few businesses are really process savvy. Process programmes in the past have been restricted to specific internal areas where the rewards were clear – generally manufacturing, order management and customer service. The new wave of process thinking will extend process territory in three important directions. Firstly it will extend to other business areas such as sales, marketing and R&D. Secondly it will invade other industry sectors, particularly financial services, banking and insurance, where many core activities are still task focused and manual, adding little value but driving the cost structure of the business. Thirdly, and perhaps most importantly, it will look outwards across the business boundary, requiring the collaboration of customers, suppliers and other partners. For many businesses, this will require a radical shift in culture, management systems and job structure which now reward secrecy and competition rather than collaboration.
- 5. Develop a library of useful process resources.** Develop a library of books, articles and executive summaries of leading process thinking, to give managers a broad overview of the various approaches to process programmes and an on-going assessment of alternative approaches. Include case studies, and keep them up to date as new BPM products are deployed, new practices are developed and new benchmarks emerge.

Step 2: pick the right target

Your first BPM implementation should kick-start the virtuous circle by delighting business managers, inspiring them to think of new opportunities, and equipping the implementers with a manageable and useful platform of new skills. The ideal project is highly visible, addresses something of real importance to the business, hits exactly the right level of risk for your business culture, and is a convincing demonstration of BPM achieving something that other technologies could not.

The two key parameters are the process *phase* to be addressed and the *scope* of the process to be managed. You have to decide whether to attack the discovery and design of a process and subsequently manage (using the new toolsets to look at new areas) or to integrate systems to implement and execute something that would have been impossible with older technology. You can opt to tackle (and subsequently manage) something internal and well within your zone of control or you can deliberately go for one of the cross-business processes that will be key to the future of the enterprise. There is no right answer – the choice depends on your businesses needs, the scale of investment available and your appetite for risk (and benefit).



1. Begin with discovery and design if you are either very poor or very good at process thinking.

For businesses new to process thinking or that have not applied process thinking to the chosen process, discovery and design are needed to understand and define the process. In many cases, a quick diagnostic will confirm that no specific process yet exists, and that customers, suppliers and other partners follow their own procedures with little understanding of the needs and interest of the other players in the value chain. Process designs developed using older or no technologies divorce the design from the implementation processes. As importantly, they store process designs on paper or in technologies that are not easily shared by process participants in distributed locations.

At the other extreme, businesses used to process improvement programmes such as Six Sigma are finding it harder and harder to reach continuous process improvement goals. The volume of process information makes it difficult to identify targets of opportunity for achieving value. The new generation of business process discovery and design tools speed the discovery and design process since they are designed to collect information through interviews as well as in team design meetings. Process designs are stored as information that can be analysed by query, rather than as drawings that require visual inspection. Information about tasks, activities and resources (people and systems) can be combined with current and proposed process metrics to simulate the process before it is deployed. Many of the vendors are committed to developing the capacity to communicate with BPMS software using *Business Process Modelling Language (BPML)*. When their products become available, complex designs will be executable directly, without interim translation to code.

Begin with Discovery and Design tools if process design is your number one issue

DISCOVERY AND DESIGN	
When to apply	Where process design and improvement is primary issue
Illustrative vendors	Proactivity, Popkin, Casewise, Proforma, MEGA, Rational, Holosofx, ISD Scheer, Lanner
Examples of process areas	Customer self service; on-going Six Sigma programmes
Short term benefits	<p>Process information can be captured in a distributed setting</p> <p>Process designs are validated through analytics and simulation</p> <p>Information is captured in a process repository and available for updates and reuse</p>
Long term benefits	<p>Once tools are integrated with process execution engines, process designs will be quickly and flawlessly implemented</p> <p>The gap between design and execution will be eliminated</p> <p>Process packs (validated predefined process definitions) based on best practice will reduce time and cost of design efforts</p>
Risks	<p>It may be difficult to generate enthusiasm for another redesign effort if you have experienced failure in the past. In this case it will probably be necessary to demonstrate rapid deployment of new process designs to achieve useful business results</p> <p>Delays in deployment of BPML will require tedious transfers of information from discovery and design tools to BPMS. This is the reason many businesses are being drawn towards business process management products that integrate design with deployment and execution engines (Step 2). Their design tools may not be as sophisticated as formal modelling tools, but they may be sufficient to design and deploy many types of processes.</p>

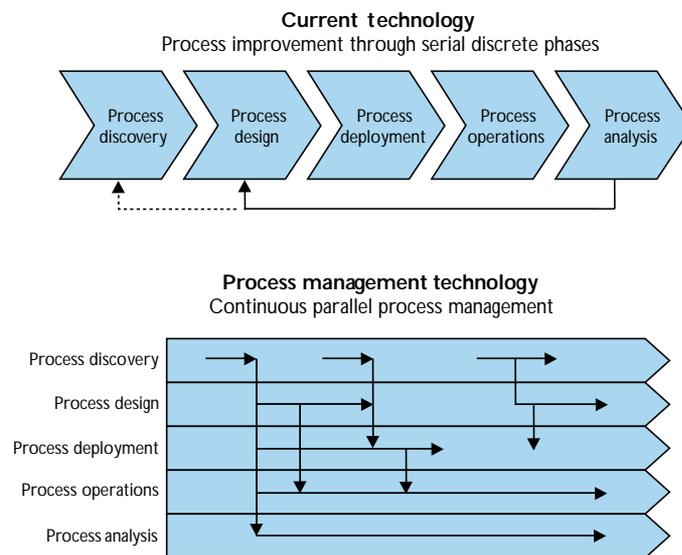


2. **Start using new business process management tools where and when you are ready to deploy new processes or to modify existing processes.**

Many businesses have a backlog of process projects within their businesses or across the value chain. The customer service organisation wants to provide customers the ability to place orders and check order status online. Senior management want to quickly integrate a new acquisition into the business. The call centre wants to reduce the time operators spend integrating information from different systems while talking to customers on the telephone. The human resources department wants to provide employees with a single self-service portal for a wide range of benefits. The sourcing organisation wants to automate the bid and proposal process and/or use an auction site for certain classes of goods. Any or all of these projects offer the opportunity to acquire a business process management platform and to build the skills and experience you need to be a process-focused business.

The project you choose and the rationale for selecting business process management technology will depend on the types of problems facing your business and the willingness of your key executives in your business to engage in process thinking.

- **Choose a systems integration project if you are facing a backlog of systems integration projects due to a recent merger or acquisition or the need to integration an ERP system with bolt-on or legacy applications.** This will reduce the time and cost of systems integration efforts while building your understanding of these new technologies. As importantly, you have the power of BPM technologies to design and to deploy the process and to change it when change is requested. While the new technologies are best deployed with the full participation of the business in the process design, you can do much of this work with little active cooperation. The chief draw back of this approach is that business process management will be seen as an IT project and you may never fully involve the business into process design.
- **Choose a business process implementation project if you are facing a backlog of requests from the business to implement processes that span applications and/or business boundaries.** This approach is well suited to the many businesses where process thinking is engrained in both the business and IT. The BPM technology provides an environment where IT and the business can work together. As noted above, these technologies will also reduce the cycle time for deployment of the new process so that both the business and IT participants will get rapid feedback on the process design. The major drawback to this approach for a first project is the inherent risk of deploying any technology for the first time in a project with high visibility.



With BPM, process improvement is parallel not serial

Once you have decided on how to introduce business process management technology into your business, your next task will be to select the specific vendors and products sets. Selection of the right products for your environment will, of course, require a detailed understanding of the your current infrastructure, applications and technology vendor relationships. For projects that cross business boundaries, it may become important to understand the infrastructure of your business partners. This type of specific recommendation is therefore outside the scope of this report.

However, when choosing specific BPM techniques it is useful to consider the capabilities the tools provide, the short and long term benefits of those capabilities and the other considerations that may increase the risk or cost of deployment.

The capabilities are:

- Deploy systems integration technologies (middleware, EAI etc)
- Integrate workflow engine with application servers and middleware to drive technical agility (process automation)
- Deploy today's advanced human workflow solutions
- Deploy new business process managers (some are workflow based but disclaim heritage)
- Accelerate application development using rules and processes
- Enhance all integration strategies with a process management platform.

As with any software procurement, match the technology to the requirement rather than fit the process to the technology. It will be tempting for both the business and IT to think all new processes can be deployed using current and (familiar) EAI, workflow or middleware platforms. Take a hard look at the processes you must support and make sure you will not need the power of some of the newer BPM technologies.

Implementing BPM



You can choose from many BPM options. Match the capability of the tools with your needs, consider the short and long term benefits and evaluate other considerations.

Capability	Deploy systems integration technologies (middleware, EAI etc) to solve problems that are primarily systems-based or to create a backbone for subsequent process management	Integrate workflow engine with application servers and middleware to drive technical agility (process automation). Process control makes it easier to switch underlying applications and use best of breed applications	Deploy today's advanced workflow solutions to manage processes that are primarily people-based. These have moved beyond the early document and imaging focus	Deploy new business process managers to coordinate and integrate the work of both systems and people. Some have a heritage of workflow, but are now oriented to BPM and may have significant integration capabilities	Accelerate application development and ease downstream changes by using rules and processes to reduce the amount of code that you have to write	Enhance all integration strategies with a process management platform
Examples of process areas	Technical integration processes	Enterprise integration processes	Workflow processes, document management	Workflow processes Integration processes	Traditional applications	Process neutral (materials, information, systems, business)
Short term benefits	Opportunity to review and renew enterprise architecture Clear win by IT – enhanced ability to integrate	New baseline for rollout of new processes Legacy preserved Flexibility to swap in and out application components	New workflow products continue to surprise with new models of human collaboration Impressive end user functionality immediately available Clear win for IT through fast track projects Areas of business never touched by technology can now be supported	Can be fast and cheap Adds supervisory support across legacy applications Typically designed to support integration with legacy applications Impressive end user functionality immediately available Clear win for IT through fast track projects Areas of business never touched by technology can now be supported Opportunity to start measuring process effectiveness	Accelerated application development Business can maintain rule set Lower cost application maintenance	Top down process deployment Integrate best of breed applications at the level of fine grained processes Streamline EAI and B2BI around coherent processes Project ingrained legacy processes (applications) into process management domain Leverage all legacy systems
Long term benefits	Manageable approach to application integration – only if best practices are leveraged	Development of a scaleable, reliable and agile enterprise architecture Opportunity to align systems architecture and enterprise architecture	Ready process models that integrate people and systems	Ready process models that integrate people and systems Lower cost of process ownership	Ease of application maintenance Can involve business more directly in application development	Opportunity to influence product and solution design to meet strategic objectives Closed loop process design-optimisation Flexible process re-configuration among partners and systems Truly process neutral architecture Lower cost of process ownership Opportunity to reflect business design in process designs independent of technical infrastructure

Implementing BPM



Considerations	<p>Could be viewed as an IT project</p> <p>Without best practices, topology can degrade to point to point and become unmanageable</p> <p>Architecture does not necessarily reflect business design (systems convergence not business convergence)</p> <p>Business may not be engaged in process design and operation</p> <p>Beware of proprietary integration architectures</p> <p>Do not confuse integration tools with process engine</p>	<p>No hiding place</p> <p>These projects will be visible to your business and possibly to your customers</p> <p>Look for fine grained integration of workflow steps and application components</p> <p>Check for process lifecycle management tools</p> <p>Standards for enterprise architecture</p>	<p>Check approach meets back end and B2B integration requirements</p> <p>Check workflow model can support design of the processes you wish to support</p> <p>Transactional processes may be difficult to achieve</p>	<p>Not necessarily an enterprise scale solution</p> <p>Check process model can support design of the processes you wish to support</p> <p>Products vary considerably – examine each on its own merits</p> <p>Standards may not be critical to getting value from these products</p>	<p>Try not to extend this to end to end processes, without including a process management engine</p> <p>Standards for rules and components</p>	<p>New technology needs careful assessment or proofing by IT partner</p> <p>Need to keep abreast of market trends in order to stay on track</p> <p>Standards for processes</p>
Illustrative³ suppliers	<p>BEA, Crossworlds, HP, Sun, Microsoft, Oracle, Seebeyond, Tibco, webMethods, Vitria</p>	<p>Asera, BEA, HP, Sun, Oracle, Tibco</p>	<p>Action Technologies, dstsystems, FileNet, HP, Sun, LombardiSoftware, Oracle, Staffware, Metastorm</p>	<p>FuegoTech, KTIVWorld, Savvion, Clear Technology</p>	<p>Asera, BsoftB, BusinessThreads, FuegoTech, Microsoft, Oracle, Versata</p>	<p>Intalio, Microsoft</p>

As is evident from the table, virtually no vendor provides a 'complete' business process management solution. Exceptions include:

- Consulting companies that are integrating best of breed process technologies from several vendors in order to provide an evolving enterprise architecture that can be customised to meet the needs of individual customers. An example is Computer Sciences Corporation.
- Large vendors who are re-engineering existing own brand products and integrating these with missing elements, e.g. Process Design tools, which they are acquiring or sourcing. The result is a process management suite. An example is IBM.
- Specialised BPM vendors who focus exclusively on process management and who rely on other vendors to supply more conventional components such as application servers, transaction servers, application communication, etc. There are a wide variety of vendors in this category. Solutions vary considerably in approach, features, scalability and adherence to standards.

For businesses that do not have a backlog of systems integration or process implantation projects – the best approach to process management may be to simply watch and wait and learn from other business or to actively seek out a business issue that be addressed by BPM technologies. If you elect to watch and wait your current

3. These suppliers are illustrative of many vendors who provide products in this category. This list is designed to provide specific examples of this type of technology and is not a list of all possible vendors that provide relevant products. Information about vendors who are developing an implementation of BPML, innovating with BPML schema or who are building their products on a BPML compliant BPMS platform will be covered in a future revision of this report. Requests for information about this should be addressed to the BPML.org. ERP and SCM vendors have not been included in this list, as the strategies of those companies in process management are not yet clear. We expect future ERP and SCM products to initially leverage 3rd party process integration products and later to include an OEM or in-house developed BPM foundation platform. This will let ERP and SCM products provide more effective enterprise process management.



EAI, middleware and/or workflow vendors may provide you with the tools you need as you upgrade to latter versions of their software. As importantly, you can learn by watching others doing. Many business have found that a strategy of 'Fast Follower' of technical innovations provides significant business return without the risk of being first to implement a new technology. The success of this strategy assumes that you keep current with your upgrades. The greatest risk is that your vendors fail to develop a robust business process management platform and you will have to catch up to competitors that have already installed and mastered BPM technology.

One way to mitigate the risk of a watch and wait strategy is to actively seek out opportunities to implement BPM within your business as a pilot project – using a process management platform. The goal is to find a business unit manager with a business issue best supported by business process management. The pilot project then provides a solution to his or her business problem, provides a proof of concept for the new technology and provides business and IT with the skills and experience for further projects. The chief limitation of this approach is that pilot projects are often small scale and not fully accepted by the business.

Step 3: cultivate a rich and varied set of Applied, Behavioural and Cognitive skills

Business and IT people require three types of skills to design, manage and optimise processes:

- A. Applied skills or subject matter expertise. This is knowledge about how to do things and is generally demonstrated by an ability to complete a specific task. For the business, this may be processing an order, closing a deal with a prospect, or assembling a component of the product online. In IT it may be the ability to use a project management tool, code in a specific language or use a process discovery and design tool.
- B. Behavioural skills are essential to work collaboratively with others. The key skills in this area are communication, collaboration, persuasion, education, and leadership. In many organisations, the B skills are found in the business but not the IT organisation.
- C. Cognitive skills are needed to create new solutions. C skills include the ability to see the broader picture, adapt to new situations, create new structures, think laterally and develop new ideas. In many cases IT rather than the business has the required cognitive skills to make sense of and develop systematic responses to what may appear to be chaotic, conflicting demands from customers, suppliers and other partners.

Process programmes require a broad range of A, B and C skills in the team. Lack of an Applied skill in the IT domain can easily be remedied by training and mentoring, but it may be harder to build new Applied business skills that require specific knowledge about why a process is done the way it is. A skills are found in practitioners, not managers.

Behavioural skills take more time to acquire. On the business side, they take the form of openness to the ideas of customers, suppliers and other partners, and negotiating skills to arrive at good solutions. In the IT group, many subject matter experts will not have been trained in communications or in expressing complex technical ideas to business audiences. Look for translators who can bridge this gap.



There are training courses and consultancies that facilitate the development of behavioural skills, but do not expect rapid change if the business culture and reward systems have not fostered them in the past. The shift of perspective in looking at the whole business process from end to end and the need to collaborate and cooperate with customers, suppliers and other partners may require major changes in culture, job structure, and reward system. It is an issue of beliefs in the organisation as much as skills in the individual.

Cognitive skills – creativity and systems thinking – are the most difficult to learn. These are the critical skills of the business, process and technical architects and they are key to your success.

- Creativity is the ability to see the new possibilities – to imagine what can be different. This is the source of your competitive advantage – providing your business with new products, services and solutions. Creativity provides you, your customers and suppliers with the opportunity to work together to create value in new ways.
- Systems thinking includes the ability to abstract the key components of a process and to understand the often complex interactions between them.

It is easier and faster to choose a team that already has the required C skills than to develop them from scratch. This may mean that you have to hire someone or use a consultant in this role.

The technical architect may be the easiest role to fill. Many IT organisations already have technical architects with the relevant C skills and the A skills are easily acquired. For example, the architect who now provides your middleware strategy will eventually master the specific technical issues of BPM architecture. Business and process architects may be harder to find. The business often lacks the needed cognitive skills whilst the IT organisation lacks the business knowledge and the B skills needed to forge consensus within a diverse team. These architects can be developed over time by having IT professionals with the requisite C skills work closely with a process owner chosen from the business. Over time, the business and process architects may be assigned to the business rather than IT.

IT must be part of core team in this round of reengineering

Business process management will require a deeper, more creative partnership between the business and IT than exists in most businesses. The Process Owner must be a senior manager based in the business, but the business cannot design processes alone and then expect IT to choose the right applications and infrastructure to implement them. Business and IT must combine their expertise with a thorough understanding of the new agility and transparency that BPM provides. This up-front integration of business and IT will deliver the fastest business results.

In a 1997 report on the *IT role in reengineering*, CSC's Research Services identified four possible roles that IT might play in the reengineering team: Team Member, Interpreter, Subcontractor and Advisor. The core team is made up of Team Members, who contribute to every aspect of the new process design, and Interpreters who orchestrate and coordinate team activities. IT must avoid the roles of Subcontractor and Advisor, which are peripheral to the process design team, and aim for the roles of Team Member and Interpreter. That way IT will participate fully in creative collaboration as new processes evolve.



CASE STUDY

Using automation to drive out time and cost while facilitating sense making and innovation

Iowa Telecom and Tesoro Petroleum applied reengineering principles to process redesign. Both eliminated labour-intensive tasks that added little value. They then automated the integration between internal systems so that the remaining people in their core processes focused on problem solving and trouble shooting.

Iowa Telecom improved customer service and reduced the order to cash cycle by eliminating swivel chair integration.

Iowa Telecom is a local phone company with more than 280,000 subscribers. One of its most difficult problems has been handling all the transactions involved in responding to customer requests to switch long distance carriers. It was also losing revenue because of the length of time it took to process billing name and address change requests from the long distance carriers. The root of both problems was the labour-intensive process by which information was passed between multiple systems.

Investigation revealed that most of the delay was in 'swivel chair integration': people re-keying data from one system to another. Using business process management software from Fugotech the process was recast so that more than 80 percent of the work was fully automated and exceptions were routed to skilled staff for resolution. Headcount for the manual activities was reduced by 88 percent. Cycle time for processing a request was reduced from 5 minutes to less than 5 seconds. A backlog of 25,000 name and address changes was eliminated. All this was accomplished in two and a half months with payback of the investment in 8 months – less time than it would have taken to build the solution using an EAI approach.

Since the initial installation, Iowa Telecom has continued to add capabilities to the system. As it learned more about the overall process, it has been able to automate the handling of progressively more difficult transaction codes. Typically these changes are made at the level of a visual diagram which can be understood by technical and business staff alike. Then XML is generated and turned into Java code that is deployed on the business process management system server.

The initial problem at Iowa Telecom was systems integration. In future the CIO, Brian Naaden, expects to make significant use of the business process management system as a way to make business processes explicit, measurable, and changeable. In contrast to telephone companies with a long history, Iowa Telecom is a new start-up company that was formed to purchase the Iowa assets of GTE, which wanted to quit the market. With its mix of old and new staff the company does not have the implicit processes, good or bad, of an established company. Iowa Telecom has the opportunity to consciously decide how its processes should work. The business process

management system will help it make them explicit and document the results.

An initial success convinced Tesoro Petroleum to launch an enterprise-wide process redesign programme.

Tesoro Petroleum is a \$5 billion energy company. Like many companies in the energy business, it has implemented SAP. However, this did not provide appropriate support for the part of the business that re-supplies boats servicing the drilling rigs in the Gulf of Mexico. When a boat pulled into to one of the Tesoro provisioning docks, the workers had to enter 50 to 70 mouse clicks over 13 to 15 screens. The training required was too extensive for the dock workers. Using business process management software from Fugotech, Tesoro was able to put more intelligence into the order entry system, use familiar names and shrink the system to 3 screens. In the background the business process management system orchestrates 14 SAP transactions and updates non-SAP systems. The pilot was up and running in 5 weeks.

Tesoro's CIO, Mark Evans, is now developing a programme of change using business process management. He expects to make use of this technology on 15 other projects including one with significant revenue implications that will link a variety of systems and sources to improve Tesoro's pricing operation. The new pricing system will involve integration and orchestration of both computer and people-based systems.

Based on his experience, Mark Evans believes that in the future Tesoro will need business process architects and projects managers, but all else will be outsourced. However, these business process architects do not exist today and will need to be grown within the company. Mark recognises that this will require strong leadership on his part, to set the example. Fortunately Mark had good teachers in his previous position at Phillips Petroleum where IT staff were trained in two important disciplines – how to think in business process terms and how to talk to business executives. This is highlighted in a famous Harvard Business School case study describing how Phillips mobilised its resources to dramatically increase its profitability in response to a business threat.

The new business process architects will not only sit with business staff to design new processes, but will work with both sides of intersecting processes to help diagnose and sort out process interaction issues. For Tesoro this clarity about what all participants in a process actually do may be one of the most important benefits of explicit process management. Previously when things went wrong between departments or between partners there was very little shared understanding of what each side did. Now with explicit visibility into how others in a process do their work there is much less misunderstanding and the root cause of issues can be quickly sorted out.



CASE STUDY

A top-down, business process management approach shaved months from a new business launch schedule

A European conglomerate realised it could increase the value of the thousands of kilometres of unused fibre optic cable it owned if it were able to offer a full range of managed bandwidth solutions to telecommunications companies, ISPs and large corporations. It would be even more valuable if the bandwidth could be changed, on demand, over the web by the customers themselves.

However, creating this new value meant setting up a new business from scratch. The problem was that telecommunications systems are among the most complex and demanding systems in the world – and the parent wanted no ordinary system, but one that would deliver exceptional customer self-service and could be easily changed in response to new business conditions. Best estimates in the industry predicted it would take at least 17 months to build such a system.

In collaboration with Computer Sciences Corporation (CSC), the core staff of the new startup company took a top down, business process management approach. Using CSC's e3 framework it started with a 14-page strategy statement and seven months later launched a completely new business. The new systems included ERP, HR, finance, telephony, a new generation operational support system (NGOSS), and a business support system (BSS). 160 business processes had to be defined and designed, and were implemented using 127 third party, best of breed applications, from Commercial Off the Shelf (COTS) vendors.

The focus on business processes meant the applications did not have to be integrated at every level, which made development much faster. Instead, the applications were integrated from the top down – starting with the business processes, not the applications that support those processes.

The team implemented a framework that made use of products from BEA, Tuxedo, Web Logic, and ELink, and a workflow management product from Staffware. They then selected commercial applications from 12 leading vendors, including the new Oracle 11i applications suite.

Developers abstracted the business processes from these components and migrated them into a business process engine built into the e3 framework. Thus business processes are configured in one central function rather than hard-coded in many applications. Because the processes were not hard-coded, it was possible to provide 10 proofs of concept during the brief development period, and the growing team could respond with informed feedback to shape the final system.

A consistent user interface across all applications, regardless of their source, was essential to make the system easy for both the staff and customers to use. Since the processes drive the execution of the applications it was possible to create consistent interaction and a single sign on through a common web portal. 400 application screens were 're-faced' to conform. The portal is designed so that many formats such as PDAs, telephones, and digital TV are also supported.

The COTS packages are not linked directly to each other, but through a hub directed by the business process. The way this was done was key to the rapid deployment of the system. The adapters that connect the hub with the COTS packages are very thin and so were quick to write. Capabilities that require very complex and hence costly adapters (such as data translation) are separate and shared by all the applications. This construction means that packages can be swapped in or out as needed in future. Packages can be used without worrying about being trapped.

Section 3

BPM

Frequently Asked Questions

Business Processes

- How many processes are we talking about?

Business Process Management

- Is business process management a new idea?
- What does it mean to remove processes from applications and what is left?
- How do I extract processes that are embedded in legacy applications?
- Does process management have an underlying theory like database management?

Business Process Management Systems

- What would a complete Business Process Management System consist of?
- Isn't an ERP package supposed to do all that?
- How will Business Process Management Systems help with these ERP problems?
- Aren't web services supposed to be the technology of the future?
- How do BPM tools provide more flexibility and agility?
- Can I realistically customise business processes?
- What is a process server?
- How do I compare vendors who seem to have very different core competencies?

Business Process Modelling Languages

- Do we really need a new language just to describe processes?
- What does a process modelling language have to be capable of?
- How do process modelling languages help with B2B integration?
- What is Business Process Modelling Language (BPML)?
- What was the impetus for BPML?
- What are the formal foundations of BPML?



Frequently Asked Questions

Business Processes

Business processes are the set of activities that deliver value to your customers. They represent the end to end flow of materials, information and business commitments. Processes are long lived, are supported by distributed computer systems and are both transactional and collaborative. Processes are composed of both automated and manual activities. Workflow processes mediate between what is automated and what is manual.

How many processes are we talking about?

In any large business there will be hundreds of unique business processes that need to be managed – internal processes, best practices and industry standards. They span multiple stovepipe applications that need to be integrated and managed in reusable integration frameworks. Hundreds of billions of lines of legacy code contain essential business rules that cannot easily be recreated and they are a rich source of reusable components if they can be extracted. Many processes, especially the ones that deliver value to the end customer, span multiple organisations and need to be managed as strategic custom business relationships.

These processes and components must be managed as knowledge assets and integrated with new systems and the growing volume of end to end process-related information needs to be extracted, interpreted and used for the benefit of everyone involved.

Process management is no longer a luxury – it's a necessity.

There are hundreds of business processes and therefore potentially hundreds of process management problems

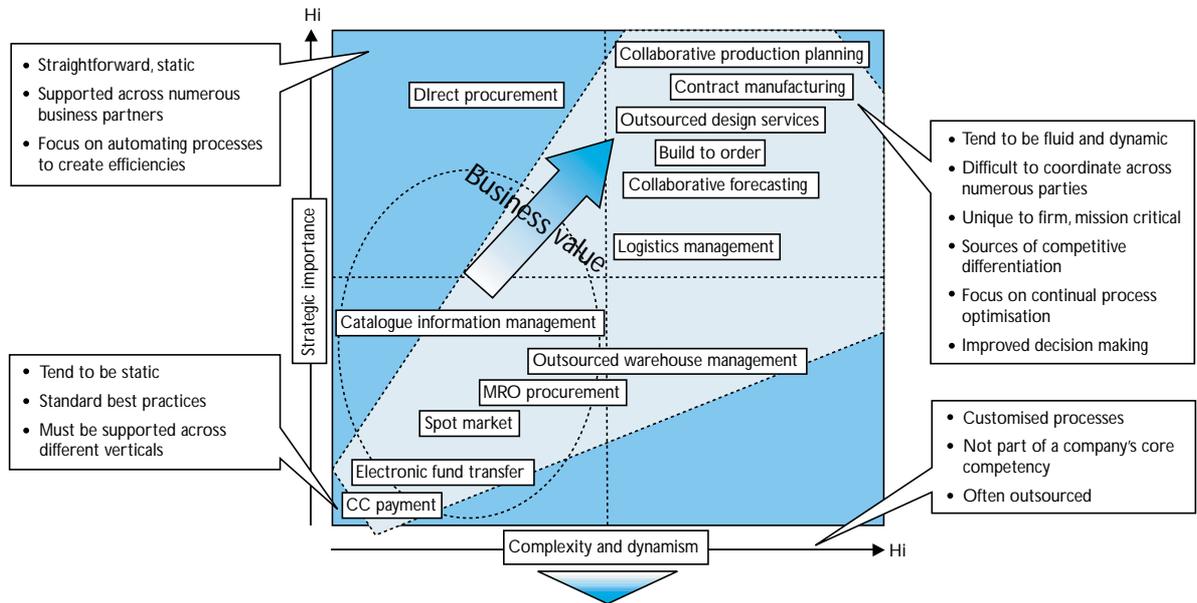
MARKETING & SALES	INDUSTRY SPECIFIC	OPERATIONS
Account Management	Commissions Processing	Procurement
Market Research and Analysis	Service Provisioning	Order Management
Product/Brand Marketing	Site Survey and Solution Design	Invoicing
Programme Management	Order Dispatch and Fulfilment	Shipping/Integrated Logistics
Sales Cycle Management	Proposal Preparation	Returns and Depot Repairs (RMA)
Installation Management	Capacity Reservation	Order Fulfilment
Sales Commission Planning	Advance Planning and Scheduling	Manufacturing
Customer Acquisition	Product Data Management	Inventory Management
Collateral Fulfilment	Supply Chain Planning	Production Scheduling
Sales Planning	Order Management and Fulfilment	Advance Planning and Scheduling
Distribution/VAR Management	Returns Management	Demand Planning
Corporate Communications		Capacity Planning
Publicity Management		Timekeeping/Reporting
HUMAN RESOURCES	FINANCE	CUSTOMER INTERFACE
Time and Expense Processing	Customer/Product Profitability	Service Agreement Management
Payroll Processing	Credit Request/Authorisation	Internet Customer Service
Performance Management	Financial Close/Consolidation	Warranty Management
Recruitment	Treasury/Cash Management	Call Centre Service
Hiring/Orientation	Property Tracking/Accounting	Problem/Resolution Management
Succession Planning	Internal Audit	Customer Enquiry
Benefits Administration	Collections	Sales Channel Management
Performance Review	Physical Inventory	Inventory Management
	Cheque Request Processing	Service Fulfilment
	Capital Expenditures	
	Real Estate Management	
	Asset Management	

Source: Savvion

Frequently Asked Questions



Business processes, from efficiency to added value to differentiation



Process management addresses the whole spectrum of business interactions, especially high value, complex, distributed processes in order to find true efficiencies and differentiation

It should also be borne in mind that businesses would often like to operate several different variants of a particular process, especially where systems interfaces, customers, suppliers and partners have different requirements. The ability to respond flexibly by customising processes would create considerable competitive advantage but it might turn hundreds of processes into thousands of variants that would be impossible to manage without good techniques and tools.

Business Process Management

Business process management is the capability to discover, design, deploy, execute, interact with, operate, optimise and analyse end to end processes at the level of business design, not technical implementation. Business process management is concerned with the reliable completion of discrete business transactions as well as complex sequences that may continue for weeks, months or even years.

Is business process management a new idea?

Business Process Management is an evolution of past methods. Businesses have always discovered, designed, deployed, executed, operated, optimised and analysed their business processes – with mixed success – but over the last ten years the way they have done this has changed radically.



Frequently Asked Questions

1. REENGINEERING (The Distant Past)	2. ERP AND WORKFLOW (The Recent Past)	3. PROCESS AS EDITABLE DATA (The Present)	4. PROCESS AS EXECUTABLE CODE (The Future)
Business Issue			
<p>A decade ago reengineering promised dramatic improvements but it was too manual and too painful. It may have improved process performance (at least within the enterprise) but it failed to provide agility or to encourage ongoing change.</p>	<p>ERP was sold at board level on the basis that if purchased the CEO would not have to worry again about IT.</p> <p>But ERP systems were as flexible as concrete – very flexible at the time of installation and very rigid thereafter.</p>	<p>Tools capture and manage enterprise processes and data from multiple viewpoints in an editable form for flexible implementation and subsequent analysis. The purpose is primarily process documentation and online work aids, but some tools support collaboration to allow employees and business analysts to refine and review process descriptions.</p>	<p>A standard for describing all processes and process management systems that directly execute process models and integrate underlying technologies from the top down. The first systems of this description are available today.</p>
Technology Issue			
<p>Computer systems of the era could not adequately represent the full complexity of business processes in a form that let them be easily changed, re-deployed and operated.</p>	<p>The ERP model encoded business processes in software, but with limited ability to change them thereafter. Subsequent application flow languages were not a complete answer. This approach attempted to offer a complete solution, but could never have been configurable in all respects.</p> <p>End users were forced to add components and customise out of bounds. These additions compromised the solution and reduced the overall flexibility.</p>	<p>These tools cannot yet carry process models directly to execution. Process models are represented in proprietary formats that cannot be used outside the tool environment.</p> <p>The tools focus on modelling activities and data flows, with insufficient attention to process collaboration.</p>	<p>Recent advances in process management technology recognise that process models developed independently of the technical infrastructure that supports them are only helpful in the discovery and design phases.</p> <p>The focus of effort in defining a viable process management language is to enable process designs to be directly executable.</p>
Organisational Behaviour			
<p>Discovery and design was done in team meetings using a whiteboard. Deployment was another team meeting. Execution consisted of little more than new rules and procedures. Maintenance was only undertaken after failure, and optimisation was wishful thinking. Analysis was rarely performed.</p>	<p>Discovery was still a manual procedure but the process designs were documented. Deployment meant rolling out the applications with huge implications if they were wrong. Initially, maintenance and optimisation were limited, but recently process improvement tools have been integrated into ERP systems.</p>	<p>In the discovery phase it is now possible to integrate multiple views of the business, edit and maintain the process blueprint and publish reports. However, there is no easy way to translate the blueprints into a running system. Optimisation and maintenance rely on visual inspection of the process designs and it is hard to keep the blueprint in step with the software.</p> <p>Although software engineering methods have matured recently, there is still a huge gap between business intent and IT delivery.</p>	<p>Discovery activity will create process designs in standard electronic formats that populate the process management system repository. Design activities use these models to simulate and explore desirable changes. Deployment is streamlined. Discovery, design, deployment and maintenance occur in parallel, not as serial programme phases. The execution state can be tuned live and processes themselves integrate metrics that provide management information for optimisation and improvement. Analysis is end to end, closing the loop between design and operations.</p>



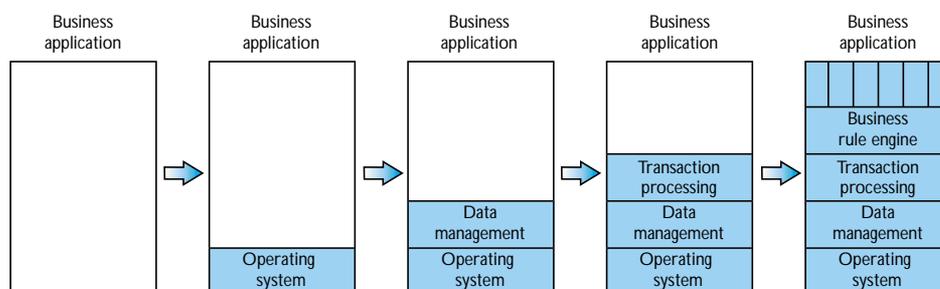
Frequently Asked Questions

What does it mean to remove processes from applications – and what is left?

The removal of certain responsibilities from business applications is an ongoing trend and at each stage we improve the architecture of the IT environment. When we take something that was embedded and make it explicit, we make it sharable, common, accessible and potentially much more flexible. Previous examples include:

- Operating systems, which took over memory management, file access and the graphical user interface
- Database management systems, which removed both the management of data and the management of the schema
- Transaction processing monitors, which extracted the responsibilities for online resource management
- Business rule engines, which extracted policies and constraints, making them both more consistent and easier to change.

ERP packages offer tables to configure processes but adding more configuration tables only adds more complexity when simplification is what is really required. Abstracting business processes from the software code to leave a set of good, manageable components is a natural evolution for ERP and for other application environments. Baking processes into a software application using an accelerated design technique does not achieve the same.



Evolution in application architecture – process management is the next logical step

Vendors that leave processes ingrained in their application logic face an uncertain future. A similar situation existed prior to the invention of the relational database management system (RDBMS). Application vendors initially resisted exposing their data model, fearing that others would replicate their software. More enlightened vendors learnt to build on the new data management systems, which gained them significant advantages – including the ability to scale their applications to serve the whole enterprise.

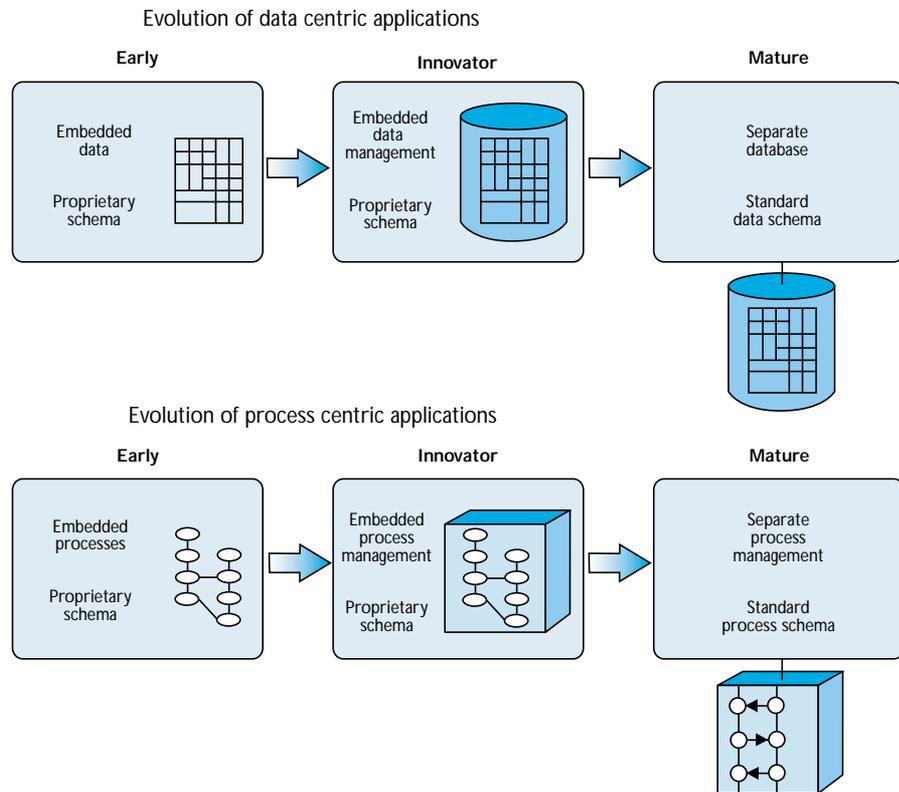


Mature process aware applications will gain the same kinds of advantages as mature data aware applications

APPLICATIONS AND DATA			
	Initial applications	First generation innovators	Mature data aware applications
Data	Embedded	Partially explicit	Fully explicit
Data schema	Proprietary	Proprietary	Standard (Relational)
Data query language	None	Proprietary	Standard (SQL)
Data management tool	Ad hoc	Proprietary	Platform (RDBMS)
Business impact	Unable to easily manage data within discrete applications Unable to combine data from multiple applications	Easier to manage data in discrete applications but still no capability to combine data sets, e.g. for query	Full enterprise wide data management enabled
APPLICATIONS AND PROCESSES			
	Initial applications	First generation innovators	Mature process aware applications
Processes	Ingrained	Partially explicit	Fully explicit
Process schema	None or implicit	Proprietary	Standard (e.g. BPML)
Process query language	None	Proprietary	Standard (e.g. BPQL)
Process management tool	None	Proprietary	Platform (BPMS)
Business impact	No ability to change processes without software engineering	Some discrete processes manageable and visible within each process manager deployed	Full enterprise wide process management enabled



Data management and process management follow a similar path to acceptance



How do I extract processes that are embedded in legacy applications?

In most businesses some of the most important processes are implemented, at least in part, by best of breed systems or bespoke legacy applications. These applications cannot be abandoned because they are supporting mission critical operational business activities so the new process management systems must enable them to play an active role.

The most common approach today is enterprise application integration (EAI) and application adapters – programmatic interfaces that allow application components to be included within a process step. Today this is best practice but it is not an ideal long-term solution in integrating existing applications with process management systems.

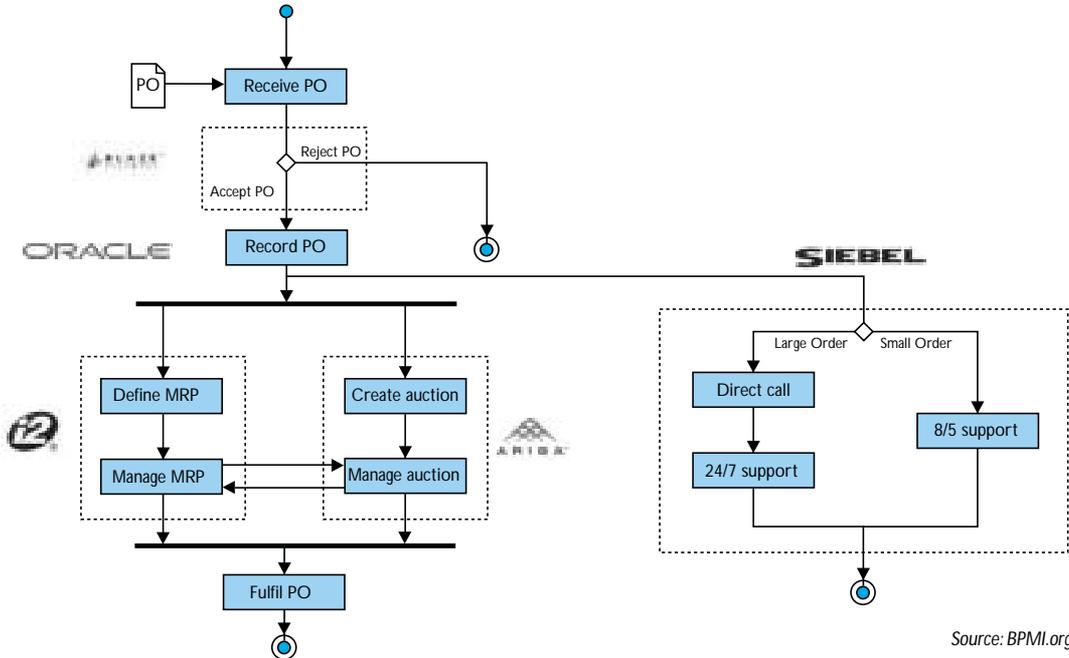
Over time, more and more of the company's business processes will need to be migrated to the process management environment. Process management vendors are therefore developing approaches to allow applications to participate more fully. We can expect alliances between application vendors and process management platform vendors that will allow application components to appear as processes in the process management environment.



Frequently Asked Questions

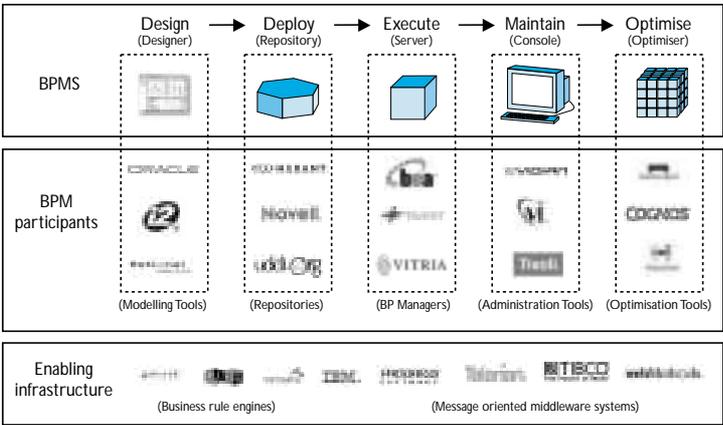
For applications that support a well-defined processing meta-model this might be achievable without source level integration. For example, it could be possible to expose processes in an ERP system to the process management subsystem. These processes then become process assets in the process repository, and can be composed and integrated with other processes. The applications are said to project their processes into the management domain; process management vendors will provide projectors, not adapters, for this purpose. A standard for process projection will be developed.

Using this projection technique it will be possible to provide a complete business management environment combining the best functionality of process management with best of breed application components.



Source: BPMI.org

A typical transactional and collaborative business process



Implementation of straight through process management using a combination of application integration (adapters) and process projection



Frequently Asked Questions

Does process management have an underlying theory like database management?

Absolutely.

Today's enterprise applications are built upon sophisticated data management and transaction management platforms. In turn, these platforms are built on strong foundations, such as the relational model and two-phase commit. The theories behind these formalisms are not simple, but data management languages such as SQL make their capabilities available to the business community and application developers. Despite attempts to unseat it, the relational model underpins the majority of business systems and activities today.

Role of the emerging process model is analogous to that of the relational data model

RELATIONAL DATA MODEL SCHEMA	EMERGING PROCESS MODEL SCHEMA
<ul style="list-style-type: none">• Supports any enterprise data model• Supports sophisticated data management operations• Supports many data management and analysis tools• Supports an infinite variety of transactional business applications• Theory of relational data model is difficult to understand• Benefits of data management system and data query language are easy to understand	<ul style="list-style-type: none">• Supports any enterprise process model• Supports sophisticated process management operations• Supports many process management and analysis tools• Supports an infinite variety of end to end process-ware applications• Theory of process model is difficult to understand• Benefits of process management system and process query language are easy to understand

Creating an integrated process management capability will depend upon equally strong architectural principles. The BPMI.org believes that BPML provides such a foundation, and is working to encourage the development of implementations. Some vendors have already developed implementations. This powerful formalism combined with a standard expression of it provides:

- The possibility of reliable logically centralised process management of end to end business processes in a heterogeneous distributed environment
- Interoperability between applications, process management systems and emerging process tools; this will leverage the process management platform
- A platform upon which vendors can develop process management systems and process-ware applications
- Consistency and coherence across a wide range of process applications, including process design, deployment, execution, operation, optimisation and analysis.

The new process management systems provide the missing dimension from applications that only perform clerical transformations on data – time. Business processes exist over time and data is the trial of their activity.



Business Process Management Systems

Some vendors call it the fourth layer of IT architecture. Others refer to new composite applications, the next generation of workflow, the new platform for applications or simply smarter middleware. Whatever it is called, the key element is the process virtual machine: a single, unified modelling and execution environment that can be applied to the support of any business process.

What would a complete Business Process Management System consist of?

You will only find a small number of complete BPM solutions today although there are a large number of products purporting to offer a process management capability. Product capabilities tend to be constrained by the heritage of the vendor's technology. For example, a workflow product evolving towards process management will have a very different set of capabilities from an application server evolving towards a process server or a newer process management product designed from scratch. For this reason, comparison between process management products is currently difficult or even meaningless.

The following table lists some of the functionality you would hope to find within each of the eight process management capabilities:

PROCESS DISCOVERY	PROCESS DESIGN	PROCESS DEPLOYMENT	PROCESS EXECUTION
<p>Process repository</p> <ul style="list-style-type: none"> Convert implicit processes to explicit processes Elicit process knowledge Project ingrained processes into management environment Automate discovery of programmatic interfaces Directory services 	<p>Process designer</p> <ul style="list-style-type: none"> Processes, rules, activities, participants Model, compose, decompose, restructure, transform processes Reuse, specialise, generalise processes Maintain process repository assets and templates Change management, governance 	<p>Process configuration</p> <ul style="list-style-type: none"> Bind participants Create public interfaces Generate private process Allocate resources Integrate application components Distribute processes Change management, governance 	<p>Process virtual machine</p> <ul style="list-style-type: none"> State management Transaction management Exception management Distributed process correlation Bind middleware services Connectivity, data flow, translation Persist processes, persist process data
PROCESS MAINTENANCE	PROCESS INTERACTION	PROCESS OPTIMISATION	PROCESS ANALYSIS
<p>Process console</p> <ul style="list-style-type: none"> Administration Manage exceptions Performance monitoring Update process Add/change participants Change private/public boundary 	<p>Process portal/desktop</p> <ul style="list-style-type: none"> Generate dynamic workflows, task lists, forms, reports Collaborate around exceptions Process coach/agent Higher level user oriented languages Personalisation, entitlement 	<p>Process optimiser</p> <ul style="list-style-type: none"> Optimise resource utilisation Convert serial to parallel where possible Remove redundancies Deadlock avoidance Close loop with process improvement design Ensure consistency of process set 	<p>Process analyser</p> <ul style="list-style-type: none"> Integrate metrics with process descriptions Key performance indicators Meter processes, live and simulated Demonstrate system dynamics Time and resource analysis



Isn't an ERP package supposed to do all that?

In the late 1990's ERP programs such as SAP, Peoplesoft and Oracle Financials were sold at the Board of Director level on the basis of promises by Davenport and others that these software packages would support "many, even most, aspects of a company's information needs". The ERP package, along with CRM and other special purpose applications, were supposed to provide real time information that would result in faster transactions, cycle time reduction and better financial management. The systems would also provide the internal tools needed to power e-commerce and make tacit process information visible throughout the business⁴ and they would succeed because they were produced and supported by professional software development houses with a deep understanding of industry best practices. These powerful applications would replace fragmented legacy systems that were expensive to build and hard to maintain. Such a package was all you needed to bring best practice and flawless information flow to your business.

The promised advantages included reliability, flexibility, agility and transparency. ERP packages were more flexible and agile than legacy systems and they supported complex and interrelated processes within the business. Key information was shared by all processes so that a change made in one was reflected in other related activities. Business process designs were also stored explicitly so that the ERP could at least in theory measure the cost and time required to conduct a process.

However, by December of 2000, the Conference Board⁵ reported that few businesses believed they had realised the business benefits expected from their ERP projects and even the leading implementers of ERP were putting future ERP projects on hold.

In practice they turned out to be much less flexible, agile, and transparent than expected.

1. As initially deployed they supported only back office functions – additional 'bolt-on' applications were needed to complete even simple tasks like processing a purchase order.
2. ERP vendors presented customers with a limited 'best practice' process template expecting that each business would adapt their business to the way the package worked. In practice, many businesses found the business processes defined in the package could not fully accommodate the needs of their customers and customisation was difficult, slow and expensive.
3. ERP stopped at the business boundary. The vendors proposed that businesses would work together by integrating their ERP systems but the plan for integration assumed that each company would have similar applications. In practice many companies had very different and incompatible instances of the same ERP application even within their own business and these could be integrated only by using middleware to perform complex translations.

4. Thomas H. Davenport, *Mission Critical*, Harvard Business School Press, 2000.

5. A Conference Board Study of 117 firms in 17 countries that implemented ERP found that only 34 percent were very satisfied with the results. Some companies reported a productivity drop for up to a year after implementing ERP. *ERP Post Implementation Issues and Best Practices* December 2000.

Frequently Asked Questions



4. Agility was illusive since every change meant at best tedious and time-consuming adjustments to the middleware and at worst a lot of rework or customisation of the underling applications. E-business could require never ending upgrades and customisation.
5. Transparency was also illusive. Processes were designed on paper or by using computerised drawing tools and then stored in a proprietary framework. They could only be viewed by someone with the same technology – hardly a seamless way to share processes with partners.

The failures of ERP programs are related to one or more of three limitations of ERP design.

1. First, ERP applications by design support a stable enterprise running standard – that is the same processes. Reality is that effective business processes are never standard and only rarely stable. By definition, business processes are designed to deliver value to the customers – who live and work in different markets and whose needs and tastes shape different cultures, law and regulations. Processes change because customers and market conditions change; In addition, business changes through acquisition, mergers and spin-offs.
2. Second, business processes extended beyond the business boundaries cannot easily be supported by applications that end at the corporate firewall. The focus on e-business highlighted the limitations of the enterprise solutions that were not built to serve the extended enterprise.
3. The third and perhaps most important limitation is that business processes have little relationship to the underlying structure of the ERP and bolt on packages sold to support them. Business processes span application and corporate boundaries. They include activities conducted by people and by systems (and rarely require support from only one application).

Systems integration – particularly the deployment of middleware – quickly became the focal point of IT efforts. Yet integration is tedious and time consuming. More importantly, business processes and the customer value they were designed to achieve were often lost from sight and mind when submerged in the detail of a series of changes to unrelated applications or detailed instructions to even more complex middleware technology. CSC Foundation Report *Packages and Business Agility* warned that ERP and other packages had all the flexibility of wet concrete during implementation and all the flexibility of dry concrete upon deployment⁶. For many businesses this assessment aptly summarises their plight – the new technology base hinders rather than enables agile response to customers competitors and change.

How will Business Process Management Systems help with these ERP problems?

The great benefit of ERP packages was originally supposed to be their integration – everything the business needs all in one place – but it rapidly became clear that they were even more valuable if they could be taken apart. Leading application vendors recognised the trend and began decomposing their application suites into discrete components. End users can now pick and choose which components to use and mix them with components from other vendors to create so-called composite applications. The vendors can also license best of breed components to other companies to create new channels to market.

6. *Packages and Business Agility, Foundation Report 107, CSC's Research Services 1997.*

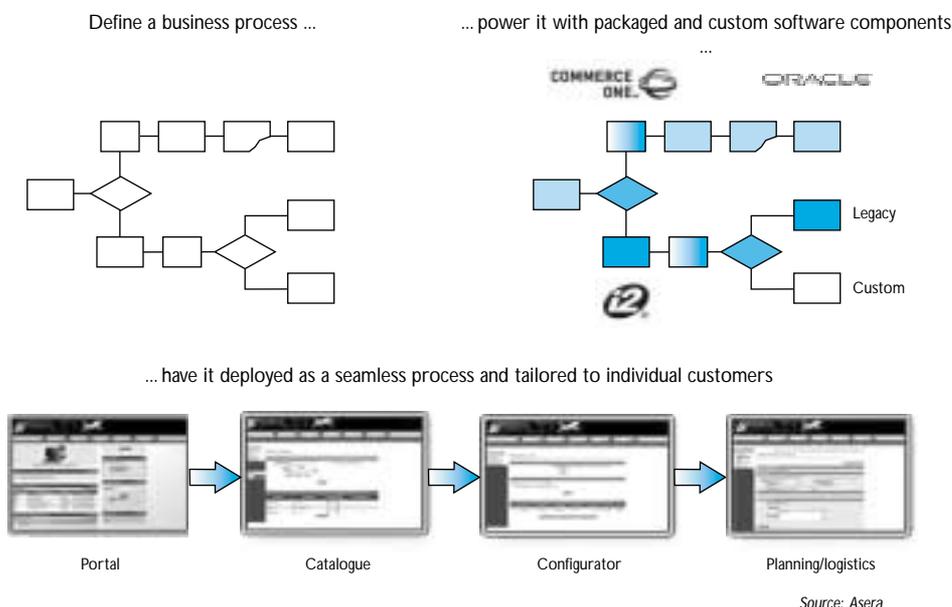


Frequently Asked Questions

As the packages break up into components and as the components become more finely grained and more independent, BPM systems provide exactly what is needed to stitch them back together in an explicit, manageable and flexible way. Crucially, the integration begins with an explicit, top-down specification of what the components are supposed to do together (a process model) rather than a hidden, inflexible, technical specification of a system interface.

The key advantages of using a BPMS to manage them from the outside are:

- It will bridge application environments
- It will include human activity by incorporating workflow – right across the composite application
- It will allow components to be orchestrated in new ways (within limits set by the grain size of component)
- It will provide the opportunity to customise the whole process for specific customers or partners
- It will provide an integrated user interface through a single portal and back-end integration
- It will oversee the process and allow new applications to be written that can interact with and transform the whole picture, end to end.



Better process tools will encourage the development of better components and they will work together to provide businesses with many advantages. The distinction between scripted processes and entity-based business logic will become blurred and business processes will become the paradigm for the management of activity within the main business object entities. As a result, functional architecture will align much more readily with business activity and support holistic end to end business processes much better – even across business boundaries. Processes will be expressed in any level of detail right down to the very fine-grained, enabling businesses to modify, redesign and evolve processes much more readily. The top down process design activity can be driven by real organisational objectives (time, cost, best practices, etc) and drive architectural alignment.



Better components will work seamlessly with better process tools

Enterprise Resource Planning (ERP) and Process Management

ERP vendors who never thought they would need to work together are finding ways to do so, using various composite application strategies. They are integrating ERP components at the level of business processes to achieve process customisation and end to end integration. Using this process management approach, the vendors can now expose ingrained processes as explicit process objects.

Process management systems are not a replacement for ERP, but they herald a supra-architecture within which application components are integrated and managed to create end to end processes.

ERP environments are already often supplemented with proprietary process management tools.

Tomorrow's ERP solutions will be fully process-aware and built upon a standards based process management foundation.

SYSTEM EVOLUTION	CHARACTERISTICS
Base level Monolithic legacy systems <i>(Better than nothing but modern process systems are now considerably in advance of this base level)</i>	<ul style="list-style-type: none"> • Separate process manager • Monolithic legacy system • Granularity at level of applications • Inflexible, coarse-grained activities only
Step 1 Components easy to call <i>(Many products calling themselves process management are at this level of maturity)</i>	<ul style="list-style-type: none"> • Business components • Interfaces for component activation • Granularity aligned with process activities • Process-driven approach • Components ingrain some process states
Step 2 Fully modelless components <i>(The best process managers are at this level of maturity)</i>	<ul style="list-style-type: none"> • Any-sequence any-time operations • Additional component complexity • Changes in process greatly simplified • Easy to re-arrange activities in any sequence
Step 3 – Process engine integrated at component level <i>(This is the domain of vendors who are creating new approaches to the management of business processes)</i>	<ul style="list-style-type: none"> • Components work seamlessly with the process manager • Process model is inherent to all components and component design • All components modelless • Most processes managed by process virtual machine • Process manager integral to business system • Operation invocation native to process modelling language • Application processes can be projected into the process management domain.



Aren't web services supposed to be the technology of the future?

Business process management technologies complement rather than compete with web services. They provide the capabilities to discover, design, deploy, execute, interact with, operate, optimise and analyse end to end processes. These are the technologies you need to discover your existing business processes, to design new processes and to execute the processes on your current technology infrastructure. They are the technology you will need to deploy and to supervise the everyday operation of business processes based upon web services.

Web services are less easy to define in part because three different definitions are used by the media – sometimes in the same article or program.

- The most common definition of web services is a purely technical definition – a set of software architecture standards supported by IBM, Microsoft and others. This is an important development in software engineering since it makes plug and play architecture a reality from software vendors and for businesses that adapt this new standard.
- The next most common definition of web service is a business service or process delivered through the web. This definition is used by many businesses to brand a new channel to market where they will perform business processes from another business using these new web services technologies. CISCO for example offers web services – order to delivery of CISCO gear – to top tier integrators.
- The final definition is used to describe a new generation of application service providers. For example, in October 2001, John Hagel and John Sealy Brown argued that the IT architecture of the future will be based upon web services – applications rented or shared by business partners for specific purposes and defined time periods. This is similar to the model of ASP (Application Service Provider), but using standards to provide integration among service providers⁷.

These three definitions share a common theme; this is a new way for businesses to make their software and/or business processes accessible to others – consumers, business customers, other business partners and regularly agencies. Web services, broadly stated, are an approach for computerising your business, software and architecture. They may be thought of as processes or process components but they do not provide the capacity to orchestrate those components into a specific business process you want to implement for a specific customers and do not provide the tools you need to monitor the performance of that business process once it is in operation.

Business process management technologies are the command centre you will need to manage web services. But the story will not end there. It will become possible to project the processing behind web services as a process and to interact with the process via an interface based on web services.

In this way, the world of process management and software services management entirely complement one other. Application developers will decide whether to write web services, or processes, or a combination, depending upon the advantages each brings.

7. John Hagel, John Sealy Brown *Your Next IT Strategy*, *Harvard Business Review*, October 2001.



Frequently Asked Questions

How do BPM tools provide more flexibility and agility?

The key problem with current technology is that businesses are trying to connect and automate processes at the level of technical integration – and they are struggling. Process management will simplify the whole environment by approaching these tasks in a quite different way. This is reflected at both technical and organisational levels:

Problem: How can I change processes with minimal impact on underlying technical infrastructure?

Why

The last round of efficiency gains came from breaking down barriers between functional stovepipes and reengineering inside the enterprise. Now the focus is on repeating this success across the interface between business partners.

The cost of cross-business reengineering is too high if managed on the basis of technical integration and systems implementation alone.

How

Business processes are modelled at the business level, independent of the computing environment, and managed in a logically centralised environment, which makes it easier to manage change.

Participants are managed in a directory that streamlines process deployment.

Application services are exposed to the process management system in a uniform methodology. Applications can be pre-integrated with the process management system once against their own process meta-model. Application components are fine grained and can be isolated, blurring the distinction between scripted processes and entity-based business logic. This enables legacy systems to be included within the process management environment.

Problem: How can I facilitate organisational change, employee empowerment and efficient customer response?

Why

Process change often implies organisational and cultural change that can be at least as costly and distracting as changes to IT applications. The introduction of new processes and systems needs to be managed in conjunction with changes in organisation structure, teams, new training and so on.

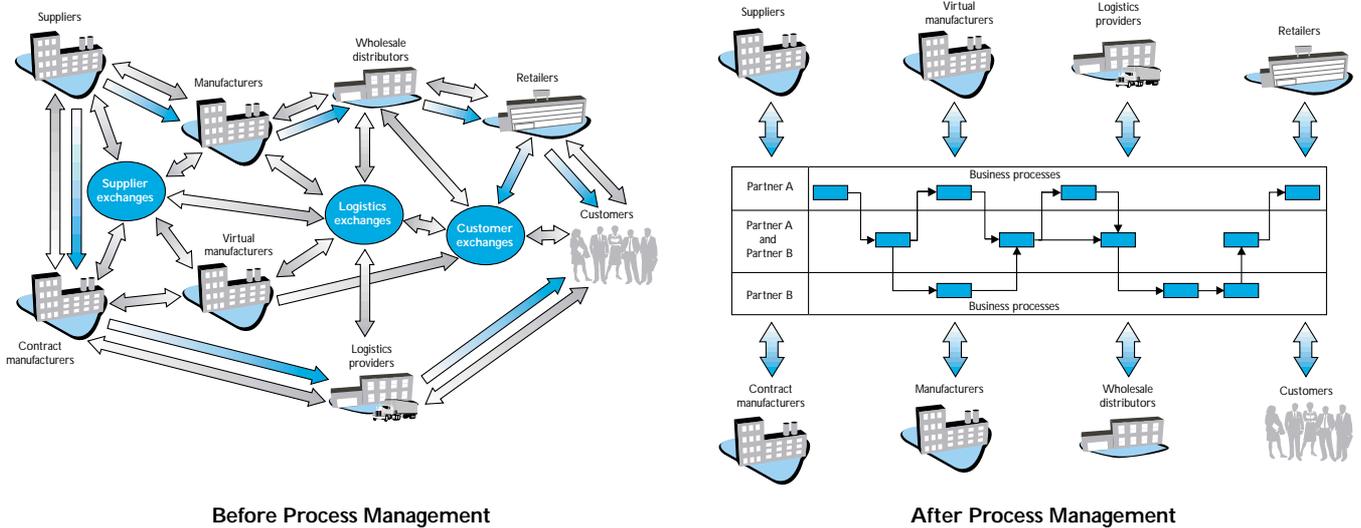
How

Workflow systems have improved over the years and now support collaborative human processes, including voting, agreements, issue identification, escalation and resolution. Workflows support networks of commitments and decision optimisation among employees, partners and customers. The new workflow models support the full involvement of teams within automated processes.

Process management systems encompass workflow. Their 'process portals' give employees insight into their role in processes and associated work items. Process coaches help users through process steps and resolve exceptions. The process desktop keeps employees involved in the process and amenable to changes in work patterns. Process management also reduces the delays in exception processing, through event-based triggers and rule-driven process routing.

Knowledge management can complement process management to help employees make smarter and faster decisions. Process changes can be deployed in an evolutionary manner. Sub-processes can be changed independently of supervisory processes, with fine-grained control.

Frequently Asked Questions



Can I realistically customise business processes?

Using current technologies the answer is undoubtedly no – but mass customisation of end to end business processes will soon be viable. It will bring significant business advantages and should be considered an objective of the enterprise architecture. More and more processes will migrate to the process management environment in the form of explicit process descriptions, and it will become possible to customise these processes for a variety of purposes. Straightforward examples include customisation for different suppliers, customers or distributors.

Process management systems will use object oriented techniques to support effective reuse, generalisation and specialisation of business processes at all levels including large aggregate end to end processes and more localised process patterns reused across a wide range of process descriptions.

What is a process server?

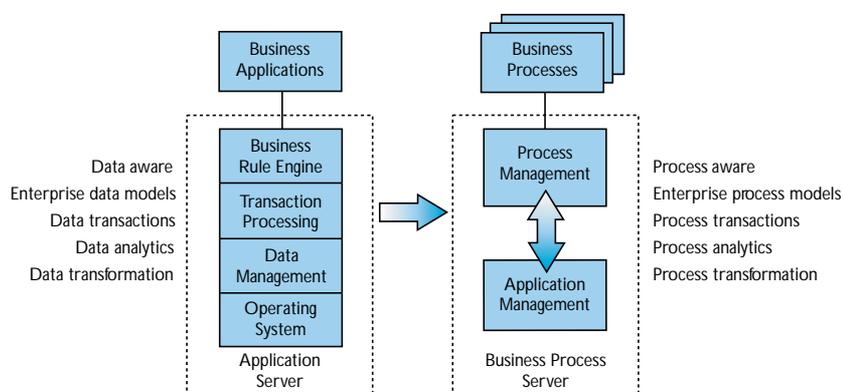
The process server can be thought of as an application server that offers dramatically more powerful capabilities to deploy processes – especially those that span multiple businesses.

Today's application servers are designed to support transactions and business logic that is primarily concerned with data sets. Using these powerful tools it is possible to build enterprise scale business applications that adhere to enterprise data models and support complex data transformation and analytics.

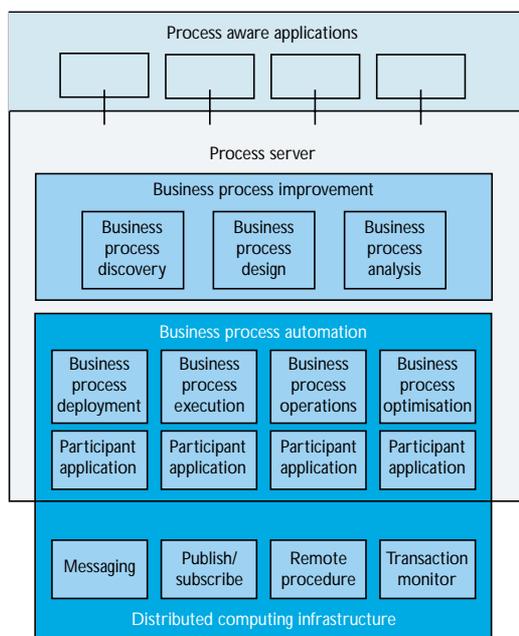


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In future, application servers will work hand in hand with process management systems to form new hybrid environments that support not just business applications, but entire end to end business processes. Components and applications built in this new environment will be aware not only of the enterprise data model, but will use the enterprise process model to thread them together. These new applications will be able to span multiple systems and multiple enterprises easily. They will transact with, analyse and transform business processes. Developing such applications will be radically simplified because of the new capabilities of the process server, which will look after the time dimension within any business application and the associated state transitions and persist the flow of data.



From application server to process server



Process aware applications are built on Process Server – they span systems, processes, enterprises and channels – and transact with, analyse and transform business processes

An analogy is helpful. Despite the fact that data in a database changes, it can be said to be relatively static in nature, whereas processes progress over time and evolve in line with changing circumstances. Processes are as real as data, but are not the focus of application development today. Most current applications are like automated clerks, reading, writing and processing relational data records, mainly fixed rows and columns. Think of data as like footprints in the sand. The process is the walk over the hill, and the footprints are the trail left behind. The hill is the objective, not the trail of footprints, yet the trail is also useful as a map.



Frequently Asked Questions

How do I compare vendors who seem to have very different core competencies?

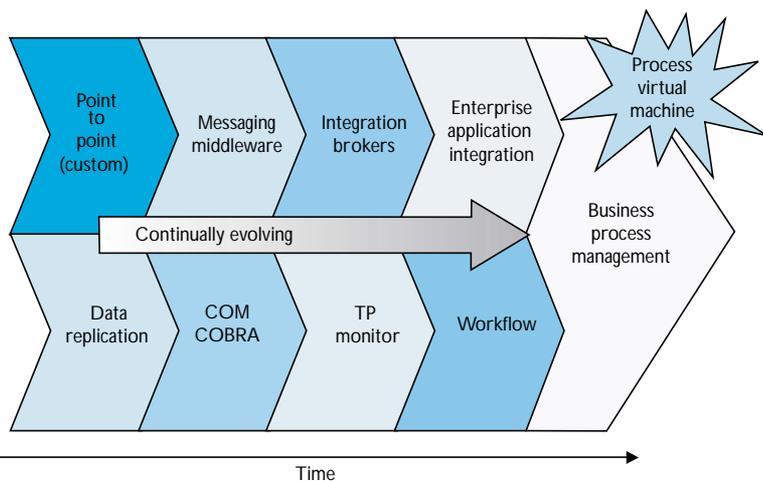
Prepare to be confused. A huge variety of software vendors are going to claim the process management space, inventing new acronyms for essentially the same ideas. Over the last year, as the benefits of process management have become clearer, vendors

in many different categories have begun to stress the process management capabilities of their solutions, or are using the term 'process management' to associate themselves with the process management movement.

Process management technology is part of a continuum, yet technical approaches vary enormously. Expect 'process management' products of all shapes and sizes, ranging from workgroup products to departmental solutions to enterprise-scale platforms.

Vendors use various terms to refer to the new capability. Some focus on process integration, others on process automation and others on the overall management of processes. Their products vary considerably in functionality. The following table distinguishes between BPI, BPA and BPM.

Integration technologies are evolving towards process management



Source: CSC Enterprise Application Integration Practice

Distinctions between business process integration, automation and management

BUSINESS PROCESS INTEGRATION	BUSINESS PROCESS AUTOMATION	BUSINESS PROCESS MANAGEMENT
<p>The set of activities that must be completed in order to process a request at the business level</p> <p>Whereas enterprise application integration solutions have typically supported discrete events in real time, process integration manages sequences of events over long periods</p> <p>Process integration is complex, because it has to handle long lived transactions, failures and cancellations driven by business requirements or conditions outside the control of IT</p> <p>Integrated processes must include complex logic to reverse out of conditions that cannot logically be achieved using the services of a transaction server</p> <p>Process integration manages the state of long lived sequenced transactions</p>	<p>Process automation builds upon process integration by providing tools to model, simulate, deploy and operate end to end processes. These tools include functional components and complex process logic</p> <p>Process automation bridges the gap between automated and manual processes by including human activities supported by workflow</p> <p>Process automation is an adaptive structure, designed to provide high agility, decision support and real time adaptation</p> <p>Whereas integrated processes are tied by the application elements they integrate, automated processes provide a separate environment in which complex logic can be executed</p>	<p>Process management builds on process integration and automation by completely separating process descriptions in a separate management environment</p> <p>The separation of the descriptions of the integration and automation processes allows them to be treated as data structures amenable to further processing of any type</p> <p>By exposing all processes in the form of explicit data, process management systems allow the enterprise to manage its process assets in a manner similar to the way in which it manages its data assets</p> <p>Applications built on process management platforms will tackle some of the most challenging problems in enterprise and supply chain design. They are built to oversee, evolve and adapt whole processes over time</p>

Several very different types of 'process management' product are emerging. Each offers the possibility of supporting reengineering and cross-engineering strategies – yet the ease with which individual products will achieve this will vary greatly.



Frequently Asked Questions

BPM product categories

PRODUCT EVOLUTION OR CATEGORY	ISSUES
<p>Extensions to Enterprise Application Integration – products with process design and management tools that assist the deployment and maintenance of the EAI solution</p>	<ul style="list-style-type: none"> • Process tools included to streamline and simplify EAI deployment are not the same as a process engine able to drive and direct integration and automation activities in line with defined business goals
<p>Process or workflow engines added to or integrated with EAI, application servers and other middleware brokers. These create a smarter form of middleware where the primary integration paradigm is the process</p>	<ul style="list-style-type: none"> • Unless the process engine has been integrated with the application component architecture in fine grained detail, the degree of control and precision within process orchestration will be compromised
<p>Evolutions of workflow products that extend the workflow paradigm into the domain of systems integration and B2B integration, sometimes through alliances or mergers with middleware companies</p> <p>Such products often have a more advanced workflow engine than the traditional view of document management and work item routing, and this allows them to support a wider variety of processes and coordinated work practices</p>	<ul style="list-style-type: none"> • Where processes are dominated by human collaboration, a workflow based process manager may be the most appropriate choice • Look closely at whether the back-end application integration and B2B integration elements of the solution also meet your needs • Can the solution model the end to end processes you wish to support?
<p>New process managers – sophisticated and adaptive software products that connect to and direct the operations of existing elements of the IT infrastructure, often positioning them in a supervisory role</p>	<ul style="list-style-type: none"> • These products have grown up in parallel with workflow and middleware products and have only recently become prevalent. Each has to be examined on its own merits • Understand whether the process engine component is primarily workflow oriented or collaboration and transaction oriented • Distinguish products that include a dynamic and sophisticated process engine from products that generate more static code from process descriptions – the latter are really just rapid application development
<p>Application development environments that use rules or processes to create applications, rapidly. The ultimate realisation of this is a model driven architecture where the business system is a simulator derived from a model of the business. This will be an area of innovation in years to come</p>	<ul style="list-style-type: none"> • Although effective at accelerating application development, the result may be processes baked into software • Model driven architectures may be complex to manage the development lifecycle
<p>Business process management systems – intended to play a role similar to that of a database management system, a logically centralised mission-critical platform for the management of enterprise business processes</p>	<ul style="list-style-type: none"> • Only a small number of vendors are attempting to create a business process management platform of this type. However, such products provide significant business advantages • Understand the extent to which they support open standards and can leverage and co-exist in mixed middleware environments • Examine how the platform supports your process management goals and allows ingrained processes in existing applications to be leveraged
<p>Process discovery, design, optimisation, analysis and simulation tools. These come in a wide variety because no single process management product that focuses on process deployment, execution and operation can also be best of breed in the discovery, design and analysis domains</p>	<ul style="list-style-type: none"> • Look for tools that complement your chosen process management platform and inter-operate seamlessly with it. Standards are critical if process models are to be exchanged easily at all levels • Ask how the loop between process operation, optimisation and design is closed; without rekeying of process descriptions
<p>Process aware applications, built on top of process managers or process management systems, that are able to transact with, analyse and transform business processes. These bring a new level of capability to the enterprise</p>	<ul style="list-style-type: none"> • For some business applications a 'vanilla' process manager will be insufficient • Many application vendors are examining whether their product functionality should in the future be based upon a process server in order to leverage the advantages of end to end process management • Some process management problems will be so complex that their solution can only be supplied as a vertical application of the process engine. Expect consulting firms to offer BPM solutions in vertical markets

Frequently Asked Questions



Process management products in all of these categories are available today (see Vendor Map, page 18) and new products are in development. These products will vary in scale, functionality, reliability and adherence to standards – just like other IT management solutions. BPML compliance is important but it is no substitute for closely examining the architecture and features of individual process management systems to ensure your needs are met.

Decide whether you are seeking an enterprise-scale backbone infrastructure that supports process management or a process manager that can be quickly and easily deployed to resolve discrete pain issues in the enterprise – or both. Individual business units will push for deployment of smaller scale, potentially very different, process managers, but building the process-managed enterprise is an enterprise-wide architectural issue. Mission critical process management will be built on best of breed middleware solutions, but middleware vendors may not provide the most appropriate process management platform in the long run, so examine the boundary between process integration, automation and management carefully when developing the architecture. Separating these layers will improve the overall management of processes.

What should I be asking 'process management' vendors?

- How can I create a stable IT infrastructure yet still have the capability to evolve my business processes rapidly?
- How does your solution separate the technical integration and automation processes from the business integration and automation processes?
- How can I model and deploy end to end processes that reach deep into my business and those of my partners?
- To what extent can I expose my existing applications as processes or as fine-grained components that can be included in end to end processes?
- What capabilities do you provide for process optimisation, analysis, transformation and simulation?
- Can I model and customise industry best practices and then deploy them easily on my IT infrastructure?
- How are transactions supported across long-lived processes that span multiple applications and business partners?
- Can I combine other best of breed process discovery, design and analysis tools with your process management platform? What standards do you support?
- Can I easily bind the public interface between business partners to industry standards, independently of the end to end process design?
- Can I write higher-level applications that read, write, transform and adapt my business processes? At run time, do these applications have visibility of the end to end state of the processes with which they are interacting?
- What development, configuration and lifecycle management tools are provided to support the development of enterprise-wide process models at various degrees of abstraction?
- In what ways does the process engine automatically optimise my processes and the computing resources they consume?
- My relationships with partners change over time and new partners and service providers need to be integrated. To what extent can I modify the boundaries and responsibilities between myself and my partners and service providers within end to end processes?



Business Process Modelling Languages

A business process modelling language is a meta-language that offers a generic execution model for business processes that can be translated into specific languages applying to vertical applications. BPML is one such language.

Do we really need a new language just to describe processes?

Business processes are perceived and described in different ways by people with different positions and roles within the business. For example:

- Software engineers understand business processes at the level of software implementation. They use a variety of process notations and methodologies for representing processes as software objects. (E.g. UML Activity and State Transition diagrams)
- Business users understand processes at the level of material flows, information flows and business commitments. They require support for integration and automation at all levels, systems, people, processes, businesses and industries
- Business analysts use a variety of business architecture and process modelling methodologies. (E.g. Zackman Framework, IDS-Scheer ARIS, CSC Catalyst™)
- Business managers understand processes in terms of organisational coherence and business outcomes. They use a variety of methods to manage and improve them. (E.g. Six Sigma, TQM and efficient customer response)
- Industry experts have developed higher-level models for processes that are specific to their sector and which help them solve problems associated with that industry. (E.g. Telecoms Service Provisioning Management [TMFORUM], Financial Services [Straight Through Processing] Healthcare HIPPA compliance [ACORD])
- In the retail supply chain, processes are collaboration oriented and focused upon planning, replenishment and forecasting
- In the finance sector, workflow and transactional support across organisational boundaries is of paramount importance
- In the telecoms sector processes govern service elements and network elements so as to provide end to end service provisioning and operations support system integration

A new language is needed that will provide people with different points of view with a common language for defining processes and allowing their direct execution.



Process modelling languages must support and unify three kinds of processes

	MATERIAL PROCESSES (THINGS)	INFORMATION PROCESSES (DATA)	BUSINESS PROCESSES (RELATIONSHIPS)
Purpose	Transform and assemble raw materials and components into other components and finished products, using resources	Store, retrieve, manipulate, display and communicate structured and unstructured data and knowledge	Articulate and complete conditions of satisfaction in interactions between customers and performers
Characteristics	Based on the traditions of industrial engineering	Based on the traditions of computer science and software engineering	Based on structures of human communication and coordination found in all languages and cultures
Verbs	Assemble, Transform, Transport, Store, Inspect	Send, Transact, Invoke, Save, Forward, Query	Request, Promise, Offer, Decline, Propose, Cancel, Measure

But process modelling languages are not intended to be read directly by humans and they are certainly not intended to become the only correct way to describe them. They provide a formal representation that is complete and unambiguous, which can be shared, translated into multiple specialist views and interpreted directly by computers so that their complexities can be managed properly.

What does a process modelling language have to be capable of?

To be complete a language must be able to:

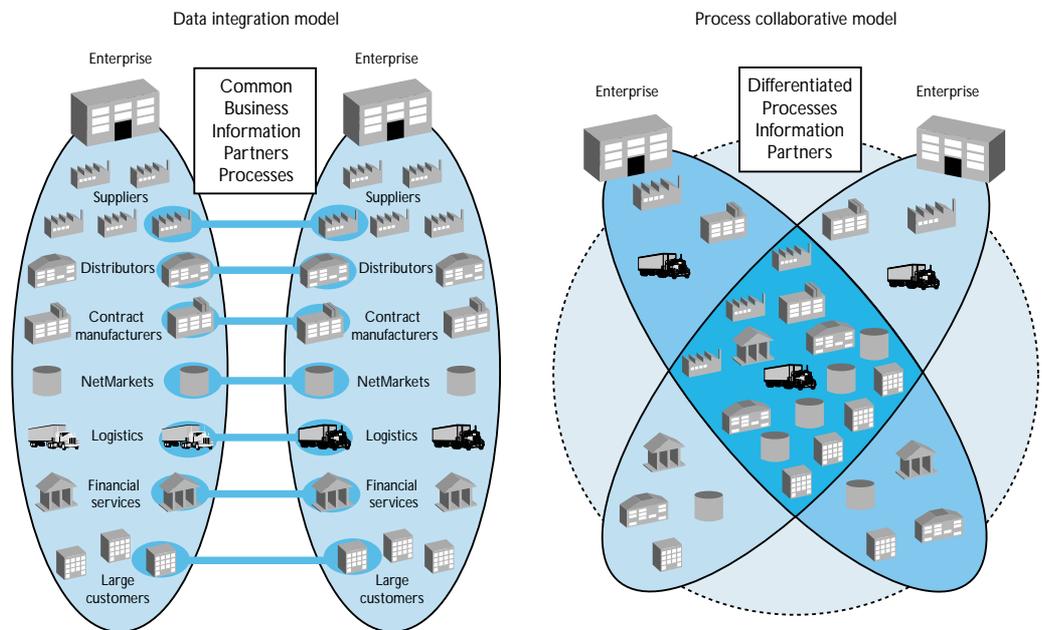
- Express the manner in which participants work together to achieve a common business goal
- Provide rich semantics for expressing the business logic, rules and information flows
- Place restrictions on data exchanged, time spans, and availability of services
- Support deeply nested business transactions and business exceptions
- Expose processes ingrained in software as explicit processes
- Compose existing process components into new value-added processes
- Enable process analysis, prediction, simulation and monitoring
- Enable processes to react to events and adapt to changing requirements in real time
- Simplify interaction between processes running in disparate systems and across business domains.



How do process modelling languages help with B2B integration?

When processes span business boundaries, loose coupling based on precise process collaboration is required because the business parties involved do not necessarily share the same application, integration technology or workflow implementation and they will certainly not allow external control over their mission critical backend applications. The collaborating processes must therefore be explicitly represented so that multiple businesses can support their execution on multiple systems.

Few existing technologies support this type of process collaboration – and fewer still can support it in the kind of heterogeneous IT environment that is inevitable in the extended enterprise – and yet it is essential if process integration and automation is to become widespread among partners. Process management must be a homogeneous capability in a heterogeneous environment.



From data integration to process integration

At the heart of the new technologies to support process management are business process modelling languages. Designed to allow the description and execution of any business process, these languages play a role similar to the relational data model in the description and management of data or HTML in the description and representation of published material. The most prominent proposal in this area today is published by the Business Process Management Initiative (BPML.org).

The emergence of these languages heralds a new era in the design of software systems. Whereas today's business processes are embedded in software packages, tomorrow's software systems will keep business processes separate from the software logic, making it possible to coordinate and manage them across any businesses that can interpret them.



The idea has caught on, creating a genuine convergence of interests but there also must be a fear that intense competition will lead to a divergence of standards. (It has happened before!) Agreement on a process representation formalism is the key to B2B integration.

Proprietary implementations of explicit process modelling languages already exist and a number of vendors are now developing standards-based process management platforms.

What is Business Process Modelling Language (BPML)?

The BPML (see Appendix 3) borrows from Thomas H. Davenport⁸ and defines a business process as: “A specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs: a structure for action”.

Key features include:

- A process, as defined by BPML.org, is a machine-executable set of transactions defined to fulfil a business objective, such as the procurement of materials, the trading of securities, and the provisioning of services
- BPML is a meta-language for the modelling of business processes, just as XML is a meta-language for the modelling of business data. It provides an abstracted execution model for collaborative and transactional business processes based on the concept of a transactional finite-state machine
- BPML processes span multiple applications and business partners, behind the firewall and over the Internet
- Participants in the process can be back-office systems (such as a database management system), software components (such as an EJB component), users (such as a purchase manager), and partners (such as a supplier or customer)
- Business transactions (such as the fulfilment of a purchase order) and system transactions (such as a transaction processed on a database table) can both be defined by a process. Business transactions usually involve two or more partners (e-business), while system transactions can involve multiple back-office systems (distributed transactions).

The unification of the dual notions of business process and technical process plays a major role in the definition of BPML.

BPML is a business-oriented language

Although you will find no business terminology in the BPML specification, its semantics reflects the characteristics and complexity of business processes. The design of BPML is a balance:

- The specification must not be so complex that it is impossible to develop implementations, yet it must also be precise
- The design must be sufficiently rich that process management systems are useful.

8. Thomas H. Davenport, *Mission Critical*, Harvard Business School Press 2000.



BPML is a foundation for other process standards

BPML is a meta-language that offers a generic execution model for business processes that can be translated into specific languages applying to vertical applications. Examples of such languages include CPFR for collaborative planning, forecasting, and replenishment processes; FpML for securities trading processes; and TMF for telecommunication services provisioning processes.

Process Execution

A process is executed by a Business Process Management System (BPMS), and by the different participants in the process (back-office system, software component, user, and partner). The BPMS is responsible for coordinating the transactions defined by the process (sequencing, synchronisation, scheduling); managing process instances (life-cycle management, persistence); and processing distributed transactions (two-phase-commit protocol, open-nested transactions, compensating transactions).

Process Participants

A business process usually involves at least two business partners. Each partner manages a subset of the participants in the process, usually the partner's back-office systems, software components, and collaborators (users interacting with the process). The BPMS deployed by a given business partner is responsible for the management of the participants in the process that fall directly under the partner's responsibility. Thus the BPMS can be seen as a gateway – or process level firewall – between process participants.

Public Interface and Private Implementation

A process deployed by an enterprise on its BPMS usually instantiates the private implementation of a larger e-business process involving the enterprise and its business partners (at the least those that are involved in this specific e-business process). Partners participate in the e-business process by interacting with the enterprise's private implementation through a public interface, usually defined in collaboration between the enterprise and its partners.

For example, in a collaborative purchase order management process, the enterprise's private implementation can be described as a procurement process, while the supplier's private implementation of the same e-business process can be described as a fulfilment process. The enterprise's procurement process and the supplier's fulfilment process are two private implementations of the same e-business process, which interact with each other through a common public interface.

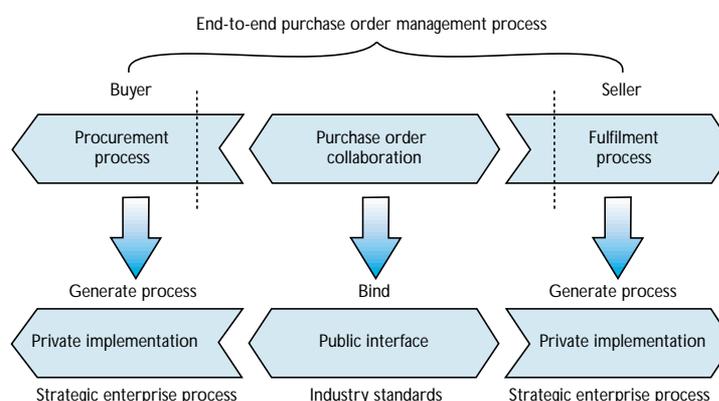
Do not confuse the private implementations and the public interface of an e-business process with the notions of 'private processes' and 'public processes'. The approach advocated by BPMI.org accommodates the notion of a private process, but only as a particular case of a business process that does not involve any other partner than the enterprise itself (that is, it is an internal business process, as opposed to an e-business process).



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Moreover, the notion of public process makes sense only if a specific entity is responsible for its execution – for example, an EDI Value Added Network (VAN), netmarket or process service provider (e-hub). Even in that case, BPML.org would not see a VAN operator as the entity responsible for the execution of an imaginary public process, but rather as a business participant in the overall end to end e-business process.

Thus BPML.org adopts an enterprise system centric view of process management. As a consequence, the private implementations of an e-business process are the only parts of a business process that have to be executed, while its public interface is nothing more than a vector for the collaborative execution of the e-business process by its participants. Such a public interface is not executed by itself but rather implemented by the respective private implementations of the e-business process.



Private process implementation – public interface standards

What was the impetus for BPML?

In the late 1990s there was an explosion of experimentation with new business models and business to business integration. It became clear that the lack of a common language to express complex business processes was hindering the development and adoption of e-business. BPML was developed during the spring and summer of 2000 to provide the solution.

The objective was to develop a language that could model business processes in a way that could carry the business semantics directly to operational execution, and that separated process descriptions from software logic such that process management systems could be developed to empower the business user. If such a language were to be successful in helping transition e-business from an ad hoc approach to a mission critical enterprise solution, it would need a rigorous mathematical foundation.

A declarative semantics and a distributed concurrent processing model was chosen so that the process management systems that supported BPML could provide end to end process analysis, prediction, simulation and metrics, spanning multiple business applications and business partners, and providing visibility across all participants.



The types of processes for which BPML were designed include:

- Processes that combine business to business collaboration with enterprise application integration
- The consolidation of workflow processes with automated processes
- Processes that include hosted applications, such as web services.

In addition, BPML was designed to:

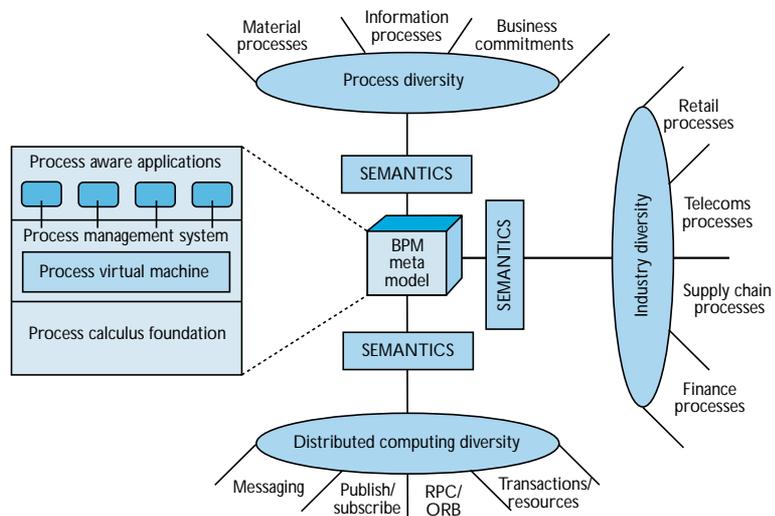
- Expose existing back-end systems and software application logic as business processes
- Allow a process engine to integrate with existing messaging and transaction (middleware) and database management systems
- Support the interchange of processes offline (packaged processes) as well as online (peer to peer)
- Enable processes to react to events and adapt to changing business requirements in real time
- Simplify the management of interactions between processes running on disparate systems and across different business domains
- Enable the rapid development and deployment of new processes, by combining existing process components into new value-added processes
- Enable IT to combine best of breed solutions, such as visual process modelling tools, process engines, process management systems and process analysis tools.

The developers recognised the importance of leveraging existing standards and technologies within BPML, including standards for the exchange of information and events, business transactions, service advertising and discovery, real time collaboration and web services. BPML powers the convergence of enterprise and B2B technology standards.

What are the formal foundations of BPML?

In order for BPML to support the definition and execution by a BPMS of any business process, BPML must be semantically rich enough to represent material flows, information flows and business commitments. It must also be able to support the different process paradigms in common use across different industries and be able to unify the various distributed computing models that underpin existing and emerging middleware. Moreover, it must be a meta-language able to model industry-specific process modelling languages.

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BPML semantics reflects process, industry and middleware diversity

The formal basis for BPML lies in research into mobile distributed agents, concurrent computing and the formalisms of process calculus (Pi-Calculus and Join-Calculus), Functional Nets and PetriNets.

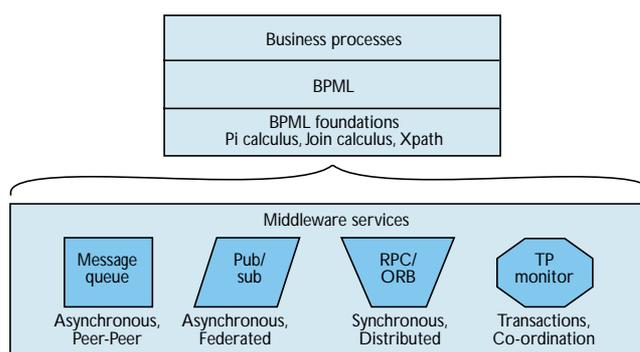
BPML requires such a formal and mathematical foundation for the following reasons:

- Collaborative commerce is a complex many to many enterprise integration problem in at least three dimensions (multiple back office applications, multiple business processes, through multiple B2B channels). Without a strong foundation, forthcoming Business Process Management Systems would be unable to provide the high integrity that leading companies demand in their e-business infrastructures.
- Strategic business processes span everything from short-lived real time transactional systems to long-lived extended collaborations. This creates demanding requirements for transactional integrity, resilience and scalability in the extended enterprise. A BPMS must be able to support advanced transaction management, including distributed coordinated transactions, open nested transactions ('sagas') and backward and forward recovery.
- It is expected that BPML will be used to publish and advertise process-based services, as well as automate those services. Therefore, BPML must be a formally defined computer readable language.
- An extended enterprise is a complex distributed and concurrent system. Numerous parallel processes span multiple applications and partners. Process topologies are dynamic and participants frequently change roles. Processes cannot be deployed in such an environment – nor running processes managed or maintained – without a sufficient foundation for ensuring the manageability of the entire system. In addition, the new Business Process Management Systems now provide the opportunity to modify (optimise) processes in real time. The state of the overall system must be known at all times.



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- Associated with both processes and applications will be business rules that express deeper business semantics, conditional logic, calculations, predicates, negation as failure and priorities. Such rules must be formally defined if we are to rely on their results and to use these within processes to provide reliable behaviour and decision control.
- BPML will be used to model mission critical processes, enterprise constraints and the utilisation of resources and services. A formal foundation is mandatory to be able to layer analysis tools into such environments and to be confident the enterprise can forecast and plan.
- Business Process Management Systems herald the potential of process analysis and simulation both within the enterprise and throughout the extended enterprise. These value-added possibilities were considered at the outset of the design of BPML and are only possible if the analysis and simulation tools can reason about both the design of the processes and the state of the process execution environment.



Process management unifies the different middleware paradigms into a single model of distributed computing driven top down by a process meta-language



The formal foundations of BPML

WHAT IS PI-CALCULUS?

Pi-Calculus is a mathematical model that focuses on communication among processes. It originates from the older CCS and permits a natural modelling of mobility (that is, dynamic reconfigurations of process linkages) using communication of names.

Asynchronous pi-calculus is a variant of the pi-calculus where message emission is non-blocking. This is important in the modelling of distributed business processes.

For more information visit <http://lampwww.epfl.ch/mobility/>

WHAT IS JOIN-CALCULUS?

Join-Calculus is a programming language that can be used to experiment with the process calculus model.

Join-Calculus is entirely based on asynchronous message passing, which is the basic operation of most distributed systems. Processes are executed asynchronously and produce no result, whereas expressions are evaluated synchronously and produce values.

In Join-Calculus, processes communicate by sending messages on channels. Messages are made of zero or more values; and channels are themselves values. Channels and the processes that use them are defined by a single language construct. This feature allows channels to be considered (and implemented) as normal functions. These features allow highly dynamic distributed environments to be constructed.

The Join-Calculus reference specification introduced the concept of a Join Pattern. This allows a process step to wait to get messages from multiple participants, which may be other processes running in parallel.

For more information, visit <http://join.inria.fr/>

WHY IS PROCESS CALCULUS IMPORTANT TO PROCESS MANAGEMENT?

Business Process Management Systems must be able to model, execute, optimise and analyse end to end processes.

An end to end process is made up of two or more independent processes communicating with each other in order to co-ordinate the overall execution. For example, process A may wait for two other processes (B and C) to reach a certain step before continuing. Thus B and C must both send a message to A, which must wait until it has received both messages.

It is possible to execute end to end processes on a single system. It is much harder to distribute the processing across multiple systems and ensure that everything works as expected. Process calculus provides the computer science theory to enable this to happen:

- Individual execution engines match up the messages sent from one process to another and associate them with the right steps in each process according to the design of the end to end process. This requires stable, named channels for communication among the autonomous processes
- To model more extended, more complex and dynamic processes, processes must be able to direct the path other processes take. This requires the ability to pass channels by name and allow these names to be used in switches and conditions
- Although other models of distributed processes exist, they are weaker, supporting only static process topologies. The process engines are centralised or focused only on the messaging. By contrast, BPML enables the orderly execution of an end to end process across many centralised engines using messaging. BPML solves many of the problems of distributed process execution:
 - No centralised engine is required
 - For any set of processes, it is possible to prove that no deadlocks will occur
 - For any set of processes, it is computationally feasible to determine if two or more processes will reach completion
 - Rich distributed processing models are possible, creating a loosely coupled distributed execution. This reflects the natural way to build the extended enterprise.



HOW DOES BPML USE THE FORMALISMS?

BPML can be thought of as a high level language that can be reduced to Pi-Calculus and Join-Calculus, both of which are lower level languages. Like Join-Calculus, BPML supports both synchronous and asynchronous communication primitives.

Based on these formalisms, BPML extends the centralised model of process by adding the concepts of Choice and All:

- Choice – a process branches based on a decision taken by another process. The branch taken depends upon which other process first communicates its decision
- All – a process waits until messages from a set of other parallel processes are all received.

As stated above, because the messages sent between processes can themselves be channels, BPML has the ability to support process topologies that are more dynamic than traditional models of workflow. The notion of these dynamic process topologies and end to end processes that span any number of participants, including participants that join the process dynamically, and participants that are themselves processes, are the central ideas that distinguish BPML from other process modelling languages.

BPML and Join-Calculus are two distinct languages that have nothing in common except the utilisation of a common mathematical model of process calculus. Process calculus by itself would not create an effective enterprise software system. BPML adds support for exception handling, transactions and flexible process data. XML syntax was chosen for BPML because it is an accepted standard. Developers and users of business process management systems will benefit from the growing body of sophisticated XML processing software.

HOW DOES A BPMS USE THE FORMALISM?

Here are some examples:

- A federation of process management systems can execute an end to end BPML process predictably. This in turn means that the BPMS can support reliable transactions
- A process design tool uses 'swim lanes' to visualise the independent process threads and the flows of messages among them
- The execution engine can guarantee not to become deadlocked
- Analysis tools ensure message match and conflicts are avoided
- Processes can be optimised. For example, serial steps can be performed in parallel, and redundant steps can be removed
- Processes can be simulated in a secure 'sandbox' before running them live.

IS THERE ANYTHING NEEDED BEYOND BPML?

BPML is a vendor-neutral interchange format for expressing processes, just like EDI is a vendor neutral format for expressing business transactions and HTML is a vendor neutral format for expressing the presentation of web pages. BPML does not create processes, nor do its limitations affect the ability of any process to exist. It simply allows a definition of these processes to be exchanged between software tools and provides formalism for the development of process management systems. Like HTML, BPML will be extended over time.

Much like HTML and EDI, the end-user does not use BPML directly but rather uses a variety of best-of-breed tools that rely on BPML as a common definition language. This is similar to the roles of web browsers, web servers and HTML.

- A BPMS, like a spreadsheet, is a business tool. Not all business users are familiar with or capable of producing sophisticated spreadsheet models, but everyone is capable of using a spreadsheet model developed by someone else. In the same way, we expect tools will be developed to help novices create BPML
- BPML is an imperative language, meaning that processes expressed in BPML can be directly executed on a BPMS. It is however possible to develop languages that express higher-level ideas. For example, the concept of 'assigning a task' can be decomposed into a BPML pattern: the business manager sends team members a message containing a description of the task (in BPML). Team members respond with a message indicating whether they can perform the task. The final message goes from the manager to the team member chosen to perform the task. The decision could be based on process data communicated to the manager by the team members in their acceptance messages



- Many different industry specific process-modelling languages – or more probably vocabularies – will be developed. These will be reducible to BPML, allow for the generation of BPML, or allow the performance of operations on a BPMS executing the BPML. Like two lawyers holding a discussion in which they refer by name to individual statutes or bodies of case law, similar high level languages will be developed to refer to BPML patterns and operations
- BPQL – the business process query language – will be developed to allow queries and updates relating to process designs in a process repository or running process instances in a process engine.

Note

The vendors involved in the development of process management systems chose to adopt this bottom up approach – with higher level languages inheriting the characteristics of BPML – so that it is possible to model business processes top down. Historically, all progress in the development of computer systems has been this way.

TO WHAT EXTENT HAVE THE AUTHORS OF BPML VALIDATED THAT IT CAN MODEL DIFFERENT TYPES OF BUSINESS PROCESSES?

- BPML can perform the computations that modern object oriented computer languages can perform, although it will not initially be practical to use BPML for all programming tasks
- The BPML data model is XML Schema. This can be more powerful than the data types found in mainstream computer languages. For example, BPML can model sequences and groups
- BPML is a model of distributed parallel computing
- BPML can model the operational aspects of middleware, including asynchronous and synchronous messaging, publish/subscribe, remote procedure calls and resource co-ordination (transactions)
- BPML can model systems that can be modelled as a finite state machine. BPML is ideal for discrete event simulation, used in many types of business simulation
- Processes in the telecoms sector can be reduced to states and transitions and can readily be modelled in BPML. However, business users will not think in those terms. They will use specific vocabulary to refer to individual states or transitions in the system, for example, to configure a service for a new user. Each of these can be modelled as a BPQL query upon the BPMS
- Supply chain processes involve communicating information between many partners up and down the chain. Each partner is represented as a BPML process in a 'swim-lane', each communicating with the others for the purpose of sharing information or co-ordinating activities
- Processes in the finance sector are more centralised, often with one internal process receiving and sending messages. BPML can model this and can also model end to end processes that allow the processes of one company to be more closely co-ordinated with those of others. This is a way of implementing straight through processing
- With the addition of timing, resource and constraint attributes, BPML will be able to model the broad area of plans and schedules. For such processes, Gantt Charts are expected to be a useful visualisation.

ARE THERE ANY LIMITATIONS OF BPML?

High level goals

Very high-level semantics like goals and objectives cannot be translated to BPML. However, this is not a problem because BPML is only intended for process execution. It will be a long time before business systems automatically translate high level goals to executable processes. BPML does however provide business people with support for goals, for example:

- Measuring the performance of a process to ascertain whether goals are likely to be achieved
- Performing a query to determine who is responsible for achieving a goal or what might cause the goal to be unreachable.

Manual processes

BPML can be used to model manual (off line) processes but obviously a BPMS cannot execute them. However, the BPMS can simulate, monitor, measure or analyse manual processes that are executing in the real world.



Appendix 1

BPM Summit Overview

Delegates to the world's first Business Process Management Summit, London, 27 September 2001, confirmed the urgent need for a new generation of technologies to manage business processes.

At the event, organised by Netmarkets Europe and CSC's Research Services, and supported by BMPI.org, delegates from business and public sector organisations heard from researchers, vendors and leading-edge users about a new wave of technologies providing business process management (BPM) capabilities. This was no ordinary conference, but a groundbreaking executive brainstorm about BPM. The 93 delegates from Fortune 500 companies used networked laptops to respond in real time to the presentations and workshops, and to answer specific questions. This dialogue confirmed that business processes – and particularly the end to end processes that reach across the value chain – are at the top of IT and management agendas. Organisations are concerned about their ability to work in the coming business process centric world, and there is a clear demand for technologies to manage business processes. Yet the delegates' message to the vendors was clear: they are wary of promises, and want to see proof that the new business process technologies deliver value.



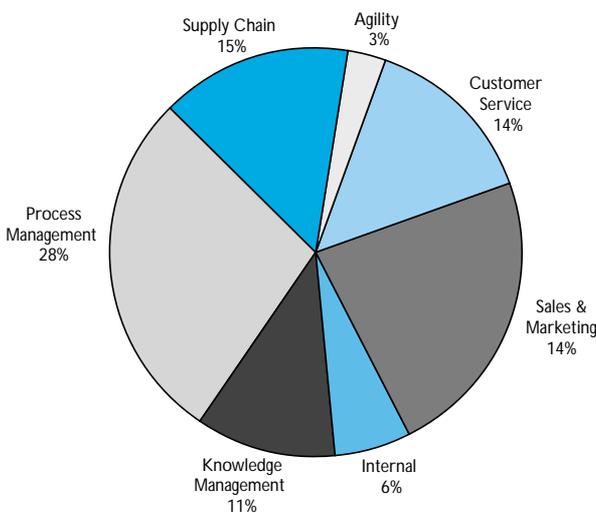
Organisations are trying to manage their business processes but today's tools are inadequate

When asked what processes they were struggling with, most delegates named processes that reach across the supply chain: customer service, sales and marketing, and the supply chain itself. Some are also addressing processes that share information with people outside the organisation – customers, suppliers and partners – and enable them to perform tasks using the organisation's information.

Customer service in this context means customer self-service: placing orders against existing contracts, assessing technical information such as material management documents, and receiving technical support on-line either directly or through a more passive list of Frequently Asked Questions.

Sales and marketing covers on-line sales of goods and services. This includes direct sales to consumers and participation in B2B catalogues, private supplier portals, auctions and exchanges, as well as on-line support for field sales staff.

What processes are you struggling with?



Delegates to Business Process Management Summit, September 2001.

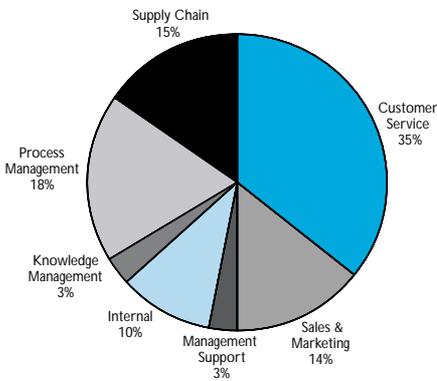
Supply chain processes by definition include suppliers and other partners such as logistics companies. Most of the projects named by delegates involved focused supplier portals, e-procurement or the use of public market sites. They rarely included an end to end view of the supply chain. Their thinking may have been coloured by types of software solutions they were familiar with.

Delegates defined *knowledge management* from the inside out. The knowledge management initiatives they cited are to gather and share internal information, although most will eventually share knowledge throughout the value chain. The internal projects named mostly focused on improving internal help desk services or administrating human resource programmes. These are not particularly pressing issues, but these internal projects are often seen as a low-risk way to test the application of new business process technologies.

Several delegates responded to this question with a plea for better, more flexible capabilities to manage business processes in general as well as naming specific processes.



Financial Services



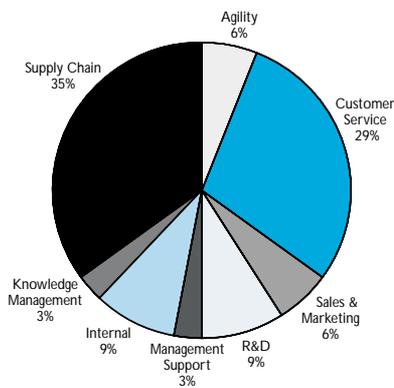
BPM priorities depend on the competitive environment in the industry and prior experience with business process programmes

Delegate response to the question: “What processes would you focus on today?” reflected the very different perspectives of different industries.

In *financial services and government*, interaction with the customer is the chief concern. For financial services, this means developing customer-friendly applications to enable customers to access information, manage their finances and buy financial products on-line. Supply chain processes are also very important here because these companies need to access partner firms and competitors in order to provide information and offer financial services products. For government organisations, whose ‘customers’ are the citizens, the chief issue is providing access to information and services on-line.

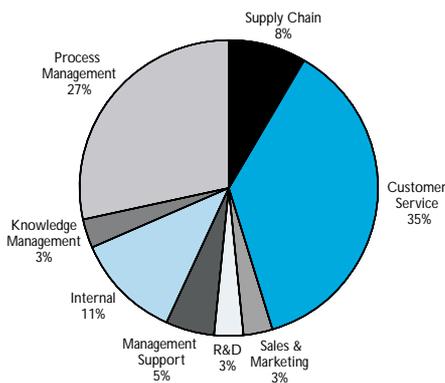
E-government initially promised improved service at much lower cost – but this will require total transformation of the business processes and enabling applications, which are now solely focused on the internal operations of individual government departments. Both these sectors want better process management tools, because both are having trouble developing processes that include customers remote from day-to-day operations.

Manufacturing



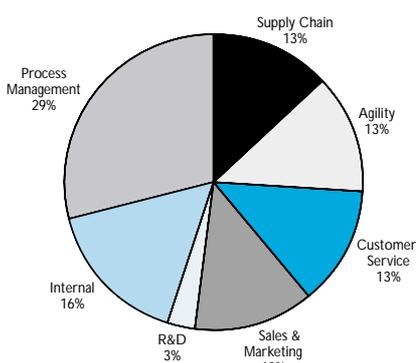
Delegates from *manufacturing* companies nominated supply chain and customer facing processes as their top priorities. This reflects their well-established supply chain programmes, and the demand from their customers for more self-service and/or direct access to information. Manufacturing companies are clearly more focused on specific processes than on their ability to manage processes in general.

Government



The *services* sector is focused internally, on back-end processes such as the supply chain. This reflects the nature of their business – solving customer problems through projects rather than providing the customer the capacity to solve problems for themselves.

Services





The business drivers cited were grounded in the three C's: customers, competition and change

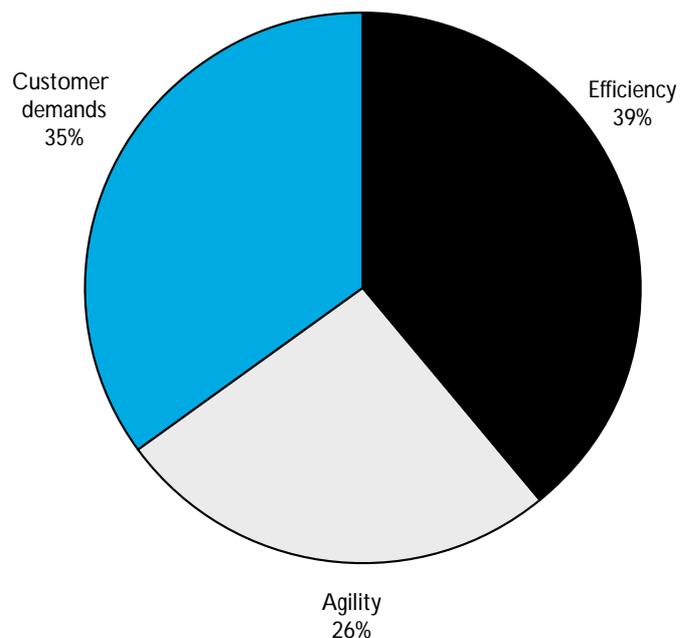
Delegates to the Business Process Management Summit see business process issues as both a product of and a solution to a challenging business climate. They divided the business drivers for their process initiatives into three nearly equal categories: efficiency, agility and customer demands.

Efficiency is the need to keep cutting costs – both operating costs and the cost of capital. New processes can lower costs by eliminating inefficiencies with the organisation, or by cutting cost in the value chain as a whole.

Agility cuts the time required to develop products and services and to respond to customer and market demands. Delegates expressed this as the need to streamline processes and integrate systems and business units. New processes achieve agility by providing better coordination and visibility, and by enabling faster deployment of other new business processes.

Customer demands are business drivers that focus on customer retention and satisfaction. Delegates believe their customers want better service and self-service. They see the Internet as the primary way of delivering the interaction their customers demand.

What are the business drivers for your process programmes?





Appendix 2

Summary of BPML Semantics

Summary of BPML Semantics



Central to the design of BPML are constructs that enable businesses to express the manner in which participants in a process work together to reach an end state or goal. Autonomous systems, applications and external interfaces can be modelled as agents, each with complex internal behaviour but communicating freely with each other. These constructs, in a highly dynamic environment, enable computerised processes to approach modelling the full complexity of business.

The table below gives a very brief summary of the main features of BPML. It is based on the public release of BPML, version 0.4. For the latest specification, refer to www.bpml.org.

It is the way these features are used together – and the options and parameters associated with each – which gives BPML the power to express complex, distributed, dynamic, end to end processes.

FEATURE	EXPLANATION	PURPOSE
Process	An implementation of a business process that can be executed by a software system, e.g. a BPMS. BPML processes manage the lifecycle and availability of all the resources involved in the process and constrain the way in which they are used.	Processes model data and document management, work items, services, software components and even equipment and perishable goods, end to end.
Process data	Used to hold or reference information that is accumulated during the life of a process.	Process data lives for as long as the process lives – days, months or even years. It can be used by applications to query the state of the process end to end. For example, an application could query the state of a supply chain process.
Messages	<p>Message exchange is fundamental to business processes. Messages are produced or consumed by processes, using a construct called an activity.</p> <p>Message consumption and production are types of activity that may be performed in a process. Others are described below.</p>	<p>All participants in a BPML process interact through the exchange of messages. Data storage and retrieval, method invocation and work item management can all be modelled in the form of message-based interactions.</p> <p>Messages are of arbitrary size and complexity, modelling everything from low-tech information such as email to high-tech information such as complex product description.</p> <p>Activities can wait on messages to be received in a lot of different ways, mirroring the complexity of distributed business processes.</p>
Participants	The participants of a process are the business entities with which the process interacts.	<p>Participants model IT systems, applications, users, partners and other processes.</p> <p>Abstractions of participants include organisational roles, business channels and generic services (e.g. sales manager, marketplace, billing service).</p>

Summary of BPML Semantics



FEATURE	EXPLANATION	PURPOSE
Dynamic participant	<p>A participant not known at process design time.</p> <p>Dynamic participants become known to a process by the receipt of a message from another process at run time.</p>	<p>Allows processes to respond to changing business conditions and to model dynamic process topologies. This is one of the distinguishing features of BPML.</p> <p>Even where participants are concrete entities like IT systems, applications, users and partners, this is very powerful. But dynamic participants can also be processes themselves. For example, a process can establish dynamic links to unknown processes established at run time by business partners.</p>
Consume	<p>The consumption of a message provided by a process participant, waiting until an appropriate message is available.</p>	<p>For example, wait for one of several buyers to send a purchase order totalling \$5000 or more, ignore all messages from unknown buyers or totalling less than \$5000.</p>
Produce	<p>The production of a message and its delivery to a participant. Time constraints can limit the availability of the message.</p>	<p>For example, send a bid to the marketplace and wait 20 minutes for the message to be consumed. If not consumed within 20 minutes, notify the user.</p>
Nested process and Spawn	<p>Defines processes that have a lifetime independent of their parent process. Nested processes are initiated within the states of the parent process. Spawn creates a new instance of the nested process.</p>	<p>Used to model services and resources that are available to participants with some restriction. For example, a service agreement process can expose a nested process for each service available under the agreement, but can exclude services when the account is overdue or the agreement has expired.</p>
Activities	<p>Represent the flow of control in a process. Processes are based on the execution of activities and the flow of information across activities and between activities and participants. The state of the process is the state of the activities that comprise the process.</p>	<p>Simple activities model the consumption and production of messages, tasks, data or goods. They also model actions and failures.</p> <p>Simple activities involve interaction with the environment and are therefore prone to communication and operational faults, requiring time constraints and compensating activities to be defined.</p>
State	<p>Each activity in a BPML process represents a process state.</p>	<p>States and state transitions are the foundation for the reliable execution of business processes.</p>
Complex activity	<p>Represents the composition of sub-activities, for example, serial, parallel and conditional flows. Sub-activities are bound to the lifetime of their parent process.</p>	<p>They model compound states consisting of multiple activities representing sub-states. Prone to all the same failures as simple activities, they may therefore require the modelling of exception handling and transactions to ensure proper execution.</p>
Process activity	<p>Process activities are used to manage the data associated with a process, to spawn and join nested processes, to suspend and complete processes and to repeat activities, including conditional and non-conditional loops.</p>	<p>Used to model activities that affect only the process and do not involve interaction with the environment, hence no exception handling or time constraints are required.</p> <p>Process activities model things like causing a process to complete, a complex activity to be repeated, a transaction to be aborted or a nested process to be spawned.</p>

Summary of BPML Semantics



FEATURE	EXPLANATION	PURPOSE
Rules	Rules affect activity selection (branching and repeating) and govern message consumption. Rules can act on information within the process or sent to the process. Complex business logic demands that a process selects one of several alternative activities or discriminates the information upon which it acts. Rules can be used at many different places in the definition of a business process.	<p>Rules can be used to model business level validation of messages, to link processes to events occurring in the environment outside the process or to express extraction of data from messages.</p> <p>An example of a rule might be that a repeating customer is defined as a customer that has visited more than once, and a valued customer is one who has bought goods worth more than \$500, but must be a repeating customer.</p>
Process branching	Occurs as the result of a decision made by the process.	Supports the modelling of process execution that depends upon the information collected and created during the lifetime of the process.
Participant branching	Occurs as the result of a decision made by a participant and communicated to the process in a message.	Used to model collaborative processes in which the process reacts to requests or reports from its participants. Combined with dynamic participants, this is one of the distinguishing features of BPML.
Co-ordinated transaction	Provides an all or nothing guarantee by assuring that all participants in the transaction agree to either complete the transaction or abort it. Based on a two-phase commit protocol. Isolates the transaction.	Enables distributed co-ordination of business transactions across multiple systems and processes.
Extended transaction	Relaxes the isolation requirement of the co-ordinated transaction, while preserving the all or nothing nature of transactions, aided by forward and backward recovery.	Allows for long living transactions to acquire resources for short periods of time, while supporting arbitrarily complex levels of nesting and interleaving that occurs in complex, multi-party, collaborations.
Compensating activity	In order to guarantee full recovery of any process, compensating activities are used to recover from activities that cannot be rolled back automatically.	Examples include sending an e-mail, shipping a package, or modifying the state of an external system that is not transactional.
Process abstract	Defines the interaction between the process and its participants. Effectively models the way in which participants wish to communicate in order to participate in end to end processes.	<p>Used to describe a system, business partner or user for the purpose of enlisting them as participants in a process.</p> <p>Collaborative processes such as those described by ebXML, RosettaNet and web services can all be represented using BPML.</p>
Assignment and release	<p>Determines what information is communicated to which participants and in which direction.</p> <p>Assignment can be very specific, but BPML also provides a simple syntax for assigning whole messages between processes. This allows the easy modelling of message routing.</p> <p>Release can be used to discard previous assignments.</p>	For example, a service provider process may hold substantive information, only a portion of which is directly relevant to the customer. It may include calculation, such as calculating the total of a purchase order and assigning this to the process data and therefore available to other participants through messages.

Summary of BPML Semantics



FEATURE	EXPLANATION	PURPOSE
Exception	Any error occurring while the process is executing, whether the result of local processing or communicated to the process by a participant.	Processes may engage in recovery, select a different path of execution or communicate failure to participants using exception handling. For example, while attempting to negotiate a trade between a buyer and seller, a credit check fails and the buyer and seller must be immediately notified.
Time constraint	Some processes are said to execute forever, yet some processes or segments of processes must be finite in time. Time constraints may be used in conjunction with many of the other BPML features described in this table.	For example, while there is no arbitrary limit on the amount of time a customer request remains open, quality of service determines that the request be resolved within time limits. Time constraints and the modelling of alternate states (e.g. escalation) using activities, can be used to model many common business situations.
Sequence Activity	Models a flow of control in which all activities execute serially. Can be repeated indefinitely. Sequences within sequences can model complex transaction sets.	For example, open a bank account, deposit money in it, inform creditor, authorise debit.
Choice Activity	Models a flow of control in which one activity will execute. The flow concludes after one activity has completed. Can be repeated indefinitely.	For example, on the buyer side, a participant branch waits for the order to be accepted and delivered, or completes if the order is rejected.
Switch Activity	Process branching. Models a flow of control in which zero or more activities will execute, depending on the outcome of rules. The flow concludes after all activities have completed or immediately if no activity should be executed.	On the seller side a process branch uses a rule to determine whether an order can be accepted. It informs the buyer of the decision, and proceeds to deliver the order if it has been accepted.
For-Each Activity	Models a flow of control in which a sequence of activities will execute over a set of values. The flow concludes after the last sub-activities have completed over the last value in the set.	For example, process each line in the purchase order and send a message containing just one of the line items.
All Activity	Models a flow of control that comprises multiple flows of control. The flow concludes once all sub-flows have concluded.	For example, notify the buyer that an order is ready to ship and ask the carrier to ship the order.
Empty Activity	Used to model an activity that occurs outside of the process, i.e. the process has no visibility of its execution, nor does it interact with the participant during its execution.	For example, modelling a meeting that takes four hours to complete, before proceeding with the next activity.
Operation	A synchronous type of activity, involving a synchronous request/response message exchange – really shorthand for a transactionally bound consume/produce pair of activities.	For example, securely depositing funds in an account.

Summary of BPML Semantics



FEATURE	EXPLANATION	PURPOSE
Repeat Activity	Used to model a repeat of a complex activity without recursion. It models a transition to the beginning of a previous state or the repetition of an executing activity.	Plays the role of a loop in a traditional programming language.
Schedule	Schedules the execution of an activity. Uses duration, recurring and relative to time types to specify the schedule.	For example, schedule a sequence of activities to occur at the end of the business day (after 5pm).
Namespace	An XML construct that is used to distinguish between the various domains in which a process may be used.	All process, abstract, message, participant and activity definitions within a BPML document are associated a namespace. Namespaces are essential to modelling reusable processes.
Extension element	BPML allows extensions to be included in a BPML document that are specific to a given implementation of a BPMS.	Needed to support implementation specific details. For example, a vendor may include extensions to provide clues to a process optimiser. In the extreme, allow vendors to differentiate implementations of a BPMS.
Annotations	Textual information having no significance to the definition of a process other than to provide documentation.	It is recommended that XHTML be used for the content of documentation within a BPML document.
Meta data	Provides additional information about BPML elements.	Supports search, advertising and categorisation of BPML documents.



Appendix 3

Business Process Management
Initiative (BMPI.org)



The Business Process Management Initiative (BPML.org) is an independent organisation devoted to the development of open specifications for the management of e-business processes that span multiple applications, corporate departments, and business partners, behind the firewall and over the Internet.

BPML.org complements initiatives such as J2EE and SOAP that enable the convergence of legacy infrastructures toward process-oriented enterprise computing, and initiatives such as ebXML, RosettaNet, BizTalk, WSDL, UDDI, tpaML, and E-Speak that support process-oriented business to business collaboration.

BPML.org defines open specifications such as the Business Process Modelling Language (BPML) and the Business Process Query Language (BPQL) that will enable the standards-based management of e-business processes with forthcoming Business Process Management Systems (BPMS), in much the same way SQL enabled the standards-based management of business data with off-the-shelf Database Management Systems (DBMS).

BPML.org has been initiated by Intalio, Inc. and created in August 2000 by a group of sixteen enterprise software vendors and consulting firms, including Computer Sciences Corporation. Membership is open to all companies, non-profit organisations, and individuals.

[Business Process Modelling Language \(BPML\)](#)

The Business Process Modelling Language (BPML) is a meta-language for the modelling of business processes, just as XML is a meta-language for the modelling of business data. BPML provides an abstracted execution model for collaborative and transactional business processes based on the concept of a transactional finite-state machine.

BPML considers e-business processes as made of a common public interface and as many private implementations as process participants. This enables the public interface of BPML processes to be described as ebXML business processes or RosettaNet Partner Interface Processes, independently of their private implementations.

In much the same way XML documents are usually described in a specific XML Schema layered on top of the eXtensible Markup Language, BPML processes can be described in a specific business process modelling language layered on top of the extensible BPML XML Schema. BPML represents business processes as the interleaving of control flow, data flow, and event flow, while adding orthogonal design capabilities for business rules, security roles, and transaction contexts.

Defined as a medium for the convergence of existing applications toward process-oriented enterprise computing, BPML offers explicit support for synchronous and asynchronous distributed transactions, and therefore can be used as an execution model for embedding existing applications within e-business processes as process components.



Business Process Query Language (BPQL)

The Business Process Query Language (BPQL) will be a management interface to a business process management infrastructure that includes a process execution facility (Process Server) and a process deployment facility (Process Repository).

The BPQL interface to a Process Server enables business analysts to query the state and control the execution of process instances managed by the Process Server. This interface is based on the Simple Object Access Protocol (SOAP).

The BPQL interface to a Process Repository enables business analysts to manage the deployment of process models managed by the Process Repository. This interface is based on the Distributed Authoring and Versioning Protocol (WebDAV).

Process models managed by the Process Repository through the BPQL interface can be exposed as UDDI services for process registration, advertising, and discovery purposes.

Business Process Modelling Notation (BPMN)

Business Process Modelling Notation (BPMN) will be an intuitive notation for the development of BPML processes at the business level. Where BPML is used to carry process semantics among computer systems and software applications, BPMN assists the unambiguous communication of business processes among business and technical users.

The business world is rapidly changing. Customers, suppliers, partners and businesses are communicating in faster and more efficient ways. The Internet has revolutionised the way in which business is conducted. The speed of e-business adoption has led to complex and intricate business interactions. In fact many businesses have grown and transformed so quickly that they do not understand their core business infrastructure. This lack of understanding is one of the factors that has led to the inability of organisations to respond to change.

BPMN and forthcoming Business Process Management Systems (BPMS) will provide businesses with the capability of understanding their business processes more fully using intuitive graphical notations accessible to business people. BPMN will give organisations the ability to converse about business processes in a standard visual manner. This will ensure that businesses will understand themselves and the participants in their business and will enable organisations to adjust to new business circumstances more readily.

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Computer Sciences Corporation, one of the world's leading information technology services providers, helps organisations achieve business results through the adroit use of technology. Since its formation in 1959, CSC has earned a customer-centric reputation for developing and managing solutions specifically tailored to each client's needs. No other company offers the same range of professional services and global reach as CSC does in areas such as e-business strategies and technologies, management consulting, information systems consulting and integration, application software, and IT and business process outsourcing.

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