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A Systems Integrator's Perspective on Business Process Management, Workflow and EAI

A White Paper by

Howard Smith

CTO EMEA, Computer Sciences Corporation

hsmith23@csc.com

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Over use of the term process management by consultants, analysts and vendors has led to some confusion among customers of different automation technologies. The situation is particularly acute because workflow engines are often used in the BPM technology stack of middleware and EAI vendors (a relatively recent development). Systems integrators have also used workflow engines for some years to drive application component behaviour within an enterprise IT architecture. Application vendors are themselves starting to pursue the same approach.

Workflow technologies have been very successful. Many consulting firms have a workflow line of service. There are numerous documented case studies showing the benefits of the deployment of workflow technology and workflow will continue to be a focus for many firms. However, new challenges and new innovations are leading architects to broaden their perspective on the use of "workflow" within IT systems. New process technologies and techniques are allowing systems integrators to develop new value propositions for their customers. Whereas the focus of workflow deployment has in the past been automation, there is now a greater emphasis on the use of process technologies to provide overall business agility.

The use of process automation has become an intricate part of the enterprise technology stack and is driving deeper into the field of software engineering

Some see processes as a new development paradigm itself that may ultimately displace the object model, referred to as Process Manufacturing. Others see process data as a new mathematical form for business assets, which may replace the relational data model and create a new breed of Business Process Management Systems (BPMS). Their advocates position such systems as the platform for the next generation of "process aware" business applications. Finally, platform vendors see process engines driving orchestration and composition of distributed software components called Web Services.

No longer do we think of business processes as being only those to be scheduled around people – for example, work that was partially done before the person got tired and left – work that is waiting for a telephone call from a customer – work that has to be processed at a specific time ("I will expect your call at 10 o'clock), or work that has to be transferred to a different person because the person who did the first part of the processing got sick or quit before the task was complete. As Charlie Plesums of CSC and the WfMC.org points out, "The development and use of workflow technology has moved from simply supporting the routing of work between people to routing work horizontally between resources (where the resource may be a person, but may also be a system or even a machine) and vertically (controlling steps that will be performed at each point in the journey, such as when programs will be invoked by the person, or actually invoking the program). And as data is being moved between processes, there is typically integration with the processing systems – which pushes workflow into the Enterprise Application Integration (EAI) arena."

Demanding process requirements from customers is driving the need for sophisticated process technologies

It has been estimated by several industry analysts that businesses are spending between 20 and 30% of their IT budget integrating systems and applications, whereas they would like to assume that the systems they invest in are interoperable. The situation is unsustainable and customers are making this clear to their systems integration partners. At the same time, the complexity of systems integration is increasing. Client's integration projects now extend well into the value chain, resulting in n-factorial points of integration among applications owned by different firms. In addition, few companies now rely exclusively on a single application image, for example ERP. Integration projects extend over legacy systems, existing ERP and new best of breed purchases.

As well as requiring IT service providers to do more for less, customers are also demanding that the processes resulting from integration projects are fully manageable thereafter. Management interfaces must operate end to end, not in discrete application domains. Corporate goals and the practical day-to-day running of the efficient enterprise demands complete control over and visibility of the IT environment supporting the operation. It is no longer acceptable for isolated pockets of information or isolated applications to exist standalone. Global firms are seeking an enterprise architecture that solves these issues once and for all, rather than in piecemeal projects or point-to-point integrations. Joined up thinking and joined up IT is now mandatory and this is driving the requirement for end-to-end processes that are designed from the perspective of the business, most notably the end customer. There is a desire to deploy processes top down as determined by the business strategy, without constraint by the existing systems supporting functional business domains.

Therefore, as the focus shifts from the application to the process, one encounters additional requirements that further stress the ability of today's EAI, B2BI and workflow suites. There is often a requirement to maintain a repository of core processes and to deploy custom variants, for different business units, for different geographies or different partners, suppliers or customers – according to prevailing business conditions and the reality of local operations. Failure to build an effective Process Managed Architecture to support this customisation results in duplicate efforts or unfulfilled projects; and business units are forced to work with processes that were not designed to meet their full needs. If this were not enough to cope with, it is now quite common to be given requirements for end user control of delivered processes. Reflecting the reality of constant business change, the management team is looking for extreme levels of configuration options in the IT environment.

It is not uncommon for the business to have been disappointed by the previous performance of the IT function. Either it under-delivered not meeting requirements, delivered too late and requirements had changed or over-engineering solutions to problems that did not exist. As Ron Brown, technical director of CSC's

¹ CSC e3 [Ref 5] is a proven open-standards based enterprise architecture that encompasses middleware, application integration, workflow, business integration and process management technology. The predominant entity in e3 is the business process and a central principle is the provision of process change services to non-technical business users.

² UAN (the Universal Application Network) is Siebel System's specification for integration services between Siebel and non-Siebel application modules.

systems integration practice states “The CEO is looking to reduce the turning circle of IT – which is often perceived as a super tanker when one considers its responsiveness to new business requirements.”

This new focus on process adaptation, reuse, localisation and change, applies not only to human workflows, but also to the systems implementation and application integration environment. Whereas workflow systems are highly adaptable to changes in work patterns, they are less useful to supporting change in the application environment, particularly if components have to be integrated at fine grain. With the customer demanding to be involved in the subsequent management of enterprise processes, including their continuous improvement, optimisation and tuning, the process coupling to application systems is particularly problematic, since to isolate the business users from the IT environment so that process changes can be made safely (without operational failures) demands additional layers in the overall architecture to cope with exceptions. These cannot be programmed piecemeal, nor can the process design interface be restricted to human workflow. To do so would generate frustration among business users since it is often the portfolio of legacy applications that is the limiting factor for an organisation to move forward to enhanced automation.

Often, the introduction of new systems or integrated processes is paralleled in the business by a Business Process Improvement programme, from either a performance, quality or resources perspective. Today, no corner of the business is exempt and process improvement extends to all processes, all business domains and disciplines and this places huge pressure on IT to deliver responsive interfaces. Whereas commodity processes may have been outsourced or implemented through sourced services, the focus of management attention often falls to core processes, those of strategic importance and much complexity. Such processes are fluid, dynamic and difficult to coordinate across multiple parties. It is precisely here where management demand new IT facilities that can support enhanced decision making in an uncertain business environment.

All of these factors add up to an increased focus on process engineering and this has led systems integrators to look for new process tools beyond workflow and EAI. The technical implications of the business requirements are extreme. Integrators are faced with the reality of long-lived, value chain wide, transactional, multi-participant processes. Application services in the form of web services appear everywhere in the business and must be included, and failure to provide end to end technical systems and process systems management is certain to lead to failed projects. In short, there is a need for an improved path from process design to implementation, i.e. to executable code, and for new tools that treat processes as the focus, not the result of integration activities. The time has come for a radical simplification of this environment, since it is simply not possible or practical to believe that we can achieve success using existing workflow and EAI technology, no matter how cleverly embodied in an overall systems or vendor's product architecture.

New developments in process technologies are making inroads for meeting both new process requirements and the associated technical challenges

A significant step forward is the publication of Business Process Modelling Language (BPML) by the BPMI.org, together with implementations of a transactional process run time that has native support for any middleware. At a heart of a process-based architecture, such infrastructure software can significantly signify systems and application integration tasks. It offers a direct to implementation path from a process model and roundtrip process lifecycle management. CSC has yet to find a business situation that cannot be modelled in BPML, reflecting the strength of its semantics and integration with modern XML technologies. In addition, through the promising technique of process projection many IT systems can be exposed as BPML processes and managed within an overall process management system, radically simplifying the inclusion (or view) of applications as process designs for reuse.

BPML's features of end to end process persistence and process level transactions can be said to be creating an entirely new category of IT infrastructure, the Business Process Management System (BPMS) and we expect such systems to become very important over the next few years. The primary reason for this is because the BPMS considers business processes as a first class citizen, in much the same way as an object-oriented programming language would consider objects as first class citizens. Within a BPMS, the business process is the core entity that needs to be manipulated, as opposed to being a “virtual process” and the by-product of manipulations that are operated upon by entirely different entities, such as systems integration tools like EAI. EAI considers the Application Programming Interface (API) as its first class entity and defines business processes as sequences of API calls and the audit trail of such calls. This is really a cross-application process, if not a cross-application procedure and does not truly reflect business level process semantics.

In the same way, workflow technology typically considers the document its core entity, and builds processes from the flow of documents, whether these are interacting with humans or systems. While this reflects many processes common in business, it is too restrictive for being able to support a broad range of processes, some of which could never be represented in the form of documents whether on paper or held in computer systems.

By contrast, the focus of BPML and BPMS is upon the interaction between participants. All participants are processes with respect to one another; and larger processes are constructed from systems of participating processes. BPML takes the process paradigm even as far as the domain of application development. Just as the programming language Java has a Java Virtual Machine that interprets compiled Java byte code, so is it possible to develop BPML virtual machines able to interpret BPML byte code, and we believe this will become the preferred way to build BPM architecture.

Processes unify the traditionally separate notions of data, procedure and interaction, to the more general form of mutable process data

Business processes, computer networks, cellular telephony networks, air traffic control networks and distributed computing environments, can all be said to be systems whose participants communicate and change their structure. Such processes grow, shrink, morph, merge and split. They are systems that evolve independently of their environment and can even be said to move through their environment, constantly changing their links with each other and their environment; so called mobile structure. For this reason, advocates of the new class of process technologies turn to Pi-Calculus [Ref 1, 2] for inspiration. Pi-Calculus expands on theories of sequential algorithmic processes to systems where interaction plays a significant and even dominant role.

Process engineers respect the Pi-Calculus in the same sense that electronic engineers respect the differential calculus or database designers rely upon the relational data model. These theories tie together the various systems, concepts and thinking without distortion and define what is and what is not common to each domain. For example, it is possible to determine the degree to which a database product adheres to the relational data model as set out by E F Codd [Ref 4] and such criteria were used to evaluate initial RDBMS products. Business Process Management Systems will be equally closely examined once their true nature is understood. Their capabilities to support multi-participant systems that interact, collaborate and interrupt once another, to support interacting parallel threads will all be critical to the usefulness of these technologies, as well as their robustness and scalability. Reliability will be paramount; will they work in the correct manner under all conditions and can we predict the outcome of executing processes?

LEARNING FROM THE PAST: E F CODD [REF 4]

- *Large data banks must be protected from having to know how the data is organised in the machine (the internal representation)*
- *Activities of users and most application programs should remain unaffected when the internal representation of data is changed*
- *Changes in data representation will often be needed as a result of changes in query, update, and report traffic and natural growth in the types of stored information*
- *A model based on n-ary relations, a normal form for data base relations, and the concept of a universal data sub language are introduced*
- *Three of the principal kinds of data dependencies that still need to be removed from existing systems: ordering dependence, indexing dependence, and access path dependence*

The same concepts can now be extended to business processes and business process management systems.

IT can now be taken off the critical path of process design and application development can be safely extended to non-technical business users

For systems integrators the new process technologies offer a host of new opportunities, permitting businesses to not only share data

and code but also entire end-to-end business processes. This is proving particularly powerful for B2B integration, but is equally applicable inside the firewall. As a result, the nature of EAI is changing and many EAI activities that were challenging before are now the natural consequence of process management systems. Using BPML it is possible to architect process neutral architectures, where many design decisions are held off until process design time. The deployment of a new process design is as simple as creating a new database table design and the deployment of a process instance is similar to the creation of a database record. Intuitive graphical notations for business processes, such as early experience with BPMN (Business Process Modelling Notation), play a similar role to the entity relationship diagram (ERD) during data design. Using such tools it is possible to provide the business analyst with an elevated level of abstraction and representation. This lets the business do their job – process design, deployment and incremental improvement – while IT does its job, to provide a robust, scaleable and mission critical process-managed infrastructure.

The direct path from process design to execution offered by the process virtual machine gives the business the opportunity to design processes from the top down and bottom up, for example designing from the point of view of the customer's customer. BPM is heralding a replacement for the painful experience of past re-engineering projects, where processes were re-designed in an one-off exercise which led to extensive and costly systems and organisational replacement and disruption, often lasting for months or years during which the new processes were ingrained into the business and its software systems. Such programmes of work are no longer acceptable to management teams, except in the most extreme cases. The focus is now upon continuous process improvement enabled by BPM architecture.

Finally, the control now afforded by these technologies is giving rise to the need for process simulation to guide re-engineering efforts. This is because ill-advised process changes can now have a considerable impact on operations due to the accelerated process design to production timescale. Ron Brown of CSC gives this insight: "Previously businesses were cushioned from the impacts of process change by the long lead times of systems and application development projects. This no longer needs to be the case. If the analogy for BPM is power-steering, then simulation must now play the role of the traffic guidance system."

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