

# The Fusion of Process and Knowledge Management

**L. Russell Records**  
Technology Director, Texas  
CSC Consulting

## Introduction

The history of Information Technology is laced with the search for the “silver bullet” that will connect the IT function closely to key business activities, minimize the cost of providing IT services, speed the development of new business applications and data bases, and then go on to solve global warming. Previous technology innovations that laid claim to this noble achievement include mainframes, client-server, object orientation, and web technology. Some pundits now claim that Service Oriented Architectures (SOA) and its Business Process Management layer are the best chance to finally achieve these goals<sup>(1)</sup>. Time may tell.

Over a decade ago, Knowledge Management (KM) was hailed as an approach that would unearth and leverage the buried knowledge held closely by a company’s employees, and would drive innovation, productivity. It would also enable the evolution of a “learning organization” where the corporate body of knowledge would be always evolving and being made accessible to employees eager to learn and apply these corporate secrets. Almost in parallel with the KM era, there began a series of efforts spanning a number of industries to focus on improving, re-engineering, or otherwise managing business process as key corporate assets. Many of us lived through the Michael Hammer and James Champy Business Process Reengineering (BPR) bubble and saw the potential of a company taking charge of how they deliver value to their customers by focusing on process effectiveness and efficiency. As Hammer points out in his book *The Agenda*<sup>(2)</sup>, one of the problems with BPR was the lack of a way of effectively implementing the process improvements that energized and empowered employee teams were coming up with. Hammer was particularly critical of large ERP packages, the embedded processes of which he referred to as “wet cement,” implying that once it was installed and configured, it hardened into an inflexible, complex set of inappropriate processes. So, many of these new processes were implemented (many done badly with few coding standards and no architecture) with new object oriented custom application development tools that very quickly became the new “legacy” applications infrastructure.

While KM and process engineering were being evolved in parallel, there was no serious effort to fuse them into a consistent, holistic architecture. KM programs over the past decade have focused on organizing employees into communities of practice and building repositories of “best” or proven practices. There was (and still is) a general lack of understanding of how valuable the fusion of processes and knowledge can be. The thought of actually taking the distilled knowledge and making it easily available to people executing the process was somehow overlooked. Employees would only stop to access the available knowledge base when the process execution came to a screeching halt due to an inability on the part of the employee to continue. Many times this would involve looking up information in an offline source like a procedures handbook or calling a friend who might know the answer. A major thrust of KM efforts in the past five years has been building these employee locators who could answer questions involving specific knowledge domains. Examples include Texaco’s “PeopleNet<sup>(3)</sup>” and BP’s “BPConnect.”

On the process side, until quite recently, application systems have been almost purely transactional by design. Users simply enter and retrieve data from a data store. There is no way of easily accessing off-line knowledge. While most modern applications feature built-in help features and drop-down table lists, the kind of access to knowledge bases that would represent a fusion of process and Knowledge Management has historically been ignored. Even access to electronic document management systems has been mostly an off-line event and has not been specifically linked to processes.

Why is it inherently valuable to more closely link knowledge and processes? Where is the boost in productivity and effective decision making? These are the issues that we will review in this paper. It turns out that Really Interesting Problems (RIP) require a disciplined methodology and architecture to address both these domains in an integrated and holistic way.

## Some Definitions

Before we look at some case examples where there have been attempts to fuse knowledge and process management, let's understand the terms we are using. Both of the terms Knowledge Management and Process Management have been defined and redefined by both the vendors who produce such products as well as the implementers of these technologies. These definitions are ones that I have evolved from our own practices of both specialty areas.

### **Knowledge Management**

*"Knowledge management is an approach to discovering, capturing, and reusing both tacit (in people's heads) and explicit (digital or paper based) knowledge as well as the cultural and technological means of enabling the KM process to be successful."*

Knowledge is differentiated from information in that there is an element of expert review and distillation where knowledge is concerned. As an example of this, I was recently looking for sample project plans to carry out a specific type of project. From a colleague, I received three different sample plans along with his recommendations about when each type of plan was best to use. The plans were information; his comments and recommendations were knowledge, which is where the real value lies.

In my view, Knowledge Management cannot be successfully accomplished at the enterprise level (Generic KM on the desktop), but must be closely linked to a particular group of processes of critical interest to the business, i.e., supporting customer product or service inquiries. Employees will not do the extra work to support KM unless it is really important both to themselves and the business.

Doing KM right also assumes that there are the means in place for organizing what data, information, and knowledge are appropriate for each task in an overall process flow. It also assumes that we have asked the questions about who will use the data, how we get it to them, and how we capture any learning that may occur as they interact with others so that it can be made available the next time the process executes, as shown in Figure 1.

This process shows a notional end-to-end product development process. The implication here is that any type of process design effort must also have a KM dimension as well. Not only do we have to consider the process flows and steps, we need to fully understand and design the structure and condition of the knowledge that will be required to execute the process. As I pointed out earlier, process execution normally stops when someone has to retrieve knowledge that has not been provisioned for them to use. When this occurs in a customer-facing process, the cost to execute the process skyrockets. According to a recent survey by KANA<sup>(4)</sup>, what they refer to as Service Resolution Management can easily cost 10 or 20 times as much if the problem is handed off to experts to solve on behalf of a customer, as opposed to being handled by a first tier customer service representative.

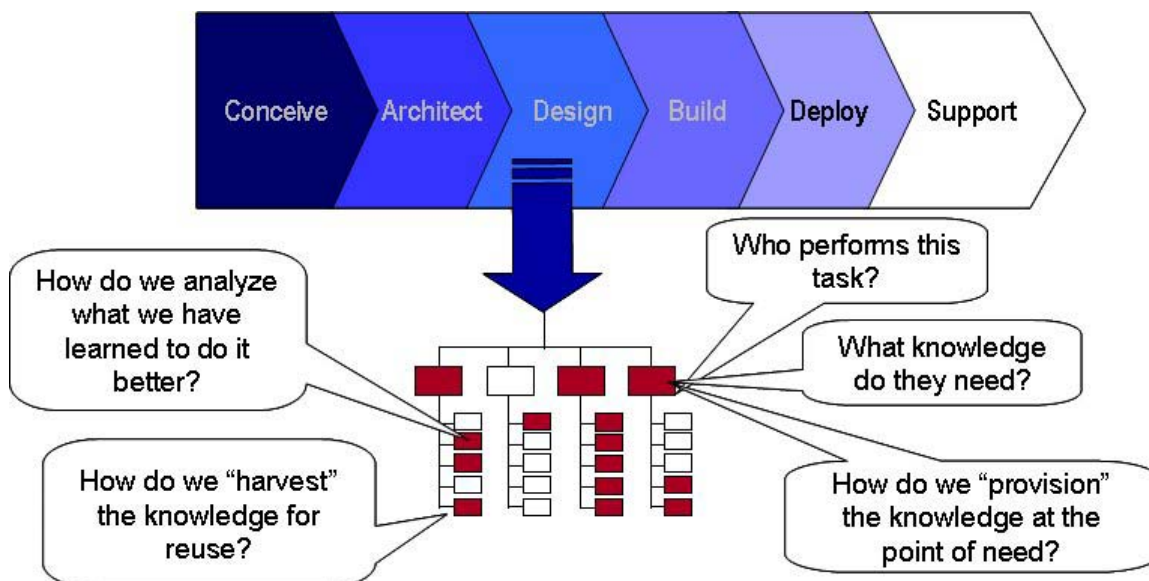


Figure 1 – A Knowledge Enabled Process

**Process Management**

Any attempt to define Business Process Management must, of course, acknowledge CSC's Howard Smith's landmark work<sup>(5)</sup> in laying out the past, future, and scope of BPM and systems that implement it. In the work that we have done following in Howard's footsteps, we have evolved a fairly simple definition for BPM.

*"Business Process Management is the ability to design, evaluate, view, manage, and adapt in real-time a number of related business activities, applications, and people, in one or more companies, in a structured sequence, that together achieve a common goal".*

This certainly has a very strong process flavor and not much of a nod to any aspect of the need for simultaneous management of knowledge. There are any number of vendor systems that attempt to provide this integrated suite of process management functionality, and we will mention several later in this paper. Most of them provide process design, simulation, integration, execution, performance management, and optimization to varying degrees. Only in recent months have I seen any recognition of the need to merge process and Knowledge Management and the evolution of systems that enable this fusion. To address this fusion, implementation methodologies and tools must address the required capabilities for both, including Automation, Performance, and Flexibility for the process side, and Collaboration, Search and Retrieval, and Taxonomy for the Knowledge Management side.

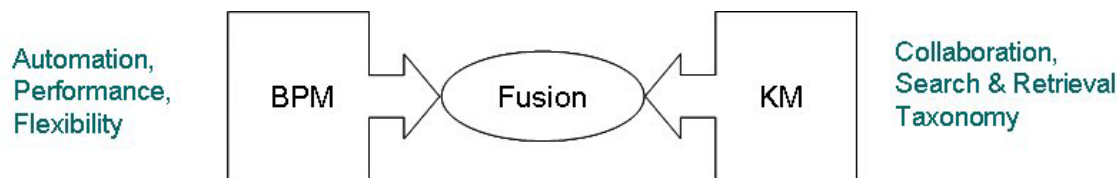


Figure 2 – Fusion of BPM and KM

**Service Oriented Architecture**

In these times where Service Oriented Architectures are in vogue, we need to explain how Knowledge Management systems and Business Process Management systems fit into an enterprise SOA.

A Service Oriented Architecture is an approach to enterprise IT architecture by which business strategies, objectives, and requirements are explicitly supported by IT capabilities provided in the form of services. Services are generally grouped together into applications for convenience and abstraction, but must be defined down to the lowest level of granularity necessary to represent a callable, manageable service capability. A generic application may provide a number of different services. As an example of this, consider a portal application, which may provide presentation services, security services, search services, taxonomy services, integration services, etc. Mapping the required services to a particular vendor offering will provide a view of the degree of fit. Missing services could be provisioned from other vendors or through the creation of custom web services. The Gartner term "Composite Applications" is frequently used for these applications when the relevant services may be provided from multiple vendor products.

## How Fusion Creates Value

In the following case studies, I will be pointing out that an approach that effectively blends Knowledge Management and Business Process Management can provide a much higher return to the business in terms of customer satisfaction, effective service resolution, and more effective decision making, all of which are great multipliers of a constrained work force. One of the major causes of process delays is the lack of the right information or knowledge at the right time, which causes the process execution to stop, more people to get involved, and costs to escalate. Most companies cannot allow customer problems to remain unresolved for more than a few hours, or customer retention will suffer. Customers nowadays have both the information and the inclination to change service providers at the drop of a hat.

As Figure 3 illustrates, there is a huge body of knowledge (the blue cloud) that exists in the minds of a company's expert employees. One of the goals of a successful KM program is to diligently and selectively move the knowledge into the IT infrastructure so that it can be used to improve the execution of key business processes. It should as well enable the development of new process improvements that improve the effectiveness of delivering services (of any type) to your customers, which, of course, is one of the goals of a successful BPM program.

A key task is the creation of a taxonomy or knowledge map to enable the process. Indexing and search tools can be used to help develop this taxonomy, and collaborations between experts can help in identifying clusters of useful, validated knowledge, as well as other types of content, including documents, business rules, emails, and other types of unstructured information. This must be a dynamic process because true knowledge is very perishable and must be constantly refined, re-contextualized, and validated before being provisioned for use within a business process.

## Really Interesting Problems - Case Studies

Really Interesting Problems have several common characteristics, including the huge amounts of investment money involved, large teams of people spread around the globe, and a large difference in financial outcome for getting it right versus getting it wrong. These two case studies are based on CSC projects that contained elements of the methodologies and technology outlined in the paper. In both cases, the driving need was to shorten the time required to complete the process, reduce the number of people involved, increase the level of collaboration between experts, and increase the economic return of the outcome.

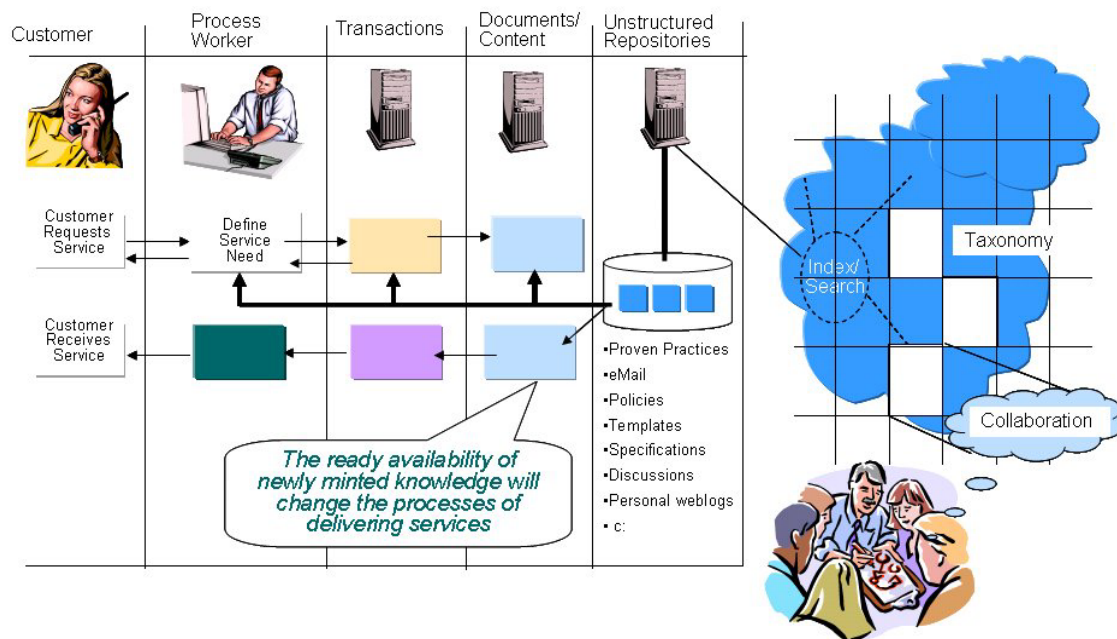


Figure 3 – Process – Knowledge Integration

### Exploration & Production International Ventures

Exploration & Production International Ventures (AEPIV) is the international business development arm of a major global oil company. Its responsibility is to determine where to spend the company's average of \$2 billion per year for investments in new projects. Do you build some new oil tankers or develop a new field in the Gulf of Mexico? Do you build a refinery in Nigeria, or drill for gas in China? CSC was engaged to help design a cohesive end-to-end process that would enable it to complete the process in less than a year, rather than the two years it was taking it to complete the process. As shown in Figure 4 below, the process required four phases:

- **Innovation** – Define as many new promising project ideas as possible and build a high-level plan and case for action. Attempt to reuse any projects that were considered in previous years but eliminated.
- **Exploration** – Put together and evaluate a deal for each opportunity that would highlight costs and potential benefits, opportunity costs, political risks, and technical risks. Identify potential partners and sources of additional investment.
- **Refinement** – Compare and cull the number of opportunities to the finalists by doing planning and comparative business modeling. Conduct negotiations with partners and evaluate the progress of the deal with required partners, governments, and technology partners
- **Launch and Measure** – Select the finalists and launch the projects. Manage the application and approval of operational, environmental, and safety permits. Arrange project logistics, personnel, contracts, and detailed plans. Monitor the project success.

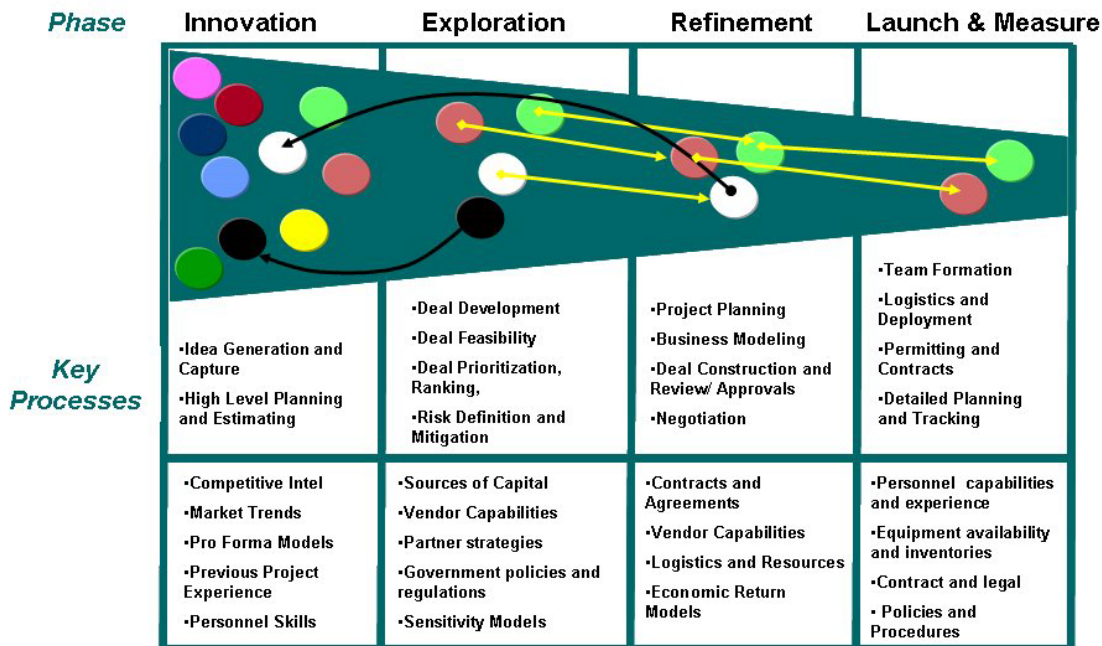


Figure 4 – An Oil Company Business Development Funnel

For each of the key processes, CSC developed a knowledge map that disclosed for the first time, all the data, information, and knowledge assets of the various roles involved in the project. What was surprising was how much of that information was in people’s heads, address books, international journals, legal documents, and government sources. In this case, over seventy percent of the content was unstructured. EPIV workers spent about 30 percent of their time just looking for information that was external to their own systems, and when critical information was found, there was no process to add to their process taxonomy, which meant that the next time someone else was looking for the same information, the same loss of productivity occurred. By clearly understanding the linkages between process execution steps and doing a much better job of identifying critical sources of external information and establishing an overall taxonomy, EPIV was able to reduce the process execution time from 2 years to 8 months.

It was also apparent to both the CSC and the EPIV people that some promising projects had been abandoned because of the difficulty in assembling the information required to understand the potential benefits and risks. Since the return on a successful project can range into the hundreds of millions of dollars, there is also an unknown but very large return attributable to being able to make the right investment decision at the right time by having the right information at hand.

**Service Company**

Service Company is a multi-billion global oil field services and operations company with 52,000 personnel and operations in 80 countries. It designs, builds, and operates complex down hole systems to drill oil and gas wells. Like many companies in the oil and gas exploration and production business, it is facing what the Society of Petroleum Engineers (SPE) is calling the “Big Crew Change,” which alludes to the fact that the work force is rapidly approaching retirement and there are not enough trained personnel to replace the workforce, particularly in the US and Europe. Also, the complexity of its products and services continues to increase as drilling operations move into harsher environments, while global competition requires new tools that can guarantee greater accuracies at lower daily rental costs.



Drilling and production platforms routinely operate 250 miles offshore in water depths of 6,000 feet

Modern drilling systems can hit a 1 foot circle in a 15,000 foot well and drill horizontally while continually measuring the formation parameters

**Figure 5 – Service Company’s Success Depends on the Application of Leading Edge Technologies in Extreme Environments.**

As a result of this, Service Company needed to find a new way to leverage its shrinking pool of technical experts and greatly increase the effectiveness of the greater number of non-expert field service personnel. The solution involved two initiatives: (1) to create a number of global service centers and centralize its expert pool within these centers, and (2) to build a knowledge system to organize its expert knowledge and give relatively unskilled field personnel access to the experts and the company’s digital knowledge assets via a web portal.

CSC was engaged to define system requirements and the customer service process through an extensive set of workshops with a wide range of users. The next task was to generate an exhaustive taxonomy to represent the information and knowledge required by the customer field service process. This taxonomy was originally pegged to contain about 1,200 elements, but by the end of the effort contained almost 18,000 elements, driven primarily by the user’s insistence on detail. This size proved unmanageable and was dramatically scaled back before the system was delivered.

The remaining tasks were to design and construct the web portal by which global access was provided to the technical and operation field staff, and to conduct training and organizational change activities. CSC provided onsite application support for the application for 2 years after the system was delivered.

The huge economic return generated from the savings on the project caught the eye of the Service Company President, and he awarded the joint team the Presidents Award for Excellence, citing the following factors for his selection of this particular project.

- Shortened interaction and communication cycle time between field and support centers,

resulting in \$250 million savings in first year of operation and recurring savings of \$75 million per year.

- Greatly increased customer satisfaction and a greater competitive win rate.
- Expansion of field bandwidth and increase in productivity, increased efficiency, and reduced operating costs
- Standardization and rationalization of content access and organization into consistent framework

## Fusion Architecture

Since both KM and BPM solutions must live within an enterprise Service Oriented Architecture, it is useful to construct a services-based architectural model for the fused KM/BPM system. The services model presented in Figure 6 depicts those services that must be provided, to a greater or lesser degree, to include the functionality of BPM, KM, and other utility functions that the systems will have to exist alongside. The set of services on the left side of the diagram show these external services. At present, there is no single vendor product that provides all of these required services. Practitioners will find it necessary to architect and build fused KM/BPM systems using conventional techniques for system design and integration. We are continually evaluating new products to see if vendors are responding to the market needs we feel are evolving here.

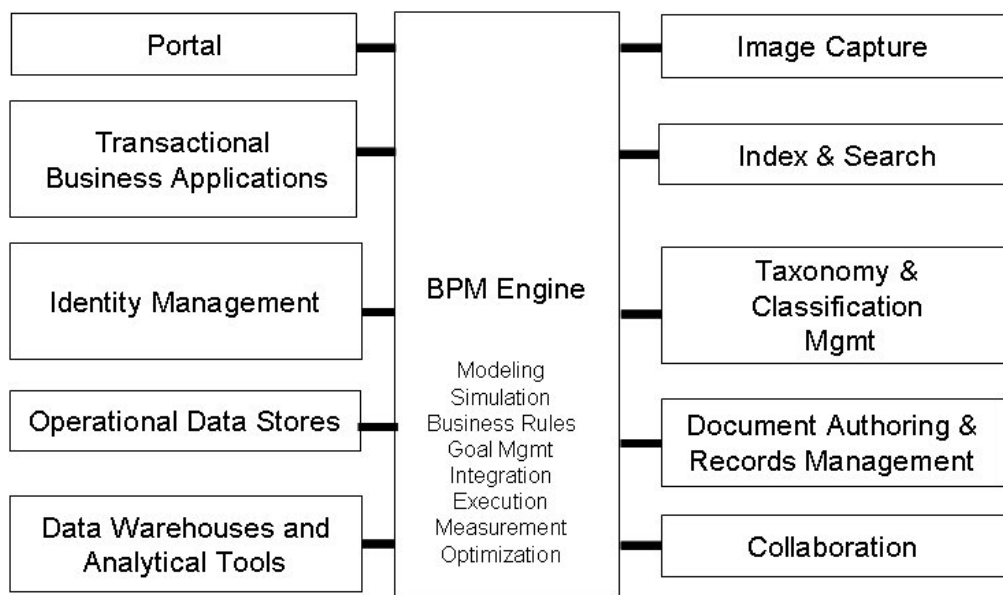


Figure 7 – Fusion Services Architecture

## Vendor Capabilities

We have been mapping these architectural services elements to the vendor products that we have been evaluating as possible sources for an integrated solution. Many BPM, enhanced Portal, Application Server, and Workflow products have some of the required components, but seem to be enhancing their tools without a particular strategy in mind. One of the leading BPM vendors, FUEGO, has built adapters for the most ubiquitous document management and portal products, but needs to improve and expand its KM services if it seeks to address this type of need.

There are at least two vendors that are addressing the need for a fused BPM/KM system.

- Kana Resolution is an enhanced call center package that blends workflow and

collaboration/guided search to solve tough service resolution problems.

- Appian is a BPM vendor that has a product vision that appears to reflect the BPM/KM fusion concept but needs to strengthen its process design and simulation capabilities.

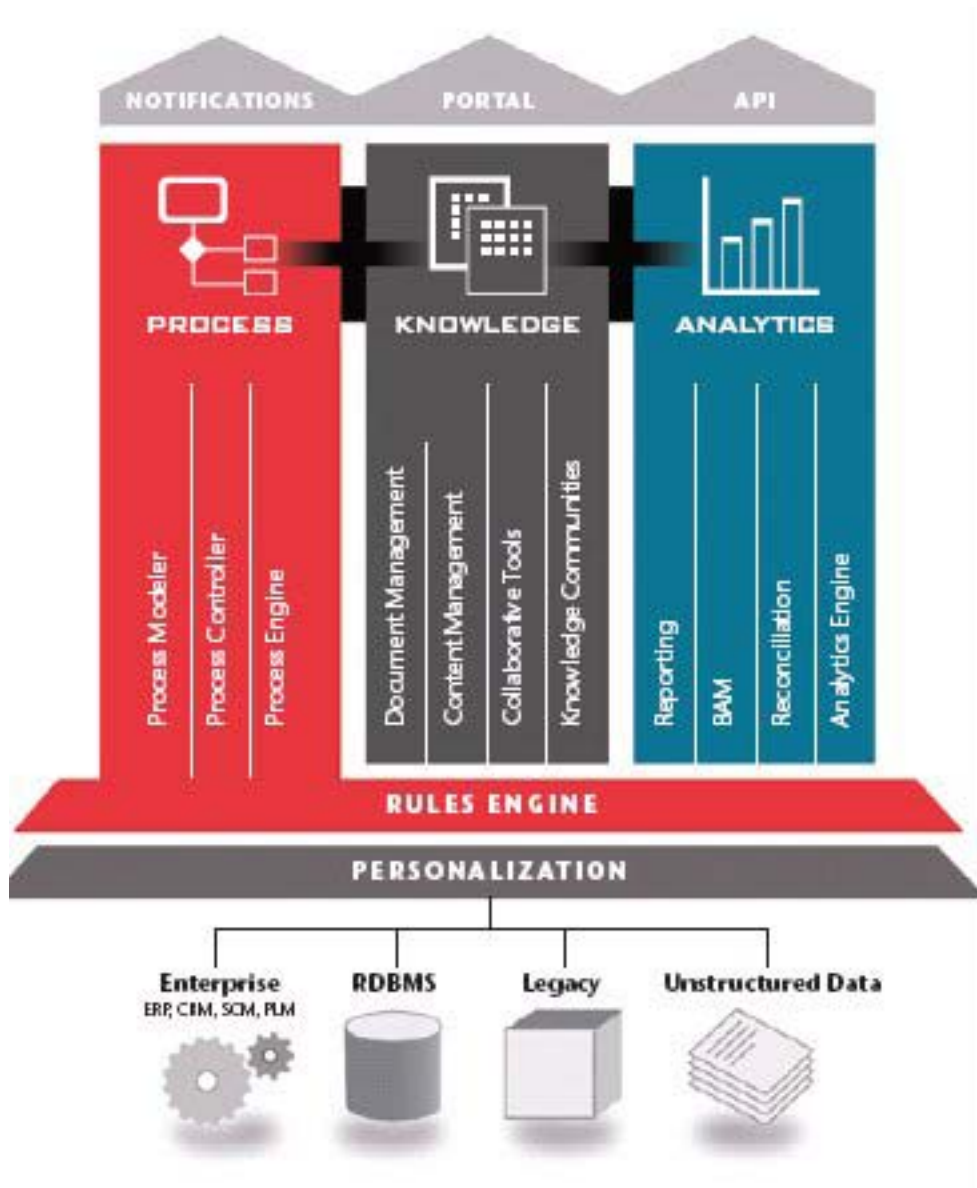


Figure 8 – Appian Product Architecture

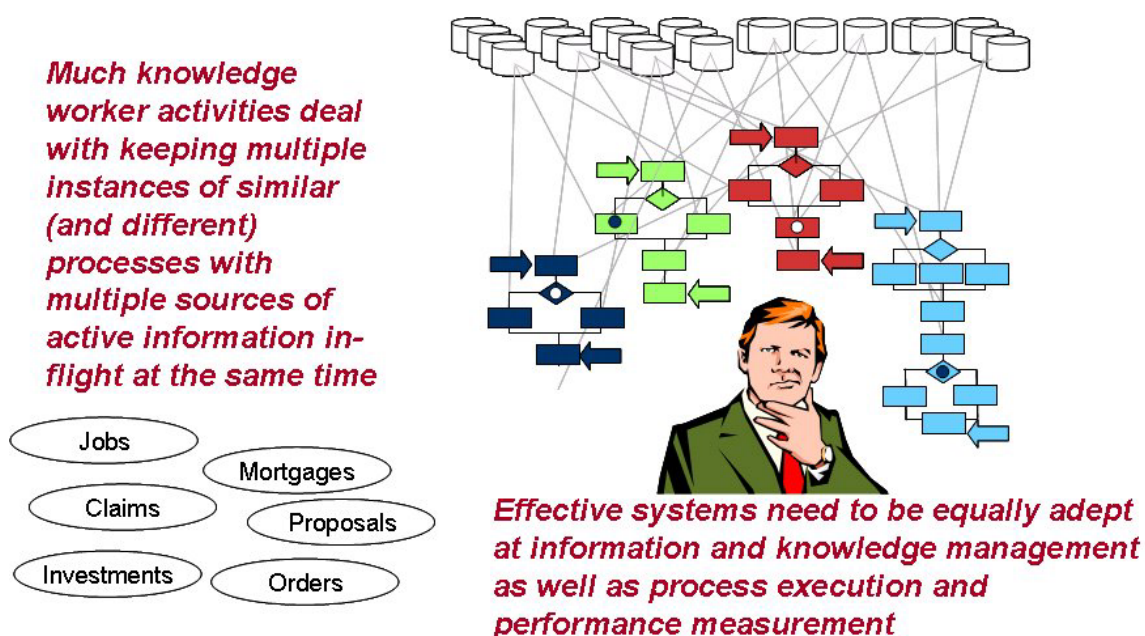
Appian <sup>(6)</sup> has integrated its BPM Modeler, Process Controller, and Process Engine with a separate Rules Engine and its knowledge components, which include Document Management, Content Management, Collaborative Tools, and support of Knowledge Communities.

We will continue to evaluate the Appian Enterprise BPM product as well as the continuing evolution of other BPM products against the fusion services architecture.

## Lessons Learned

We have learned a number of lessons over the past six years as CSC has been engaged to deliver both Knowledge Management and Business Process Management project work for clients. The most permanent and valuable lesson is that Really Interesting Problems are **not** simply linear or continuous processes. They contain multiple, asynchronous, long-running processes and lots of content of all types, including data, information, and knowledge. We have also observed that the breaks in the processes, where process execution stops, is where knowledge is being searched for, updated, or created, and where knowledge creation and harvesting must be done. Fused KM/BPM systems must provide this capability.

In the view of a single worker, a task requires him/her to have multiple instances of a number of related processes at different execution stages, with multiple sources of active information in-flight at the same time. While a process is halted, content is likely to change, and this new information may restart or redirect the process. Effective systems must be equally adept at information and knowledge management as they are in process execution and performance measurement.



**Figure 9 – Really Interesting Problems are Complicated!**

Most BPMS systems that exist today provide a work portal where the process execution steps or “worklist” applicable to a particular worker is displayed. For the large majority of the BPM systems that we track, the display of any type of content seems to be an afterthought. These systems must improve their capabilities in this regard.

The design of Taxonomies and Classifications are just as important as process design activities. CSC’s Catalyst Methodology does not address this important issue and CSC teams who are attempting to build fused KM/BPM systems will have to rely on other sources for taxonomy design methods or to start with Catalyst Data Architecture and modify it as required.

Current BPMS tools deal with business rules in various ways; some tools embed the rules within the business logic while others place the rules in a separate repository. We have learned from this body of work that rules need to be treated like other content; they should be easily viewable,

easily changed, and searchable.

## Conclusion

We feel that more and more new client applications and vendor products will be designed and constructed as fused KM/BPM systems. We are actively working with vendors who share this same vision. New techniques and integrated services architectures are required to build these new systems, and organizational change issues, which are huge whenever knowledge systems are involved, will become even more important for fused systems. It is difficult to get employee commitment for sharing one's personal store of professional secrets, yet professionals in high performance companies do it well, and they do it all the time. Yet, despite the challenges, the payoff is worth it. When applied to Really Interesting Problems, fused KM/BPM systems can significantly boost productivity and the effectiveness of decision making when it really counts.

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