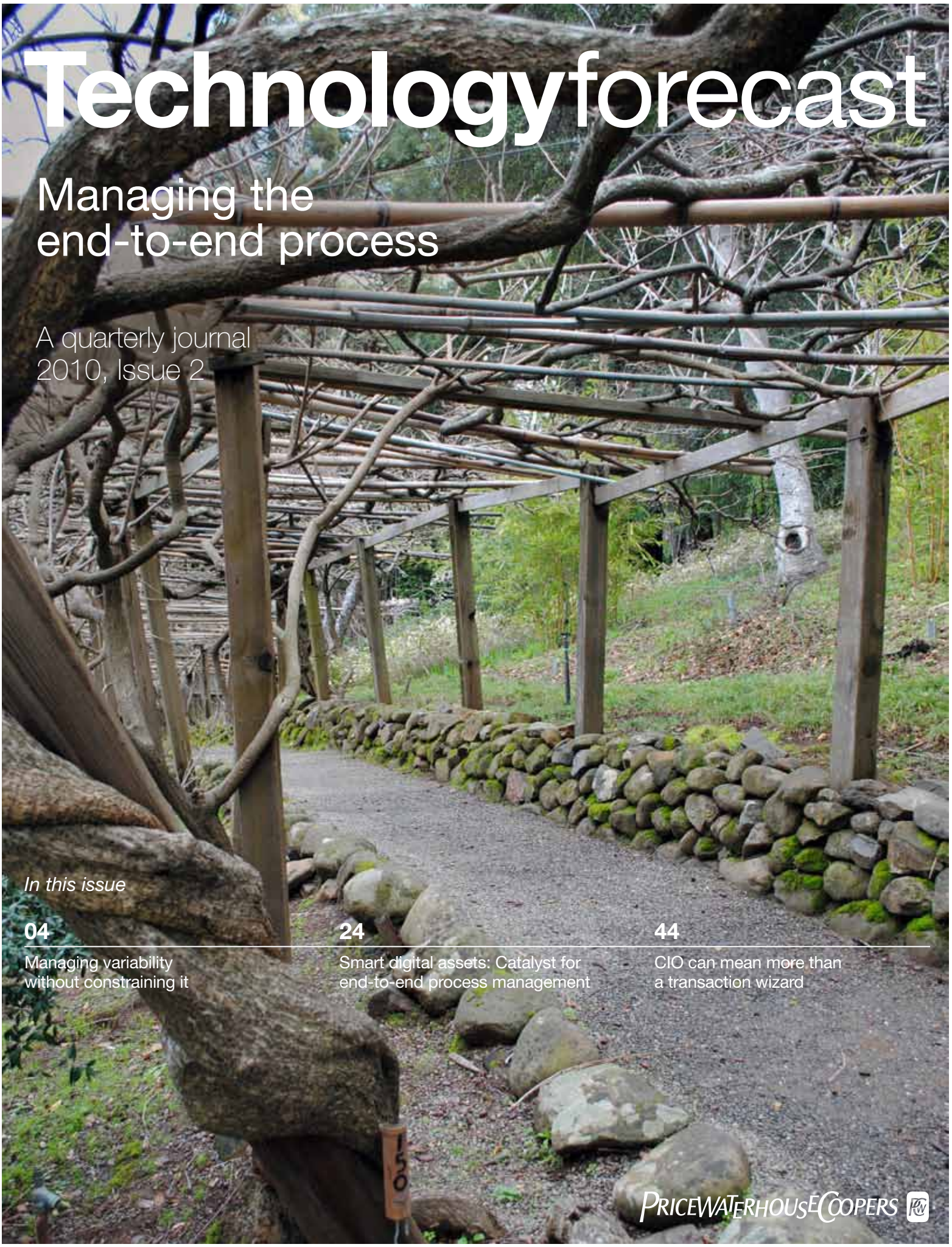

Technologyforecast

Managing the end-to-end process

A quarterly journal
2010, Issue 2

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PricewaterhouseCoopers

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In this issue of the *Technology Forecast*, we examine the yin yang[1] of structured or repeatable work processes and versatile or variable human processes. Most large enterprises have spent much of the past 15 years implementing business infrastructures focused on standardized processes supported by modern enterprise applications. The words roll off the tongue so easily that we often forget that for most large enterprises, these highly standardized, repeatable, and automated processes represent a fraction of what really happens in the business. For every "yang" in the business, there are probably two "yins"—the more variable, responsive, creative, analytic, and insightful activities that heavily rely on the versatility of employees' efforts.

Software-based process management of the yin of the enterprise has never really taken off. After all, if the process is highly variable, what could actually be standardized for automation? Why would an enterprise want to insert structure where it is not wanted or useful? Shouldn't we just leave the yin of enterprises alone? How could software possibly improve on what is essentially a human process?

During our research for this issue, we explored ways that companies are beginning to bring the yin and the yang together in pursuit of end-to-end business process management. What we uncovered is that managing the yin doesn't mean standardizing and constraining the value-creating variability of human actions. Rather, it requires adding just enough structure into the yin of creative processes to actually enhance them while connecting the overall work activity to the yang of structured process and data.

A good analogy is in the role and usefulness of music notation. The human mind seems highly attuned to the sound of music, regardless of culture or experience. Music clearly represents a creative activity for both the composer and the performer. And yet there is archaeological evidence of efforts to introduce structure into music as long ago as 2000 BC.[2] And the reasons are obvious.

1 From Wikipedia: In Chinese philosophy, the concept of yin yang (often referred to in the west as yin and yang) is used to describe how seemingly disjunct or opposing forces are interconnected and interdependent in the natural world, giving rise to each other in turn.

2 A. D. Kilmer, "The Discovery of an Ancient Mesopotamian Theory of Music," *Proceedings of the American Philosophical Society 115* (1971): 131–49.

Imagine a world without music notation and an individual playing a song. That scenario is not too difficult. Imagine now 10 musicians playing a song together—possible, but only with lots and lots of practice and after many hours of experimenting to determine which notes blend together to create a pleasing sound. Now extend this test to 100 musicians. That's OK for very simple forms of music but nearly impossible for anything complex—unless there is some agreed-upon higher-level structure for describing the pitch, rhythm, and tempo of the sounds coming from each performer.

In fact, the specification of pitch, rhythm, and tempo, among other details, constitute the music's metadata—creating shared visibility and making it possible for all participants to be in harmony.

Large enterprises are much like a 100-person orchestra when it comes to the human activities that really define the value propositions of an enterprise. Whether it is in product design, customer knowledge, or continually adapting a supply chain to deliver the best value, individuals and teams of bright, creative employees and partners working together make all the difference. And a few companies such as Schawk, a brand management company, are learning that metadata (a structure) can go a long way toward helping everyone work more effectively together. In the process, they are achieving higher performance from both their yin and their yang.

This issue of the *Technology Forecast* examines how digital assets resulting from human activity have become smarter over time. These smart digital assets present the opportunity to extend process management to human-driven activities without constraining their value-creating variability. The first article introduces the idea of meta-process management, achieved by combining digital asset metadata with asset management and process management technologies, as an approach to managing and continuously improving an end-to-end process. The article details the experience of Schawk in using smart digital assets to facilitate end-to-end process management.

The second article describes the rise of smart digital assets as metadata about them has become richer and deeper over time. The last article explores the CIO's role in bringing meta-process management to the enterprise.

As always, our articles are supported by in-depth interviews with leading executives and thought leaders who are defining the future of IT. Stephen Kaufman of Schawk describes how the metadata of smart digital assets enables the company to manage its end-to-end process of brand management from creative to delivery, while facilitating the versatility of staff contributions to customer value. Steve Miranda of Oracle discusses how metadata is making a difference in managing human workflow processes. Marge Breya of SAP forecasts how smart digital assets combined with the personalization of process present a compelling opportunity for business process management. Ismael Ghalimi of Intalio discusses the need for process owners in an enterprise and for process models to drive execution. And Dr. M. A. Ketabchi of Savvion details how business process management systems are process applications that complement transactional and other applications.

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And as always, we welcome your feedback on this issue of the *Technology Forecast* and your ideas for where we should focus our research and analysis in the future.

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Managing variability without constraining it

Leverage smart digital assets to extend process management to variable human tasks.

By Vinod Baya and Bo Parker

Schawk, a global brand management company, works with clients to design and deliver the visual branding for the packaging of consumer goods. The design process is creative, unpredictable, and expensive, and the stakes are high: packaging directly affects the shopper's buying decision, and legal issues can arise if text isn't accurate. Clients need to be able to make changes as late in the process as possible. At Schawk, this deadline used to be 30 days before delivery, but in recent years the company has reduced the "freeze date" to 15 days before delivery, creating a major competitive advantage for Schawk and its clients.

Schawk halved the freeze period by shifting its management focus from assets to processes. "We were too heavily focused on asset management, so we flipped that paradigm and began putting much more of our thought in the process piece," says Stephen Kaufman, CTO of Schawk. "Assets enter and exit [the process], and they have intelligence and metadata. The more metadata they have, the more intelligent the digital assets can be, but typically they're still players on the stage of process. You don't want process to be a player on the stage of assets."

Specifically, Schawk combined an existing business process management system (BPMS) with an existing digital asset management (DAM) system to build a system to manage the end-to-end process from creative to delivery. This system uses metadata about the digital assets to provide the agility and variability necessary for rapid visual brand development.

In contrast to this new system, most companies typically focus their automation efforts on the transactional processes best suited to standardization and reduced variability, because variability is considered wasteful and value destroying. The result has been a nearly exclusive emphasis on managing transactions instead of processes. Most companies optimize automation flows rather than what really counts: their end-to-end processes. Rare is the company that manages variable processes, including value-producing, creative activities like visual brand design.

This issue of the *Technology Forecast* examines how smart digital assets and their metadata offer the opportunity to extend process management to human-driven activities without constraining variability. This first article introduces the idea of meta-process management, achieved by combining digital asset metadata with asset management and process management technologies, as an approach to continuous improvement of an end-to-end process. The second article explores technologies that exist to support this approach; the last article explores the CIO's role in this approach. In the following section, we start with a closer look at Schawk and the lessons it offers.

"We were too heavily focused on asset management, so we flipped that paradigm and began putting much more of our thought in the process piece."—Stephen Kaufman, Schawk

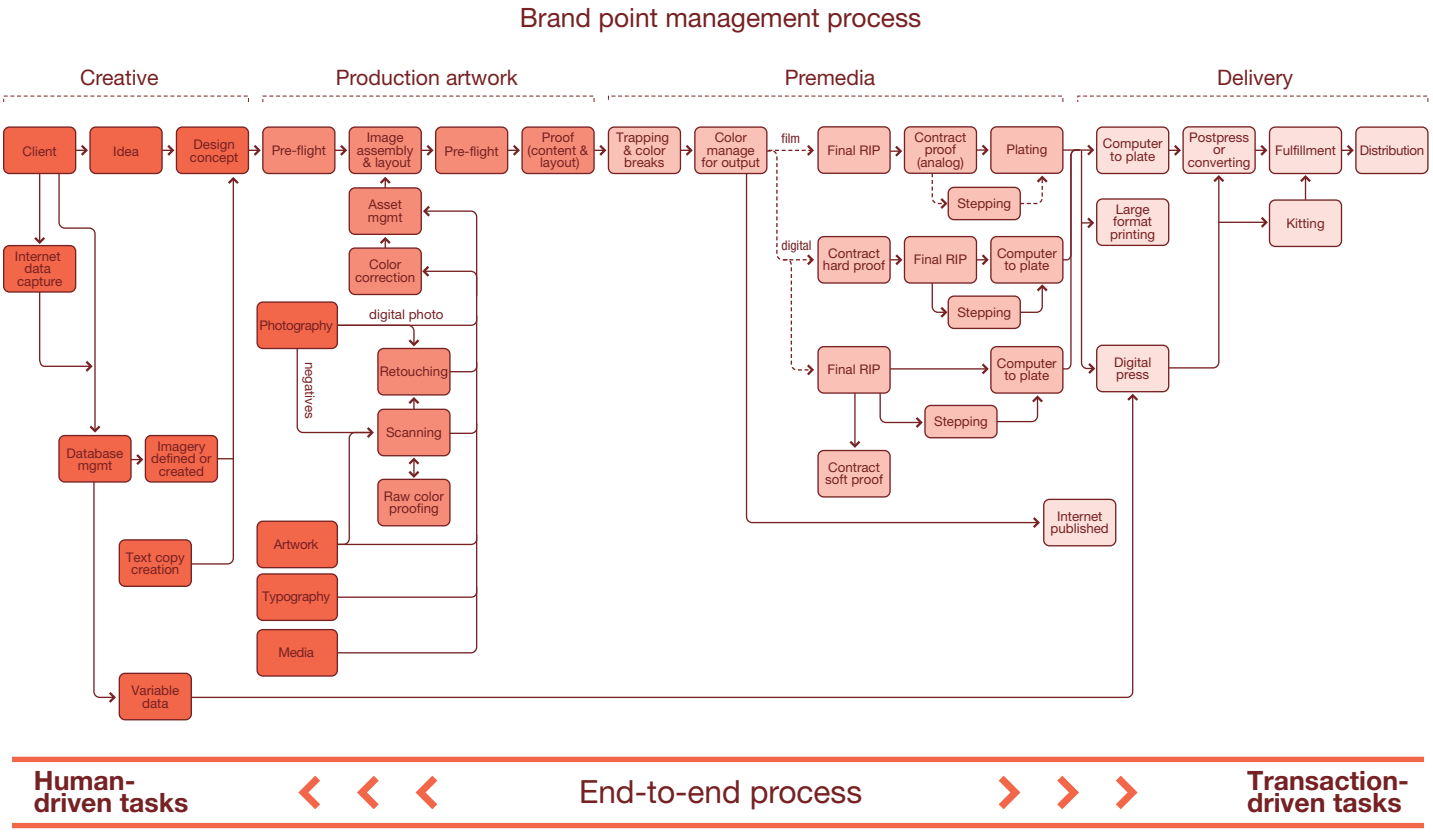

Figure 1: **The key end-to-end process for Schawk, the brand point management process, goes from creative to delivery. The tasks closer to creative are largely human driven, and those closer to delivery are more transaction-system driven**

Source: Schawk

Flipping the paradigm

End-to-end process management has remained elusive to most enterprises, because they have difficulty monitoring and managing the variable human activities in the process. At Schawk, existing data assets, proven technologies, and a willingness to look at things from a different perspective led to effective end-to-end process management.

Based in Des Plaines, Illinois, with more than 3,000 employees in 48 offices around the globe, Schawk works with some of the largest consumer packaged goods companies to create consistent and compelling brand experiences for all touch points. "There's an industry standard that estimates that for a given product, roughly 70 percent of the buying decision is made in the store," Kaufman says. "The process of looking at the package, analyzing the buy decision, and deciding whether to put the product in the shopping cart is often based around the look and feel of the product, and the graphic presentation of the product or branding concept."[1]

One end of the branding process includes creative tasks to develop the brand expression. On the other end is the delivery of the brand expression on the products. (See Figure 1.) Tasks closer to delivery are repeatable, highly structured, and driven by transactional systems, while tasks closer to the creative end are human driven and highly variable. The process is dynamic and changes are common at all stages—changes to the artwork or text on the label, and downstream in the printing supply chain. Something as simple as the client

[1] See the interview, "Using metadata of smart digital assets for end-to-end process management," on page 16 for a detailed conversation with Stephen Kaufman of Schawk.

finding a better bulk price for palm oil than for coconut oil could lead to a last-minute change in the ingredients list for a few dozen versions of the package. Schawk previously managed this process with a focus on the digital asset—the artwork, the text, or the in-store displays. All were filed and controlled using a DAM system and its workflow capabilities.

Over the years, Schawk took on different types of work across multiple regulatory, demographic, and geographic markets spanning many languages. At the same time, it saw a tremendous increase in its clients' needs for customization. Dealing with changes as late as possible became a competitive necessity and a key differentiator. "In the late '90s, you might have found one or two basic variations on a candy wrapper," Kaufman says. "Then, maybe the brand owner would change it once at Halloween and put a pumpkin on it, and at Christmas it might have a holly leaf on it, and that would be about it. In today's market, the same company might have a size and a package for Wal-Mart and a different one for Target and a different one for Sam's Club or Costco. They might change that package four or five times in a year for seasonal promotions, and they might also do a cross-brand promotion for a not-for-profit organization and have a temporary color variation on the package, and so on."

This dynamic affected operations in ways not immediately apparent. The watershed moment came when Schawk achieved a deeper understanding of its end-to-end process. "Initially, we saw it as a relatively straightforward, linear process. But the more we peeled that onion, the more dependencies we discovered. These dependencies included critical path gateways and events that had triggers that we might not have understood when we started studying the problem," explains Kaufman.

Schawk executives wanted to manage the complex, nonlinear, end-to-end process while allowing the changes necessary for competitiveness. They found a solution by shifting the approach from asset-driven management to process-driven management. In practical terms, the company combined an existing BPMS with the DAM system and some other functions, and included the metadata of the digital assets.

The resultant system is called BLUE, first rolled out more than two years ago. The most recent version is BLUE 3.0.

Process management today most often focuses on transactional tasks and human tasks closest to transactions, because those are what today's systems capture and automate. (See Figure 2.) Schawk extended process management all the way back to the human-driven creative tasks. The human-driven tasks needed to accommodate a high degree of variability, in sharp contrast to transactional systems and traditional workflow systems.

The key to achieving this inclusion of human-driven tasks was the metadata of the digital assets. Metadata is descriptive information about the asset, such as the author's name, dates of creation and modification, size, location, status, keywords, and other characteristics. This information can help manage, execute, and integrate the asset with a process. Some metadata is created automatically by the software, and some is created by the people working with the asset.

Using the metadata, BLUE 3.0 gives Schawk staff greater visibility into the human-driven processes and an improved ability to be flexible with late changes. Schawk has made impressive progress toward a meta-process for managing and handling changes, and for staying on a path of continuous process improvement. In addition to reducing the freeze date to 15 days, the approach sharply reduces the number of required touch points, including reviews. Fewer touch points limit the possibility of introducing errors, and thereby avoid costly mistakes.

All this directly impacts the client's return on investment (ROI), Kaufman says. "Imagine a market where only two key brands compete for a valuable market. If one brand makes a change shortly before the holiday season, the other thinks, 'That's going to give them a competitive edge this Christmas season. We need to get something to market to match that.' You can only imagine the amount of money at stake in the retail environment when they can execute that responding change before the holiday season as opposed to after."

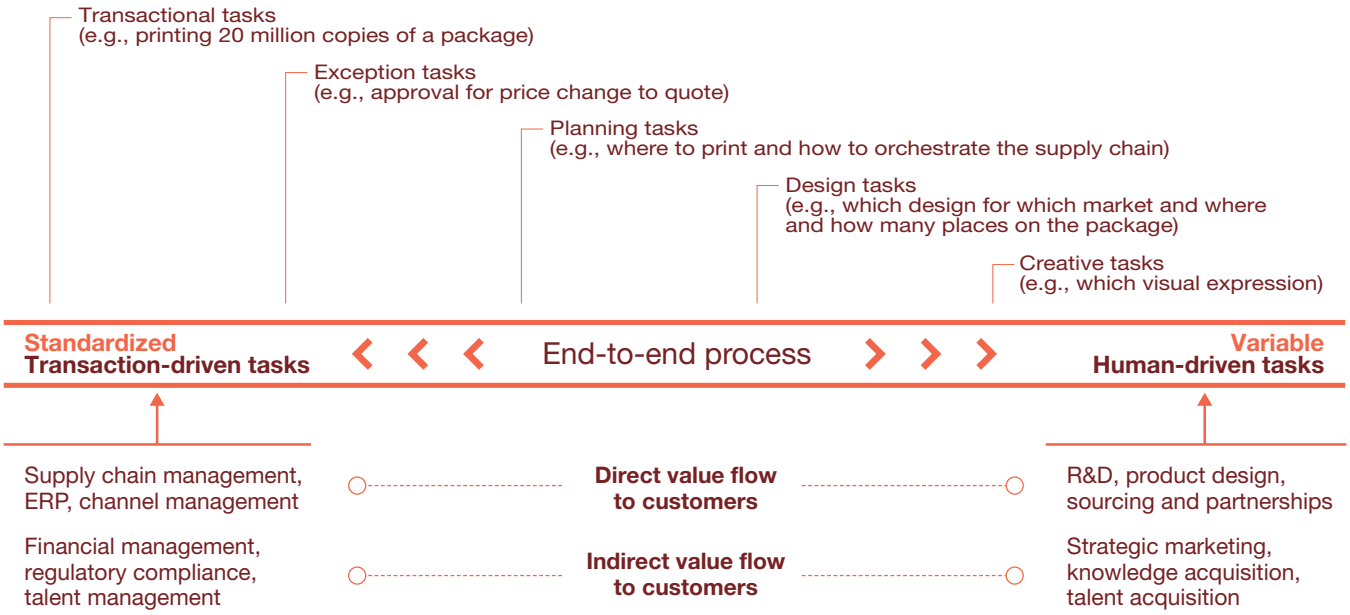

Figure 2: **This figure describes the continuum of human tasks in the end-to-end process. The figure contrasts business activities that create value from standardization managed by traditional enterprise applications versus business activities that create value by encouraging variability in thinking and process**

Task variability from human versatility

Schawk is an exception. In general, enterprise attempts to create more value from process automation have hit the proverbial wall because the goal of automation is to reduce variability by focusing on repeatable processes and standardizing them. Further, most repeatable business processes that can be standardized—primarily transactions—already have been automated.

But most enterprise activity is not transactional; it comprises human-driven tasks, which in an end-to-end process range from those close to the transactional systems to handle exceptions to those further from the transactional systems to handle planning and strategy. (See Figure 2.) These human tasks are collections of loosely integrated activities that benefit from variability and rely on judgment, creativity, analysis, wisdom, and other cognitive capabilities of the staff. Human-driven tasks are highly variable because humans are versatile. Tapping that versatility is how most enterprises deal with the dynamism in their business environment. However, human-driven tasks have been largely unexamined, rightly seen as too complex to enhance through standard automation. Human tasks can be opaque; management cannot always see, audit, or measure them.

Now, many experts say human-driven processes are ripe for process management. "You can group processes in an enterprise into either system-centric or human-centric processes. Looking forward, the more interesting category is user-centric, because that's where a large portion of the enterprise processes are and that's where the adoption of new systems and technologies in the enterprise will succeed or fail," says Marge Breya, executive vice president at SAP.

Further automation of business processes should not be seen as a fool's errand, but as a great opportunity for improvements in human-driven tasks and processes. As Schawk illustrates, what is needed is a new approach for process improvement that explicitly accounts for value from the versatility of human activity. At the same time, the new approach should include a structure for orchestrating the broader activity within which that versatility occurs.

Understanding the end-to-end process

Today's enterprise applications claim to support end-to-end processes, such as order to cash, procure to pay, or design to deliver. In reality, they support only the set of linked transactions that define the initiation or conclusion of more substantive, human-centric tasks associated with these transactions.

Consider order to cash. Before an order is received, various sales initiatives, account plans, pricing analyses, and other activities occur. If those activities are successful, an order is placed, which is the transaction that starts the so-called end-to-end process of most applications. The myriad activities that preceded the order do not exist in the transactional system, yet the intellectual capital in a sales team is a significant component of enterprise value. Figure 3 shows this distinction graphically, illustrating how human effort and transactions are interspersed in a process.

At a high level, today's enterprise processes comprise primarily two groups of tasks: automated and manual. (See Figure 3.) The automated tasks are driven by transactional systems, whereas the manual tasks are driven by humans. Until recently, the darker parts of Figure 3 would have been entirely manual. For example, the human activities in a sales planning process would have included a series of meetings supported by note taking, task assignments for individuals to create lists of ideas about approaching a target, and a plan on how to proceed, perhaps detailed in a paper document.

As Schawk came to realize, the combination of analog and digital tasks in an end-to-end progression results in complex, nonlinear, and interdependent processes. Managing and improving such processes are beyond the capabilities of transactional and linear workflow systems.

The collection of human-centric tasks supported by digital tools is rarely made explicit for visualization, understanding, analysis, and process improvement.

The rise of smart digital assets

An odd thing has happened to many of these human-driven manual tasks. They have become partially digital because people use software to organize, design, collaborate, and manage deliverables. Office workers use collaboration and productivity applications such as social media tools and the Microsoft Office suite. Marketing staff use tools from Adobe Systems and others to create compelling collateral. Semiconductor engineers use tools from Mentor Graphics and others to design new chips. Hardly a discipline exists that does not have its own collaboration and productivity software.

The use of these digital tools in the human-centric components of end-to-end processes has created separate "solar systems" of technologies and work products. As Figure 4 shows, transaction systems sit in one solar system waiting for what is often a long-running, human-centric collection of activities in a separate solar system to deliver an event of some kind. Mediating between these systems has been a job for a human. The collection of human-centric tasks supported by digital tools is rarely made explicit for visualization, understanding, analysis, and process improvement.

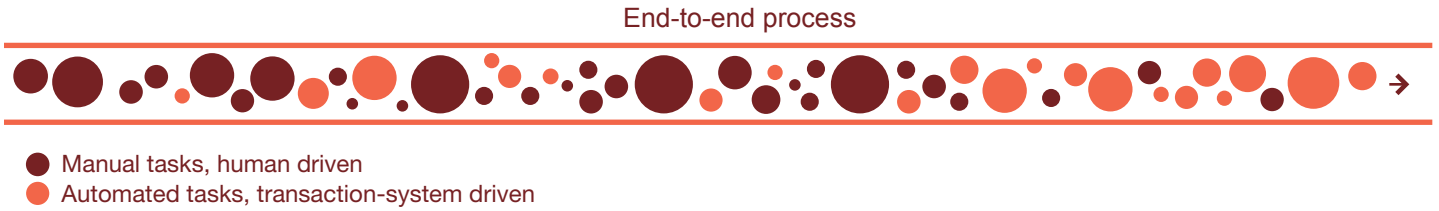

Figure 3: **End-to-end processes include automated tasks driven by transactional systems and manual tasks driven by humans**

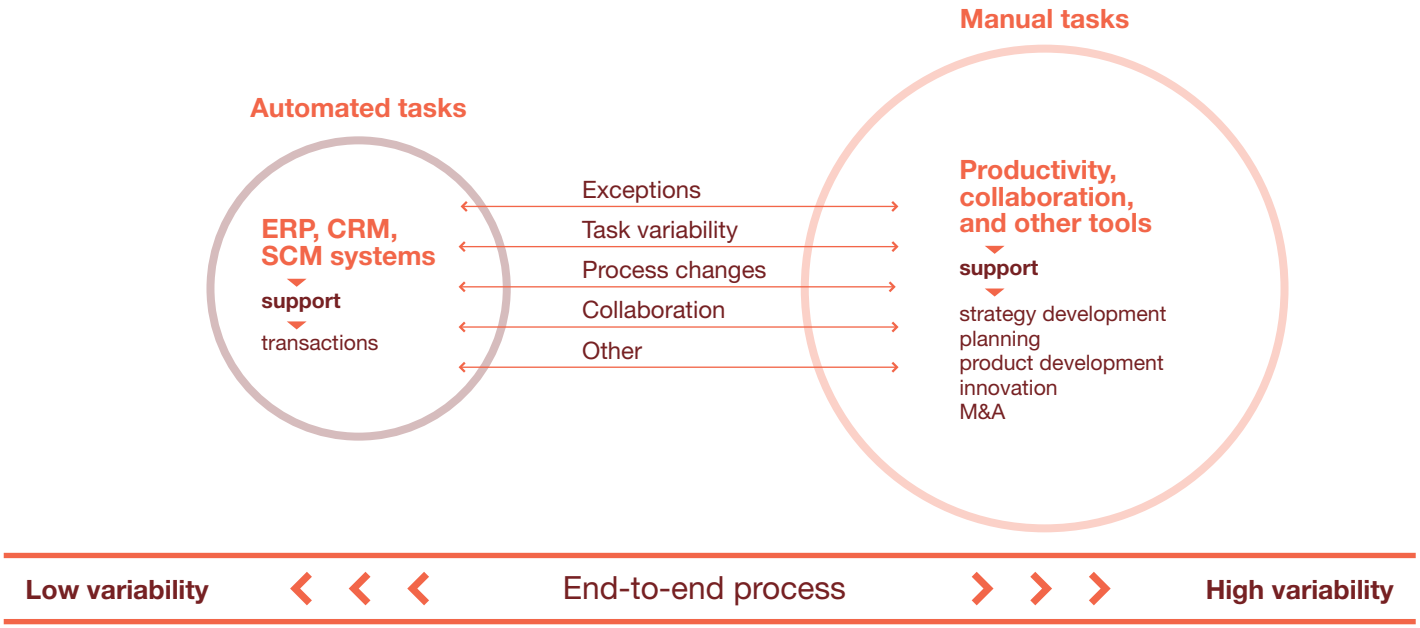

Figure 4: **The activities in any end-to-end process largely exist in two categories based on the variability of the associated tasks. The movement between the two categories results from exceptions, changes in process, collaboration, and variability**

The news is not all bad. The result of humans using these tools is a new set of digital assets—documents, drawings, architectures, methods, models, videos, images, and others. Rather than mere outcomes that need to be managed as content, these digital assets have become smarter over time and present an opportunity to extend process management to the entire end-to-end process. Digital assets have become smarter for the following reasons:

- They are enhanced with extensible metadata capable of tracking important details concerning the author, date created, version number, and more specific information related to the specific tool.
- The digital assets are themselves becoming more modular and organized around components that define different mini-workflows. Text and image development, for example, can follow separate timelines, supported by different subteams, and then be integrated at the last moment before production. The metadata is increasingly open to third-party software, conforms to industry-standard formats, and can be used to manage processes.

Metadata about a digital asset is a key contributor to the smarts of the digital asset and helps with managing and executing an end-to-end process. The Schawk example shows that the metadata associated with smart digital assets is the key to extending process management to the end-to-end process without constraining the necessary variability of human tasks. Standards and technologies that allow metadata to be used this way are discussed in the article, “Smart digital assets: Catalyst for end-to-end process management,” on page 24.

Metadata about a digital asset is a key contributor to the smarts of the digital asset and helps with managing and executing an end-to-end process.

Confluence of process and asset management protects variability

Smart digital assets present a significant opportunity for end-to-end process management by bringing focus to the versatility of human activities. Establishing this focus requires the confluence of two classes of solutions that separate the data created by the human activity—the digital asset itself—from the metadata about the digital asset. The first class of solutions creates or manages the digital assets, and is represented by what PricewaterhouseCoopers calls collaboration and content management systems (CCMS). The second class of solutions supports the modeling and management of processes, and is commonly referred to as business process management systems (BPMS). Both leverage the metadata of the smart digital assets.

Schawk achieved this confluence by separating the smart digital asset from its metadata. Metadata is usually embedded in the digital asset, but, according to Kaufman, this approach has limitations. To remove the limitations, Schawk stored the metadata in a relational database and managed it separately. This technique also separated the human activity from the management of the process by using the metadata as a standard interface for the variable processes. The metadata creates visibility into the variable human activity and offers relevant metrics useful in end-to-end process management.

Combining a CCMS and BPMS, as Schawk did, allows the orchestration of the end-to-end process without restricting the variability and versatility of human effort. These technologies, when combined with the metadata of smart digital assets, essentially provide the bridge to bring together the manual and automated tasks in the two solar systems. (See Figure 5.)

BPMS and CCMS are not new technologies, so enterprises do not need to take risks with early-stage software from small vendors that have uncertain futures. However, the enterprise must integrate these technologies in a way that supports a different approach to process management. Schawk found this effort worthwhile. The reward for taking this approach is a set of process models that accurately reflect how the business actually works, a management team that fully understands how the enterprise creates value, and a meta-process for continuous improvement and agility in a dynamic business environment.

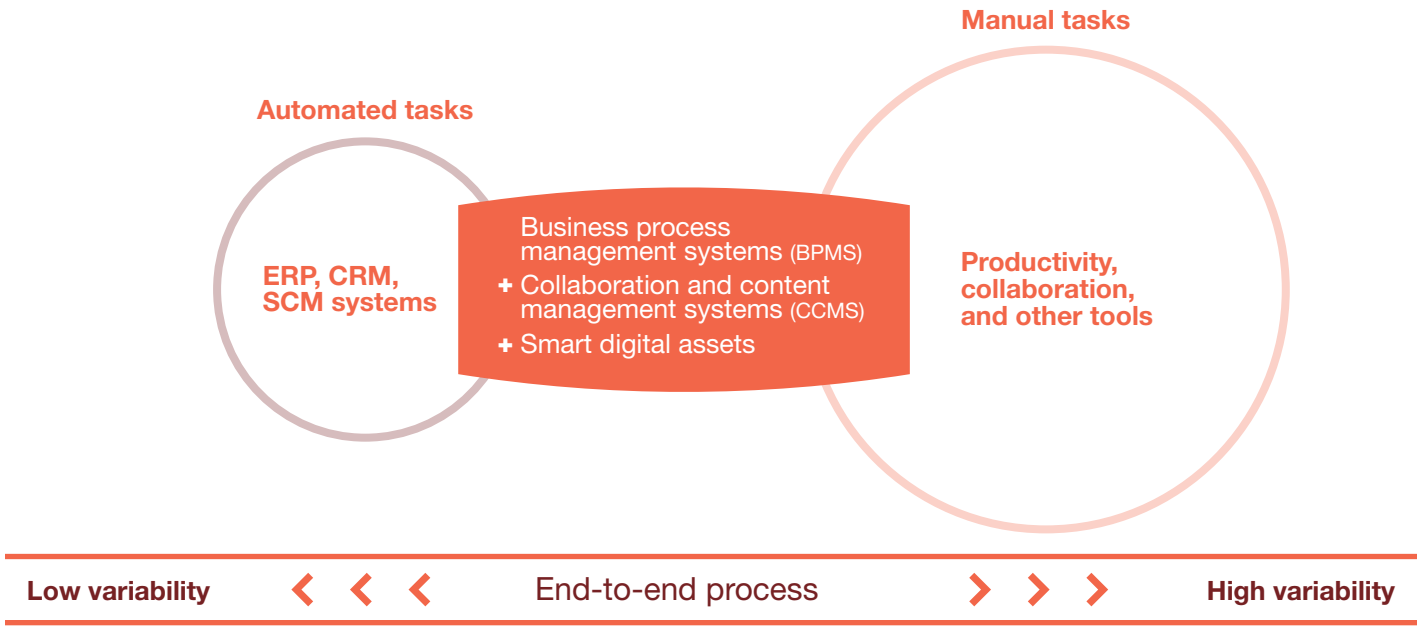

Figure 5: **The combination of BPMS, CCMS, and smart digital assets allows the management of the end-to-end process without constraining the versatility of human efforts**

Role and benefits of business process modeling

A key step in the use of a BPMS is business process modeling, the activity of describing how work gets done in a company at the appropriate level necessary for a desired objective. A model of a strategic process could be fairly high level, while a model that needs to drive an execution environment would have a much deeper level of detail. The goal of business process modeling should be to capture the end-to-end process so it can be better understood and supported by systems. Business process modeling is an important activity to facilitate management of the real end-to-end process. "The model-based design goes more toward completeness of the solution. One part of this is bringing more of the complete end-to-end process into the model and the resulting application logic," explains Steve Miranda, senior vice president of Oracle Application development for Oracle. Model-based design is a key feature of Oracle's Fusion solutions.

Business process modeling of complex work streams can be time-consuming, so much so that process modeling tools have not been as widely adopted as enterprise applications. Potential adopters wonder whether they will see a return on investment from detailed process modeling. And entirely human processes have not had a software support infrastructure to ensure behavioral compliance with any enhanced work-process designs.

This is where smart digital tools and assets come in. By predefining a number of mini-workflows and modularity in the architecture of digital asset creation, smart digital tools introduce a level of process standardization to human-centric activities. The metadata of the digital assets can play two key roles in this regard:

- The metadata can serve as an abstraction of the model of the human effort that takes place. Business process modeling tools can inherit much of this process architecture, simplifying the detailed modeling that previously would have been necessary.
- The metadata provides a standard interface to the variable activity, eliminating the need to structure, standardize, or constrain the variability necessary for human versatility. These standards at specific points in the process then create opportunities to produce metrics that introduce a minimally invasive mechanism for better management of the end-to-end process.

Enterprises have long known the value of treating data as a strategic asset and investing in systems and processes for creating an authoritative source for data and information. The creation of process models in BPMS establishes the potential for enterprises to also treat process as a strategic asset. The sidebar "Using models to manage processes as enterprise assets" contrasts enterprise treatment of data and process as a strategic asset.

The metadata provides a standard interface to the variable activity, eliminating the need to structure, standardize, or constrain the variability necessary for human versatility.

Using models to manage processes as enterprise assets

Ask any CIO or chief operating officer about the company's end-to-end processes, and they'll likely say they have no authoritative repository of information. The documentation they do have for the transactional systems is likely to be outdated, because the enterprise lacks a process for keeping it up to date. Besides, this documentation usually explains the operations of the transactional systems, not the activity that is human driven.

However, enterprises have long known the value of managing data as a strategic asset. Data provides visibility into operations, drives decisions, and is the key to managing an enterprise. Enterprises spend significant resources collecting, normalizing, storing, and managing this data. Table 1 contrasts where enterprises are with respect to their treatment of data and process.

Many enterprises would like to do the same with end-to-end processes but have no authoritative source for process information. This is where process models can pay dividends and present a compelling value proposition.

"In systems today, the single source of truth of a process has to be the BPEL process, the BPM [business process model] process itself, because that's the reality of what's being executed," says Steve Miranda, senior vice president of Oracle Application development for Oracle, explaining how models can be the authoritative source of information about the end-to-end process.*

Although models can be built just for the capture, visualization, and analysis of processes, the trend is toward having the model drive the actual execution environment by creating a tight coupling between the two. "Unless this [business process] model is there to drive—in a closed-circuit fashion with a direct feedback loop—a transactional system that will automate major portions of the process model, you've wasted your time," says Ismael Ghalimi, CEO of BPMS software maker Intalio, a company that offers hosted cloud-computing services. With model-driven execution of the end-to-end process, the enterprise will have a single authoritative description that will allow it to manage that process as a strategic asset.

* Business Process Execution Language (BPEL) is the industry standard that describes how to assemble and execute a set of activities into a process.

Data	Process
Seen as an enterprise asset	Needs to be an enterprise asset
Value of an authoritative source of data is well understood	Value of an authoritative source for process information is not well understood
Metadata is becoming managed (metadata management)	Meta-process needs management (meta-process management)
Data modeling and analysis are known competencies	Process modeling and analysis are evolving
Data cleansing and data integrity are well known, advanced capabilities	Process cleansing and integrity need support from tools

Table 1: **The enterprise view of process as an asset lags behind that of data**

Meta-process management for continuous improvement

Changes and transformations constantly challenge enterprises to stay on a path of continuous process improvement. So far, BPMS and other process management solutions have largely focused on managing the process that is modeled and executed. These solutions are useful, but enterprises need a meta-process for managing and changing the end-to-end process.

Schawk has made impressive gains toward creating a meta-process for change. Smart digital assets and the combination of CCMS and BPMS resulted in a new approach for managing continuous process improvement that we call meta-process management. (See Figure 6.) Meta-process management is a better fit for end-to-end processes because of the following reasons:

- It extends process management to include human-driven activities while acknowledging the need for staff versatility to respond to changing job requirements and deliverables.
- It uses business process modeling tools to reveal the desired process models and process logic for changes, discussion, and analysis.
- It treats the end-to-end process and associated process models as strategic assets that need to be governed and managed to maintain an authoritative source for them.
- It leverages the smartness of smart digital assets by managing the metadata separately from the digital assets and using it to manage and improve the process.
- Finally, the full life-cycle management of an end-to-end process becomes a much more compelling possibility in the context of continuous improvement.

This continuous improvement loop shown in Figure 6 is important in the dynamic business environment most enterprises face. By maintaining accurate models of value-creating processes, management can respond to change with agility. Therefore, any significant enterprise transformation has far greater potential to successfully achieve desired results.

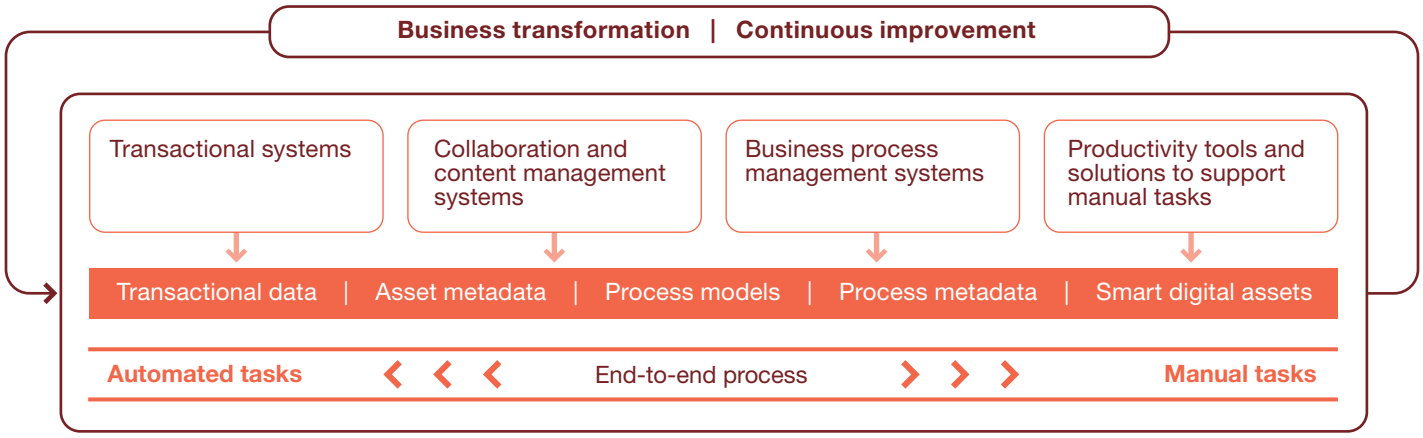

Figure 6: **Meta-process management for business transformation and continuous improvement**

"The model-based design goes more toward completeness of the solution. One part of this is bringing more of the complete end-to-end process into the model and the resulting application logic."
—Steve Miranda, Oracle

Conclusion

Most enterprises have found management of the end-to-end process to be elusive, because the goal of traditional process automation is to assert repeatability and standardization into the process—to reduce variability. However, all end-to-end processes include significant human-driven activities, which are and must be highly variable.

Certain trends now make it possible to extend process management to human-driven activities without constraining the value-creating variability. The outcome of much human activity in enterprises includes documents, media files, and other digital assets, all of which are getting smarter. The smarts are a result of the increasing amount of metadata in these digital assets. Metadata can become a standard interface that, when integrated in a processes-driven approach, can extend visibility and management to the variable human-driven activities and the end-to-end processes.

In addition to digital asset metadata, two classes of enabling technologies make end-to-end process management possible: a CCMS optimized for the management of digital assets and team activities, and a BPMS for shifting focus from managing assets to managing process.

The future for enterprises, and a key responsibility for the CIO, will be to leverage the smart digital assets and associated enabling technologies to create a meta-process of managing the end-to-end process through changes and transformations in business. The metadata is the link among all the activities and processes, enabling the smart digital assets to improve the organization's ability to be efficient and versatile. Meta-process management will extend the power of technology to assist human activities, facilitating the key enterprise asset of human versatility.

For more information on the topics discussed in this article, contact Hemant Ramachandra at +1 973 236 5546 or Gerard Verweij at +1 617 530 7015.

Using metadata of smart digital assets for end-to-end process management

Stephen Kaufman of Schawk discusses how the confluence of process and asset management enables the company to manage its end-to-end process while facilitating the versatility of staff contributions to customer value.

Interview conducted by Vinod Baya, Steven Kahn, and Bo Parker

Stephen Kaufman is CTO of Schawk, a worldwide brand services consultancy headquartered in Des Plaines, Illinois. Schawk's clients include many well-known consumer product companies, pharmaceutical firms, and global retailers. Kaufman provides Schawk with strategic technology visioning and currently serves on Schawk's Strategic Advisory Board. He is chairman of Schawk's Technology Leadership Council and, specific to the packaging industry, is also chairman of the Intelligent Packaging Consortium (IPC), which creates Extensible Markup Language (XML) standards for the packaging supply chain.

Kaufman came to Schawk in 1993, where he became the founder and first CEO of Schawk Digital Solutions. Schawk Digital Solutions created BLUE, the packaging industry's leading digital asset management and graphic arts workflow suite. In previous roles, Kaufman has served as Schawk's technology director and vice president of client strategy.

In this interview, Kaufman shares how Schawk manages changes at all stages of its end-to-end process by combining metadata from smart digital assets with a business process management and digital asset management system.

PwC: Would you please tell us about Schawk and its business?

SK: Certainly. Schawk has been around for more than 50 years. The company started in Chicago as a printing plate manufacturer, reinvented itself through the years, and has expanded the scope of its offering to include integrated strategic, creative, and executional services. Our focus today is on helping companies create compelling and consistent brand experiences at home, on the go, in the store, and on the shelf, starting with brand strategy and design, through production and print management. We currently operate in 17 countries out of 48 offices worldwide, mostly in North America, with some significant presence in western Europe, Asia, and Australia. We refer to our offering as brand point management and while our sweet spot is packaging, our services include specialized pockets of expertise that include retail marketing. Our client base includes 64 Fortune 500 companies, across different industries, but concentrated in the CPG [consumer packaged goods], retail, and life sciences categories.

When our work relates to packaging services specifically, one of the values that Schawk might bring to a brand client would be a "fit for use" analysis. This analysis allows us to apply our deep knowledge of the printing and publishing process, and help the brand client understand up front if their design intent can be accomplished with a given process.

Capturing intent early on and helping the brand client steward that intent through a complex production process brings high value to the brand and often significant cost avoidance. Said another way, we are simply determining the feasibility of a potential plan. We translate what the brand wants to execute from a creative notion into an engineering action. We want to stand at that nexus between creativity and execution.

PwC: What is the key business process that is the core competency and a differentiator for your company?

SK: I should point to this graphic that shows our key end-to-end process. [See Figure 1.] As you move to the right in the graphic, the processes become more transactional. All the way to the right is delivery, which is almost completely transactional. However, on the left, the activities are human driven. They are creative- or decision-based activities, completely non-transactional. So our end-to-end process has strong elements of both kinds of activities.

The overall process starts with a client trying to understand and identify a market opportunity [not shown in the figure]. That activity eventually results in a revenue forecast against the opportunity and usually a VP-level decision to move forward to market test the production of the product or the product design.

From that point, the process moves to a creative phase. The client might hire three or four competing design firms for ideas about how this new product can best be launched. This is where creative agencies, including Schawk's strategic design company, Anthem Worldwide, may be involved. You might start with fifteen ideas and narrow it to four. Then you narrow it down to two, and finally the client will pick one idea. At this stage, the client's brand marketing or marketing services people are still in control and these activities are largely being orchestrated from within their walls.

The next stage is often referred to as production artwork. This stage occurs as the client moves that one idea—we sometimes call it the "big idea"—into the supply chain for packaging and brand point management. In other words, while the package design file is moving physically into the supply chain, the "big idea" is moving quickly toward the consumer. Our role as stewards of that idea is to facilitate that movement through the process such that the original intent is not distorted or diminished along the way. This activity is executed in our "virtual" office if we are on-site at the customer's location, or it might quite literally move into our brick-and-mortar operations and into our systems.

During this all-critical phase, the client routes that design through its legal department, regulatory department, trademark group, and so on. Everyone is vetting the content in their area of expertise. As the process progresses, more investment is involved and the stakes get progressively higher. A mistake anywhere past this phase is going to be very costly to the client, because they've now ignited a lot of supply chain activity. Also, the liability for consumer-readable text is always exceptionally high.

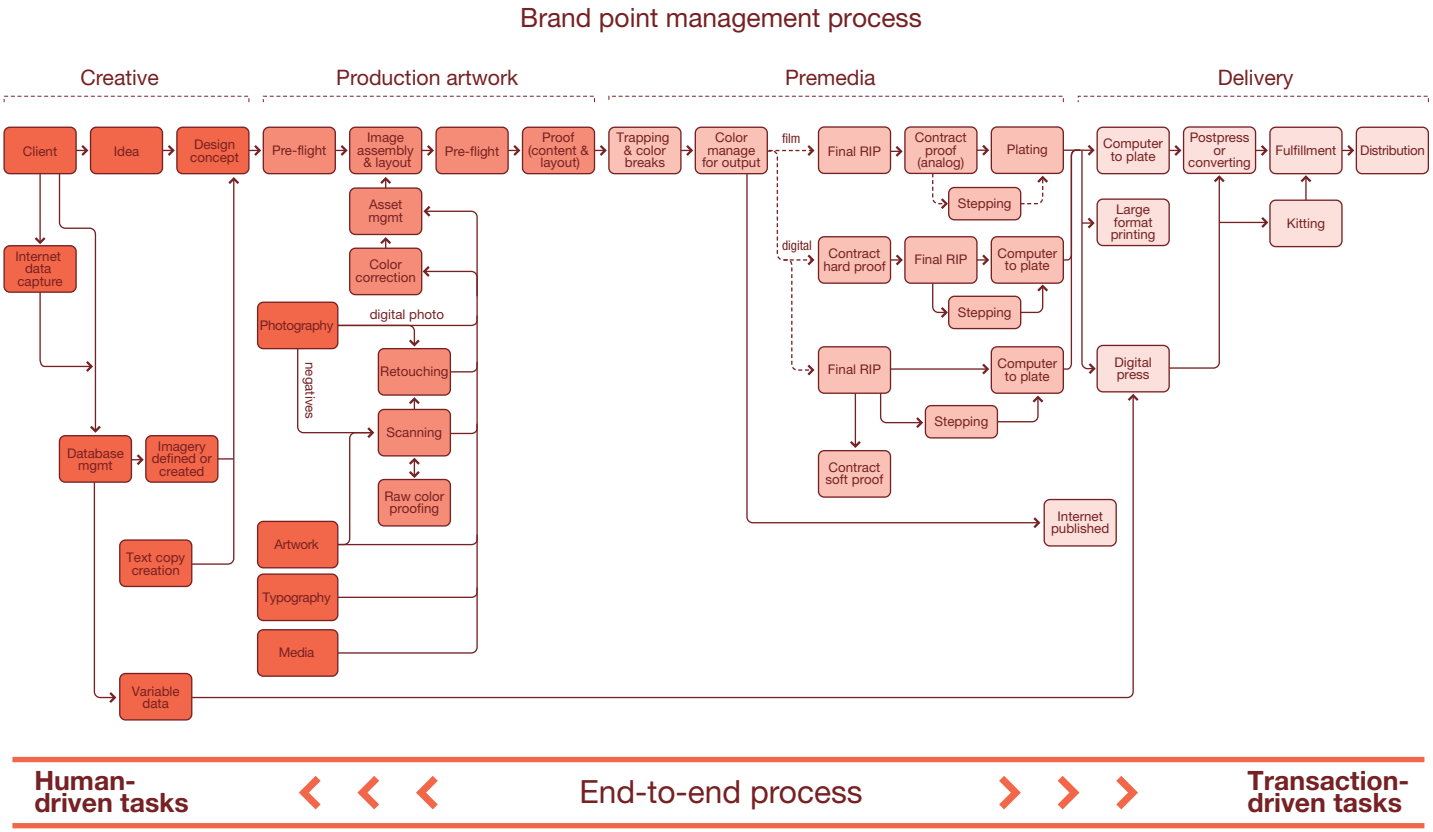

Figure 1: **The key end-to-end business process for Schawk, the brand point management process, starts with strategy and creative and continues to delivery**

Source: Schawk

Once we get all these designs finished and approved by the client, we then move to premedia. Premedia is an industry term that signifies an engineering phase that involves looking at that digital file representing the packaging and asking, "How is this actually going to work on a high-speed printing press with, let's say, a polymer substrate, soy-based inks, and a metallic emboss?" This is a highly technical phase, and in a sense we are applying a technical process to a creative endeavor. We might also ask postproduction questions like: "What if this product sold in a high-humidity market, where the temperatures are such and such?" There are a lot of engineering aspects at this point in the flow.

During this journey, small changes are taking place in the artwork. To the untrained eye, the design might stay the same, but in premedia terms, they actually might change things by as little as a thousandth of an inch to get them to work on these high-speed presses.

At the back end of premedia we have a digital file that we send to the printer. The printer might test that digital file on its printing presses, running 500 or 1,000 samples. The printer might check the sealing machines and how the product works with that design. Then the printer will move into mass production and pilot the materials, and then the printed product will be picked up and moved into a further production step, or possibly directly to retail distribution.

"The more metadata they have, the more intelligent the digital assets can be, but typically they're still players on the stage of process. You don't want process to be a player on the stage of assets."

PwC: What are some of the challenges that you must contend with in this process?

SK: A key challenge is dealing with changes at all stages of the process, while ensuring that we have a good view of the state the process is in and ensuring that costly missteps will be avoided. For example, in production artwork, many files need to be routed to many internal and external supply chain stakeholders. A lot of quality assurance is going on, but the content is still somewhat in flux, which adds complexity. Let's say the food product originally was designed to contain coconut oil, but now palm oil is a much less expensive commodity, and procurement has decided to substitute an ingredient. That new information has to make its way through nutritional analysis again, because there might be an impact on taste or quality, and so on. The important thing to note is the deep interconnection of the entire flow. The artwork for the product must be revised to reflect the ingredients, and if we have 32 different sizes or variations for the various markets (convenience, grocery, club retailer, etc.), then we need to make that change from coconut oil to palm oil in all 32 instances. We have to be diligent about this. If it was an allergen ingredient such as peanuts, it could be a matter of life or death.

Also, ongoing business dynamics have led to an explosion of customizations for our clients. For example, in the late '90s, you might have found one or two basic variations on a candy wrapper. Then, maybe the brand owner would change it once at Halloween and put a pumpkin on it, and at Christmas it might have a holly leaf on it, and that would be about it.

In today's market, the same company might have a size and a package for Wal-Mart and a different one for Target and a different one for Sam's Club or Costco. They might change that package four or five times in a year for seasonal promotions, and they might also do a cross-brand promotion for a not-for-profit organization and have a temporary color variation on the package, and so on. Today, there are many more iterations of individual packages than we saw 10 years ago. On top of that, different geographic and regulatory requirements create additional customization requirements for the package design.

Being able to deal with these challenges is how we create value for our clients.

PwC: How are your clients trying to drive more value into the end-to-end process?

SK: At some of our more advanced clients, they talk about their involvement as "touches." A large consumer product company might have five or six million touches a year if you consider all of the company's products globally and the number of times people at the company made some decision, large or small, relative to some product, large or small. They know each of those touches costs money, and so they're looking to their supply chain to provide automation and expertise so that they can reduce that number of touches. And when there are touches, the client wants to be sure that they are "high value." This is the business issue where business process management [BPM] and automation are coming into play for us.

PwC: As you just mentioned, you have adopted business process management [BPM] technology to manage your end-to-end process. Was there a moment that caused you to pause and realize you couldn't stay with what you had and you needed to look at BPM?

SK: Yes. There was a watershed moment. I think it was a collision of two factors. One factor was that our

"The process model represents the single place we can go to understand and visualize the process and analyze any potential changes."

understanding of the process itself became richer and deeper. Initially, we saw it as a relatively straightforward, linear process. But the more we peeled that onion, the more dependencies we discovered. These dependencies included critical path gateways and events that had triggers that we might not have understood when we started studying the problem.

This nonlinearity of the process is a result of how both our business and our clients' businesses have evolved. Formerly, we worked in a very narrow slice of the workflow, maybe from very, very late creative to very early execution, just to get through a little bit of content approval. Gradually, however, the supply chain has become more complex as Schawk itself has begun to work on multiple aspects of the brand point management process as well as working across multiple regulatory environments and multiple demographic and geographic markets.

The second factor was the matter of "framework" selection. We had the problem defined, but faced the question of what toolkits addressed the problem, had reasonable TCO [total cost of ownership] metrics, and were sustainable from a technology perspective. Once we started looking at jBPM and other BPM frameworks, we started to believe they could indeed interoperate with our workflow software. We then found a specific BPM framework that had enough computational capability and enough backbone to be worth the integration effort.

PwC: When you had a deeper understanding of the process, what were you looking for from your process management system?

SK: As I said, the workflow itself has become much more complex. We could no longer look at the workflow as linear. And the business rules, which were essentially hard-coded in our legacy system, needed to be much more dynamic and intelligent. We needed the notion of triggers and metadata associated with the triggers. The systems that sit beneath these supply-chain-oriented workflows needed to be more robust and smarter than they were formerly. We basically came to understand that the tools that we had in place simply weren't capable of being the foundation for this cross-supply-chain workflow. I think the word "nimble" properly describes what we were looking for.

PwC: A good portion of your process is human driven and results in digital assets, such as files, documents, graphics, and so on. Have these assets become smarter over time and do they bring benefits from a process management perspective?

SK: Yes, I would strongly agree. As I look at asset management and workflow, there are systems where the most important thing in the database is a digital file, and the metadata attached to the digital file actually drives the entire process. This is flawed in a number of ways. In our tool and in our core philosophy, the most important "thing" is the process itself, and the digital file is nothing more and nothing less than metadata dangling off the process. In other words, the process is the king of the hill, and the assets are well-dressed subjects in the palace. We believe that the process-driven tool is stronger than the file-driven tool, because we don't believe the file is an overarching notion. This distinction is critical and fundamental.

We ran into this dichotomy early on, because we were too heavily focused on asset management. So we flipped that paradigm and began putting much more of our thought in the process piece, like the BPM piece. Assets enter and exit, and they have intelligence and metadata. The more metadata they have, the more intelligent the digital assets can be, but typically they're still players on the stage of process. You don't want process to be a player on the stage of assets.

PwC: So, for you, the drive toward a process-driven tool was actually the confluence of these smart digital assets with a process orientation driven by a BPM system?

SK: That is indeed what we have done and it works for us. Many workflows today are embedding the metadata (process details) inside of the file, and that creates a number of limitations during the workflow. If you want to read or write metadata, you have to have access to the asset and the security to write to that file. What if there are multiple copies or versions of the file? Which one holds the "truth"? How can this be arbitrated in a structured way?

Additionally, these assets are large and cumbersome to move around. You wouldn't want to have to move it from point A to point B just to get the metadata. We believe the trend is that an asset will simply have a serial number as metadata, and its serial number will refer to a database in the "cloud," so to speak, and the data in the cloud will be the definitive record for that asset.

PwC: Most process improvement approaches aim to standardize tasks to eliminate variability. Was preserving the context that leverages the versatility of staff in the human-driven processes essential while you extended process management to the end-to-end process?

SK: That was a very strong consideration for us, since human tasks on the creative end of our processes need considerable freedom. In general, when you get into the creative process, if you use words like workflow, KPI [key performance indicator], and process, I think the typical knowledge worker in that field sees those terms as potential restrictions to creative freedom.

There's a cultural limitation of putting a highly auditable and visible process in a creative space. So you need to figure out ways to introduce process management without interfering with the versatility of human processes, which create immense value in the creative and execution phases of our processes.

PwC: Enterprises are continually transforming as they deal with changes in their processes. What is the role of BPM in handling and managing these changes?

SK: Over the years, we have learned that enabling the agility of our client to make changes during the process is impeded if we work in extremely linear workflows. These are workflows where a design is approved and then "locked" from a graphics perspective, and then nobody gets to touch it until it gets to production.

But the reality is that during that process, somebody might want to change the graphics. More often, they want to change some copy or content or tag or ID. If we don't have tools like BPM, the management of change during the work in progress is particularly difficult and costly to the client. These files are managed by different systems, so they might be in a desktop graphics application like Adobe Illustrator early on, and then they can get transitioned into Acrobat files or fully proprietary file formats. If the client wants to make even a simple typographical change, the process to support that kind of change, the sign-offs, the execution, and the communication of that change to the rest of the supply chain can be extremely manual.

Changes of this type cost time and money and in some cases preclude a client from making them at all in the linear workflow. If they were pursuing an optional change, the price point or the time required for that optional change might simply cause them to say, "We can't make that change, because either we can't move the date or we don't have the budget." With BPM, we can lessen the cost of this change and manage it more efficiently. Now, rather than having to make their final change 30 days before their in-market date, we can perhaps provide them a window so they can make a change 15 days before their in-market date. The actual metrics for this vary from client to client and have as much to do with production and distribution logistics as anything, but the basic trend is the same—BPM facilitates a more flexible change environment deeper into the process.

That's very, very valuable to brand customers from an ROI [return on investment] perspective. Imagine a

"With BPM, we can create triggers that can actually manipulate and modify the metadata itself, so that the next step is more informed about what it should be doing and where it should be going than the preceding step."

market where only two key brands compete for valuable space on the shelf of a global retailer. If one brand makes a change shortly before the holiday season, the other thinks, "That's going to give them a competitive edge this Christmas season. We need to get something to market to match that." You can only imagine the amount of money at stake in the retail environment when they can execute that responding change before the holiday season as opposed to after.

There's an industry standard that estimates that for a given product, roughly 70 percent of the buying decision is made in the store. For the end customer, the process of looking at the package, analyzing the buy decision, and deciding whether to put the product in the shopping cart is often based around the look and feel of the product, and the graphic presentation of the product or branding concept. To be sure, it's all a very mercurial process, but changes and counter-changes, executed in a timely fashion, can have a high-volume impact on market share and the success of our clients' products overall.

PwC: What is the role of modeling in business process management? What value does it create for you?

SK: Modeling is very important and is the foundation for our system. The process model represents the single place we can go to understand and visualize the process and analyze any potential changes. As I learn more about a process for one of my clients, I find it interesting how assumptions they had in the beginning can change as the clients learn more about their own process. Modeling helps with that. It shows the parts of an existing process that are causing the most problems, and what parts aren't as much of a problem. Bottlenecks, critical paths, what-if scenario building—all of these help the brand control its process flow and decision-making algorithm.

PwC: How does the BPM system help you with planning for and visibility into the end-to-end process?

SK: The client might have greater agility now, but the interdependence in the process is much more complex and needs to be presented visually and explicitly. BPM helps with that. For example, five years ago, if we had 32 salad dressing flavors to do, we'd probably do the execution in one location with one team of people. They're all sitting 15 feet from each other, and they're sharing any nuances that need to occur with production. Well, we don't have that much time anymore. Sometimes, Schawk's tactical production artists need to turn around those 32 design mechanicals in 72 hours. That faster turnaround means we need visibility into a load-leveling production plan. I might do 15 of them here in Des Plaines, just outside of Chicago, and I might want to send 5 to Chennai, India, and the balance to Penang, Malaysia, tonight to get worked on.

So now I'm actually pushing out beyond the traditional brick-and-mortar of a single Schawk location and leveraging a global production capability that works around the clock. We need to find the lowest price point where we have the production lift tonight or tomorrow night to do that work. That can be down the street or across the ocean. We don't have the luxury to have people sitting together sharing best practice. The best practice has to be embedded in the workflow as metadata, and we have to be able to shuttle that work around even though our client may not know or care about the physical location of the production work. They just want us to do each SKU [stock-keeping unit] at an agreed-to price, and in an agreed-to time frame. On our end, we intend to use BPM to orchestrate work to and through our highest-value production locations.

Another example is using the process-supported knowledge in BPM to predict a finish date given a process and a known start date. This is called

"Date-Rippling" scheduling. You can ripple forward from a start date, or you might ripple back from an end date, answering the question, "If I need it in store by dd/mm/yyyy, what date do I have to start?" Prior to using BPM, we didn't really handle that well, particularly when clients wanted completion time estimates that were accurate within a few hours of asking the question.

PwC: We discussed how the digital assets are getting smarter because of the metadata associated with them. What role does this metadata play in managing the process?

SK: What's unique about BPM, or at least the way we've begun to think about applying it, is that the metadata needs to be much more dynamic. BPM can actually orchestrate the change to the metadata during the process. Rather than thinking, "I have 10 data fields in this file. Let's push it through the process and hope nothing changes with that data while this file is in the pipe," we need something more dynamic.

As we move through each decision point, we want to move the process information, reroute data and replicate data, update data, act on data. With BPM, we can create triggers that can actually manipulate and modify the metadata itself, so that the next step is more informed about what it should be doing and where it should be going than the preceding step. In a sense, we're adding some intelligence to the workflow that it just didn't have with the older toolkit.

PwC: Does this metadata allow you to introduce a level of standardization into these highly variable human-driven processes?

SK: Yes. In many cases, the process is not completely standard because the way individuals do work is subject to change and personal interpretation. So, what becomes standard is a higher-level abstraction of what the process represents, and for us the metadata is a key component in that abstraction. Abstraction is a technical term, but what it really means is creating repeatable patterns that operate above the level of work instructions, and more at the level of activity, or direction, or process step.

I need to get that "abstracted" data out of the file asset and into a database, because it defines the intelligence that I need to manage that asset or project. This data in turn informs the process, together with other factors, like a rejection, revison, status change, or altered deadline.

With BPM, we can make these little bits of data into decision gates in the process itself. So if somebody rejected a proof, the workflow moves this way instead of that way. If we pick up a file asset that's a newer version than we had in the first instance, then we might want to know who worked on the asset and in what location it was worked on. This way we can determine whether we have the right version. I think the key here would be a very interconnected process managed by a flexible system that supports intelligent decision making. That's the core goal: informed, effective, and process-relevant control. ■

Smart digital assets: Catalyst for end-to-end process management

The rise of smart digital assets presents a compelling opportunity to extend process management to variable human-driven processes.

By Vinod Baya and Karen Schwartz

If you need to know which lines of business produce the most revenue or which factories have the most downtime, you can usually get the answer at most companies. But if you want to know the processes by which HR hires employees or engineers design products or marketing creates collateral, the answers aren't easy to find. As discussed in the previous article, the only parts of end-to-end processes that enterprises have visibility into are those closer to transactional systems—which focus on standardized tasks and ignore variable, human-driven processes that depend on the versatility people bring to their work.

In today's business environment, it is crucial to be able to manage human-driven processes with the same steady hand as transactional processes. The challenge is how to get there without investing heavily in detailed process modeling of every nook and cranny in the enterprise. A quick start is needed, one that takes advantage of process standardization driven by factors inherent to the activities themselves.

This quick start is now possible thanks to what PricewaterhouseCoopers calls smart digital assets and their integration into an approach for process management that leverages existing business process management systems (BPMS) and collaboration and content management systems (CCMS). As noted in the first article of this issue of the *Technology Forecast*, we call this approach meta-process management. This article examines advances in three key technical areas that make our vision of meta-process management possible.

Smart digital assets: A function of metadata

Human activities are increasingly supported by software and result in the creation of digital assets. And these assets are getting smarter because their metadata goes beyond simple descriptors that have long existed—like file name and time stamp—to include more process-specific information. Metadata is relevant data about the data—embedded information in the digital asset that can be used by both software programs and users.

Most human-driven activity now occurs with the support of the software that enterprises use to conduct business. This software includes office productivity software such as that from Microsoft and others, CAD/CAM applications, applications from Adobe Systems and others for various creative work, and other software that support a wide range of human activity in all industries. Although specific to particular tasks, these tools are designed to accommodate and support the versatility that humans need to carry out their knowledge work.

Human activities are increasingly supported by software and result in the creation of digital assets that have metadata.

Figure 1: **An example of the metadata associated with a photo**

Source: http://rsbweb.nih.gov/ij/plugins/images/exif-metadata.gif

In many ways, these tools have allowed knowledge workers to develop and express their own methods of carrying out the variable tasks. "I would say that users also have their own personal methods, and those, too, are smart digital assets. If they want, they can publish their personal methods and then others can decide if they want to use them or not," explains Marge Breya, executive vice president at SAP.

In the course of using these tools, workers produce digital assets—documents, media files, engineering drawings, legal arguments, business contracts, presentations, and countless other work products. These digital assets are becoming smarter because today's applications generate more and more metadata. Metadata can be descriptive (title, author, keywords), structural (for instance, how pages are ordered to form chapters), administrative (when a file was created, file type, who can access it), or provide other pertinent details.

All computer files have long captured data about when the file was created, edited, accessed, and reviewed. This metadata is not new. What is new is that metadata is increasingly part of any digital asset created by human-facing applications. And metadata has become richer and deeper, detailing more aspects of the digital asset and the associated human activity.

Metadata getting richer

Metadata is becoming richer. For example, the digital asset that results from taking a photo would have metadata as shown in Figure 1. This metadata discloses devices, resolution, key activity parameters, and other useful details. Figure 1 shows metadata in the Exchangeable Image File Format (EXIF), a standard for sharing metadata about photos. The metadata can be preserved and added to further creative work, such as editing and post-processing in Adobe Photoshop or similar applications.

Metadata is captured and available for digital assets, and digital assets can be in any of the different media formats, such as audio, video, Web pages, pictures, graphics, or sometimes even a physical artifact such as a book with a radio frequency identification (RFID) chip. Therefore, the use of metadata can cut across content types and can be used to represent the full spectrum of content resulting from human activity.

Metadata is most often created by the software, as in the case of the metadata in Figure 1. In some cases it can be added manually. For example, most photo editing software allows the user to add ratings, keywords, captions, and other details useful for searching, processing, and sharing images. Scanned forms and documents in insurance or medical claims usually require the input of other details necessary for processing.

Metadata can result from collaboration with colleagues or industry partners on the digital asset, detailing which participant handled it for each step in a value chain. "The social and the collaborative technologies are giving us a host of metadata we didn't have before, and it's already transforming some industries," says Steve Miranda, senior vice president of Oracle Application development for Oracle.

At Oracle, the most helpful documents on the company's support Web site land at the top of the list, not because Oracle has put them there, but because of the metadata created by customers who believe

Metadata has become richer and deeper, detailing more aspects of the digital asset and the associated human activity.

those documents are helpful. "We get the hits on the documents, we get ratings on the documents, and then it's kind of a survival of the fittest on these—the smarter digital assets," Miranda says.

Metadata getting deeper

Metadata now reaches deeper into a digital asset and is becoming standardized. The Extensible Metadata Process (XMP) format from Adobe allows metadata to be specified for the overall digital asset as well as a particular subcomponent of the digital asset. (See Figure 2.) This capability improves the visibility of actions at the component level of the asset, and allows more granular business rules for validation and action regarding the asset in any process. For example, on food product packages, the metadata for the creative graphic and for the text about ingredients can be entirely separate. Then if changes are made to the text, the document needs to be routed only to the nutritional or regulatory expert, thereby limiting the number of touch points and potential errors in a review cycle.

But XMP goes even further to make metadata useful. It builds on Semantic Web technology—an extension of the Web that uses metadata expressed in the Resource Description Framework (RDF). Developments in the metadata world are intersecting with developments in the Semantic Web world. RDF is a standard from the World Wide Web Consortium (W3C). An associated W3C standard is Web Ontology Language (OWL), which is typically used to define the properties of artifacts defined in RDF. OWL is also used to define relationships among RDF entities.

Many believe that a data Web will develop that fully augments today's document Web. (See the article "Spinning a data Web" in the Spring 2009 issue of the *Technology Forecast*.) Enterprises will be able to find and take pieces of data sets from different places, aggregate them without warehousing them, and analyze them in a more straightforward, powerful way than they can now. The underlying technology used for Web-based information also applies to internal information and non-Web-based external information. In fact, it can bridge data from anywhere—including data from an enterprise's data warehouse and business partners. These developments create more opportunities to manage metadata and use it for many purposes.

Metadata that is not semantically consistent across functions in an enterprise can create many problems for its interpretation and use in processes. Technologies from the Semantic Web world can harmonize and rationalize metadata that have overlapping but not identical meaning. Many content management systems include features to harmonize taxonomies of metadata. This portends a future where metadata and Semantic Web technologies make it possible to orchestrate business processes that span organizations and business units to support flexible and easier integrations of human activities.

Metadata as a standard interface to variable activity

In addition to carrying valuable information, most metadata exists in an Extensible Markup Language (XML) format. This means that it can serve as a standard interface to what is otherwise a highly variable activity dependent on employees, as shown in Figure 3.

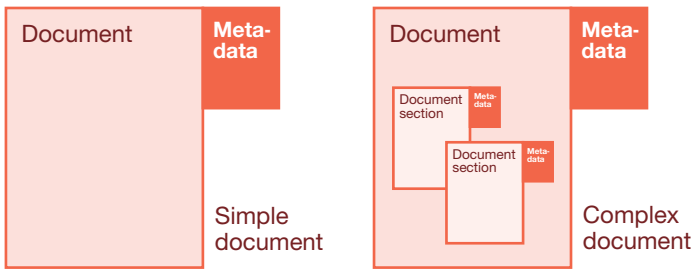

Figure 2: **Metadata can be tied to the entire document as in a simple document, or to the subcomponents within a complex document**

Source: Adapted from Adobe Systems

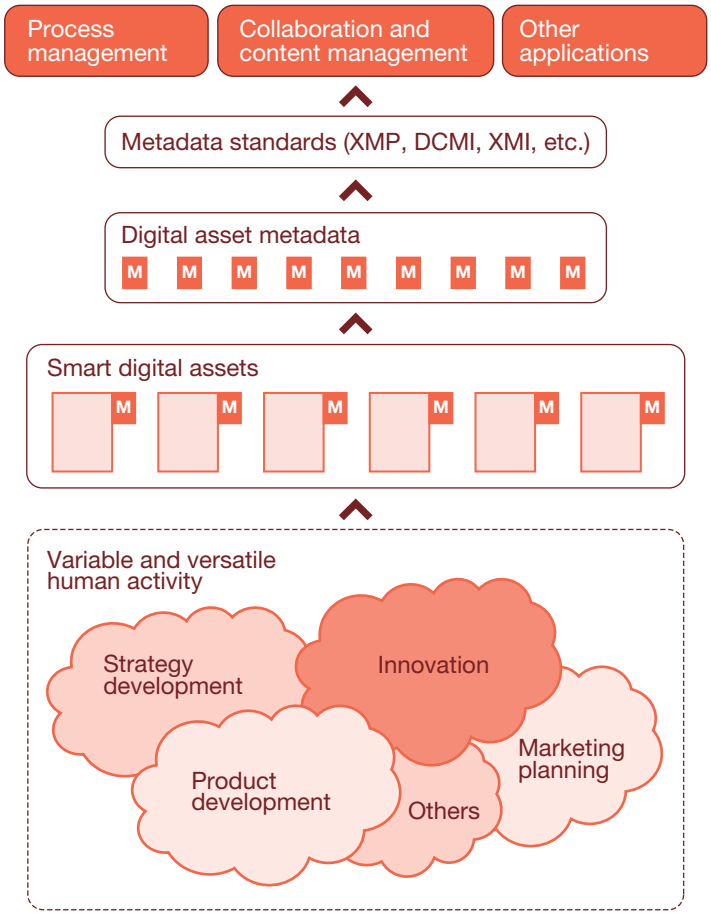

Figure 3: **Metadata serves as a standard interface to a variety of human activity and therefore can be used in process management or other applications**

"In many cases, the process is not completely standard because the way individuals do work is subject to change and personal interpretation. So, what becomes standard is a higher-level abstraction of what the process represents, and for us the metadata is a key component in that abstraction," says Stephen Kaufman, CTO of Schawk, a global brand management company. As a standard, metadata can be easily used in programs to take actions such as routing for approval, requesting changes, or review. And, as a standard, metadata also becomes a key resource for integrating with other applications and solutions as necessary for managing the process.

The Object Management Group (OMG) has created a standard called XML Metadata Interchange (XMI), which enables the use of XML to exchange information about metadata, so programmers can use the metadata in their applications. The Web gave rise to new standards for exchanging metadata and facilitating its use in applications and processes. For instance, the Dublin Core Metadata Initiative (DCMI) is an open organization developing interoperable metadata standards that support a broad range of purposes and business models. It provides standards used to describe information resources on the Web. The e-GSM standard is a similar metadata standard for government resources on the Web.

The importance of metadata is growing so fast that vendors are providing products focused on its capture and management. SchemaLogic provides a metadata management server to address the growing use of Microsoft SharePoint servers for office productivity and collaborative work. The increasing importance of metadata is likely to push collaboration and content management vendors such as Autonomy, Microsoft, and others to extend their taxonomy management tools into full-blown metadata management tools. Taxonomy management tools largely focus on classification and categorization of content for efficient search and retrieval.

Metadata augments the actual digital asset and does not need to be visible to end users or interfere with their actions. Therefore, metadata does not constrain the human activity. Metadata allows software programs to apply business logic as part of a process management infrastructure while preserving the necessary versatility of human actions.

Using metadata in process management

If used intelligently and to their full potential, smart digital assets, which can be integrated and manipulated in applications and process tools, can create greater visibility into end-to-end processes and provide more context than the asset alone. Both tools and people can then use that visibility and context to improve their actions and processes.

Metadata makes activities visible and can trigger events.

Metadata makes activities visible and can trigger events. For example, a brand management activity that incorporates package drawing files for toothpaste might include metadata on the regulatory disclosure requirements for ingredients for each market, so designers can ensure they adhere to each requirement in the common file and anticipate the effects on the design before the compliance review begins. It's already accepted practice for layout files to contain metadata about the color model, so whatever printing press is used can apply color correction algorithms to ensure consistency across different presses and ink vendors, and so the designer can preview the results on screen before deciding on the final color palette.

Metadata has become such an important part of Microsoft Office that the company provides many ways to use it. Microsoft Office SharePoint Server 2007 allows users to route content to a specific location in its repository according to content type—essentially a type of metadata.

Microsoft Office SharePoint Server 2010 promises to provide more uses for metadata. One new feature, called Managed Metadata Services, allows users to define their metadata structure, maintain consistency, and share it. Managed metadata is a hierarchical collection of centrally managed terms that an organization can define and then use as attributes for items in the repository. Newly created managed terms or keywords are stored in the database specified in the managed metadata service. SharePoint 2010 is expected to include support for ad hoc metadata, in which users will add their own tags, either in document libraries or via new social media features such as wikis and blogs. All these features improve visibility and the management of human-driven processes that result in Microsoft Office–created digital assets.

When combined with a process management system, metadata can also be used in the broader end-to-end process in which the digital asset is created. For example, CAD/CAM systems include metadata to help the architect understand the interplay among all systems (heating and ventilation, electrical, structural, and so forth) before committing to a blueprint. Creative tools from Adobe have increasingly included, used, and generated metadata to help designers better understand the source assets and how they interact, how they might be affected by production systems (such as printing presses and computer screens), and how they might be used in multiple media in what is called an XMP workflow.

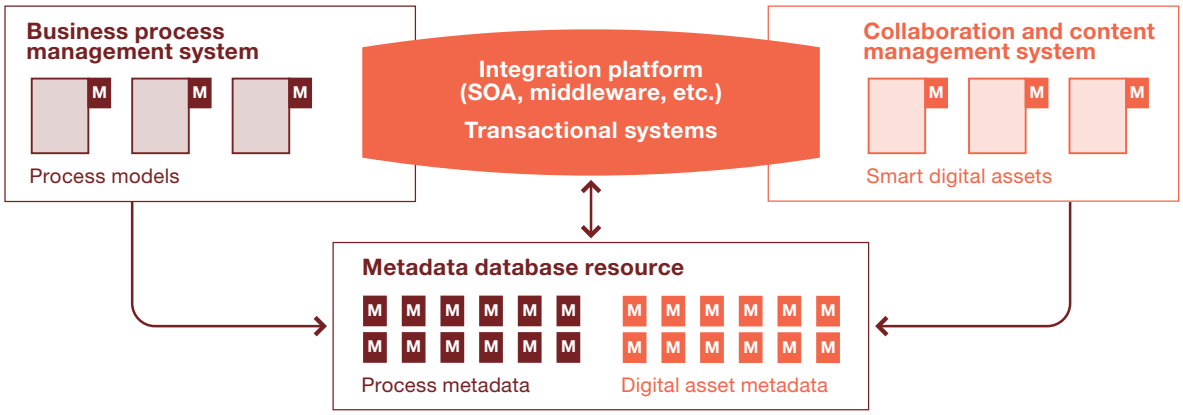

Figure 4: **Integrating BPMS and CCMS leverages asset and process metadata along with metadata standards**

Combining process and digital asset management

As described in the article, "Managing variability without constraining it," on page 04, end-to-end process activities are trapped in two separate worlds: those driven by transactions and those driven by humans. The rise of smart digital assets creates a compelling opportunity for enterprises to extend process management beyond the transaction capture components of end-to-end processes by targeting the human-driven activities.

The key to managing the entire end-to-end process, including activities that rely on the versatility of humans, is the integration of two classes of solutions: collaboration and content management systems (CCMS) and business process management systems (BPMS). (See Figure 4.) CCMS comprise the systems and technologies used to manage digital assets resulting from human activity. BPMS offer modeling, process execution, and analysis technologies.

For highlights of some vendors and their solutions in these classes of solutions, see the sidebars "A sampler of collaboration and content management solutions" and "A sampler of business process management solutions."

Many building blocks for this integration are not new, which should help IT organizations to adopt the concept

A sampler of collaboration and content management solutions

Collaboration and content management systems (CCMS) support a large set of human-driven activities and include capabilities to create and manage the digital assets that result from those activities. When augmented with metadata, business and process logic, and even analytics, these systems can do much more. At most enterprises, CCMS solutions are siloed: they are deployed to support the specific need for content management or the collaboration of a team.

EMC Documentum: EMC Documentum is a content management offering that spans the life cycle of content from creation to disposal. It also includes capabilities for collaboration and storage. Many options are available to manage the assets in a distributed environment and to use them in workflow.

IBM Lotus Connections and Quickr: Connections connects the networks and knowledge of co-workers, partners, and customers. Its portal site aggregates information, while its task management tool helps groups work. Other features include a blogging, social bookmarking, content library, wiki, and micro-blogs. Quickr helps teams share content; it offers libraries, online places for projects and teams, prebuilt templates, and personal file sharing.

Microsoft SharePoint Server: SharePoint allows users to create their own collaborative workspaces and coordinate teamwork using shared calendars and alerts. Communication with team members occurs via presence and instant messaging (IM). Document workspaces streamline the document creation process, while improved communication helps streamline people-driven processes.

Novell Teaming: This platform focuses on social networking within the enterprise. It allows the quick formation of workspaces for sharing knowledge through a built-in workgroup feature. It includes an automated review process that makes work immediately visible for feedback and revision.

Open Text ECM Suite: This content management system allows management and collaboration on business documents, Web content, images, audio, video, e-mail, forms, and reports. It fosters collaboration through community workspaces, forums, blogs, wikis, and IM.

Oracle Beehive: An integrated set of collaboration services built on Oracle's centrally managed collaboration platform, Oracle Beehive enables users to access information in a central repository using features such as version tracking and check-in/checkout. It includes workspaces, mobile access, presence, conferencing, voice mail, IM, and telephony to foster collaboration on documents, e-mail, wikis, calendars, and tasks.

more quickly and to leverage existing expertise and IT assets. Depending on the environment, different prevailing integration technologies—such as service-oriented architecture (SOA), middleware platforms, and application development platforms—can play a role in providing the infrastructure necessary to carry out the integration.

However, from a process perspective, the focal point in the confluence of these two technologies is the metadata about the smart digital asset. The previous section detailed how the standard interface that metadata provides and the ability for programs to manipulate it enable enterprises to use the metadata in the context of processes. The standards are indeed necessary for sharing and exchanging information across systems. Also crucial is an understanding of the following:

- **Most asset management systems manage the metadata with the asset.** Schawk found that this approach limited its ability to use the metadata to manage the process. "Many workflows today are embedding the metadata (process details) inside of the file, and that creates a number of limitations," Kaufman says. For example, this forces someone to access the digital asset to get to the metadata. Since the digital asset can be large (in bytes), moving it around to access the metadata can be cumbersome. By exporting the metadata to an

A sampler of business process management solutions

Business process management systems (BPMS) are used to model and execute business processes. Today, BPMS are typically used for standardized, repeatable workflow management, including the automation of digital paperwork routing in applications such as invoice approval and loan document verification. Their deployment has been limited to applications close to the transactional environment. As a result, most implementations are not extended far enough to incorporate variable human activity.

Dr. M. A. Ketabchi, president and CEO of BPMS vendor Savvion, suggests that BPMS solutions represent a new class of applications he calls process applications. These applications complement transactional as well as collaboration and other applications. For more on BPMS and process applications, see the conversation with Dr. Ketabchi on page 32.

Intalio|Cloud BPM: The Intalio|Cloud BPM Enterprise Edition, built around the standards-based BPMN Modeler and BPEL Engine, has two components: Intalio|Designer for code generation and import, and Intalio|Server, a high-performance process engine. Add-ons are available for business activity monitoring, business rules management, and enterprise content management.

Metastorm BPM: This business process modeling product has modules for creating graphical models of business processes, and for integration between business processes and the applications and databases that support them. There are also dashboards and user interface options, as well as monitoring and reporting tools.

Oracle BPM Suite: This suite consists of five products for business process management for collaboration and development. A full complement of features include role-based access, Really Simple Syndication (RSS) notification, a comprehensive dashboard, and a scalable server. The suite also covers process management, business activity monitoring, business rules, and a Web center suite.

SAP NetWeaver BPM: SAP's approach to business process management is concentrated in its NetWeaver BPM tool, which includes components for modeling, executing, and monitoring business processes based on a common process model.

Savvion BusinessManager: Savvion BusinessManager consists of a process modeling tool to map and analyze business processes and simulate results, a version-controlled repository for sharing ideas, a development environment, a set of Java-based engines that manage the running of process applications, and an online task management and monitoring system.

A conversation with Dr. M. A. Ketabchi of Savvion on business process management systems

Dr. M. A. Ketabchi is the president, CEO, and founder of Savvion, a business process management systems vendor. He was a full professor at Santa Clara University when he founded Savvion in 1994. Under his leadership, Savvion launched the first business process management product in the market in 1999, has built a strong customer base of leading enterprises around the world, and has reached profitability and growth.

PwC: You have been promoting the concept of process applications. What is a process application?

MK: A process application is developed using a business process management system [BPMS] and is the execution of an end-to-end process, which typically involves both people and systems. For instance, an end-to-end process could include a step performed by one person, which triggers a task for another person, which triggers a transaction on a database, and so on. From the time a process begins until it ends may be a day or a year. AT&T has built a cell tower construction process application. Several of our customers have a new product introduction application. It is common for those processes to take months, and maybe a year.

PwC: How are process applications different from collaboration or groupware applications?

MK: Groupware overlaps in functionality but not in purpose. Groupware applications are end user productivity applications. In contrast, the main purpose of process applications is to let the business monitor and change the process easily. The single most important difference between a business application developed via a BPMS and a traditional business application is agility—the ability to change the application when the business conditions change. This agility is possible because the business logic is not hard-coded into the applications.

PwC: Why are process applications needed? Why can't enterprises just use transactional applications to do the same thing?

MK: Because business objectives are not achieved by individual transactional applications. Business objectives are achieved through the execution of business processes, which span multiple transactional applications as well as multiple human actions interweaved with the execution of the application. That focus on the end-to-end process—versus a function—creates the need for process applications.

PwC: What is the role of process modeling in process applications?

MK: It's a necessary component. The model defines the logic of the process application. But you want to be able to monitor the process that is in execution. Without a BPMS, your monitoring will reduce to what you have with business intelligence [BI] systems. The key difference is that a BPMS allows you to monitor and analyze in the context of the process.

The way we define business process improvement involves modeling the process, monitoring its performance, and improving the process. To monitor your metrics in the context of the business process, there is also a modeling element. But the process you define for the purpose of monitoring is not necessarily the process you define for the purpose of execution and automation. Why? Because when you define a process for automation, you can't skip steps.

PwC: A BPMS can allow enterprises to treat processes as assets. What aspects of the process become an asset?

MK: First of all, a process is not just a diagram. There are a variety of important artifacts, such as metrics and information around the process, all the documentation and SOPs [standard operating procedures], and so on. All of that is part of the process. All of these together are assets because they capture enterprise know-how. By the virtue of the fact that you have defined them, now you can analyze them and run a simulation scenario without changing the process. You can decide that instead of ten people to review an order and five people to ship it, you need to have it the other way around: five people to review and ten people to ship. A lot of improvements are possible just because you have defined your process and you are able to simulate and analyze it.

Additionally, I think it plays an important role in compliance and regulatory situations, because if anyone walks through the door and asks, "How do you order your goods?" or "How do you process your orders?" you basically pull up the process model and say, "Well, this is how we do it."

PwC: Does a BPMS allow variability and freedom of knowledge work?

MK: There are parts of a process that are collaborative, ad hoc, and dynamic, and you don't want to restrict knowledge workers too much. So you may enforce the process end-to-end, but you would not define some of the steps in the process very rigidly. You would say, "These are the five tasks that need to be performed. You can perform them in any order, using any method." But the process will move forward after all those five are done.

PwC: Developing detailed models can be expensive and time-consuming. How can enterprises transform their business without first building detailed models of their end-to-end process?

MK: The core to understanding the relationship between a BPMS and business transformation is understanding that transformation requires business process improvement first. That is, before I spend all that time to define my processes in detail and re-automate my processes, I have to justify it.

How do I justify the transformation? One way to justify is to define your process for the purpose of monitoring. And the monitoring process can be at a higher level than the detail you need for execution, because you are not executing. You understand your business, you understand the key steps in your process and the key metrics around your process, and then you monitor the performance of the process based on the execution you have. You look at the metrics. If everything is fine, then continue monitoring and make sure it remains fine. However, if you see things are broken, then you say, "All right, what do I do now?" You can incrementally build deeper models of the various steps this way.

PwC: Do process models help people visualize the process?

MK: I'm a very strong believer in the value of visualization in the context of a BPMS overall, because this has to do with presenting a lot of information to senior business managers to help them understand the processes and make decisions. Visualization is a critical success factor.

external database, Schawk created a platform for integrating asset management and process management. “I need to get that ‘abstracted’ data [metadata] out of the file asset and into a database, because it defines the intelligence that I need to manage that [file] asset or project. This data in turn informs the process, together with other factors, like if somebody rejected a revision of a graphic, changed a status, or removed a deadline,” Kaufman says.

- **Metadata does not have to be limited to the digital asset, but can be extended to the process.** Just as digital assets can change, so can the end-to-end process. “BPM [business process management] can actually orchestrate the change to the [asset] metadata during the process,” Kaufman says. “With BPM, we can create triggers that can actually manipulate and modify the metadata itself, so that the next step is more informed about what it should be doing and where it should be going than the preceding step. In a sense, we’re adding some intelligence to the workflow that it just didn’t have with the older toolkit,” he explains.

Such intelligence, which relies on the information about the process, means that the very process itself can be characterized with metadata. Process metadata can be represented in process models or managed separately like digital asset metadata. Metadata about the process externalizes the ways in which the overall process can change and becomes a key resource for meta-process management.

Combining the CCMS and BPMS is complementary. Where the BPMS adds value beyond the CCMS is in its use of modeling. The modeling capability can support the creative activities involved in process design to improve efficiency or enable new product and service delivery. If informed by metadata and connected to other systems to gain more thorough knowledge of the end-to-end process, BPMS can significantly enhance the creative and transactional processes in an organization.

There is a push in the business process management community to make the model drive the execution of the process. This is essential to keep the model and the execution in sync and to have a single and authoritative source of what the process is and how it is carried out. However, it is not uncommon for some organizations to use BPMS as a modeling tool only. As a result, the models are often disconnected from the actual processes and their metadata, so the utility of the models is confined to early-stage process redesign. “Unless the model is the runtime, the model is useless,” says Ismael Ghalimi, CEO of BPMS software maker Intalio, suggesting that if models do not drive the runtime, they lose their value.

By focusing on the end-to-end process and using process models, enterprises can gain unprecedented visibility, enabling the analysis and prediction of the impact of changes. As Kaufman explains, “An example is using the process-supported knowledge in BPM to predict a finish date given a process and a known start date. This is called “Date-Rippling” scheduling. You can ripple forward from a start date, or you might ripple back from an end date, answering the question, ‘If I need it in store by dd/mm/yyyy, what date do I have to start?’ Prior to using BPM, we didn’t really handle that well, particularly when clients wanted completion time estimates that were accurate within a few hours of asking the question.”

Unlike traditional transactional applications, another distinct capability of BPMS is the way it externalizes business or process logic. It creates the potential for continually adjusting the end-to-end processes to accommodate changes in the business. PricewaterhouseCoopers uses the term meta-process management to name the method by which changes to a process are managed for continuous improvement. As we have discussed, the versatility of human activity is necessary to allow and accommodate frequent changes. BPMS provide a key component for deploying this type of meta-process management. In contrast, the current meta-process for making changes to how an enterprise resource planning (ERP) system manages processes could be described this way: wait for the next upgrade and hope the desired change is included—or engage in expensive customization.

Conclusion

Enterprises need to enable and foster the value-creating versatility of their employees. They therefore need to extend their process management approach to include variability in the process. The growing capabilities of metadata associated with the digital assets that result from human efforts are helping to standardize many types of human activity. With these standards, metadata brings more context to improve the human actions and the resulting processes.

It's important to think holistically about metadata and its possible use in the end-to-end process for the maximum benefit across processes. Otherwise, enterprises can end up with separate, unrelated sets of metadata that could cause confusion or require expensive ex-post-facto integration. The use of industry-specific metadata standards, such as XMP and DCMI, across products and processes can help reduce integration efforts pre- or post-deployment. Ultimately, though, broad information sharing and true scalability can happen only when these standards are part of a Semantic Web–based metadata. The industry-specific standards need to be considered within the context of this broader whole. Much of the power outside specific domains comes from the rapid integration capability associated with RDF and OWL.

In addition to metadata, two technologies are needed to support a new approach to managing processes: CCMS and BPMS. These technologies are not new, which is good news. It means enterprises do not need to take risks with early-stage software from small vendors. However, the technologies do require integration to support a different approach to process management and improvement.

This approach of combining CCMS and BPMS to manage an end-to-end process is applicable to all enterprises and not just those creating and using digital media assets, such as Schawk or other media enterprises. Variability and versatility of human efforts are common to all functions in an enterprise, including HR, sales, product development, legal, and others. In all these functions, the human activities are becoming accessible to process systems because of the smart digital assets.

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Model-based design

Steve Miranda of Oracle discusses how metadata is making a difference in managing human workflow processes.

Interview conducted by Vinod Baya and Bo Parker

Steve Miranda is senior vice president of Oracle Application development for Oracle. He is responsible for the development of all enterprise applications including financials, HR and payroll, procurement, corporate performance management (CPM), projects, customer relationship management (CRM), supply chain management (SCM), and the functional architecture group.

Miranda has been with Oracle since 1992, holding a variety of leadership positions within the development organization. Prior to Oracle, Miranda worked at GE Aerospace. Miranda holds a Bachelor of Science degree in mathematics and computational sciences from Stanford University.

In this interview, Miranda shares how model-based design of applications will address the completeness of end-to-end processes and the need for a tight coupling between models and execution.

PwC: Enterprise applications have done a great deal to bring value to transactional processes. Where is the next big area of opportunity for applications?

SM: The area that we see beyond transaction processing is the blending of transactions and business information. We call it embedded business intelligence. Today, good ERP [enterprise resource planning] systems have automated a lot of the process and have moved us from clerks to knowledge workers and then to knowledge workers dealing with exceptions. When staff are dealing with exceptions, there's a lot of data warehouse and business intelligence [BI] systems involvement to support exception resolution.

Going forward, we think you'll see much more of a blend of transactional applications with exception-based navigation, role-based UIs [user interfaces], role-based navigations, and then business intelligence to tell you what you need to know and do.

PwC: If you look at another dimension, applications have provided a lot of support in the automation and improvement of transactional processes. What role do they have or how will they influence human-driven processes?

SM: Two classes of activities fall into that category. One is where you lack systems entirely to do the job or integrate a system, and you must capture it online. For example, in talent management you have a talent review process, which is exactly that kind of offline activity. It's a management team room type of use case, at the end of which you capture some outcome and bring it back online to the system. So one class is the offline where there's no application to serve the purpose.

The second class of offline processes is where the activity is closely associated with a traditional transactional system, meaning you communicate with people for simple approval workflow and whatever process you want, and you go offline to figure out

whether you should approve that process. Today when you go offline, you're calling, e-mailing, texting, or IMing somebody, and all of that has to happen outside the context of the transaction system. Going forward, we think we'll each have a contextual action that is directly embedded in the transactional system. The system tells you not only what you need to know to help you make that decision, but also who you need to know—who are the right people that you need to be in touch with to do that. And we do that through our collaboration capabilities or through the openness of integration with others' collaboration technology.

PwC: How does this fit with model-based design, which is a key focus in Oracle Fusion Applications, right?

SM: Yes, it is indeed a key focus. The model-based design goes more toward completeness of the solution. One part of this is bringing more of the complete end-to-end process into the model and the resulting application logic. The other part that Oracle Fusion Applications address is to use model-based design to capture the enterprise-specific configurations of the software in such a way that it's protected through application revisions and application upgrades and improvements.

The traditional approach to enterprise applications predefines a business process in terms of certain steps taking place in a certain order. If that doesn't meet the customer's needs, then users typically go offline and around the system, if you will, to do the process in the way that their business needs it.

One of the things that model-based design affords is the ability for the end user to configure the system much more easily by doing so in this model-based fashion or in a meta-database fashion. They can modify the process. They're not customizing the code in the system; they're only reconfiguring the default Oracle Fusion model. And they're not stuck on a custom system of their own that we can't upgrade and improve.

PwC: In the continuum from transactional processes, to exception processes, to entirely human processes, how far into that do you see the model-based application development going?

SM: I think today it already impacts the human workflow part, so we've extended beyond transactional applications. We based our model-based workflow on the BPEL [Business Process Execution Language] standard, which is an industry standard and very structured. It does not include what we call human workflow. BPEL is the standard for how end-to-end processing runs untouched. It doesn't support an approval system that includes extensive human collaboration. For example, I send an approval request to you, and you approve it and send it to a third person, who sends it to a fourth person, et cetera. So we've extended BPEL with something called human workflow.

"Going forward, we think we'll each have a contextual action that is directly embedded in the transactional system."

Getting into more predictive analytics is exactly where we need to go. Oracle already has some capabilities like that. We acquired Tacit Software, which provides a rules-based engine to mine data. We see business processes becoming much more predictive with this combination of BI and the business process. Systems will start utilizing the BI functionality instead of just presenting it to a user. Enterprises will be able to start writing rules based on BI-sourced data, where the business process moving to A or B is the next step depending on that data. Some of this is possible today. Going forward, the system will analyze data and set up rules to be a lot more predictive about how a process flow should execute.

Some of it's already there. If you look at the self-monitoring that we have to detect issues and bottlenecks in business processes, that piece is already there. The system is mining certain data or looking for patterns.

PwC: Do you see the BPM process models becoming an authoritative source for process information, a single source of truth for processes? Should enterprises aspire toward something like that?

SM: I think they definitely should. In systems today, the single source of truth of a process has to be the BPEL process, the BPM process itself, because that's the reality of what's being executed. If you look at the way audits work today, you have your documentation, but in the end you must actually audit the process, because that's the only way to know what really is happening.

"The key is not so much what is the single source of process truth as much as whether the process models and actual process behaviors are tightly coupled."

To me, the more important thing is how tightly and easily do you couple the model with the execution? The key is not so much what is the single source of process truth as much as whether the process models and actual process behaviors are tightly coupled—then you're in a much better world.

PwC: How will enterprises keep the models current, so they always reflect the current state of how the process happens?

SM: I think we're getting closer—to the point where it's becoming not as much of a technical issue as it is a change management issue. The debate here is about the role of the end user making changes to the process. Your definition of end user really comes down to who do you want changing process definitions in models, and what is change management for those models and their execution. Who do you want in control? All of this is in the realm of governance and life cycle management of the process.

PwC: A lot of human work results in digital assets such as documents. Over time, the amount of metadata associated with the documents has risen. Are these digital assets becoming smarter and a key resource for managing the process?

SM: I would say the assets, what you call the digital assets, are becoming smarter—not only with BI, but with a lot of things. It ties in with the collaboration as well. The social and the collaborative technologies are giving us a host of metadata we didn't have before, and it's already transforming some industries.

The way social media Web sites behave is all about social media metadata, like how many people have seen the video. It's just a number, but it can help separate the mundane from the interesting. I think you'll start to see that even in business applications now. On our customer support systems, the most helpful documents are getting sorted to the top, not from Oracle doing anything, but by leveraging the metadata on popular documents.

We get the hits on the documents, we get ratings on the documents, and then it's kind of a survival of the fittest on these—the smarter digital assets.

The metadata coming from social media and phenomena like the wisdom of crowds is giving all assets a lot more smarts. It means information can be filtered in a lot of different areas, without additional effort. And now you can put a lot more sophisticated filtering on that, using Tacit and other capabilities.

PwC: How will these collaborative and social media applications come together with transactional apps to manage the end-to-end process?

SM: I think it's happening today. Let me give you an example. If you're a sales rep and you get a new contact, chances are if you're a pretty sharp sales rep, you already go to LinkedIn to try to figure out if you know someone who knows someone who knows this person. Our sales apps and our social apps give you the ability to go to some of these commercially or publicly available places and also start to gather that data internally.

As another example, our talent management succession planning apps allow you to start forming social networks internally as well. Again, these are just examples of where it's already happening today.

PwC: Some of the examples you have shared are in the consumer space. How will collaboration and associated metadata find their place within the enterprise, particularly in supporting process management?

SM: The collaborative document is changing. Consider how we used to put up a Web site. Maybe we'd have a discussion forum, but now we almost certainly have wiki pages. And it's not external like Wikipedia wiki pages. It's an internal wiki page. It's like a marked-up document with some metadata.

On top of that you have things like secure enterprise search to help you search for and parse that wiki page.

And then on top of that you have capabilities such as those in Tacit, which help you detect patterns and find other interesting parts of the data. So I think it's already happening. I think the fact that the document itself has changed form, from a static Web page or Word document into more of a wiki page, is becoming the norm. And you're already seeing it move into that metadata realm for internal documents.

Increasingly you will find the collaborative development tool bring together document metadata with other metadata about roles and activities. So whenever you create a project today, some things are common. We create a group space. It gives you collaboration capability, it gives you direct restructure capability, it gives you wikis or it gives you discussion forums, if that's what you'd like to use instead. It also gives you a directory structure and a security structure. You don't have to add security to the wiki page or say who has access to it, because it automatically does that for you.

PwC: Do you view business process management systems as having a distinctly complementary but different value proposition from that of applications?

SM: We have a hard time separating them. That's why I started with the BI. At one point we played around with different messaging on this, but leaving the marketing words aside, we think we're moving from a vicious cycle to more of a virtuous cycle. When you have better information, you move to better processes. Once you start moving to better processes, you start getting better information. And then better information, in turn, leads you to even better processes. So to us, that is applications.

PwC: So in the future, enterprises should not distinguish between BPM and applications, right?

SM: Well, sure, and I think that's where it comes down to what we talked about before. What's the source of truth: the documents on the shelves or the software? It doesn't really matter. To me, the closer you bring those two things together, the better off you are. I think that's what we're able to do now that we couldn't do before. ■

Personalized and participatory business process

Marge Breya of SAP forecasts how smart digital assets combined with the "process of me" present a compelling opportunity for business process management.

Interview conducted by Vinod Baya and Bo Parker

Marge Breya is executive vice president at SAP. Breya oversees the full product line for business intelligence (BI) and enterprise information management (EIM) solutions, as well the portfolio of SAP BusinessObjects OnDemand offerings. In addition, Breya is responsible for the portfolio and solution management of SAP NetWeaver within the Technology Group at SAP, leading the Business Solutions and Technology (BST) organization. Breya holds a bachelor's degree in electrical engineering from the University of Illinois at Urbana-Champaign and a master's degree in business administration from the University of Oregon.

In this interview, Breya shares how personalization of process combined with business process management technology will extend the reach of process management technologies to user-centric processes.

PwC: As you look at business process management [BPM] in an enterprise, where are the interesting opportunities in the future?

MB: You can group processes in an enterprise into either system-centric or human-centric processes. Looking forward, the more interesting category is user-centric, because that's where a large portion of the enterprise processes are and that's where the adoption of new systems and technologies in the enterprise will succeed or fail. This is especially relevant for user-centric process management. I think everyone in an enterprise should be able to use a process management tool. That sets the bar for the usability of the tools. Today they are pretty easy to use, but when you're putting in a human-centric step, how do you describe it so that everyone would want to use it?

PwC: What is it about BPM that makes it relevant in the human context?

MB: I believe there are two kinds of processes, and this also maps to what people do. There are the repeatable processes, where you're driving out costs and you're really trying to get efficiency, thereby minimizing the variance and improving the process.

Then there are the tasks that are largely done by humans. When I ask, "Bo, how do you do your job?" versus "Vinod, how do you do your job?" both of you could have the same job position, but you're going to do your jobs differently. There's an art associated with it, and so you have your own method of how to do something—meaning that across humans, the methods are highly variable. I believe that in addition to the enterprise processes, where technology has

largely been focused, there is also the "process of me." To me, there's a missing piece—this user-defined workflow—in applications. That's one of the things we're working on right now.

PwC: Does that mean that the processes are personalized to individuals?

MB: Yes, indeed. The whole idea is to account for the fact that the way Marge Breya runs a business is likely very different from how other people do. I have a friend who used to run analytics for an e-commerce company. He set up all the analytics for the business. What is amazing to him is that every time a new general manager came in, he had to change all the measurements, because of the way the new general manager wanted to run it.

It's a very personal thing—how you run your business, how you manage your day-to-day activities. There are certain things that, yes, you want to systematically capture. And for certain things you want to have some human workflow as an extension. But many personal activities almost exclusively center around human activity. I think that's the category that's being added to the continuum here, and that is the process of me.

PwC: Nowadays, much of that human activity is supported or facilitated by tools that create digital assets, such as documents, graphics, wikis, rich media, and so on. Increasingly these assets have metadata associated with them, which makes them smarter. Do they have a key role in this process of me?

MB: Yes, absolutely. Let's say you walk into your first job. How do you find out what you should know in this job? What are the reports that people in roles similar to yours actually look at? Who are the experts that they turn to? Which workflows are most efficient? Unless the job is very transactional, you have no visibility into what you should know about your job, almost none.

You go in blind. If we can have role-defined, appropriate metadata, you could search across the enterprise to say, "I'm in sales and working on the company A account. I should know everything about it. Tell me who's working on it and what we have done or are doing." You should be able to tunnel through and find all of it.

PwC: How does this relate to the process of me?

MB: Most people don't know how their assigned work activities relate to other activities; they don't know they're in a larger, end-to-end process. What they could really use is to be able to see every step of the way: I am here, right? You are here. Here's the context of how my current activities fit into the broader process. And if an interrupt comes, can I tell if that interrupt is part of the process I'm currently in, or is it a part of something else? And how does it relate to what I or someone else is doing, so that I can optimize? How do you even know half the time when something comes in your e-mail, unless somebody is a very clear communicator, that if you don't respond within X amount of minutes, there's going to be a delay in some important process?

When you think about the process of me, how you do your job, most people would not say that BPM is relevant to them. If you have metadata for some of these smart digital assets and something comes across your desk virtually and is relevant to you, wouldn't it be good if you could search and find all the processes that are relevant to that? This becomes possible if you have an asset that actually could describe that for you.

"What we see during the next five years, first of all, it's making sure that the BPM tools themselves are user-centric so that human-centric business activities can be described in a simple and compelling way and can be shared."

That description is something process models can do because they can publish the flow, show you the lanes, branch points, recursions, and the like.

When we talk about what we see during the next five years, first of all, it's making sure that the BPM tools themselves are user-centric so that human-centric business activities can be described in a simple and compelling way and can be shared. The process itself as well as the digital asset describing it are both enterprise assets.

From a process of me perspective, I would say that users also have their own personal methods, and those, too, are smart digital assets. If they want, they can publish their personal methods and then others can decide if they want to use them or not. If those methods are repeatable enough, then you can put the investment into translating them into BPMN [Business Process Modeling Notation] so that you can share that as a repeatable process.

PwC: Are you saying that end users actually participate in the creation of and changes to the process, and that BPM tools could facilitate that?

MB: Exactly. And BPM really starts creating value when the users themselves, because they know best what to do, can participate in contributing to what the process is. That's what Toyota does with car manufacturing and the Toyota Production System methodology. People in the process know best what to do. There's a participation in even just saying, "Here's what I'm doing right now. Here's my little secret sauce for closing a deal or my secret sauce for doing pricing or getting pricing through the pricing committee." It might be, "Make sure you talk to this person, this other person, and that person, and be sure to use this kind of format."

PwC: Are smart digital assets beginning to make it possible to shine a light on opaque human activities that were entirely analog and in a black box before?

MB: Sure, absolutely. Just getting that level of metadata in there makes a big difference. It's helping people know what the next step is in a process. It's how you get folks to say, "For me to get it to that next step, this is what I do, and if you copied it, that would be really cool."

Part of what we are working on in the labs right now, and what have in some private customer betas, is to start looking at tools that capture that whole process of me. What tools will best support the individualistic way people make decisions? Some people do paper-rock-scissors; some people have intelligence associated with it and do pro/con charts. There are a lot of tools all over the place that people could reuse, or methods for deciding, collaborating, or whatever. But first we need tools that can capture and make available for others to reuse these method descriptions as simply as Flickr makes photo sharing.

PwC: When you talk about methods, it seems that some of them could be short-lived, or disposable, processes. Is that a useful distinction?

MB: Indeed, from disposable to enduring, there's a continuum. And at some point in time, some things start becoming reusable. Disposable also means try many, throw away the ones that don't work, and keep the ones that do work. The ones that work, see if you can capture and share.

PwC: With disposable processes and the process of me, won't there be an explosion in the number of processes? How will enterprises manage it?

MB: We believe that at some point in time there will be a category around decision intelligence that will inform business processes. This is a category that tells users who makes really great decisions and why. If you can capture their method for how they make decisions—whether it's problem solving or deciding which account to go after; whether it's participative or whether they just go it alone—there's something to be said for exposing that kind of intelligence that then can inform others.

PwC: Enterprises have long understood the proposition that data is an asset. Do you think enterprises have the same appreciation for their processes?

MB: Many enterprises are developing a better appreciation for the value of their processes. And process models in a business process management system are a good starting point for raising awareness. What becomes essential is for enterprises to keep the model synchronized with changes in the business. So the governance then should be around how you keep the model current as well as improve it for completeness and expressiveness.

PwC: How can enterprises maintain a current and consistent model?

MB: From my perspective, first and foremost, you have to have somebody own the process. You can't measure what you can't manage, and you can't manage something if you don't know who's in charge.

Next, look at the core processes of any company; for example, customer acquisition. GE did this in the '90s. The company developed expanded views of customer acquisition, product development, delivery, quote to collect, and customer service. Everything else was considered supporting; it takes just those four. At any company, how many times can you get an answer to, "Who is running customer acquisition for the company?" Usually you get, "Well, the head of sales is this person; the head of marketing is this person." Without a single owner of customer acquisition, nobody has the end-to-end view of how to acquire customers better and faster than their competitors.

PwC: You've introduced the concept of process variability associated with personal methods, or the process of me. How can BPM systems improve this aspect of an enterprise without forcing value-destroying variability?

MB: It starts with simple measurability. Just by letting people know that a decision takes them three days longer than it takes somebody else will change their behavior. Context is important, for sure. The process knowledge has to be relevant to the human being. But I think it would be very useful if a salesperson knew that their pipeline conversion rate is three times worse than the group average, right? It's just like batting averages or things like that.

PwC: Enterprises invest heavily in large episodic changes and will set up a program office to manage the meta-process of the transformation. However, many of the smaller changes suffer from neglect because of the lack of a similar meta-process. Do you think BPM systems have a role in creating and managing the meta-process of continual smaller changes in processes?

MB: Yes. I think the question to be asked is how BPM systems will surface themselves to a user, a manager, or a change process. Going into a BPM system today to do the change is not very effective. It's not the right way to surface the process model, engage with the model, and document the new process.

What we're looking to create is a very personal process environment, and BPM today has not been personal. It's been a professional tool for an analyst or a process designer. It hasn't been a personal tool like project management. So we need to insert that personal tool in the context of the change. I think that's what you're going to see emerging: a personal business process management tool, helping you manage your own methods. ■

CIO can mean more than a transaction wizard

The CIO can lead the way to derive more value from long-neglected processes.

By Vinod Baya and Galen Gruman

The ultimate goal should be to work at the meta-process level. Meta-process management leads to continuous improvement in end-to-end processes and to business transformation.

CIOs have been told for years that they need to empower the business by bringing technology to bear on end-to-end process management. Good advice, but most CIOs have focused only on automating transactional processes, which are a small portion of total enterprise processes and the proverbial low-hanging fruit.

CIOs and IT organizations have succeeded in making transactional processes more efficient. Although this transactional efficiency has value, this value generally isn't considered strategic. Strategic value is created by human-oriented processes—especially orchestrational and creative processes.

Service-oriented architecture, business process management, master data management, and other technologies were supposed to help CIOs provide more strategic value. But none of these have been widely adopted, in part because the dot-com implosion caused a decade-long rethinking of IT as a cost center to control rather than as an enabler of business agility. This attitude of cost curtailment and efficiency only hardened in the 2008–09 recession.

No one has expected CIOs to address human-oriented processes, but PricewaterhouseCoopers thinks this expectation is about to change. In the future, enterprise leaders will demand more from technology than mere transactional efficiency. We say this because we continue to find that the concept of agility—as outlined in the PricewaterhouseCoopers paper "How to build an agile foundation for change"[1]—appeals to the C-suite.

CIOs need to prepare for a change in what is expected of them—to pursue value-creating activities beyond transactional efficiency. This is not as big a leap as it might seem; the CIO can improve human-oriented processes by using existing business process management and decision support technology as well as the metadata in digital assets.

The ultimate goal should be to work at the meta-process level: enabling and managing all processes and the interactions among them. Meta-process management leads to continuous improvement in end-to-end processes and to business transformation. It allows CIOs to treat enterprise end-to-end processes as strategic assets that can be managed and improved over time.

[1] http://www.pwc.com/en_US/us/operations-management/assets/agility_foundation_for_change.pdf

Understanding the process types

In PricewaterhouseCoopers' view, end-to-end processes comprise three types of processes: transactional, orchestrational, and creative. (See Table 1.) The sections that follow provide a brief description of each of process type.

Transactional processes

Transactional processes focus on repeatable, quantifiable tasks, such as registering a sale, issuing a check, producing a ball bearing, packing a container, delivering a download, and so on. Predictability, consistency, and standardization are key attributes of transactional processes, which also means these processes are easier to automate. Transactions are important and are the obvious first place to apply technology.

The focus on transactional systems, such as enterprise resource planning (ERP) and manufacturing resource planning (MRP), has made transaction processing more efficient. This focus also has increased the predictability and consistency of results, which helps improve customer satisfaction, cost-effectively increases the scale of operations, and meets compliance requirements.

Orchestrational processes

Orchestrational processes focus on the flow of information, objects, decisions, and so forth. They usually involve known options and preferred workflows, but need to account for exceptions, conflicts, and uncertainties. Many organizations use workflow management systems to track flows (usually status and approval, such as for loans or regulatory documents) and to route the work product on the basis of status, critical level, number of outliers, and so forth. ERP, customer relationship management (CRM), and manufacturing systems perform some orchestration. This orchestration typically is for activities where the possible paths of execution and outcomes are highly predictable and thus automatable, or at least fit within an otherwise automated system.

In orchestrational processes, however, workflow management is just the first step—one that borders on transaction processing. That's because workflow management tends to focus on the transactions relating to the flow and on low variability in the flow, which makes routing rules-based and therefore automatable.

Many workflow processes aren't neat and tidy, which is why some companies have people perform the actual

Type of process	Transactional	Orchestrational	Creative
Definition	Repeatable, quantifiable tasks	Tasks that focus on flow of information, objects, decisions, and so on in an often predefined and structured manner	Tasks to generate new ideas, products, concepts, and strategies to run or advance the business
Process characteristics	Highly structured	Loosely structured	Highly variable
Supported by	Transactional systems	Workflow systems	Productivity applications
Examples	Placing an order Registering a sale Issuing a check Booking a flight Delivering a product Shipping a product	Loan origination Claims processing Exception approvals Customer service	Planning and strategy development Product development R&D and innovation Business development

Table 1: **The three types of processes that make up the end-to-end process**

orchestration. People use judgment, experience, and context to manipulate the greater production system to handle the ever-shifting demands. Versatility is a key attribute of orchestrational processes, and that tends to require the use of people rather than software.

Often called traffic coordinators, these people are critical in organizations that manage many individual components. Whether packaging creators, sales managers, airline crew schedulers, software development consultants, and so on, their work goes beyond updating status, approval, and routing, because they can manage—or at least influence—the product itself and the production system.

For example, a packaging creator has enough subject knowledge to know how far to push a certain printing press or to realize a design has failed to account for legal requirements in one of the client's markets—a level of context and judgment that a rules-based workflow management system cannot achieve.

The opportunity here is to enhance the versatility of the coordinator with technology, typically by providing better access to product and production metadata. In this way, the coordinator has more contexts in which to make decisions. Different coordinators can also share that context so individual projects do not stall when any individual coordinator is unavailable.

Creative processes

Technology-supported process improvement is most difficult to achieve for creative processes—those that rely on a mix of art, skill, experience, and science to produce ideas, concepts, strategies, and other intangibles with potentially tremendous enterprise value. Product designers, investment managers, mergers and acquisitions specialists, writers, architects, artists, marketing and advertising creators, lawyers, and business strategists are examples of roles that have extensive involvement in creative processes.

Many of these professionals use software to execute their work—from spreadsheets and word processors to CAD/CAM systems, from databases to 3D modelers. And these technologies have significantly improved what these people can create, enabling richer preproduction modeling and more complex and detailed final products. Sometimes they help increase revenues, improve service, and raise client expectations. Such tools continue to be updated to add new capabilities, but in most cases their improvements are incremental.

And most of these tools don't do much to help the creative process; they focus on execution. Part of that situation is the nature of the creative process. The way each person performs creative work can differ widely, and trying to impose a specific approach can be counterproductive. As a result, focusing on execution enablement rather than imposing a structured process (à la ERP) makes sense.

Interweaving processes

In general, most enterprises have focused on transactional processes while paying little attention to the other two. But transactional processes rarely account for even a quarter of all business processes. Orchestrational and creative processes have received haphazard or accidental technology support, yet they give CIOs an opportunity to demonstrate the more strategic value of IT. Taking advantage of this opportunity can help IT shed the cost center stereotype as companies emerge from their recessionary caution and look to grow again.

While emphasizing transactional processes, CIOs can easily forget human activities. But the truth is that "business objectives are achieved as a result of the execution of business processes, which span multiple transactional applications as well as multiple people interweaved with the execution of the application," says Dr. M. A. Ketabchi, president and CEO of business process management (BPM) software maker Savvion, a Progress Software company.

In contrast, by not fully understanding the distinctions among these three process types, some organizations have actually destroyed value when they applied technology designed for a transactional process to the other two.

One such example is 3M, which applied Six Sigma–and Lean-derived levels of consistency to product innovation processes. Efficiency programs such as

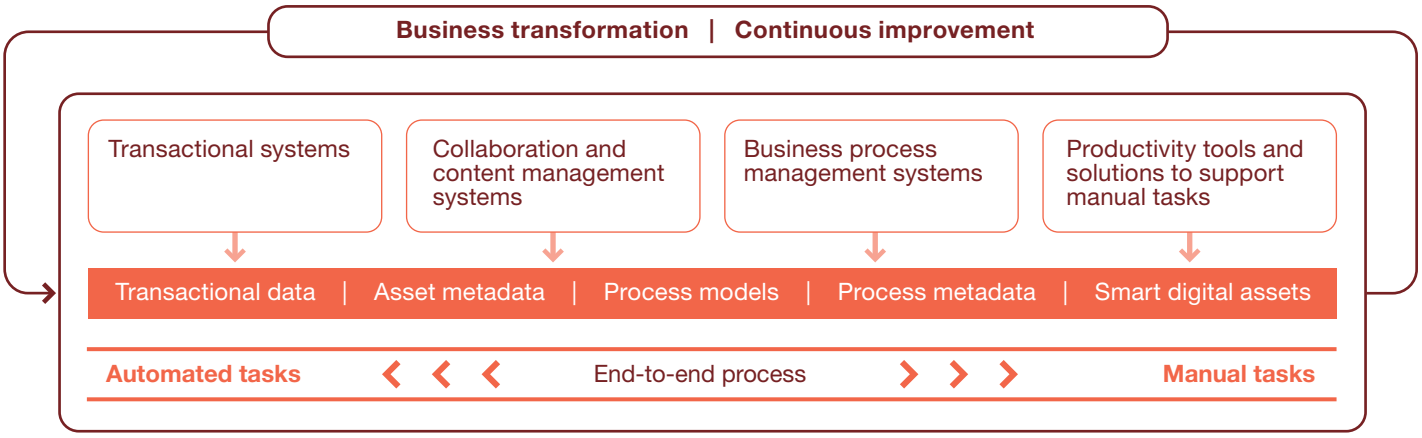


Figure 1: **Meta-process management**

Six Sigma are designed to promote standards and repeatability in work processes, and they use rigorous measurements to reduce or eliminate variability. They can often assume that innovation is a precise transaction process, such as milling ball bearings, or a highly predictable activity, such as just-in-time manufacturing.

In broadly adopting Six Sigma, 3M achieved significant short-term efficiencies. However, the reduced value-creating variability adversely impacted long-term product development and eventually revenue growth.[2] 3M later changed its broad application of Six Sigma; in particular, 3M limited the role of Six Sigma in product development. As a result, 3M was able to reenergize its product pipeline after years of lost opportunities.

Combine metadata with assets and processes

How can CIOs help their organizations enhance value through the use of technology in orchestrational and creative processes? By understanding the types of activities in the end-to-end process and extending process management to all of them, a CIO can effectively expand the use of technology into value-added business improvements.

In an approach we call meta-process management, a CIO can bring together three key technologies to manage the end-to-end process for continuous improvement. (See Figure 1.) Most large organizations already use these three technologies: digital asset metadata, collaboration and content management systems (CCMS), and business process management systems (BPMS). The technologies are briefly covered here; for a deeper discussion, see the article, “Smart digital assets: Catalyst for end-to-end process management,” on page 24.

An example of a company that has made this leap is the brand services firm Schawk, profiled in this issue of the *Technology Forecast*. (See the article, “Managing variability without constraining it,” on page 04 and the interview on page 16.) Schawk used BPMS with digital asset metadata and CCMS to manage the meta-process for improvement across all three types of processes.

[2] Brian Hindo, “At 3M, A Struggle Between Efficiency And Creativity,” *BusinessWeek*, June 11, 2007, http://www.businessweek.com/magazine/content/07_24/b4038406.htm

In a sense, these technologies provide the interface for the human-centric activities that are key to orchestrational and creative processes. They act as a glue linking related processes and as a lubricant facilitating interprocess communication and workflow. They can serve the same dual role between transactional processes and the other two processes, as Figure 2 shows. That's because metadata is a standard interface to variable activity and allows the same building blocks for process management found in transactional processes, such as metrics, monitoring, analytics, and others. By leveraging the metadata, variable activity can be made visible for use in managing orchestrational and creative processes.

Transactional systems have already begun reaching into human-centric activities, says Steve Miranda, senior vice president of Oracle Application development for Oracle. "Today, good ERP [enterprise resource planning] systems have automated a lot of the process and have moved us from clerks to knowledge workers and then to knowledge workers dealing with exceptions," he says. "When staff are dealing with exceptions, there's a lot of data warehouse and business intelligence [BI] systems involvement to support exception resolution. Going forward, we think you'll see much more of a blend of transactional applications with exception-based navigation, role-based UIs [user interfaces], role-based navigations, and then business intelligence to tell you what you need to know and do," he adds.

The key is not to use the three technologies—digital asset metadata, CCMS, and BPMS—to impose patterns on the processes, but to enhance the processes and their human-guided patterns. Seek to create the framework for interplay among processes, not to force them into a standardized, rigid, computer-driven process. If you apply a transactional mindset, you end up reducing or eliminating the opportunities for staff to add value through versatility and insight; in other words, you eliminate opportunities to create more value.

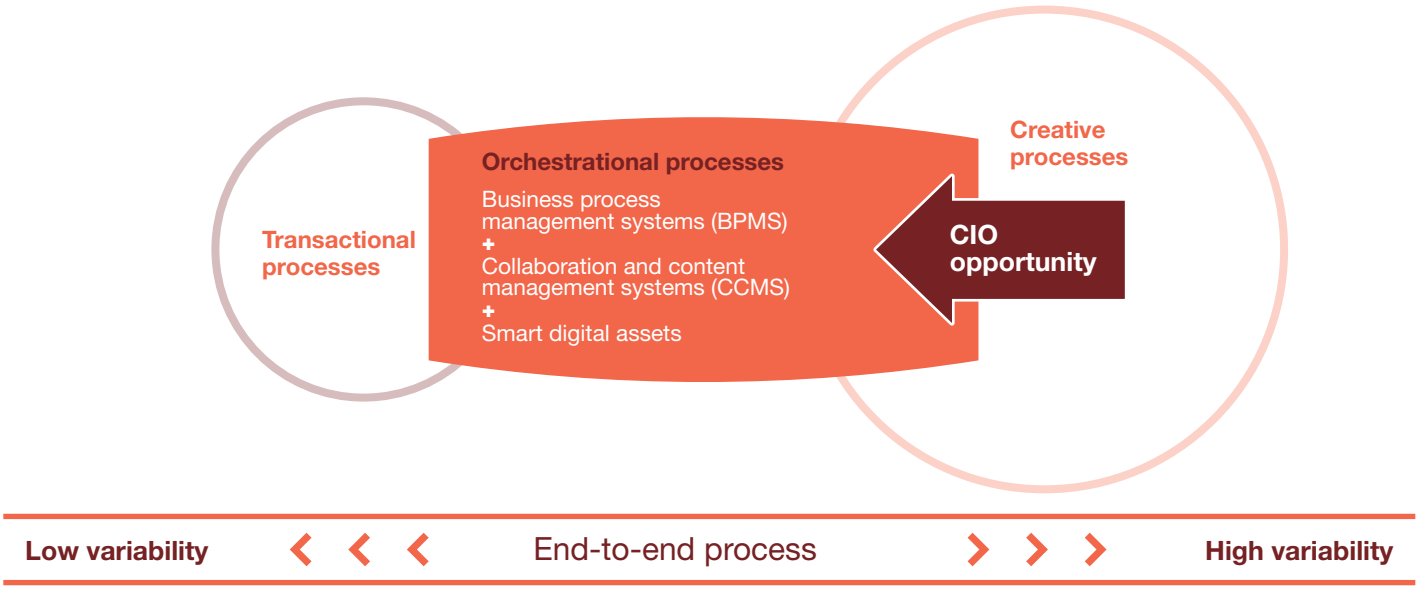


Figure 2: **An end-to-end process consists of three distinct types of processes. The CIO's opportunity is to bring visibility of what happens in the creative processes into the orchestrational processes, so those activities can be managed in the context of the end-to-end process**

A well-known example of not simply following the transactional meme is Toyota, which has both highly standardized processes and an empowered human workforce that can make its own decisions. “That’s what Toyota does with car manufacturing and the Toyota Production System methodology,” says Marge Breya, executive vice president at SAP. “People in the process know best what to do. There’s a participation in even just saying, ‘Here’s what I’m doing right now. Here’s my little secret sauce for closing a deal or my secret sauce for doing pricing or getting pricing through the pricing committee.’”

In its procedures, Toyota has standardized the desired outcomes, not the means of achieving them, which ensures a consistent final result even if individuals achieve it differently. The kaizen tenet of continuous improvement pushes for efficiency to weed out unnecessary variation, while encouraging creative variation to improve quality and efficiency.

Technology interplay

Each of the three technologies—digital asset metadata, CCMS, and BPMS—is beneficial in and of itself. But when used together, these technologies create a fabric of context and process support that can improve transactional, orchestrational, and creative processes and help increase the interplay and visibility across all three.

- **Digital asset metadata—**This contextual information is stored with digital assets, so the context is portable as the asset travels through tools and processes. The metadata can also be managed outside the asset and used to drive the process, as Schawk has done. The metadata can be used to inform transactional and orchestrational processes in automated or semi-automated ways—for example, in a printed document, metadata about the color model used can indicate the type of printing press and inks needed. The metadata can also aid creative processes. The same color metadata can let a designer use the soft proofing capabilities in layout tools to “test” what colors will look like on different materials and printing presses before choosing the final colors.

By taking advantage of the power of digital asset metadata, CCMS, and BPMS, an organization can reap more value than is possible from a transactional focus alone.

- **Collaboration and content management systems (CCMS)—**Tools in this category vary according to their intended use, but as a class they share several functions: collaboration, workflow, and approval routing; library capabilities such as archiving, discovery, categorization, and retrieval; and editing and commenting tools designed for group work on documents. Examples include enterprise content management systems (used primarily for documentation and other text-oriented assets), Web content management systems, and digital asset management systems (used primarily for non-text media such as video). They all focus on managing the asset (the content).

- **Business process management systems (BPMS)—**These systems focus on managing the process, from a simple set of rules to a more complex model of activities and expected results. Some BPMS are used to execute simple workflow processes. Others are used to model current processes and test proposed variations or new processes, to help predict efficacy, to discover points of failure, and to extract automatable patterns.

What distinguishes BPMS from typical enterprise management applications is that they externalize process logic so people can work directly with processes as part of the meta-process management. That’s critical for orchestrational and creative processes because they are much more likely to need constant attention due to competitive and market forces, the special needs of your most important customers, and various ecosystem developments that call for agility. Compare that with the internal process logic in ERP systems, which are designed to discourage change to

ensure predictability and stability; their internal process logic is updated infrequently and by the vendor, so there is no ability to manage and adapt those processes (that is, manage the meta-process) without expensive, difficult customization.

The CIO's unique capability: Own meta-process management

The CIO can certainly assess and provision the technologies that support better orchestrational and creative processes. But we believe the CIO can do more than that. We believe the CIO can become a central enabler, even a strategist, for the organization. That's because the CIO is in the unique role of not only seeing organizational processes that cross departmental boundaries, but having operational responsibility for their execution when the process is embedded in IT.

The ownership of cross-functional execution is what gives the CIO the opportunity to lead the effort into process improvement—sometimes in concert with business units but more often alone because no one else wants to own processes outside their spheres.

The CIO has the visibility, the tools, and the access to the processes to formulate a vision and then lead the organization to it.

CIOs might dispute the notion that they have the tools or the access to processes beyond the transactional ones for which they have implemented CRM, ERP, and other systems. But they also manage the repositories of digital assets—in data warehouses, business intelligence systems, content management systems, and databases. They can leverage the departmental tools in place for working with digital assets by tapping into the metadata that these tools create, using Extensible Markup Language (XML) and similar mechanisms. CIOs can connect this often unused metadata to other systems that can take advantage of the metadata in various processes.

Not all organizations see the CIO's role in meta-process management the way we suggest, nor do all CIOs aspire to such a role. But someone must lead. "Organizations have a challenge identifying who should be in charge of deploying and managing these business process management systems," says Ismael Ghalimi, CEO of BPMS software maker Intalio.

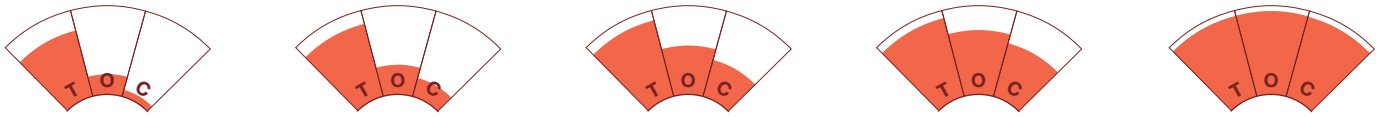
If not the CIO, who? An organization could create a chief process officer, but that person would need ramp-up time and strong executive support for other C-suite members to accede to him or her. It cannot be individual line-of-business managers, because that would limit improvements to department-level processes. In most cases, the CIO is the only option. Assuming that ownership or co-ownership exists, you can think of the CIO's initial role as a process harmonizer. To begin, the goal would be to use enterprise architecture, modeling, master data management, and the technologies described in this article to map out processes and determine a plan to integrate both the specific processes and the interplay among them. Much of the infrastructure for transactional systems can be used for this effort.

But the big opportunity is to go beyond harmonization to help improve process effectiveness, flexibility, scale, reach, efficiency, and so on. The CIO has done much of that for transactional processes. The majority of the organization's processes are still in need of smart improvements that empower the organization to do both more and better.

Leading the enterprise to process superiority

If the CIO takes the next step and applies this knowledge and responsibility to orchestrational and

"Organizations have a challenge identifying who should be in charge of deploying and managing the business process management systems." —Ismael Ghalimi, Intalio



Ad hoc

Process management largely focuses on transactional processes

"Process heroes" rule the day

General understanding of transactional processes exists

Process is named, but no documentation or model exists

All variability in process is seen as value destroying

Defined

Process management extends to exceptions to transactional systems

Process is documented and standardized

Process exceptions are known and can be identified as they occur

Stakeholders are defined

Outputs/outcomes are defined

Customer requirements are known

High-level process models exist

Variability is dealt with by reducing it

Managed

Process management extends to orchestrational processes

Performance and quality measures exist

Quantitative measures are used to monitor and control processes

The ability to meet customer goals is known

Coordination responsibility is formally assigned

Metadata is identified to create visibility into human actions

Process models represent human actions and the associated variability

Improved

Process management extends to many creative processes

Process is formally improved while considering variability

Process is deemed capable of meeting customer requirements and goals

Metadata from smart digital assets is standardized

Metadata for process is identified and made explicit

Superior

End-to-end process is managed

Process management values standardization as well as value-creating variability

Process management is balanced across the three types of processes

Meta-process for managing changes to the overall process exists

Continuous improvement of end-to-end process is a reality in dynamic business conditions

T – **Transactional processes**
O – **Orchestrational processes**
C – **Creative processes**
■ – **Extent of end-to-end process managed**

Figure 3: **Process maturity levels and their characteristics and how that relates to the extent of end-to-end process that is managed**

creative processes, not just transactional, the CIO can build and own the framework for meta-process management. (Obviously, the CIO does this in concert with other business leaders, and in stages.)

Meta-process management is the instrument by which significant strategic value can be brought to the organization, enhancing processes long neglected and, through design and management, creating a virtuous circle among transactional, orchestrational, and creative processes. Because process logic is exposed and managed, and because the implications of changes within and outside the process can be modeled, the meta-process approach allows an organization to be agile in periods of change and to help lead the change when the market is more static.

As Figure 3 shows, PricewaterhouseCoopers has extended the familiar maturity model typically used to guide improvements in transactional processes to show how enterprises will extend the scope of process management to orchestrational and creative processes as they achieve higher and higher levels of process maturity. Pursuit of end-to-end process management requires that all three types of processes be managed.

In each of the process types, the highest level of maturity takes a meta-process view, works across organizational boundaries, and supports and demands flexibility and versatility. These aspects are often neglected as organizations focus on specific problems or silos, yet the organization is ultimately dependent on the whole working well, not just the specific pieces.

Most organizations will be at different levels for each type of process and should seek to raise those processes at the lower levels to match that of their best process (likely to be the transactional process).

Otherwise, the ability to fully capitalize on excellent transactional processes, for example, is compromised by the inability to orchestrate as effectively or to be better at creating products that would lead to competitive differentiation. In other words, you may transact properly but design products that do not satisfy customers, and poorly coordinate customers, suppliers, internal departments, and so on. But when all three process types have high maturity, you can create leading products or services, manage your processes and ecosystem much better than your competitors, and execute with superior certainty and efficiency.

Conclusion

Given the tough times most CIOs and their organizations have endured, it may be difficult to think about doing more in new areas. But businesses are beginning to emerge from the recessionary night, and their management is beginning to think about how to grow. Even before the recession, CIOs were increasingly asked to add more value—more than simply operating technology systems efficiently. This demand will become much louder as companies move beyond survival concerns.

The good news is that the CIO can do more. The CIO can use the art and science of IT to improve the processes that have benefited little from technology, namely non-transactional, human-driven processes. The CIO is typically the only role that has the ability to lead such process improvements. Many of the underlying technologies exist, and they may already exist in some form in your organization.

By including what is commonly neglected—orchestrational and creative processes—and by taking advantage of the power of digital asset metadata, collaboration and content management, and business process management, an organization can reap more value than is possible from the transactional focus. The ability to manage and maintain the end-to-end process using the meta-process management approach is key to being agile in a changing environment and to staying on a path of continuous improvement. Doing so will allow the CIO to make processes a strategic asset for the enterprise.

Although most processes are human-centric, they can be augmented through technology. When technology is used in the framework of meta-process management, the CIO can become the value-add chief process officer or chief innovation officer that many companies yearn for.

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Who will own the process?

Ismael Ghalimi of Intalio discusses the need for process owners and for process models to drive execution.

Interview conducted by Vinod Baya and Bo Parker

Ismael Ghalimi is the CEO and co-founder of Intalio. He is an entrepreneur and industry observer, creator of BPMI.org, initiator of the BPM 2.0 movement, producer of the Office 2.0 Conference, organizer of the Extreme Productivity Seminars, and founder of the Monolab|Workspace. Ghalimi is an advisor to several high-tech companies, including 3TERA, AdventNet (also known as Zoho), BuzzGain, EchoSign, Egnyte, EveryTrail, Intellimaker, Move&Play, Muchobene, and Presdo. Ghalimi holds an engineering degree from Ecole des Mines de Nancy.

In this interview, Ghalimi explains how most enterprises lack the role that would manage an end-to-end business process, thereby limiting the adoption of business process management systems.

PwC: Intalio has been in the business process management [BPM] market from its inception. How do you characterize the state of this market?

IG: BPM has not succeeded to the extent that it could. It's been limited by many factors. One factor is the lack of standardization. There are still too many players in the market. Gartner tracks about 100 BPM vendors. It's a very fragmented market, where most of the products use either proprietary notations or proprietary execution models for processes. The lack of standardization has significantly hindered or inhibited the adoption.

Another factor is that organizations have a challenge identifying who should be in charge of deploying and managing these business process management systems. No organization has someone with the title of a chief process officer. So you are left either selling this platform to the CIO, who is not empowered to reengineer the various processes of the company, or selling it to a line-of-business manager, but in that case you're going to be limited to department-level business processes.

Today, it's very difficult to identify who you sell a business process management system to in an enterprise context for end-to-end processes. The market is growing, but it is not exploding. At Intalio, we have decided to expand our footprint and move into the cloud-computing market, where we provide a private cloud platform to large organizations that want the benefits of cloud computing, including usage-based pricing, elastic scalability, and on-demand provisioning. But we provide that behind the firewall, in their data center, instead of using public clouds such as Amazon or Google, which wouldn't afford the level of security and privacy that these large organizations desire.

PwC: How does business process management intersect with cloud computing?

IG: BPM is one of the core engines of what we call our platform as a service, which is the platform you use to build applications. Some of these applications are about managing and automating business processes. So BPM is one of the building blocks of the cloud platform. During the past ten years we've been in the business, we have found that when you do business process management, you look at the application from only one dimension, which is the process dimension. We have a fundamental belief, and we've held this belief since the very beginning, that enterprise applications have at least two core dimensions: process and data.

Data is essentially the space dimension and process is the time dimension, and if you take only one view into the problem, you're not going to be able to solve it. You need to be able to blend the data side and the process side of the story together to really implement these applications. We have built a platform as a service that is deployed in a cloud-computing environment that consists of our process engine and our data object engine. And we provide very sophisticated modeling tools to model the entire problem space that includes processes, data objects, business rules, and user interface and workflow tools.

PwC: What business issues do BPM solutions address for an enterprise?

IG: BPM is trying to address the problem of managing processes that change often and that require changes at a faster rate than a traditional IT development process would be able to sustain. Such processes require real-time visibility from management and the business side of the house, and the ability to enact changes to these processes as quickly as possible. BPM also addresses the issue of deploying—in a unified environment—processes that blend services from third-party applications as well as end user interactions or workflow.

PwC: Should BPM allow enterprises to manage their processes as corporate assets, similar to how they view data as a corporate asset?

IG: We agree with the theoretical idea that processes should be corporate assets. Where we have an issue is that an asset needs an owner. Consider processes that cut across multiple functions of a company, such as an order-to-cash process, which would cut across sales and finance and maybe distribution and logistics. For this process to be characterized and recognized as an asset, you need an owner for that asset, and in most large organizations today, there are no owners for these cross-functional end-to-end processes.

"BPM is trying to address the problem of managing processes that change often and that require changes at a faster rate than a traditional IT development process would be able to sustain."

For the department-level processes or functional processes, you will find owners. The owner of the sales process is the VP of sales. The owner of the accounts receivable collection process is the CFO. But the owner of the order-to-cash process is unknown.

PwC: Should process models in the BPM context make a process a corporate asset?

IG: I have a contrarian approach to that. I have a deeply rooted belief that models without a clear link to execution are essentially useless and a big waste of resources. If you develop process models in the abstract, and if the model on a piece of paper or on your computer is the end product, you've wasted a lot of valuable resources. By the time you're done with the modeling, the modeling is obsolete, because it is changing every day.

Unless this model is there to drive—in a closed-circuit fashion with a direct feedback loop—a transactional system that will automate major portions of the process model, you've wasted your time. Additionally, you've also misled the organization into thinking that it understands what it's doing. That is not the case since the model does not represent what is being executed.

At best, there was a point in time at which the model represented the business as it was conducted: the point in time when the model was created. And you know what? If I have a clock that is broken, that clock is going to tell me the absolute accurate time twice a day. Nevertheless, that clock is absolutely useless, and process models that do not drive execution are like that broken clock.

BPM is not just business process modeling. BPM is business process management, which includes execution. BPM is a cycle. It's a loop that starts from discovery, goes on to modeling, deployment, execution, monitoring, and optimization, and then loops back to discovery.

"You can keep models current by having the model drive the transactional system or drive the execution."

PwC: How can enterprises ensure that they keep the models current?

IG: You can keep models current by having the model drive the transactional system or drive the execution. When a change occurs, it should be made to the model first. That model is an executable model. It is the blueprint or more than a blueprint. It is the high-level design of the running application—an application such as ERP [enterprise resource planning] that is supporting your business on a daily basis.

PwC: So instead of the transactional environment being the run-time environment, you're saying the model actually could become the run-time environment?

IG: That's what we do. The model is the runtime. They are the same entities. Unless the model is the runtime, the model is useless.

PwC: What is the challenge to enterprises in making the model their run-time environment? Do they buy into this?

IG: The challenge is that nobody owns the asset. As we said before, it is very difficult to find the process owner in organizations. In most organizations, BPM has yet to become a corporatewide discipline and architecture because process owners, to a large extent, are nowhere to be found. So the only deployments you will find are department-level deployments. They are isolated.

PwC: By creating visibility into the end-to-end process, can BPM help more of a company's employees see their path to customer value? From an end-to-end process perspective, there is a customer at one end and something else at the other end.

IG: Absolutely. But such visibility is not just an aspect of BPM. It's an aspect of process orientation. Let me give you an example. If I'm in the shipping department, all I see is orders coming in. I'm going to box them and put them in a truck, and that's all I see. I see that sometimes boxes come back, and I don't see very much correlation between the box that I shipped and the box that came back.

Now, if I take a process orientation, and me being part of the shipping department, I am now involved in that order-to-cash process. I have a clear understanding of what that order was and the customer who made that order. My job is to ship that order and make sure that it's shipped on time so that I get paid on time, or the company gets paid on time, and then I'm also involved in the return process. I'm going to be able to close the loop myself and correlate the order I shipped with the order that came back and realize that actually I made a mistake in the fulfillment of the order and I shipped the wrong product. I have visibility about the customer, what the customer wanted, and whether the customer paid me on time.

That process orientation took an employee who was completely disconnected and connected that person to the customer. And it's not just the customer. That process orientation also connected that person to the supplier, because maybe that order required some additional parts to be ordered from a third-party supplier. A process orientation connected that person to other functions in the enterprise. And the list goes on. Process orientation, indeed, is a way to connect the dots.

PwC: We have been thinking that enterprises need to manage the meta-process of handling changes. Should the process owners own the meta-process, too?

IG: Let me tell you what some of our customers do to address that. One of our customers in the insurance industry has 150 accountants, and their job at the end of the quarter is to conciliate the financial results. The accountants have used our tool to model the account conciliation process, which has about 250 steps. It's a big process.

That process changes every quarter. Every time it's different, because the organization changes all the time. Sometimes the company buys another company. Sometimes it sells one. Sometimes the regulation changes. That process aggregates a whole bunch of data from different parts of the organization and involves lots of reviews. The accountants design the process and click a button, and that process runs. Never, ever, is IT or any technical person involved in the change of that process. The process is the runtime. The picture is what runs. And the accountants themselves, on an ongoing basis every day, make changes to that process to reflect changes in the business.

The meta-process here is very simple: whatever makes sense, do it. They must have the right level of approval and governance, of course, so it's not chaos, but it's agility in the purest way. The cycle of discovery, modeling, deployment, execution, monitoring, and optimization has been massively compressed so that they make iterations of that cycle several times a day. Several times a day they get new requirements, they get new ideas, and they make new changes. They run with that and they see if it works for the better. It is continuous improvement. ■

Acknowledgments

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Sponsor & Technology Leader
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US Thought Leadership

Partner-in-Charge
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Center for Technology and Innovation

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Special thanks to

Jefferey Baker, Terry Cheney, Rajesh Ganesan, Stijn Goedertier, Naoki Hayashi, Jerry Lewis, Yukinori Morishita, Arnold Nel, Hans Verheggen

Industry perspectives

During the preparation of this publication, we benefited greatly from interviews and conversations with the following executives:

Marge Breya, executive vice president, SAP

Ismael Ghalimi, chief executive officer, Intalio

Stephen Kaufman, chief technology officer, Schawk

Dr. M. A. Ketabchi, president and chief executive officer, Savvion, a Progress Software company

Steve Miranda, senior vice president, Oracle Application development, Oracle Corporation

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This publication is printed on Coronado Stipple Cover made from 30% recycled fiber; and Endeavor Velvet Book made from 50% recycled fiber, a Forest Stewardship Council (FSC) certified stock using 25% post-consumer waste.

Recycled paper

Subtext

Smart digital asset	Digital assets resulting from versatile and creative human processes, such as documents, media files, contracts, presentations, and several other work products. They have become smart as they now include rich metadata that can be used in process management.
Process modeling	The activity of describing how work gets done in an enterprise at the appropriate level necessary for a desired objective. The resulting process models have the potential to be strategic enterprise assets.
Collaboration and content management systems	Systems and technologies used to collaborate on and manage digital assets resulting from versatile and creative human activity.
Business process management systems	Systems and technologies used to model, analyze, execute, and orchestrate business processes across standardized transactional activities and variable human activities.
Meta-process management	An approach to managing and changing the end-to-end process, spanning standardized and variable activities, to achieve continuous improvement.

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