Business Process Management: The Third Wave

Howard Smith and Peter Fingar

Technical Excerpt
Theory

*Endorsed by the Business Process Management Initiative and
the Workflow Management Coalition*

BPMI.org   *Workflow Management Coalition*
WfMC

About this Book

While the vision of process management is not new, existing theories and systems have not been able to cope with the reality of business processes—until now. By placing business processes on center stage, corporations can gain the capabilities they need to innovate, reenergize performance and deliver the value today's markets demand. This book heralds a breakthrough in process thinking that obliterates the business-IT divide, utterly transforms today's information systems and reduces the lag between management intent and execution.

A process-managed enterprise makes agile course corrections, embeds Six Sigma quality and reduces cumulative costs across the value chain. It pursues strategic initiatives with confidence, including mergers, consolidation, alliances, acquisitions, outsourcing and global expansion. Process management is the only way to achieve these objectives with transparency, management control and accountability. During the reengineering wave of the 1990s, management prophets' books full of stories about other companies were all you had to guide the transformation of your business. Although their underlying theories were based on age-old common sense and general systems theory proposed fifty years earlier, they offered no path to execution. By contrast, the process-managed enterprise grasps control of internal processes and communicates with a universal process language that enables partners to execute on shared vision—to understand each other's operations in detail, jointly design processes and manage the entire lifecycle of their business improvement initiatives.

Process management is not another form of automation, nor a new killer-app nor a fashionable new management theory. Process management discovers what you do, and then manages the lifecycle of improvement and optimization, in a way that translates directly to operation. Whether you wish to adopt industry best practices for efficiency or pursue competitive differentiation, you will need process management. Based on a solid mathematical foundation, the BPM breakthrough is for business people. Designed top down in accordance with a company's strategy, business processes can now be unhindered by the constraints of existing IT systems. Short on stories and long on insight and practical information, this book will help you write your own story of success. It provides the *first* authoritative analysis of how BPM changes everything in business—and what it portends. Welcome to the company of the future, the fully digitized corporation—the process-managed enterprise. Welcome to the next fifty years of business and IT.

Appendix C

The Theoretical Foundations of the Third Wave

An intrinsic relation between two things A and B is such that the relation belongs to the definitions of basic constitutions of A and B, so that without the relation, A and B are no longer the same things.
—Arne Naess, *The Shallow and Deep Ecology Movements*

While a self-organizing system's openness to new forms and new environments might seem to make it too fluid, spineless, and hard to define, this is not the case. Though flexible, a self-organizing structure is no mere passive reactor to external fluctuations. As it matures and stabilizes, it becomes more efficient in the use of its resources and better able to exist within its environment. It establishes a basic structure that supports the development of the system. This structure then facilitates an insulation from the environment that protects the system from constant, reactive changes.
—Margaret Wheatley, *Leadership and the New Science*

Changing The Process of Change

For those managing change, it often seems there is a sharp distinction between the process of change and the change being introduced, but this is an illusion. David P. Norton, ex-CEO of the consulting firm The Nolan Norton Institute and now a Director with the Balanced Scorecard Collaborative states: "To execute strategy is to execute change at all levels of an organization. Seems self-evident, but overlooking this truth is one of the greatest causes of a failed transformation effort."[1] Whatever we choose to call the "change process"—reengineering, Six Sigma, Change Management, innovation—*it* changes over time and those changes need to be managed, just as *it* exerts control over the processes it seeks to improve or introduce. Any theory of process management must recognize this and break down distinctions between the *process of change*, the *process under change* and *change in both*.

As we have discussed in this book, change occurs for many reasons. Examples include changes in business regulations, audit requirements or improvements in our understanding of how to mobilize and catalyze resources. Distinctions between different types of change only arise as a result of today's inadequate, disparate and disjoint process management methods and technology systems. In the third wave, there is no need for a distinction between the change process (e.g. Six Sigma, project plan) and the process under change (e.g. customer service, product manufacturing)—they can be one and the same. But, of course, some companies applying process management, may still choose to make such distinctions.

Third-wave processes are inherently open to change; theorists call this "mobile" behavior. Mobile systems are systems whose participants freely communicate and change their structure. They do this in two

ways. First, links between participants, which represent the relationships between them, may themselves change. New links may be formed, old links being broken. To an observer this looks as though the participants, or the links, are moving. A second type of mobility is the relationship of the linked participants to the environment in which they exist. This in turn looks as though the whole process, or subset of linked participants, is moving. Such "mobile" processes now pervade the *informational* world of computer systems and networks as well as the wider *real* world of which they are a part. Examples include industrial supply chains, the Internet, cellular mobile telephony networks, air traffic control and distributed computing.

In a supply chain, a message may indicate the physical movement of goods or the level of inventory in a warehouse. On the Internet, protocols between routers establish preferred routes for packet switching. In a mobile telephony network, a base station announces the availability of circuits to receivers in the same area. In air traffic control, aircraft move into and out of controlled airspace. In a corporate IT infrastructure, messages create relationships and share data between different business applications. Communication and interaction within such systems is rich and varied. Modeling such behavior is hard, but crucial if effective process management tools are to be developed.

At every level there is change. What we commonly refer to as a "business process" is no different. We now understand that trying to capture these descriptions at a specific instant in time, in a software application, is futile. We need a more mutable digital form: prone to change, capable of change and of being changed.

Participants in a business process include employees, information sources, business units, computer systems, business partners, machines, trucks, goods, even business processes themselves (for example as occurs in outsourcing). Change occurs through the acquisition or loss of these participants, through the growth or contraction of relationships among them and their interactions with the environment. A business process "moves"—as it changes—in the multi-dimensional space of time and structural evolution. Like a living entity under the influence of Darwinian evolution, it exists in the past, the present and has possible futures.

In understanding a business process we therefore distinguish different characteristics such as *state*, *capability* and *design*.

- *State* can be understood through the *execution* of the process, the values of calculations performed and the information collected and generated along the way.
- *Capability* can be understood as the specific *participants present* within the process at any time: what they are, the *activities* they are capable of performing and the *relationships* established among them and through which they *communicate*.
- *Design* can be equated to the *intentional* characteristics of the process, those put in place during the design process, before the process was set free to execute, to evolve and to change. Thus, we speak of the difference between intentional design and observed behavior.

How can we start to link the world of business *management* with the world of business *technology* using these process characteristics? Perhaps we can think of operations, the everyday running of the business, as being mostly concerned with process state. Perhaps business strategy is largely a matter of intentional process design. Somewhere between the two lies the management of process capability, the actions taken to grow the business, its customers and its market share. If we accept these rough analogies, then:

- Business *intelligence* is an *analysis* of the past and present state, capability and design of business process.
- Business *insight* is a *simulation* of future state, capability or design.

Today, while the analysis and simulation of process state is perfectly well understood, what does it mean to analyze and simulate growth in a processes capability, or changes in its design? The third wave points to possible answers.

A New First-Class Citizen in Computing

In the esoteric world of technology, there are plenty of ways of developing IT applications that automate business processes. The IT marketplace has a nasty habit of regularly generating new technologies that tease developers into trying out new ways to develop computer software. Not only do new computer languages constantly appear, but new methodologies, each with their own "first-class citizen," the center

of their computing universe. Recent examples include peer-to-peer, grid and utility computing, self-organizing data networks, the semantic Web and distributed agents. This constant evolution in computing infrastructure, information types, applications and process approaches is confusing to business people. They wish to find technology that reflects the way they understand their business.

When technologists examine the applicability of each of these new techniques, and compare them with more established practices such as component and object-based software development, they are, in effect, examining their *relevance* to modeling and support for the classical six domains of change within a company: process, organization, location, data, application and technology. Yet *process* is not a category. Process encompasses *change* in the representation of the other five. Therefore, in developing a process representation language, the third-wave innovators looked not for a single new theory, but a theory that provided a synthesis of other theories. In process calculi they found approaches that could describe the previously separate descriptions of a company's organization structure, locations of operation, data model, application logic and technology infrastructure requirements. They then asked, "what if this were the basis of a new foundation for computing?"

Just as there are countless ways for technicians to implement an automated business process, there are just as many ways to develop and execute a business strategy. In, *The MacRoscope*, Joel de Rosnay postulates, "The fundamental concepts that recur most often in biological, ecological, and economic models can easily be grouped into major categories: energy and its use; flows, cycles, and stocks; communication networks; catalysts and transforming agents; the readjustment of equilibriums; stability, growth, and evolution. And above all, the concept of the system—living system, economic system, ecosystem—that binds all together all the others." Similar thinking can be applied to existing management theories. Six Sigma, TQM, Balanced Scorecard, Activity-Based Costing, Economic Value-Added (EVA) , Value Analysis, each can be represented using a small set of core concepts—an ontology of commerce—a vocabulary of well-defined primitive forms that can be combined in a recursive procedure to represent any business process, no matter how complex and how expansive.

Examples of such primitives include ideas such as identity, relationship, exchange of value and knowledge about a system. We now

understand that the outcome of a process is nothing more than the result of the flow of interactions among participants at every level, from the digits involved in a calculation to the most complex exchange of assets between two economic legal entities. Formalizing this *business* vocabulary and providing precise *definitions* of these elements will emerge as the counterpoint to the exploitation of process management systems over the coming decade.

Unification of Data, Computation and Interaction

In process calculus, relationships represent anything from a physical link (a lorry arriving at a warehouse) to a business relationship (two parties entering into a contract) to a mathematical property (such as calculating tax). Using just a tiny set of primitives, these theories can unify both the large-scale (macro) structure of mobile process systems and the small-scale (micro) structure representing intricate behaviors, themselves processes.

Previous theories in computer science, notably the Lambda-calculus, focused on the behavior of much simpler computer systems, where there is either a single thread of execution or a set of parallel but non-interacting tasks. Such algorithms are procedural, sequential, goal-oriented, hierarchical and deterministic. All of today's well-known programming languages can be studied using Lambda-calculus, including Fortran, COBOL, Pascal, Lisp, C and Java. By contrast, in process theories such as the Pi-calculus[2], the main focus is on systems that interact and interrupt one another, where there are many deeply nested, independent, but coordinated, interacting threads of execution. Business processes are an example. The differences between these theories are striking, for even our notion of what constitutes a common-sense interpretation of *data* and *value* has changed utterly.

In conventional computer languages there exists the concept of a "type." For example, the type of the number "five" is called an *integer*, the type of the text "hello" is called a *string*. Such types represent *values* —such as 24, "customer name," "purchase order number." These values are then aggregated to form *records* and these are stored in databases. All conventional languages focus upon *computation* using values and records, for example, *counting* customers that match certain criteria or *evaluating* their credit worthiness.

By contrast, in languages derived from Pi-calculus, types represent *behavioral patterns*. In business terms this would mean things like "signing a new customer," "exchanging contracts" or "performing work." In this brave new world, computation is harder to envisage. To do so, think of analogies such as "measuring the acquisition cost of new customers," "understanding the value exchanged through a negotiation" or "analyzing work habits." If brown is the new black in fashion, then behavior is the new data in the third wave.

Process engineers and designers of process management systems respect Pi-calculus because it identifies the concepts that underpin a wide variety of concurrent systems. This is no different from other fields of study. Electrical engineers respect differential calculus. For them, it ties together various frameworks, concepts and thinking without distortion and defines what is common to all *electrical systems*. Likewise, database engineers respect the relational data model originally proposed and defined by E. F. Codd[3].

Process calculus would, however, be of no use if it were wonderful at describing *business* processes but omitted to describe traditional *computational* processes. Fortunately it can do both. For example, the operation to *combine two lists* into one—a common operation in most computer programs—can be regarded as a change in the relationship between the lists, from disconnected to connected. In process calculus the movement of a piece of data inside a computer program is treated exactly the same as the transfer of a message, or indeed an entire computer program, across the Internet. Taking decisions and computing results—in fact all common programming tasks—can be represented and understood as "processes."

This process approach, where process is the new first-class entity, can be applied even to the lowly task of adding two numbers—one plus two equals three. The sum itself is a process. It can be understood as a process in two ways. The first is: The "one" participant joins "two" in the "plus" relationship, which then grows to include the participant "three" in the "equals" relationship. The second is: A participant receives a message containing "one" from another participant, and a similar message containing "two" from a second participant. It then performs the "plus" activity and sends the result "three" in a message to a third participant. These rough analogies hardly give credit to the richness of Pi-calculus, but they help us understand how any calculation can

be represented as a process. This perspective gives the third wave of process management its inherent ability to *capture, describe and manage whole processes*—not just integration between existing algorithmic procedures written in conventional software languages and embodied in today's packaged software. This approach to process representation can be applied to a wide range of problems. Other examples include:

- Hypertext links that are passed around, created, or which disappear
- Connections between mobile telephones and base stations
- A job scheduler, allocating work on a production line
- References passed as arguments to methods in "business objects"
- Business partners changing roles in a business process
- Work passing between participants in a business process
- Code sent over a computer network to execute on another system
- A vending machine, serving up a can of Coke
- A mobile device acquiring a new capability over a telephony network
- Procedures passed as arguments to methods in computer systems
- A business process passed to a business partner for execution

Relationships, specifically their namesappear to be something fundamental. They are ubiquitous in computing, in the form of addresses, identifiers, links, pointers and references. They are ubiquitous in business, in the form of purchase order numbers, product codes, organizational roles, the identity of partners, the types of business relationships and the infinite ways of organizing, performing and referring to items and patterns of work. In process calculus the names of relationships can be used for many purposes, such as channels over which processes communicate, the names of processes themselves, the names of objects (as in traditional programming), proxies for physical locations or references to encryption keys. Names received in one interaction can be used to participate in another. By receiving a name, a process acquires a capability to interact with processes that were previously unknown to it. A name can even refer to the specific pattern of a process design. The connections among participants—the structure of the system—can thus change over time and in ways not envisaged by the process designer.

Process-aware Applications

In business, a supply chain director is required to understand complex processes, such as a logistics network, but his or her ability to manage and optimize that network is still very much an art, rather than a science, and presents huge challenges. By contrast, to a software engineer, even the most simple business process, such as the exchange of a purchase order, can be difficult to program and hard to represent. This is because today, most software engineers use constructs such as records, objects and interfaces, first-class entities of a past era, not attuned to the representation of business processes. This mismatch, between the reality of business and the artifacts of traditional software, limits the ability of the software engineer to provide tools to the supply chain manager to help manage real business.

In many industries, business and systems architects strive to create software applications that accurately reflect their business. Sometimes they do not realize that a perfect simulation is their ultimate aim. Architects in other industries know precisely that this is their task. In the logistics industry, companies often model their IT architecture closely around the behavior of the physical logistics networks they monitor and control. The tools they have to achieve this are improving all the time. Gradually architects are finding ways to represent the behavior of complex systems—interconnected and inter-related mobile processes—within the business applications they develop. Soon they will realize that mapping business concepts into artificial IT artifacts such as objects, interfaces and procedure calls, should be replaced, or at least complemented, by the process calculus models of the third wave. These artificial constructs arose to support the composition of software, not the representation of business. Architects are now looking for methods, tools and systems that are purpose built for business. Increasingly they are looking to business process modeling languages for solutions.

Drawing on themes from concurrent programming and agent-based systems, process-modeling languages treat process participants as autonomous "agents." An agent is free to act, having both an internal process that it follows, and an external interface through which it communicates. As it interacts with other agents, it collects information from them that it can refer to in making decisions, calculating results and constructing messages to send to others. It can then pass on this derived

information to other participants. Partly autonomous, and partly constrained through process design, agents act in parallel and in consort. The action of any particular agent depends upon both the anticipated actions of the agents with which it interacts or the agent's analysis of the state and structure of the system process in which it exists. Such systems are called "adaptive complex networks" and they occur widely in nature, not just in computing. Examples include the economic networks and value chains studied by economists and business people alike.

Imagine a typical business application today and ask: "Why does it stay the same? It's digital stuff right? So why can't it change? Why does a new version of the application have to be developed for each and every situation? Why can't it adapt to me?" It is now legitimate to ask such questions—IT industry experts are already anticipating software programs that will write themselves to agreed process patterns. IT infrastructures will take on—auto-magically—the form of the organizations that use them. From now on, the business process is the "app," and the "app" is nothing more than mutable data. For this is the "third wave" form of business asset described in this book. Let's move on and build the new "process-aware" applications of the third wave and not try to preserve paradigms that fail to fully represent the complexity of business. Those companies wishing to take this step will need a mission-critical infrastructure designed for the purpose, the business process management system (BPMS), upon which they can manage their "mutable process data."

References

[1] Norton, David P., *The Balanced Scorecard Report*, Harvard Business School Publishing and the Balanced Scorecard Collaborative, Volume 4, Number 1, January-February 2002.

[2] Milner, Robin, *Communicating and mobile systems*, Cambridge University Press, and Sangiorgi, Davide & Walker, David, *The Pi-calculus: A theory of mobile processes*, Cambridge University Press.

[3] Codd, E. F., "A Relational Model of Data for Large Shared Data Banks," *Communications of the ACM*, Vol. 13, No. 6, June 1970, pp. 377-38.

About the Authors

HOWARD SMITH is Chief Technology Officer (Europe) of Computer Sciences Corporation (CSC) and co-chair of the Business Process Management Initiative (BPMI.org). With more than 24 years in the IT industry, he is a sought after speaker and advisor. His work in predicting and shaping technology at the intersection with business led him to take an active role in the development and application of the third wave. He is currently researching the application of *business process management* to corporate sustainability, innovation and growth, for which he has global research and development responsibility at CSC.

PETER FINGAR is an Executive Partner with the digital strategy firm, the Greystone Group. He delivers keynotes world wide and is author of the best-selling books, *The Death of "e" and the Birth of the Real New Economy* and *Enterprise E-Commerce.* Over his 30-year career he has taught graduate and undergraduate computing studies and held management, technical and consulting positions with GTE Data Services, Saudi Aramco, the Technical Resource Connection division of Perot Systems and IBM Global Services, as well as serving as CIO for the University of Tampa.

Other Advanced Business-Technology Books from Meghan-Kiffer Press

Business Process Management: New Directions
The Evolution and Applications of Business Process Management

The Death of 'e' and the Birth of the Real New Economy
Business Models, Technologies and Strategies for the 21st Century

Enterprise E-Commerce
The Breakthrough for Business-to-Business Commerce

The Real-Time Enterprise
Powering Profits with Process Automation

Find out about PMI's fastest-growing certification: Professional in Business Analysis, PMI-PBA®. Explore the business drivers that are making this certification so valuable to both organizations and the individuals who earn it. Also learn what the requirements are for PMI-PBA certification and tips for applying past experience to count towards the required hours needed. Project professionals who already have the Project Management Professional (PMP®) certification will get perspectives on their project experience to help them capitalize on their PM-BA hybrid role. Attendees will come away with The Second Wave • Business Process Re-engineering (BPR) • Processes implemented with ERP software, for example • Business and Process Logic Hard-Coded • Led to EAI (Enterprise Application Integration) i.e. application-to-application focus. The Third Wave:Business Process Management • We are now entering, and we are in, "The Third Wave," the wave of Business Process Management • The ABILITY to CHANGE is FAR MORE PRIZED than the ability to create in the first place • BPM enabled by an SOA Infrastructure is the "Secret Sauce" to implementing this for businesses • Goal is to fa The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Theodore Panagacos. 4.1 out of 5 stars 73. They lament the disruptive and "painful reengineering" second wave advocated by their former colleague, James Champy. They see the main differentiator of BPM as being its ability to connect outwards to partner businesses. What Smith and Fingar hope to achieve with business process engineering is to cut IT entirely out of the business change loop. They envisage being able to completely describe all business processes in BPML diagrams - down to the "Coke" machine's inputs (coins) and outputs (cans of soda).