Class Notes: BPM Research and Education

Jan Recker

Jan Recker [j.recker@qut.edu.au]

X-Aware Business Process Management

In my last Column this year, I want to draw your attention to some current efforts in the space of BPM research and education that try to move BPM thinking forward into new areas of application. I am subsuming these efforts under the notion of **x-aware BPM**.

Now what do I mean with this term? Awareness is generally defined as a state of consciousness in which we perceive and recognize the relevance of a certain object. This means that as individuals, awareness refers to our ability to sense objects and cognitively react to them. Awareness might thus relate to other people, to other life forms, to tangible and intangible objects. Indeed, many argue that "self-awareness" – our ability to consciously recognize ourselves – is a key defining property of humans.

The concept of awareness has also been used to conceptualize our state of recognition of how organizations work: organizational awareness in this sense refers to the state of recognition of the organization's mission and functions, and how it's social, political, and technological systems work and operate effectively. Organizational awareness typically includes knowledge of the programs, policies, procedures, rules, and regulations of the organization.

Several research streams over recent years have now attempted to define what "awareness" means for business process management. The objective has not been to define the recognition of BPM or to elevate the understanding of its rules, policies, procedures and regulations. Instead, the efforts towards x-aware Business Process Management are attempting to raise the awareness of BPM tools and techniques to recognize relevant *other* objects and phenomena in the wider organizational context, and to make BPM as a management approach fit new and emerging challenges.

What is the common idea behind all these initiatives? It is to reconsider our thinking of BPM as a fully developed one-size-fits-all toolbox and management approach, and instead to improve the classical BPM to "fit" new problem domains and emerging challenges. Some of these efforts, in turn, try to *extend* BPM thinking, tools and methods to cover new problems (e.g., context-aware process modeling [9]), and some efforts seek an *integration* of BPM with methodologies typically associated with other domains (e.g., project-aware process management [2]).

Let me now introduce you to some of these current, ongoing and future streams that challenge and extend our conception of what Business Process Management is about and, importantly, where and how it can be applied. As a note of caution, I want to highlight that many of the subsequent illustrations describe work-in-progress where not all solutions have (yet) been found.

Context-aware BPM

One of the first attempts in extending the range of domains to which BPM can be applied has emerged as the notion of context-awareness in managing business processes. This work is grounded in the observation that in many organizations, business processes can be coupled with elements in their external context (e.g., weather patterns, commodity prices, or industrial actions). For example, an Australian agency handling disaster claims had to apologize to victims of the Victorian bushfire in 2009 after automated letters were sent out, demanding that they provide identification, despite the fact that many of them had lost all proof of identification in the inferno. In another example, a German bank lost €300 million in an automated swap transaction with its business partner, Lehman Brothers, on the day the American investment bank announced bankruptcy. There are many more cases where, as a result of coupling to an event in the wider "context", processes need to rapidly adapt if their context changes.

One of the key challenges in these and other cases has been that the requirement for rapid, context-driven adaptation has not fully found its way into the typical BPM approaches. For example, typical methods of process modeling do not yet consider context variables but instead focus on articulating internal process viewpoints such as transformation, events or decompositions [7].

Work on context-aware business process management has firstly attempted to establish an understanding of "which context matters to business processes". In our own work, we have proposed a typology that recognizes an immediate, internal, external and environmental context relevant to business processes (see Figure 1). A more detailed description of these onion layers is provided in [8].
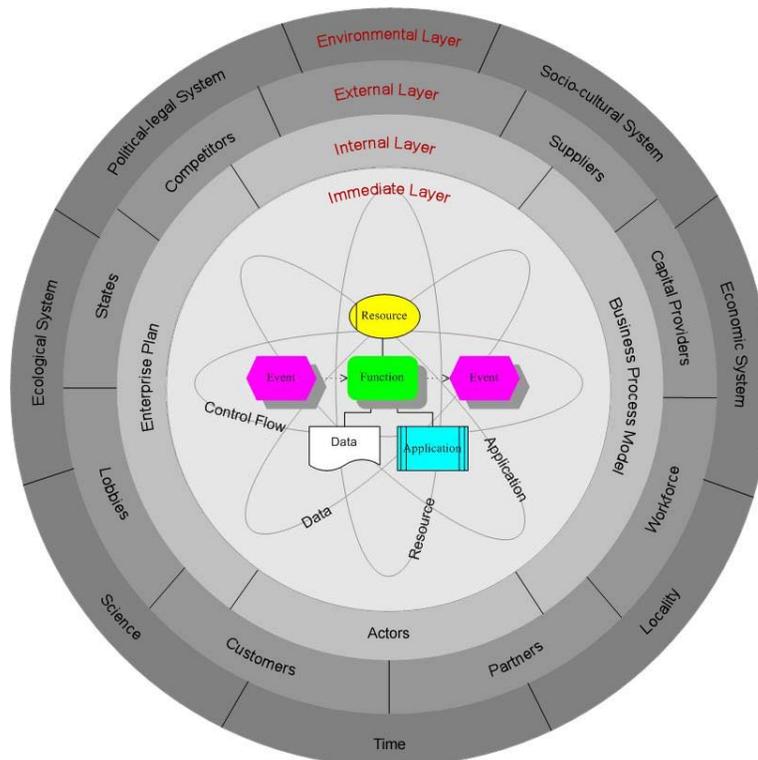

Figure 1: The Onion model for context classification and typing [8]

Based on a better understanding of "**which** context matters?", we can then proceed to ask questions such as "**where** (in which processes) does context matter?" and "**how** does context

matter (impact)?". With these guiding questions we can develop solutions to increase our awareness of context in business processes, document their relevance and impact, and ultimately enable context-driven process adaptation, viz., the ability to make rapid changes to the way processes are executed when the context of the process changes. Figure 2, for instance, shows the difference between context-unaware and context-aware process modeling using a simple value chain model of an insurance claims handling process.
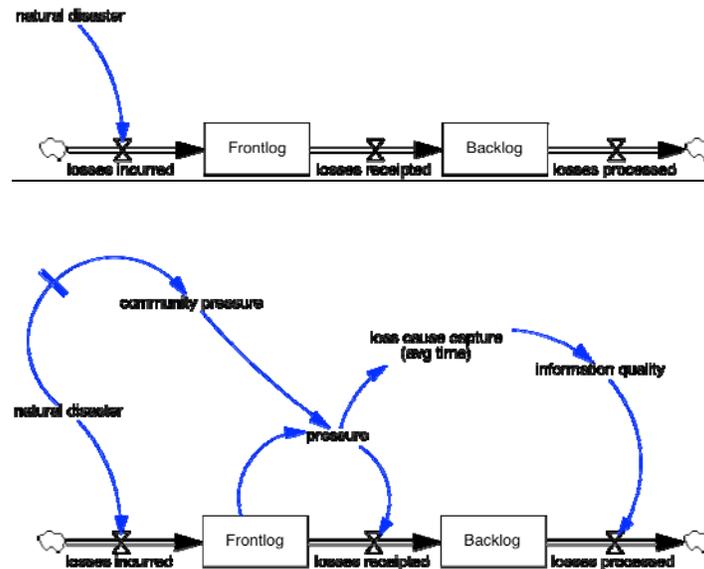

Figure 2: Context-unaware (top) and context-aware (bottom) process models [5]

Risk-aware BPM

Similar to the establishment of awareness for external, contextual elements that impact the way processes are executed or managed, we have started to explore how risks, their mitigation and management impacts the management of business processes. In turn, risk-aware BPM challenges our current application of BPM with the question to what extent we consider process risks in our management of these.

Risk-aware BPM attempts to integrate two typically separate disciplines – process management and risk or business continuity management. This traditional separation often leads to inefficiencies as decisions can be contradictory and a consistent information basis is missing. Therefore, the vision of risk-aware business process management is to become capable of providing information for economic, process as well as for security concerns in a holistic and integrated manner. Figure 3 depicts the essential steps of the risk-aware BPM lifecycle.
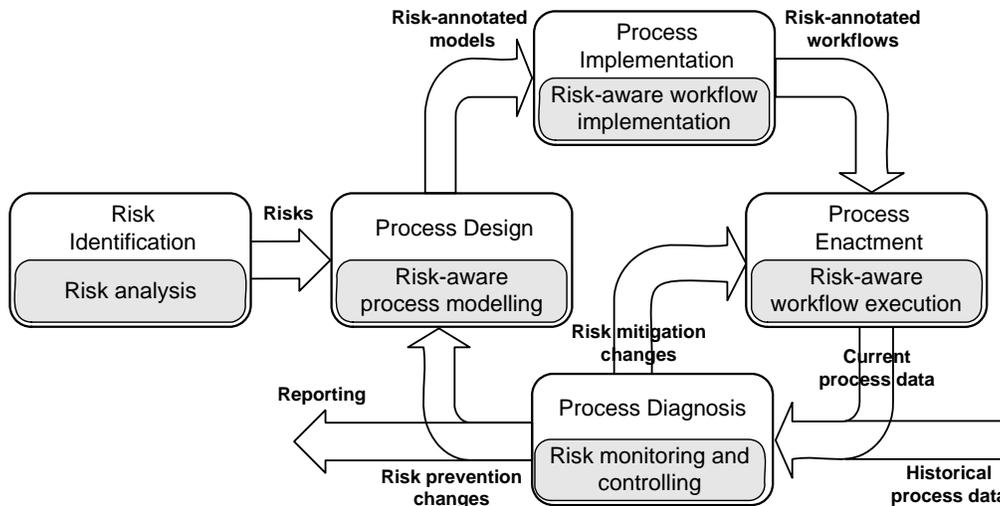
Figure 3: The risk-aware business process Management lifecycle [1]

Early efforts in risk-aware BPM have developed new approaches for modeling risks in business process models [4]. The objective here has been to enhance transparency to enable an understanding where risks in business processes originate, what their impact could be, and which control and mitigation strategies are (or should be) in place. These early efforts have now been extended with work that develops novel approaches for identifying and detecting risks in business processes during execution [1]. Via a distributed, sensor-based architecture, at design-time (when the processes are specified), sensors can be defined that specify risk conditions that, when fulfilled, are a likely indicator of faults to occur. Both historical and current process execution data can be used to compose such conditions. At run-time (during execution of the processes), each sensor independently notifies a sensor manager when a risk is detected. In turn, the sensor manager can interact with the monitoring component of a process automation suite to prompt the results to the user who may take remedial actions.

Cost-aware BPM

Inspired by the abovementioned examples of x-aware business process management, some of my colleagues at Queensland University of Technology, together with scholars overseas have suggested approaching a stronger focus on process costing in business process management tools and methods.

Process costing has traditionally been one of the measures associated with cost-benefit analysis and financial management, whose task it was to manage organizational costs so as to plan ahead of time and to make informed strategic and operational decisions based on cost. However, the value of this cost analysis could be limited if accurate cost figures about process activities in which these costs manifest are not readily available to a business. By the time detailed reporting and auditing have been carried out on process activities, it is often too late to make any cost saving adjustment necessary for that period. Hence, the ability to monitor the overall cost of process activities closely and to make necessary changes to the relevant processes quickly is highly desirable for any manager.

It is at this intersection where cost-aware BPM attempts to apply process management principles and tools to the management of organizational costs at the activity level. This is because process models, as a key BPM tool, contain descriptions of what activities need to be performed, when they need to be performed, by whom they need to be performed, and what information they need and what information they produce. BPM systems also provide the ability to monitor processes

and examine various properties of these processes. However, to date these systems are typically neither cost-aware nor is the execution of a process typically cost-driven. The ability to understand the true origins of costs involved in business activities, and to be informed about this on a real-time basis, would allow organizations to increase its profitability and to recognize early on the need for reorganization of its process practices.

Work on cost-aware BPM has just recently commenced so I am not yet in a position to provide much detail. Still, in this innovative project funded by the Australian Research Council, the interrelationship between cost measures and business process activities are being brought together in a sophisticated cost-aware business process management solution. The aim is to develop a process-based approach to the management of costs of business activities by making workflow systems cost-aware. The outcomes of this research will enable businesses to make operational and strategic decisions with confidence based on accurate and real-time true cost information about its operations. The project will apply their solutions in various domains, including rural industries, finance, health, and utilities. Organizations interested in participating in this research project are welcomed to contact me via email.

Sustainability-aware BPM

Some of you may remember my last Column entitled "Green, Greener, BPM?" [6]. In that Column, I presented my views on using BPM principles in an effort to develop "greener", that is, more environmentally sustainable processes. So, why I called this approach Green BPM, one may also embrace the initiative under the umbrella term "sustainability-aware BPM".

I do not want to bore you by copying and pasting my last Column. Please do read the Column if you are interested. What is interesting to note, however, is that this field is in fact quite active at present. In my last Column I showed you preliminary solutions for sustainability-aware process modeling and analysis. Other academics have focused on further management solutions. Figure 4, for instance, describes a framework that enables organizations to focus on challenges such as "how much carbon emissions does a process emit up to a certain event?" or "how much carbon emissions are emitted by executing a particular task?". As part of that effort, the management provides guidelines for improving the carbon footprint of process ecologies (that is, organizational portfolios of processes).
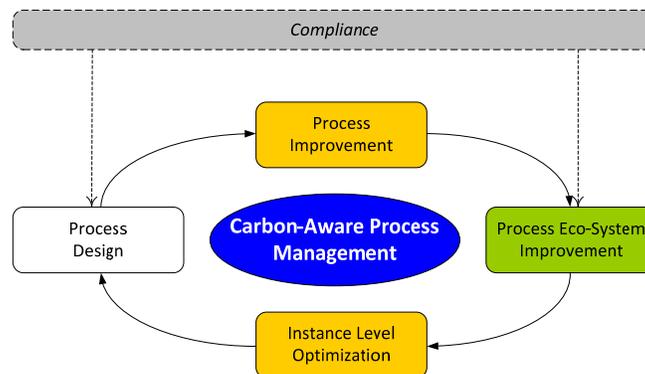

Figure 4: Carbon-aware business process management. Adapted from [3]

What's next?

When reflecting upon these selected examples of x-aware BPM, I find a striking similarity across all these initiatives. In all efforts of making BPM tools, principles and solutions more "aware" of a particular challenge (be it costs, risks, sustainability or context), as a first step we always consider how additional, relevant information (such as carbon footprint, resource or energy consumption, weather, economic or political pressures, risks and controls, or cost figures) can best be modeled in explicit conjunction with business process. I suppose that, congruent with the classical BPM view, our first task is always to develop a better, more comprehensive and holistic understanding of how processes relate to, and manifest in, the new challenge we consider.

Once we reach a thorough basis of understanding, we attempt to identify how processes can be analyzed and improved with a specific view towards the goal that is of interest (such as risks or costs). These principles you can witness in all formats of x-aware BPM. And this also implies that the three central questions of BPM will also traverse through other emerging challenges as they occur now or in the future: What do our processes look like given this or that view? How do they perform? How can we make them better?

Which forms of x-awareness loom at the horizon, we will see. Customer-awareness, I believe, will emerge as a central process design principle at least in some verticals such as retail, banking or other service industries. Before long, professionals will question the traditional view on their processes and ask "How can BPM help me to make my processes truly customer-aware?" "How can customers participate better in my processes, and how do I participate more in my customers' processes?"

Of course, there will also be other x-awareness challenges that I do not really foresee. If you believe there is a particular need for more awareness, please, drop me an email.

Acknowledgments

In this Column I consider research work and inspired thinking from a variety of BPM research institutions and thought leaders. Many of the ideas summarized in my own plain interpretation relate to scholarly work undertaken by academics such as Michael Rosemann, Arthur ter Hofstede, Jan vom Brocke, Wil van der Aalst, Hajo Reijers and others.
The interpretation of their as well as my own work should be considered as my personal views that not meant to represent those of my colleagues.

As usual, please feel free to contact me with your suggestions, feedback and comments – or for a copy of articles related to the topics above.

About Me

Jan Recker is Associate Professor for Information Systems at Queensland University of Technology in Brisbane, Australia, where he is co-leader of the BPM research group. Jan's research interests focus on the use of process design in organizational practice, the quality of process designs, and the development of innovative and sustainable process (re-) designs. He is globally recognized for his research on the industry adoption of the BPMN process design standard. Jan has written a book on evaluations of the BPMN notation, co-authored over 100 academic papers in journals and conferences and presented his research all over the globe. He holds a PhD in Information Systems from Queensland University of Technology and a MS in Information Systems from the University of Muenster, Germany.

His research and publications can be accessed at http://www.janrecker.com/. The best way to contact Jan is via email (j.recker@qut.edu.au). You can subscribe to his tweets at www.twitter.com/janrecker/.

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