Workflow and Business Rules: A Common Approach

Heinz Lienhard and Urs-Martin Künzi
ivyTeam-SORECOGroup, Switzerland

A BPM approach is proposed for addressing processes, Web Services, and the use of business rules by the processes, starting from graphical models. Transparent, easy to manage, and mathematically sound solutions are obtained in a coherent way.

Jean Faget, Mike Marin, et al, in their article, “Business Processes and Business Rules (BR): Business Agility Becomes Real,” which appeared in the Workflow Handbook 2003, stress that “processes are not policies (business rules) and policies are not processes” and hence should be treated in different ways to obtain the necessary “separation of concerns.”

On the other hand, access to the Business Rules (BR) by the processes is vital; hence, some people recommend building bridges between BPM and BRM (Business Rule Management); i.e. an integration of the two systems is proposed.

The new hype about the declarative way to handle rules reminds the authors of the logic programming (or declarative programming) craze some 20 years ago. A lot was promised then and very little achieved, even while the battle cry was the same as today: “WHAT, NOT HOW...”

True, processes do have to satisfy business rules. But business rules themselves can be optimally managed via a management process or workflow. Using the appropriate workflow or BPM approach, one can naturally take into account who is authorized to set up or change which rules (or policies) when and how. This requires certain features in the workflow system for depositing and accessing business rules in a database (repository) and the capability to use these rules for computing decision attribute values. And from within the actual business process, one must be able to call on these rules or policies when necessary.

And what about the above-mentioned “separation of concerns”? As described in an earlier Workflow Handbook¹, the integration of workflow and Web services in a common platform offers, besides many other benefits, an elegant solution to separate the business rule part from the actual business process.

It can be shown that starting with the business processes and using a modern BPM/Workflow approach one can obtain solutions that do satisfy the legitimate demands of the BR people without the need for yet another tool.

To learn the use of a different tool to manage business rules and to properly integrate it with the BPM engine does not make life easier. As an alternative, we propose an elegant way to address processes, separation of concerns, and the use of business rules starting from graphical process models. Transparent, easy to manage, and mathematically sound solutions are obtained; in addition, rules about rules (metarules) can be used together with a rule management workflow system, just as business rules are used for business workflow.

Business Processes or Business Rules?

In the last couple of years, business seems to have been under BPM’s spell. But we hardly finished reading about the next 50 years on “The Rise and Rise of Business Process

Management" when — as seems inevitable in the IT world — a new hype gains momentum long before the 50 years are over. Having just started to ride the third wave, we are now being told: “Processes are not that simple. In fact they are quite complex and therefore quite difficult to change.” (Ronald G. Ross). And — as a conclusion — we are asked to concentrate on the business rule approach, the new gospel now being preached.

Interestingly, very similar claims are being made on both sides. The Business Rule Approach promises:

• “Increased speed of implementation. It can take a long time to change some computerized applications. A business rules engine can permit new business rules to be implemented immediately. This increases organizational agility.”

• “Management of diversity. Many enterprises have operations that are increasingly diverse, or even customized. They find that no one set of business rules meets any particular situation... Organizations are looking for ways where new sets of rules can quickly be implemented for specific, perhaps even transient, situations. Business rules engines can meet these requirements. They permit organizations to expand their portfolio of operations and quickly take advantage of new opportunities.”

• Etc.

And the BPM people tell us

• “BPM provides enhanced business agility…”

• “BPM provides a direct path from process design to a system for implementing the process. It’s not so much ‘rapid application development’; instead, it’s removing application development from the business cycle.”

• Etc.

Of course, you should buy a Business Rule Engine before you have even come to grips with Business Process Management and the necessary Workflow Engine. Worse, in order to make real use of both systems you will have to integrate the two engines. Good luck!

After many business processes have been successfully implemented as workflow using modern BPM, we are very confident that this approach is here to stay. By starting from graphical process models, which have been set-up together with the business people concerned, successful solutions have been obtained in a very efficient way. BPM has grown out of workflow management systems that have proven their usefulness over many years.

Rule systems also have quite a history behind them. A couple of decades ago, “rule-based systems,” also known as “expert systems,” were the solution to everything from computerized medical diagnostics to running your business successfully. And normal programming was predicted to be soon displaced by logic programming, allowing the solution of problems in a strictly declarative way: “WHAT, not HOW.” Unfulfilled claims went so far that at one point, expert systems – artificial intelligence in general – fell into utter disgrace.

Apparently, enough years have passed to get the bandwagon rolling again. In a white paper to CEOs, CIOs, etc., we read, “The biggest challenges facing business and IT in the 21st century are Change and Complexity. Artificial Intelligence and Business Rules are the answer (from BizRules®.com).” No comment.

It seems as if the answer to the question in the title above would be processes (or the derived workflow). In many cases, this is really the answer: The necessary rules to make decisions on

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4 How to Build a Business Rule Engine by Malcolm Chisholm, 2004
how to proceed in a workflow are naturally integrated into the process model, i.e. are part of it. Modern BPM tools do allow adapting processes in a simple and efficient way. Hence, should some rules change over time, this does not pose a difficult problem.

**Separation Of Concerns**

But there are other cases where larger sets of rules are important, rules that may often change and have to be managed by people other than the ones concerned with the actual business processes. This seems to be especially true for insurance companies. Also, in such cases many of the rules may directly influence the flow in the business processes, but it may be a decisive advantage to separate the concerns for the processes from those regarding the business rules. Therefore, on the one hand, these rules must be directly accessible by the business processes (should in a way be part of them); on the other hand, they are preferably managed by specially authorized people (those not directly involved in the actual business processes).

It turns out that the natural way to manage these rules, i.e. to modify them or to add new rules, is to set up appropriate processes implemented as workflow or process-based Web services (see ref.1 above). By assigning the corresponding roles to the people concerned, we can easily define who is to do what, when, and where in the business rule management process (see examples below). And we do not need to buy and introduce a separate Business Rule Engine: We use what modern BPM has to offer. This has many significant advantages:

- No need to train people to master yet another tool set
- The look and feel of the rule system functionality is the same as the BPM look and feel.
- The form design used for BPM can serve to input and edit business rules (see example Figure4).
- The rule management processes can be monitored and audited in the same way the business processes are.
- The rule system (i.e. the rule management processes) can easily be adapted via graphical process models (BPM).

We are convinced we can get the most mileage out of a BPM approach by extracting the actual business rules into dedicated processes to evaluate the rules and to manage them; hence, the above title should read:

**Processes with Business Rules**

Modern BPM Tools allow us to go from a process model directly to the workflow implementation (see ref.1); we therefore use process and workflow more or less interchangeably in the context of this paper.

**Categories of Business Rules**

It seems that there are more classification schemes of business rules around than rules ever implemented. We find "presentation rules," "action assertions," "producer," "enabler rules," "process trigger," etc. (see Ross⁵ or www.businessrulesgroup.org). In the religious approach, where everything is Rules, this is hardly surprising. But business processes do play a fundamental role in businesses and, allowing for the fact that they belong technically to the branch of system science known as “Discrete Event Dynamic Systems” (precisely those systems that describe what activities take place under what circumstances), we actually have powerful and well-proven means to control the behavior of a business system in a mathematically sound way.

Hence, one does not need rules to express these things; simple and clear conditions within the workflow usually suffice. One is asking for trouble trying to do it all with rules; invariably one winds up with immense heaps of all kinds of rules that are either trivial or will likely lead to problems in

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⁵ “Principles of the Business Rule Approach” by Ronald G. Ross
some grandiose inference engine. But even if this is not the case, one often gets into asking questions and checking rules where it does not make much sense, such as “given birth to how many children,” “how many miscarriages suffered,” etc., when in effect the applicant (e.g., for an insurance) turns out to be a boy…

Better if the process (i.e., workflow) specifies what has to happen at a certain point and all the “rules” have to do is spelling out what (usually simple and precise) specific conditions one or the other action has to occur. All that is usually needed are either rules that evaluate to true or false, or possibly rules with a numerical value upon which is decided what has to happen next in the process.

Processes Come First

Graphical process models (especially if they can be simulated and animated) help a great deal in making businesses transparent and much easier to understand. This is not hype but an experience noted by people involved in such projects. As mentioned above, new BPM approaches support this – and much more: If people involved in a process are content with what they see in the model, the corresponding workflow is readily deployed. Piling up rules (as some advocate) makes the business neither more transparent nor more manageable nor easy to support by IT. Although many rules may actually be involved in a business, at a certain point in a process only one or few rules may be necessary.

Back To The Separation Of Concerns

Nevertheless, the BPM approach can be further improved by heeding the advice of the “rules people” to separate those rules from the actual business process that are likely to change often and/or have to be managed independently of the business workflow. But, as mentioned earlier, workflow can be just the way to evaluate and manage a rule base without having to resort to another tool. An adequate BPM/Workflow tool may be all that is really needed. By “adequate,” we mean the ability to set up a workflow combined with Web service calls and to model and deploy process-based Web services as described in the Workflow Handbook 2003.

All we have to do is to create another workflow application separated from the actual business processes that provide the necessary Web service interfaces (see the mentioned chapter in the Workflow Handbook 2003). The resulting BR evaluation and management application may reside on a different server anywhere in the world. Obviously, this approach might just as well be used to take out certain parts of a business workflow that we want to be run and managed separately from the main process. Web services in conjunction with workflow allow a very elegant solution to marry business processes with business rules.

A Simple Example

In Figure 1 we give two graphical process models, one exhibiting part of a business process, the other showing a possible process for the evaluation of the business rules contained in the rule catalog (DB). These process models are built with standard process elements (see Ref. 6) from an element palette (e.g., with Decision, e-mail, DB-Step elements, etc.). By double clicking on these elements they can be configured; i.e., masks are provided to insert parameters or complete assistants to configure elements like DB access, Web Service calls, etc., without any programming. With the configured elements the models actually represent the workflow that is simply obtained by deployment (upload) of the models onto the corresponding application server.

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Figure 1 Actual business process on the left; Web service process for rule evaluation on the right. Both are shown in the animation mode: The data object flowing through the process (dot) exhibits some of the attribute values.

The process on the right side of Figure 1 uses special Start and End Elements. From this model, a Web service is automatically generated during deployment (e.g., generation of the Web Service Definition in WSDL). On the left side of Figure 1, part of the actual business process is shown: A customer (customer number 1002) is ordering some items for a total price of $2000 (Attribute PriceOrder). In a database, information about the specific customer is accessed, like "Age," "CustStatus" (gold in this case), etc. With this information, a first rule is invoked and evaluated (the next step, a rule call to obtain the rebate factor for a customer buying for more than $1000 and having the customer status "gold." The corresponding IF-Rule (CustRule1) is accessed in the rule catalog and evaluated for the given terms ($2000, "gold"), and the business process moves on to modify the price according to the rebate ($1600).

We have shown how a business workflow may use (evaluate) business rules that are separated from it in a special workflow application through an appropriate Web service interface. In the modeling phase (or when a business process has to be modified), one needs access to the rule catalog from the modeling environment to select and assign rules to particular process elements. In the above example, this is done for the decision element "Is young customer?" But for other elements like an event start or a trigger element, such rule assignments will also be needed. This rule access can be done via a similar Web service interface as seen in Figure 1. This way one might read out the catalog and present it to the process designer for rule selection, i.e., to identify the name or ID of the rule required at a certain point in the process or workflow respectively.

Rule Management Workflow

So far we have shown how the business workflow can have a business rule evaluated that is separated from it. Now we turn to the rule management process (workflow). The same way we model the business process – and turn it into an operating workflow – we may implement the workflow to setup and manage business rules and their catalog. Figure 2 presents part of such a process.
The process model is shown at the moment that the data object (dot) is about to enter the Page Element “Approval.” The browser-based interaction is on the right side of Figure 2.

The user – here the BR manager, after having logged-in – has activated his assigned task to check the proposed new rule. Now he has to decide whether to accept the rule (click on the OK button), or to refuse it and fill in a comment that will be mailed to the person soliciting the new rule. Only when clicking on the OK button will the process proceed to enter the rule into the catalog (see process element “Enter new Rule into DB”). In case the rule is only modified no approval from the BR manager is required. Here “business manager” actually indicates a role (in the classical workflow sense) that some users may have.

**Rule Management Processes with Metarules**

Metarules? Well, we do not have to stop at what we did in the example above. For the rule management process given in Figure 2, one may ask the question whether the decision to have new rules approved by the BR manager (or somebody else) should be made with the help of another rule; i.e. a rule about rules: a metarule. The evaluation and management of such metarules can be done following exactly the same approach we proposed for the business rules – within a (meta) workflow handling the metarules.

In reality, the business rule catalog will consist of various classes of rules. A metarule may spell out for which classes of rule what kind of role has to be selected in the business rule management workflow (e.g., the one shown in Figure 2). Figure 3 exhibits such a scenario:

Before the task of checking a new rule for approval is assigned, the metarule is accessed (called via Web service interface) to determine which role or person is responsible to decide in the given
In principle, the trick could be used again, leading to metametarules and so on. But the iteration has to stop somewhere – in the end, with the ultimate authority that can decide…

...or performance-dependent rules

Another interesting aspect of business and rule management interaction is the capability to let rules depend on specific information from business workflow monitoring. BPM usually offers such information for auditing or business workflow improvements. As an example, a pricing rule may depend on process information about consumer reactions and be adapted accordingly. Now we need a Web service call in the opposite direction – from rule management to the business workflow. This, of course, requires a Web service interface in the latter.

![Modification of Rule Management process using a metarule to get the required role](image)

Figure 3 Rule Management with Metarule

Rules In Natural English

Today one would expect a general acceptance of the fact that machines are not speaking or understanding natural English, but some in the religious BR camp seem to ignore this. While it may be necessary for the business audience to have some additional explanations in English, that does not change the fact that, computer systems, in the end, understand only the formal, mathematically sound, rule formulation. The “Business Rules Manifesto” clearly states:

“5.3. Formal logics, such as predicate logic, are fundamental to well-formed expressions of rules in business terms, as well as to the technologies that implement business rules.”

Actually, it may be counter-productive to use some pseudo-English, because humans and machines are likely to understand different things. What can and is being done successfully is the rule formulation support by templates; i.e., one may use well-defined natural-language terms that are synthesized into viable expressions. Since BPM tools usually offer quite powerful form design capabilities, such a rule support might easily and efficiently be implemented using BPM.

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{http://www.businessrulesgroup.org/brmanifesto.htm}
Just to give a flavor of the possibilities, Figure 4 (left side) shows a little process to build up Boolean expressions with the help of a template (right side), which is nothing, but a browser-based workflow form. By clicking on Exit in the form, the Boolean rule is stored into the rule catalog.

![Figure 4](image)

**Figure 4**

**Build Boolean Expressions with Template**

### Rule Inference

Up to now we have shown how to use explicit rules to arrive at decisions within the BPM environment. But sometimes we want answers that need inference from a whole rule base, i.e., from given facts and a number of rules to infer new facts. In logic programming, this is done via the so-called resolution algorithm\(^8\) (e.g., implemented in Prolog). Such an algorithm can easily be embedded in the rule management workflow.

Figure 5 gives an example of using resolution in the BPM context. On the right side, the relevant rule base is shown to answer questions about the authorization of people to carry out specific tasks or actions, which cannot always be decided upon by a single rule.

Also in this case the rule base is created and modified by a process.

A concrete example would be the question, “Does Dave have the authorization to sign contracts?” (formally: permission(dave, SignContract)). The answer will be yes, since he is one of Bob’s substitutes and Bob has the explicit permission to sign contracts.

**What Are The Benefits of a Common Approach?**

There is no way around BPM – Why not fully use what modern BPM has to offer? As has been shown before, the marriage of workflow and Web services brings decisive advantages (see, e.g., Ref.1): These services become easy to set up and to coordinate (or orchestrate) without the need for additional tools.

What we propose is a *ménage à trois*, i.e., a further marriage with business rule management – also done with BPM.

This way we have:

- business processes and business rule management system that become transparent, and their interaction easier to understand
- a common approach using a single tool: same look and feel, similar functionality
- straight-forward data exchange between the business process and the business rule world
- metarules in the context of the rule management process as a natural addition
- rules that can be adapted automatically as a consequence of the monitored business process data
- very high flexibility for processes and rules
- rule inference that is embedded within the common approach.

Practical experience with Business Rule Management within BPM will have a beneficial influence on the further development of BPM technology. What is already possible to do now will become very easy to do in the future, e.g., totally integrated calls to rule management from process elements (like “event starts,” “process triggers,” “decisions (gateways in BPMN),” etc). As well, rule inference may become a natural part of these systems.
Starting from graphical models has proven very attractive for all parties involved—a picture is worth a thousand words…

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Heinz Lienhard is the founder of ivyTeam, which merged with SORECO in 2004. Urs-Martin Kunzi is a member of the ivyTeam-SORECO R&D staff.

This article originally appeared as a paper in *The Workflow Handbook 2005*, edited by Layna Fisher and published in association with the Workflow Management Coalition (WfMC). For more information on the *Handbook*, please visit: [www.wfmc.org/information/handbook05.htm](http://www.wfmc.org/information/handbook05.htm)