Enterprise Architecture as a Meta-Process

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It's the processes: the effective implementation of processes makes all the difference to the success of an Enterprise Architecture project. Business processes should be designed not only for optimal business support but also for easy process management in a dynamic business world.

Introduction

With *Enterprise Architecture (EA)* one tries to address the fundamental base of an enterprise's organization, but should it be called this way?

The architecture of a house, e.g., usually means something solid and durable – you do not keep on changing it all the time. But experiences in recent years (some very bitter ones) have shown clearly that change may be one decisive constant concerning business and enterprises: "keep re-inventing your business", as the saying goes. Hence it seems that what is fundamental about successful enterprises of the future will be their dynamism and not so much their structure or architecture. As will be shown, this can be done applying appropriate BPM technology. Through business rules accessed by the processes many changes are possible without redesign of the process model. Meta rules allow reconfiguring a process in a dynamic, automatic way. The main components of an EA process are identified in the meta-process, through which all other processes are managed. They are modified, often automatically, either to improve their performance or to accommodate new strategic inputs. This, of course, requires monitoring the performance of the various processes – which is part of modern BPM systems. In short: a coherent powerful approach to Enterprise Architecture viewed as a process is presented.

In management literature the increasing relevance of a process oriented view of a firm is widely acknowledged. Citing Gartner Research (2005): "we believe that successful enterprise architecture programs are process-focused…"

The benefits are significant:

EA as a process treats an enterprise for what it really is: a dynamic system. And the most mileage is gotten out of a technology that is required anyway: BPM. No plethora of methods and tools is required, keeping things simple - which is unusual in the IT area…

> *BY PROPER INITIAL DESIGN OF PROCESSES THEY ALL BECOME MANAGEABLE IN A TRANSPARENT AND EFFICIENT WAY. A LOT CAN BE DONE WITHOUT CHANGING THE TOPOLOGY OF THE PROCESS MODELS – AND EVEN THIS CAN BE ACHIEVED QUITE EFFICIENTLY THANKS TO MODERN BPM. HENCE, BASICALLY A SINGLE TOOL IS REQUIRED TO IMPLEMENT ENTERPRISE ARCHITECTURE AS A META-PROCESS.*

Practical examples from business and eGovernment illustrate the value of the proposed approach.

Therefore – to use current terminology – BPM is needed (Business Process Management), albeit with some reinterpretation: its not only the business processes that have to be managed, its all of them (see above).

Enterprise Architecture should first of all mean the setting up of meta-processes allowing the enterprise to be efficiently adapted to a changing world. But nice pictures of these processes won't do: they have to be implemented, i.e. supported by powerful technologies. This has also been proven crucial to business processes. In the days of Business Process Re-engineering (the hype then was BPR) a lot of beautiful graphics with explaining text has been produced – just to be lost and forgotten on some shelf. Processes only gained center stage when modern BPM/workflow technologies allowed going from graphical process model directly to the real-time application.

Why focus on Processes?

Well, everybody is now talking about processes. Maliciously one might say: if there is no solution, there must at least be a process – like with all those peace processes going on in the world. No, there are good reasons for focusing on processes.

It has been shown before[1] that processes are at the heart of IT applications – or almost any application for that matter. Usual standard applications never provide all functionality necessary to run a business, despite their growing complexity. This will of course be accentuated by the growing need to constantly adapt one's business. Even traditional business software – whether one realizes it or not – uses implicit processes, usually hard coded ones. There is a lot to be gained by making these processes explicit: Applications are obtained that are flexible, easier to understand, better documented and amenable for customization by the end user. Now even the world's second largest software company explicitly addresses processes…

In management literature the increasing relevance of a process oriented view of a firm is acknowledged[2]. Is not management a process too? Maybe the future will bring management processes into the limelight instead of the CEO with a hilarious salary? Probably not. But daily work of management will be supported more and more by IT-implemented processes allowing the CEO to become a proper entrepreneur again, taking full responsibility for the enterprise and its people.

And what about enterprise architecture? It should first of all provide meta-processes to manage all relevant processes in the enterprise, such as:

- Core Business Processes
- Management Processes
- Business Rule Processes[3])
- Support Processes
- Content/Knowledge Processes
- BPM Methodology Processes
- etc.

Hopefully, it will become evident in the following.

Technologies for Enterprise Architecture

What is hardly desirable are more new tools and frameworks to distract people from their essential tasks, namely doing business and caring for customers. However, there is no way around mastering the business processes, hence no way around BPM. Why not fully use what modern BPM has to offer? Put it to work for mastering the meta-process to manage the Enterprise Architecture. This brings significant advantages:

- No need to train people to master yet another set of tools
- Look and feel remain the same
- The meta-process and the related ones (e.g. management processes) can be monitored and audited the same way business processes are
- By starting from graphical models flexible and transparent solutions are obtained.

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[1] Lienhard, H. (2002) Workflow as a Web Application – the Grand Unification. In L. Fischer (Ed.), *Workflow Handbook 2002* (pp. 65-80). Future Strategy Inc., Florida USA.
[2] Spickers, J. (2004). *The St.Gallen Management Model*. University of St.Gallen, CH.
[3] Lienhard, H., Künzi, U.M. (2003) Workflow and Business Rules – a Common Approach. In L. Fischer (Ed.), *Workflow Handbook 2005*(pp. 129-139). Future Strategy Inc., Florida USA.

The chosen BPM approach should be founded on well-established Internet standards like XML/XPDL for process export and import and WSDL for Web Services, which are instrumental for tying together existing business applications within overall processes (EAI) and to link customer's and business partner's processes. Therefore it is important to seamlessly integrate Web services into the processes to orchestrate them[4]. This allows to obtain (in a straight forward way) solutions based on a *Service Oriented Architecture* - another current hype. Tight integration of process modeling and workflow definition is a must to be able to go straight from graphical model to executable solution. And BPMN, see BPMI.org, provides a common language for graphical process modeling.

These are the technological choices to be made for insuring rapid and low cost adaptations of the IT infrastructure, an important part of a viable *Enterprise Architecture.*

It has already been shown elsewhere (ref.1) how the same technological choices also allow an efficient management of business rules and policies and make them directly accessible for processes and meta-processes. In addition, we show here how all processes can be managed by making judicious use of BPM.

Business Processes and Business Rules

As pointed out before (ref. 1) both the BPM and the BR (business rule) gurus are making similar claims. The Business Rule Approach promises[5]: "Increased speed of implementation" and the BPM people tell us: "BPM provides enhanced business agility…". There is only one serious answer: *you need both of them together.* This becomes evident in the context of enterprise architecture.

Clearly a business process has to do one thing: optimally support the business. To be sure that it does so the process has to be monitored – and adapted where necessary. But even in the case processes run well there will be changes required due to an increasingly dynamic business environment. Hence, process designers are confronted with a double challenge: to design them to suit business needs *and* to anticipate changes as far as feasible. With modern BPM approaches (as described in ref.1) processes can readily be built and adapted via graphical models that are automatically translated into real-time applications. But this requires some familiarity with the design tool and should hardly be done on an hourly or daily basis. Yet such rapid modifications may be needed, without influencing the basic underlying workflow. The following example of a simple order process (Fig. 1) is a case in point. An executable process design is shown allowing for changes in business policy without actually modifying the process, i.e. its implementation as workflow:

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[4]*: Lienhard, H. (2003) Web Services and Workflow – A Unified Approach. In L. Fischer (Ed.), *Workflow Handbook 2003*(pp. 49-60). Future Strategy Inc., Florida USA.

[5] Chisholm, M. (2004) *How to Build a Business Rule Engine*. Boston: Elsevier.
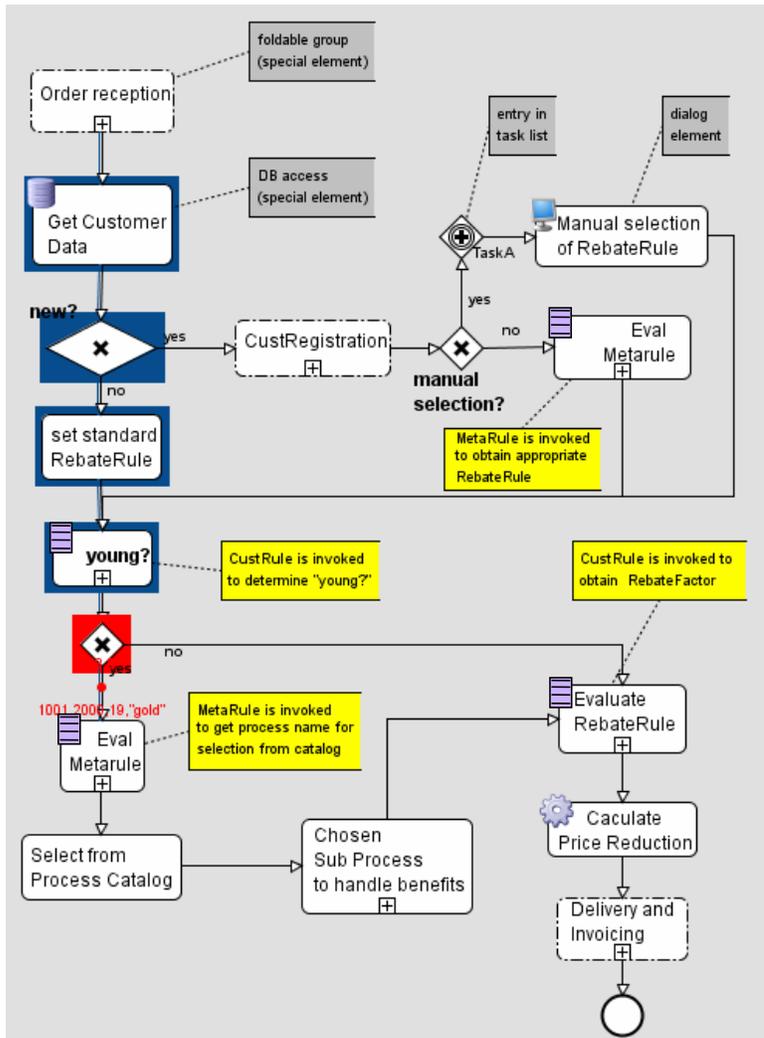
Fig. 1: Part of Order Process Model

The process model (Fig. 1) shows a simulation snapshot:

A customer (number 1001) is ordering some items for a total price of $2000. Database information about the specific customer is accessed, like "Age," "CustStatus" (gold in this case) etc. After deciding that the customer is not new, meaning a standard rebate rule may apply, a BR (business rule) is invoked by the process and evaluated to find out whether a "young customer" (in the meaning of the rule) has placed the order. Since the answer "yes" is returned, the process proceeds to the step below. The red dot representing the dataobject flowing through the process is just about to enter a meta-rule call that will yield the current policy on how to treat such customers. Depending on the current policy an appropriate sub-process from a process catalog will be selected: maybe one for shipping flowers in case the young customer happens to be a female – or a football ticket in the other case. After execution of the chosen sub-process another business rule will give the current rebate rate for the specific customer (e.g. depending on status and order price).

An example for BR to determine the rebate rate:

```
CustRule1:   IF((TL(0)="gold" and TL(1)> 1000), 0.75, 1.0)

TermList TL = [in.CustStatus,in.PriceOrder] ;
```

i.e. a customer with status „gold" placing an order for over $1000 will currently benefit from a 25% rebate.

In case the customer is new he/she will be registered, then either a meta-rule will be evaluated to determine which rebate rule has to apply, or a manual selection of the rule is necessary because of certain customer information. If this is true a task is assigned to an employee with the appropriate role to perform this selection. A special dialog element presents the authorized person with the possible rules within a standard browser (Fig. 2).

Fig. 2 : Dialog Page

The process model has been designed and implemented as workflow with the help of Xpert.ivy in BPMN (Business Process Modeling Notation)[6]. A number of special elements, e.g. to access a database or generate a dialog form, have been used, fully compatible with the standard. The rule evaluation symbol has been specially marked, although it represents the usual sub- process call (independent sub-process, to be precise).

By using business rules and meta-rules accessible by the process there is a lot of flexibility built in, without having to change the model. This brings about another advantage: separation of concerns and responsibilities. Thus, the rules can be set up and managed by people other than the ones concerned with the process implementation. These rules may reside in a rule catalog (DB) on a totally different system from the one running the workflow – and may be managed by a special process. All that is needed are appropriate Web Service interfaces between the systems (see ref. 4 above).
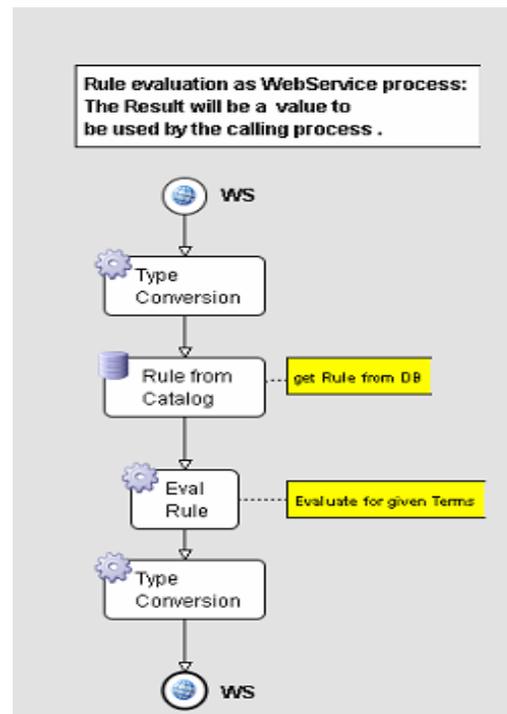

Fig. 3: The Web service process for rule evaluation (uses special start and end elements).

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[6] Lienhard, H., Bütler, B. (2006) From BPMN Directly To Implementation - The Graphical Way. L. Fischer (Ed.), to appear in *Workflow Handbook 2006*. Future Strategy Inc., Florida USA.

Fig. 3 shows a process-based Web Service that evaluates the value of a rule. It is called from the process with the rule name (or other identification of the rule) and the appropriate terms as parameters. The Web Service process accesses the corresponding rule expression from a database and forwards it to the evaluation step; the result (true, false or any other values) is returned to the calling business process.

The term meta-rule is used in two different ways: for logical rules that are rules about business rules (to be chosen from a rule catalog), and to select sub-processes from a process catalog, actually a meta-rule about configuration of the business process. The simple example (Fig. 1) already exhibits a lot of flexibility without touching the process design itself. Rapid modifications are simply obtained by adapting

- business rules
- assigning rules to process nodes
- meta-rules selecting business rules
- meta-rules selecting sub-processes.

All rules are naturally managed by another process (see ref.1), i.e. by a corresponding management workflow that may constitute a sub-process of an overall *EA-Process* (see below). In some cases it may even be possible to fully automate needed modifications depending on business results. But all this requires that business (and support) processes be designed not only for optimal support of the business, *but also for ready manageability by an EA meta-process.*

META-PROCESSES

Those processes that support the management of other processes, e.g. business processes, are called meta-processes. Obviously, meta-processes can be designed just as flexibly as was exemplified by the business process shown above (Fig. 1) – and these in turn may be managed by meta-processes invoking meta meta rules…Well, it has to stop somewhere, but as in mathematics truly powerful concepts can be iterated or even used recursively.

It is important that business process models be designed to allow for efficient process management, providing as much process flexibility as possible to allow for adaptations without changing the graphical model. Thus, important gains in transparency and flexibility are achieved via properly managed rule and process catalogs. In addition, it is a major step towards "separation of concerns" among process – and meta-process – participants. The least desirable solution to adapt the behavior of a process is redesigning the graphical model, which requires a manual meta-process. Thanks to modern BPM tools this task can also be carried out efficiently.

EA Meta-Process

This is of course the top meta-process which supports the management of all the important processes. Two main sub-processes, *Rule Management* and *Process Management* (see Fig. 4), are part of the EA process. The first is concerned with defining and modifying business rules and meta rules, the second with adapting the processes. The *Process Management* sub-process may also call upon the rule management process, e.g. to modify some meta rule that influences the behavior (see above) of a business process being managed. The *EA Process* and its main sub-processes as depicted in Fig. 4 are shown only on the top hierarchical level. The *EA Process* will be enacted when

1. performance of some business processes is not satisfactory
2. business changes require adaptations
3. business strategy is revised.

Most modern BPM systems (like Xpert.ivy) monitor what is happening in the workflow and provide information about the cases having been run, like:

- Start and end times

- Started by which process
- Creator of case
- Start and end times of all tasks
- Roles and users involved in tasks
- Merging times of tasks
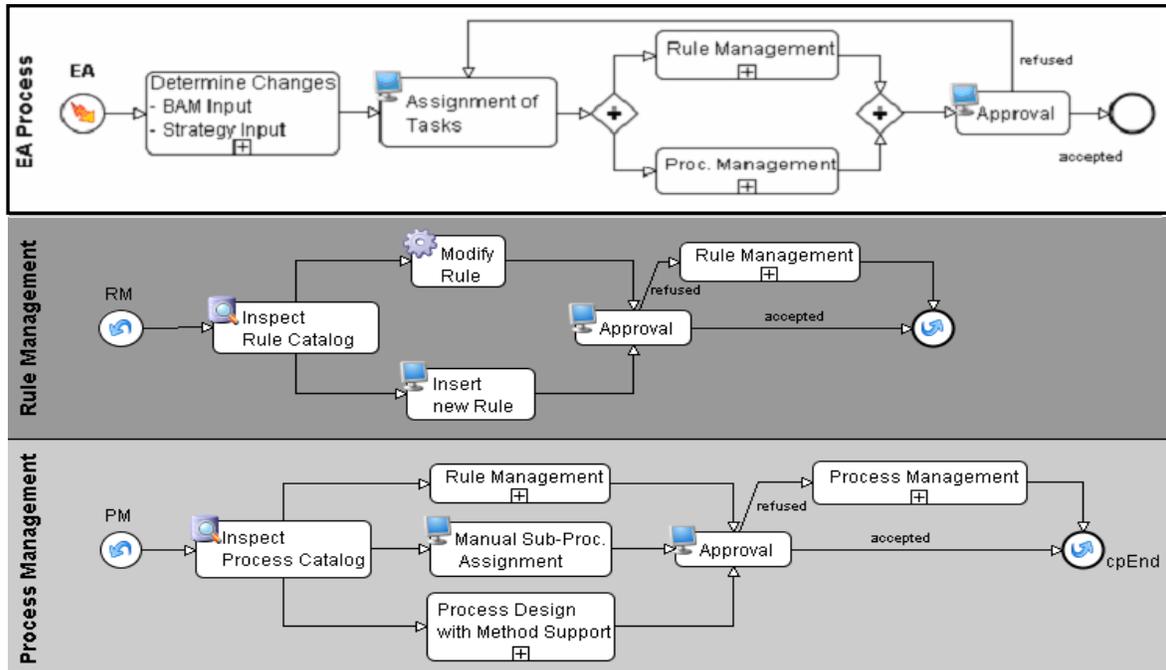- What data has been entered into forms
- etc.

Fig. 4: EA Meta-Process and main Sub-processes

A performance overview is usually obtained through a *BAM (Business Activity Monitoring)* process. Based on this information necessary modifications of the business processes (1. above) can be determined. As well, in the first task of the main EA process (Fig. 4), changes may be decided on because of new business requirements or new strategy input (2. or 3. above). In a next step tasks are assigned to implement the changes, where possible automatically, otherwise by assigning specific tasks to corresponding roles. Then one or both of the sub-processes may be invoked, depending on the nature of the changes. Before ending the *EA Process* all modifications have to be approved. If refused, the whole process starts again with the task assignments.

The *Rule Management* sub-process guarantees the editing of the rule catalog(s) in a controlled manner. On the lower, more detailed level, the process may cross several organizational boundaries involving different persons with different roles, to accomplish the task. Certain adaptations may be fully automated; e.g. the rule defining a customer rebate (example of Fig.1) might be modified if some performance figures drop below a given threshold without any manual intervention.

The *Process Management* sub-process will be started whenever the process itself has to be altered. In the simplest case modifying a meta rule may suffice, as has been discussed in the order process example above, and therefore the changes will essentially be handled again by *Rule Management*. But the situation may have escalated to where it becomes necessary to select other sub-processes from a process catalog to be assigned, i.e. called, at specific places in the

main process. As an example the sub-process that defines the steps for rewarding a particular customer status has to be replaced by another one because of loosing more and more customers to the competition. As a last resort a person has to be involved having a role as "model designer", i.e. somebody authorized to modify the process model with the help of a design tool. When approved, the new version of the process will be uploaded on the workflow server and will take over all new cases. Before general approval of all work done in this management sub-process, the assignment of rules to specific nodes in a process are checked and possibly changed. This step can again be done without redesigning the model. If all adaptations have been approved, the sub-process terminates, i.e. control is returned to the *EA process* - otherwise the *Process Management* sub-process will be started again.

To summarize: the management of business processes contains several main steps (in order of increasing sophistication)

- assignment of Rules to Process Nodes
- modifications in the Rule Catalog
- adaptation of Meta-Rule Catalog
- selection of Sub-processes (from Process Catalog)
- (re-) design of Processes

A clear distinction of the various steps allows for a clear separation of concerns, i.e. assignment of different tasks to appropriate roles, resulting in a dramatic reduction in complexity. But EA is more than this: all activities mentioned above become integrated into an overall control process (see Fig. 5).
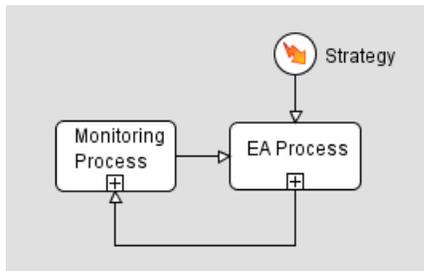

Fig. 5 EA: Overall Control Process

Process Analysis: Why not Test the Real Thing?

Analysis of processes has, so far, not been addressed. Well, before embarking on a BPM tool to obtain executable models, ivyTeam first developed and promoted tools for analytical modeling. Years of experience have shown that processes can be simulated and analyzed to the end of the world and back – to find out that reality is something else again. Often, this endeavor is not much more than a waste of time. In his excellent report[7] on BPMS, Bruce Silver eloquently argues that *executable* models are central to BPMS; if analytical modeling is required, "the trend is to bring it inside the BPM suite". And that is the solution. After all, as was argued above, modern BPM systems do provide monitoring of process, i.e. workflow, performance (BAM). Why not use this same feature for analyzing the behavior of the executable solution albeit in a "time lapse" mode? All what is needed are some additional parameters in the executable model (to be turned into a workflow, as demonstrated before) and a small robot process to start processes according to some desired statistics. In this way the real thing is tested and not some abstract analytical

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[7] Silver, B. (2006) *Understanding and Evaluating BPM Suites*.BPMInstitute.org

model. Process (or workflow) monitoring is used twice: to analyze the process behavior under some given statistics and later to continuously improve the operational workflow.

Practical Examples

An interesting eGovernment application nicely underlines some of the points made above. A couple of years ago, the interior department of the **State (Canton) of Zug, Switzerland**, decided to support, and where possible automate, the Citizeship Administration Process. Because it combines modern BPM with extensive EAI (Enterprise Application Integration) functionality the BPM tool Xpert.ivy was selected to implement the solution. The whole project was realized in 2.5 months. The participants in the process were involved in the process modeling right from the start, leading to exceptionally high user acceptance of the final system. Large savings were immediately obtained, despite ever increasing numbers of applications for citizenship. Especially important, the very consuming periodic statistical reports to the state government were now automatically generated by a click of a button.

About half a dozen minor adaptations were necessary because of new requirements introduced since the beginning of the project. Specifically, in the past year new legislation has been introduced requiring special treatment of certain cases, thus making changes in parts of the process necessary. As an example, we show the sub-process "generation of documents" (Fig. 6, left) which generates different responses when different rules (paragraphs) apply, e.g.

- Paragraph 28: applicant is spouse of an expatriate Swiss;

- Paragraph 58: re-naturalization of a Swiss etc.

Such additions or changes to the law are expected to proliferate in the future. Hence, a new version of the sub-process (Fig. 6, right) will be the best alternative. In this version the evaluation of a meta rule will provide the ID of a process to be chosen from a process catalog (DB) according to the paragraph that applies in the particular case, and a generic sub-process call will execute it. Hence, changes in the law can now be managed without touching the actual process.
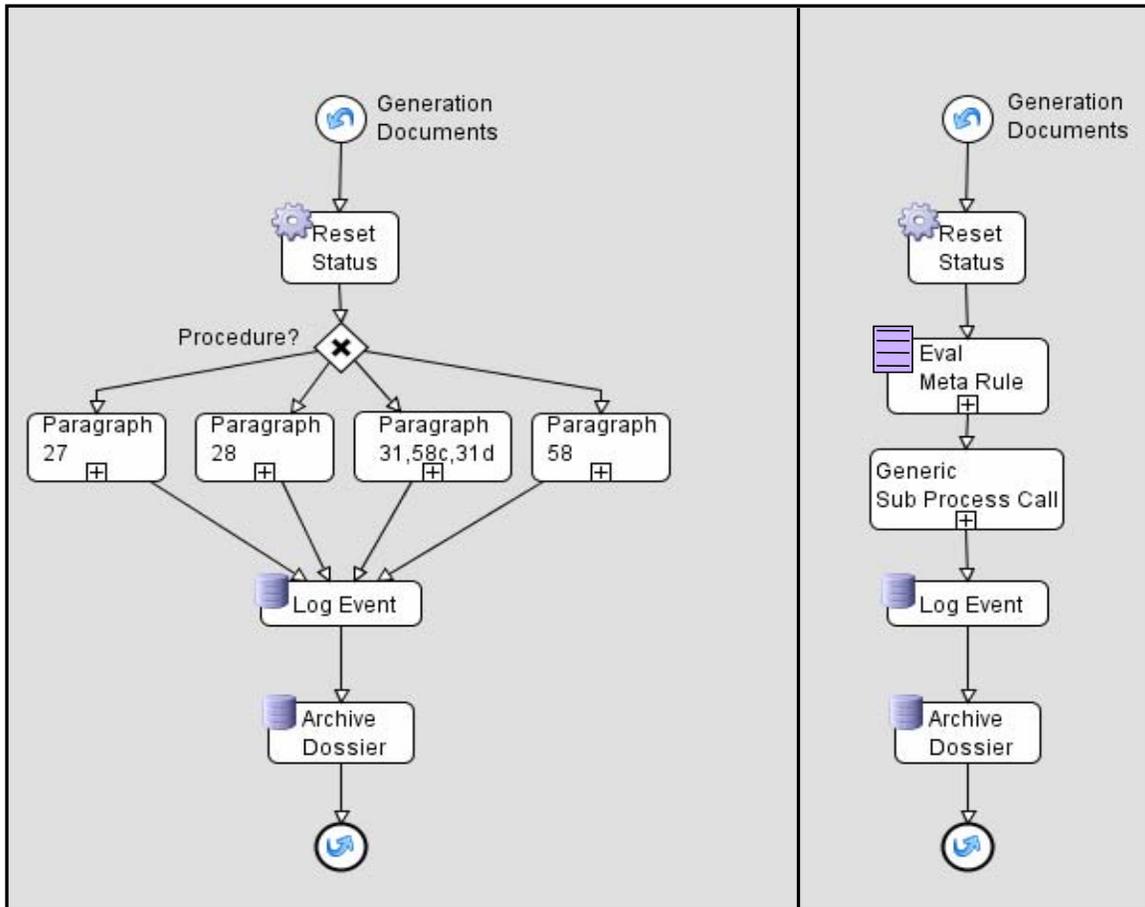
Fig. 6: Two versions of sub-process from Citizenship Administration;

left: fixed topology; right: dynamic configuration with meta rule.

An example where extensive process monitoring has been implemented is the call center of the **Town Utilities of Munich,** which has over 1 million customers and is the biggest independent utility in Germany. Here the automated processes guide the service employees at the center through all required support activities. Since the introduction of the solution, the call center staff does not have to operate and serve a number of different systems and applications any more, but are being automatically served via the process with information, documents etc., for providing an efficient and high level of quality service to the customer. A number of real-time process data are made available to different organizational levels to manage the call center's operations.

Another significant Utility Enterprise Germany operates a similar call center supported by BPM. It features a very powerful solution for monitoring the performance of individual staff members as well as entire teams. Quotas for successful contract completion in a first customer contact case (i.e. without intervention of the back office), is an important key statistic alongside duration times for handling the various activities. Notoriously long service times by all call center employees usually indicate a weakness in the process design, making modifications necessary, i.e. the EA process loop has to be started.

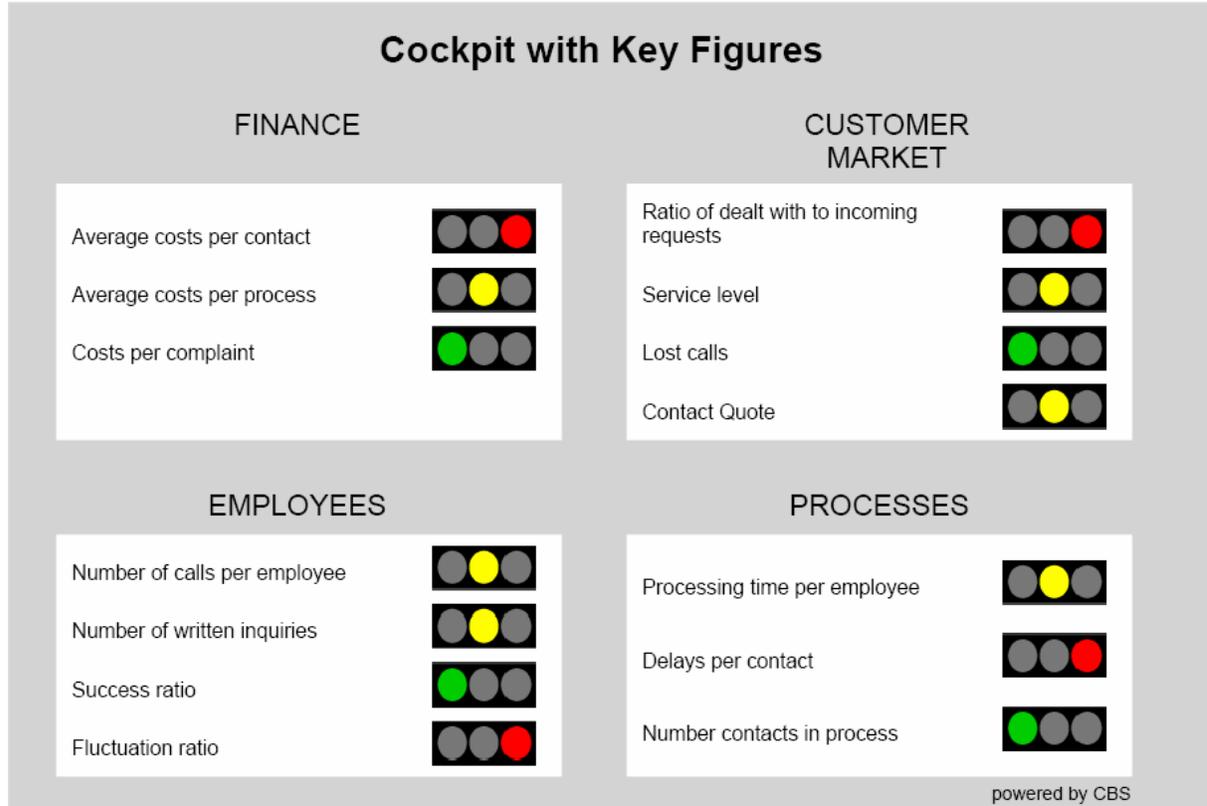Fig. 7 shows an example of top-level cockpit information automatically assembled from process monitoring (via Xpert.ivy)[8].

Fig. 7:　Real life cockpit information of the call center.

Average costs per completed customer contact in relation to given objectives is another example of readily obtained performance information for management (see Fig. 8).

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[8] Figures 7 & 8 have been kindly provided by Customer Business Solutions GmbH, München, the company that implemented the mentioned project.
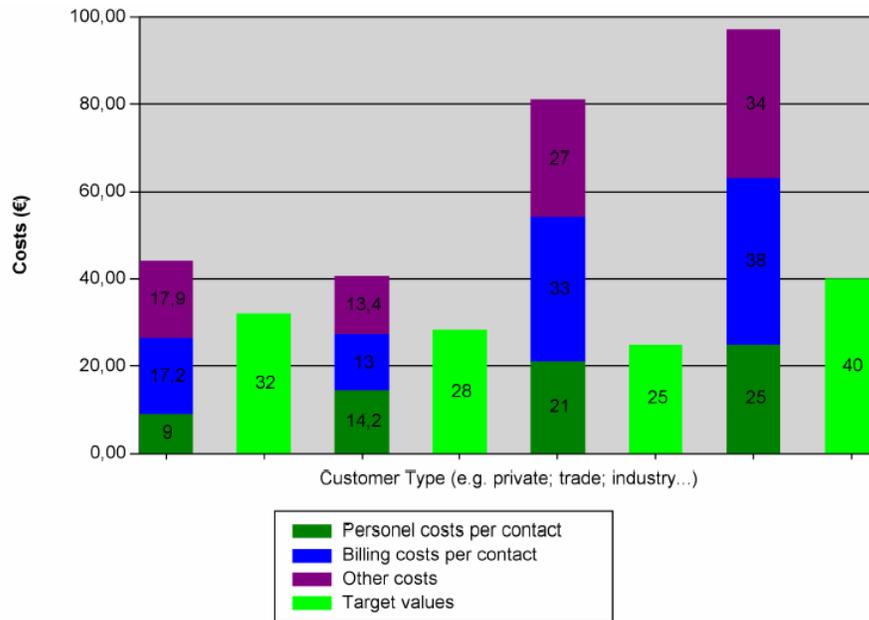
Fig. 8: Average costs of completed customer contacts in relation to target.

What are the Benefits

EA as a process treats an enterprise for what it really is: a dynamic system. And the most mileage is gotten out of a technology that is required anyway: BPM. No plethora of methods and tools is required, keeping things simple - which is unusual in the IT area…

BY PROPER INITIAL DESIGN OF PROCESSES THEY ALL BECOME MANAGEABLE IN A TRANSPARENT AND EFFICIENT WAY. A LOT CAN BE DONE WITHOUT CHANGING THE TOPOLOGY OF THE PROCESS MODELS – AND EVEN THIS CAN BE DONE QUITE EFFICIENTLY THANKS TO MODERN BPM.

To summarize the value of the process approach to EA, the following benefits can be achieved:

- Use of a single tool: same look and feel, similar functionality, lower cost
- Flexible and transparent solutions
- Straight-forward data exchange between the business process, the supporting processes, and management processes
- Monitoring of all relevant processes and obtaining feedback information for adaptation via the EA meta-process
- Monitoring of the EA meta-process itself allows for transparency at that level
- Synergies from bringing together rule and process approach
- A natural fit into modern IT architecture (like SOA), in fact, enabling it

- it's the processes, isn't it.

Upcoming Trends

BPM is key to automate and manage processes – and not just Business Processes. The B in BPM should not be taken too religiously. An enterprise is a highly dynamical system best described by processes, i.e. by executable models. Hence, Enterprise Architecture will be recognized as a meta-process through which all the other relevant processes are managed. And it has been shown that this can be done in a coherent uniform approach combining BPM with

business rules (BR) and meta-rules. Even process analysis can be carried out using executable models.

Future BPM systems will allow rich Web interfaces besides the classical HTML forms[9]. This way they become a very powerful tool to set up *Rich Internet Applications[10] ,* or to use a trendy term, *Web 2.0 Applications.*

Eventually BPM will become fully user-centered and the notorious business-IT divide does not even have to be bridged anymore: the IT-department as known today may simply disappear…

Enterprise Architecture as a meta-process will be for business people implemented by business people, supported by a professional *Process Group.*

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[9] E.g. Version 4.0 of Xpert.ivy.

[10] von Gunten, K. „Process-based Application Development: A flexible and End-user centered Way of creating Software" to be presented at the Jazoon Conference 2007