An Evaluation Framework for Business Process Management Products

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Abstract. The number of BPM products available has increased substantially in the last years, so that choosing among these products became a difficult task for potential BPM users. This paper defines a framework for evaluating BPM products, and discusses how this framework has been applied in the development of an open and objective evaluation method for these products. Our framework has been developed based on the BPM lifecycle we developed as a result of a thorough literature survey. Our method consists of a set of criteria, a test case and a rating schema. The paper also discusses how we evaluated our method (and indirectly our framework) by applying it to three BPM tool suites. We show that our method allows the rigorous comparison of these products according to different criteria, so that the choice of BPM product can be tuned to the specific goals of the users of these products.

Keywords: Business Process Management, BPM evaluation framework, BPM lifecycle, KPI, business process monitoring.

1 Introduction

Many different vendors have recently released products that support Business Process Management (BPM). Some vendors of BPM products, like Cordys, Pegasystems and Savvion, have always targeted BPM as their main activity area, while others, like IBM, Oracle and TIBCO Software, are in the BPM market for some time but started their businesses in other areas. The number of BPM products available in the market has increased substantially, so that choosing between these products became a difficult task for potential BPM users. Some advice can be gathered from companies like Gartner and Forrester, but their research methods are not open and their results are difficult to verify. This has motivated us to develop an open and objective evaluation method for BPM products grounded on scientific principles. To the best of our knowledge such a method is still not available nowadays.

This paper defines a framework for evaluating BPM products, and discusses how this framework has been applied in the development of an open and objective evaluation method. The foundation for our framework is the BPM lifecycle that we developed as a result of a thorough literature survey. Our method consists of a set of criteria, a test case and a rating schema. The paper also discusses the evaluation of our

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method (and indirectly our framework). Our method was evaluated by applying it to three available BPM tools, namely Cordys BPMS, Oracle BPM Suite and IBM WebSphere BPM. We show that our method allows a rigorous comparison of these products according to different criteria, so that for a potential user of a BPM product (or some consultant on behalf of this user) the choice of product can be tuned to the specific goals of this user, by focusing on the criteria related to these goals.

This paper is organised as follows: Section 2 presents our research approach, Section 3 concentrates on one criterion of our evaluation method and discusses the application of our evaluation method to three BPM suites with respect to this criterion, Section 4 discusses the results of the evaluation of the three BPM suites with respect to all the criteria considered in our method, Section 5 discusses the suitability of our evaluation method, gives our conclusions and identifies topics for future work.

2 Research Approach

In order to define our evaluation method, we have first developed a framework based on the BPM lifecycle. This framework identifies tasks, their relationships and responsible actors, which have formed the basis for the criteria and the steps that should be considered when defining an evaluation method. In the method we defined, we still selected a couple of steps based on their relevance and taking into consideration our practical limitations. Our method was finally tested by applying it to three popular BPM products.

2.1 Evaluation Framework

We defined our framework in terms of the phases of the BPM lifecycle. We performed a thorough survey to identify relevant literature related to these phases [1-21]. By studying this literature, we identified tasks that have to be performed in each phase.

Fig. 1 depicts schematically the BPM lifecycle considered in our framework. In our BPM lifecycle, we start with the assumption that implicit business processes in an organisation have to be made explicit, i.e., the business processes have to be discovered. Implicit business processes are normally embedded in the working patterns of employees and in the application logic of software applications. An implicit *business process* is represented schematically in Fig. 1. Once a business process is made explicit, a model of this process can be produced, making the business process more precise. Alternatively an inexistent business process can be devised to support some business objectives, in which case it has to be defined and properly modelled.

The business process model should be analysed and improved if found necessary. This business process can be then implemented with or without IT support, or it can be even outsourced. When implementing a business process without IT support, new policies and work patterns may be created with which the employees have to comply. In case IT support is available, the business process model is made executable and a business process execution environment is normally designed to support this process. This business process execution environment consists, among others, of a business process execution engine, which is able to execute the executable business process models, interaction means for the users to interact with the executable business process

models, and some management functionality. An executable business process model can be translated into code and executed by a business process execution engine. Employees can interact with running process instances and managers can monitor and control them. Running and finished process instances can be analysed and improved accordingly.

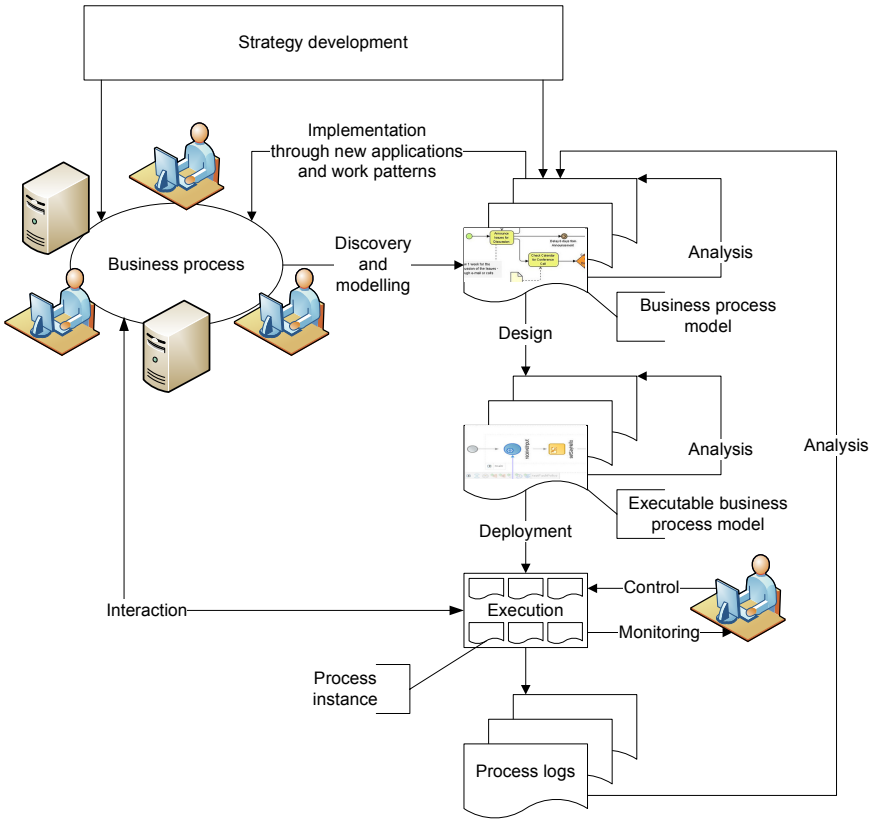

Fig. 1. Simplified representation of the BPM lifecycle assumed in our framework

Strategy development is expected to be performed on top of these activities. This is the process in which the organisation's management defines the strategic objectives of the organisation.

Our initial assumptions on the activities of the BPM lifecycle have been further refined based on a literature survey. For example, according to [1,2], the first phase of the BPM lifecycle (strategy development) contains three steps: (i) capturing the organization's objectives, (ii) creating an overview of the organization's business processes and (iii) linking the objectives to the business processes. Fig. 2 shows an excerpt of our BPM lifecycle, which shows the strategy development, discovery and modelling phases. This complete lifecycle consists of the *strategy development*, *discovery*, *modelling*, *design*, *deployment*, *execution*, *monitoring & control*, *interaction* and

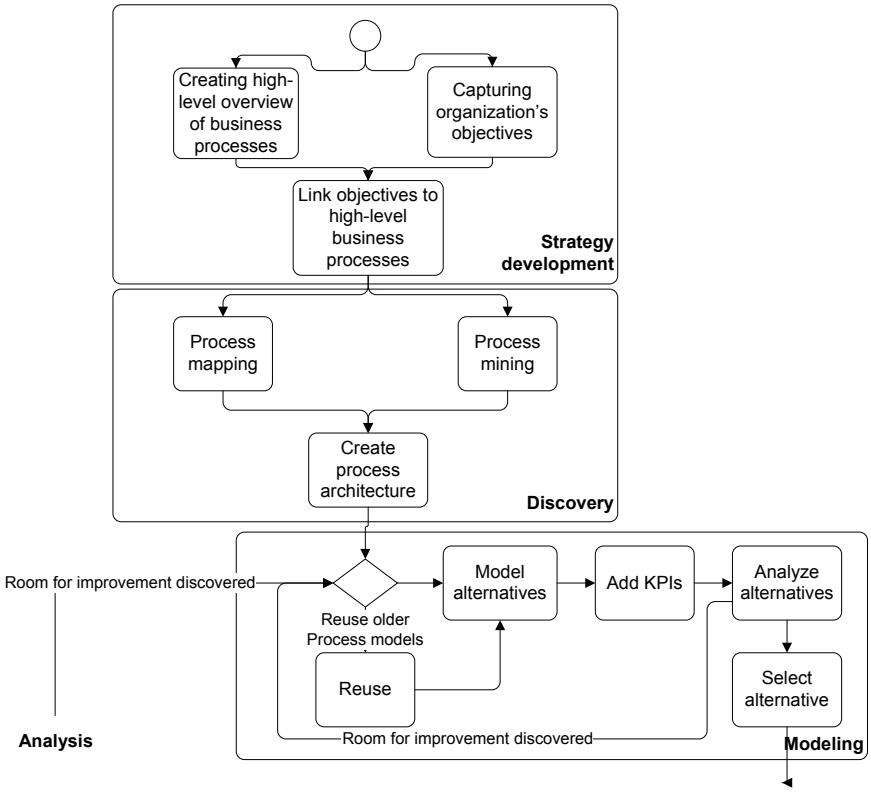

Fig. 2. Excerpt of the complete BPM lifecycle

analysis phases. The complete BPM lifecycle assumed in our framework and its justification can be found in [22].

Based on this lifecycle, we defined the criteria that should be used in our evaluation method concerning each lifecycle phase. For example, Table 1 shows the criteria we defined for the strategy development phase.

Table 1. Strategy development criteria

#	Strategy development criteria
1	Support for capturing the organization's objectives (for example, using a Balanced scorecard).
2	Support for creating a high-level overview of the business processes (for example, using a value-added chain diagram).
3	Support for linking the organization's objectives with the high-level business processes.

Summarising, our BPM framework consists of a detailed description for the BPM lifecycle phases and their corresponding evaluation criteria. These criteria have been the input for the development of our evaluation method.

2.2 Evaluation Method

Our evaluation method consists of set of criteria, a test case and a rating schema. Due to the time constraints imposed by the project (the duration of the Master graduation project reported in [22]), the criteria supported by our method are a subset of the criteria defined in our framework. We have selected only criteria from the modelling, design, interaction and monitoring & control phases and we have ignored criteria from these phases that would be difficult to evaluate in the time-frame of our project. For example, complex criteria that would require extensive training or that required specialised execution environments were ignored. In total we selected ten criteria in our method; some of these criteria are structured in terms of sub-criteria, so that even with the scope limitation our method is far from trivial. Appendix A gives the criteria supported by our method.

In order to make our method operational, we defined a test case based on the selected criteria. Our method prescribes that this test case should be implemented using the BPM product under evaluation. This test case consists of a business process in which a client applies for a mobile phone subscription, and it has been described both informally and an event-driven process chain diagram produced with IDS Scheer's ARIS Business Architect [23] (figure omitted here due to space limitations). This test case has been defined as follow:

A customer applies for a mobile phone subscription through an application form. In this form he enters his name (first and family name), address (street, number, city and postal code), date of birth (day, month and year) and the type of mobile phone subscription he wants (price per month and length of subscription). Based on the information the customer enters in his application form, and the risk is determined automatically by a risk service. This service classifies the application either as low risk or as high risk. If an application is classified as high risk, the customer is checked for any debts, and based on the result of this check, a supervisor decides to approve the application or not. If the application is of low risk it is approved automatically. Approved applications are verified by an employee. If the data in the application form is correct, the application is verified. The customer is informed by e-mail of the acceptance or rejection of his application. The contents of this e-mail message are determined by the acceptance or rejection of his application. When an application is rejected the reason for this rejection is given in an e-mail message (for example, no person with the given name lives at the provided address or he has too much debt).

This test case was chosen because of its average complexity: it is not so complex, so that the evaluator can concentrate on the evaluation task and is not distracted by too many details, but it is not so simple that it can be trivially implemented.

For each of the selected criteria, the method prescribes how to use the criterion in the test case and how to rate the criterion for the BPM product being evaluated. The rating schema applied in our method is meant to quantify the criteria and to allow comparison of evaluation results. Our current rating scheme features a distribution of points based on our own judgment and does not assign weights to different criteria.

2.3 Testing the Method

In order to test the suitability of our evaluation method, we have applied it on three BPM suites. We have selected BPM suites from different quadrants out of the latest

Gartner's Magic Quadrant for BPM suites [3]. We have selected IBM WebSphere BPM from the leaders' quadrant, Cordys BPMS from the visionaries' quadrant and Oracle BPM Suite from the challengers' quadrant. For each of the BPM suites, we have worked through our test case and applied the selected criteria. We have done this after we have made ourselves familiar with each BPM suite by using all the (online) documentation and product expertise that was available at the consultancy company where this project took place. At the end we obtained an evaluation of these three BPM suites. Each evaluation consists of a description of the evaluated suite and a radar chart showing the rating for each criterion.

3 Method Illustration

Since it is not feasible to discuss all the criteria considered in our method in detail here due to space limitations, we only illustrate our method by discussing the 'Support for KPIs' criterion in detail. This criterion was chosen because it is representative for the criteria supported by our method. In the sequel we describe this criterion and the way it has been tested and rated for the three evaluated BPM suites.

3.1 Support for KPIs

In our BPM framework we consider that Key Performance Indicators (KPIs) normally have to be defined in order to monitor the performance of the running business processes. By assessing KPIs while business processes are being executed, business analysts can check whether these processes currently fulfil their objectives or they can estimate whether these objectives will ever be fulfilled.

A BPM product needs to offer support to business analysts for defining KPIs for a business process. We have identified two dimensions of this support that should be evaluated for a certain BPM product [4,5]:

- *Flexibility*. This dimension determines the types of KPIs that can be defined using the KPI model supported by the BPM product.
- *Ease of use*. This dimension determines if the definition of KPIs is facilitated by the BPM product. The definition of KPIs can be facilitated if templates are available, possibly to be applied in combination with (structured) natural language. In contrast, the BPM product may force the user to write implementation code of some sort, with negative consequences for the ease of use.

In order to evaluate the BPM products according to this criterion, we defined the following two KPIs for the test case in our method:

- Number of accepted applications from the total number of applications.
- Number of high risk applications from the total number of applications.

Flexibility has been evaluated by checking whether these KPIs can be completely defined using the BPM product being evaluated. Five points are granted for each of these KPIs in case they can be defined using the product. Ease of use has been evaluated by checking how the definition of KPIs is supported by the product. Natural language support yields seven points, graphical notation five points and code three

points. In case templates for defining KPIs are available, three additional points are assigned to this tool for this dimension. A total of twenty points can be rewarded for the 'Support for KPIs' criterion, equally distributed over the two dimensions. We rated this criterion by dividing the total number of points by two.

3.2 Cordys BPMS

The Cordys Business Process Management Suite C3 version 4.2 [24] was evaluated by the first author of this paper in [22]. This product is developed by Cordys, which is a Dutch vendor specialised in BPM. Cordys BPMS supports the definition of KPIs with the KPIComposer. In order to calculate KPIs, the required information has to be stored in a database and retrieved from this database by using user-defined methods. These methods are called in the KPIComposer and the KPIs are built based on the information that these methods retrieve. The definition of KPIs in Cordys is therefore not really user-friendly, since the user is forced to write these methods.

For our test case, an application information entity had to be stored in the database, and a method had to be written to retrieve this information from the database. We were able to write a method that retrieved all applications from the database, but with KPIComposer it was not possible to define the required KPIs since KPIComposer only allows the user to define KPIs based on some predefined elements (mainly based on arithmetic operations). We concluded that the definition of KPIs in Cordys is inflexible and assigned zero points to this dimension. However, Cordys offers templates to generate code, so that we assigned six points for ease of use. The total of number points for the 'Support for KPIs' criterion is six points for Cordys BPMS, which corresponds to a three on our one to ten scale.

3.3 Oracle BPM Suite

The Oracle BPM Suite version 10gR3 [25] was evaluated by the first author of this paper in [22]. This product is developed by Oracle, which is originally a databases developer. However, Oracle also entered the BPM market after the acquisition of BEA. The Oracle BPM Suite supports the definition of KPIs with the Oracle BPM Studio, which allows the use of widgets to define graphs on activity workload, activity performance and process performance. These widgets can be considered as templates with limited options and underlying code. They can be used on a BAM dashboard that can be shown in the Oracle BPM Workspace.

We have been able to define our KPIs using Oracle BPM Studio, but we had to modify their definitions slightly. We were not able to compare the number of high risk applications with the total number of applications. Instead, we had to define a KPI that compares the number of high risk applications with the number of low risk applications. Similarly, we had to define a KPI that compares the number of accepted applications with the number of applications that were not accepted.

Because we could define KPIs with the supported KPI model, but not exactly the ones we wanted, we awarded six points for this dimension instead of the total ten points. KPIs can be defined using templates with underlying code, so that for the ease of use we awarded six points. The total of number points for the 'Support for KPIs' criterion is twelve points for Oracle BPM Suite, which corresponds to a six on our one to ten scale.

3.4 IBM WebSphere BPM

The IBM WebSphere BPM suite version 6.2 [26] was evaluated by the first author of this paper in [22]. This product is developed by IBM, which is originally a computer manufacturer with a long tradition in the servers market. IBM WebSphere BPM supports the definition of KPIs with the Integration Developer. This tool allows its user to define a monitor model in which a certain event, for example, the start or end of an activity, fires a trigger, which updates some metrics. These metrics are updated at process instance level, so that KPIs can be calculated based on the metrics of multiple process instances.

KPIs can be defined with the Integration Developer by using templates. Information like an aggregation function between two KPIs or a trigger condition can be defined by writing code, but many options are provided, so that KPIs can be defined by selecting the right elements in the right order.

Both our KPIs could be modelled using the KPI model offered by this tool without modification. Therefore, we awarded ten points to the flexibility dimension. Since the KPIs are defined using templates with underlying code, we awarded six points to the ease of use dimension. The total of number points for the 'Support for KPIs' criterion is sixteen points for IBM WebSphere BPM, which corresponds to an eight on our one to ten scale.

4 Global Results

We tested the suitability of our method by comparing the evaluation results of the three BPM suites. These evaluations allowed us to discriminate between the BPM products, indicating that the criteria supported by our method are not too general or too specific, and the method is useful, i.e., it is suitable for our evaluation task.

We have compared the evaluations by comparing the outcome of the ratings for all criteria. In this way we established the suitability of the method, but we also identified the criteria for which all products scored maximum points. These appear to be too general (supported by any BPM product) and could be excluded from the evaluation method. For example, there were two criteria which evaluated the support for business rules: the support for implicit business rules and the support for explicit business rules. All three BPM suites support business rule implicitly in a business process model by allowing a business rule to be modelled as a decision point. Furthermore, all three BPM suites support the business rules explicitly by including a reference to the business rule in the business process model, and by allowing a business rule to be managed by a business rules management application. Support for business rules either implicitly or explicitly appears to be a common feature for BPM suites, and therefore all three evaluated BPM suites scored the maximum points for these features. In our evaluations, these two criteria were found to be too general and not useful for distinguishing between BPM suites. If the evaluation of other products confirms these observations, these criteria can be removed from our method in future.

Fig. 3 shows the combined results of our evaluations plotted on a single radar chart, so that these results can be compared.

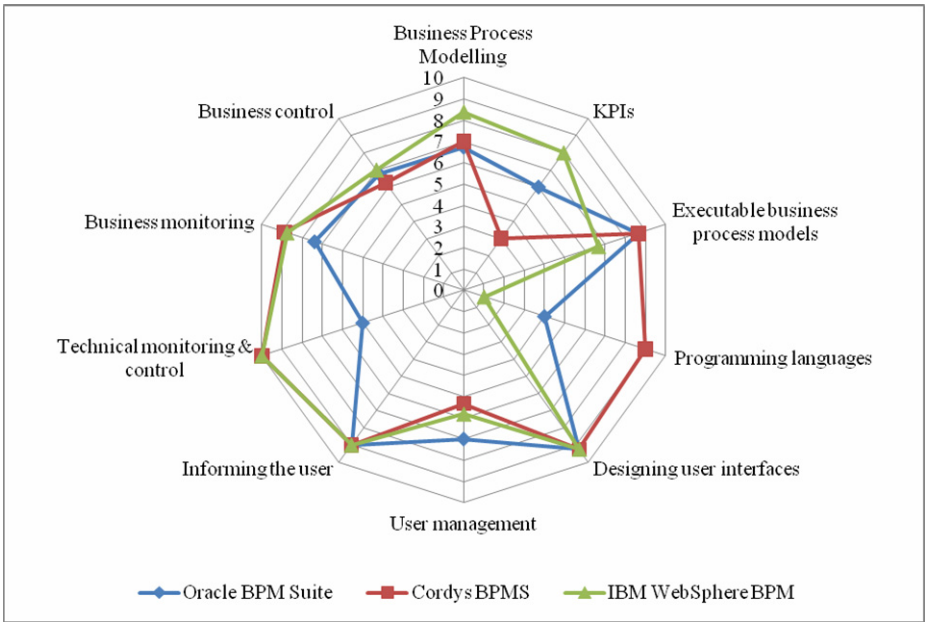

Fig. 3. Combined radar chart with the evaluation results of the three BPM suites

5 Conclusions

Although our method has shown to be suitable for the evaluation task at hand, comparing products using this method may require a lot of time, depending on the evaluator's experience with these products. For example, for each BPM suite, about two to three weeks were needed to master the product and to perform the evaluation, with no prior experience with these products. Therefore, we suggest using our method in a setting where each different vendor is asked to evaluate its own product. A representative of each vendor could then walk through our method, while a neutral observer applies our rating schema to rate the product. This should result in an objective evaluation of all the relevant criteria.

The results of this work have been delivered to a consultancy company. Consultants from this company found these results interesting and useful, but they have been reluctant to apply these results in their advising tasks. This is possibly due to their personal preferences or to the bonds they maintain with certain BPM vendors, which may prevent them from giving a truly objective advice.

We tested the suitability of our evaluation method by applying it to BPM suites, which consist of tools sets. This gives a good impression of these BPM suites' capabilities, but the results from this evaluation become depend of the specific tool packaging chosen by the vendor. Some vendors may keep some relevant functionality in tools that are shipped separately from the BPM suite, so that to get a better evaluation of the BPM capabilities of a vendor we should also include other relevant products of this vendor in the evaluation, in addition to the vendor's BPM suite.

We have also identified some areas in which our method could be improved in future. Due to time constraints we have focused on a few of the phases of the framework and have omitted some criteria from the evaluation method. Our method should be extended so that most of or all criteria from the BPM framework are considered. The test case would probably have to be extended and new information concerning the testing and rating of the additional criteria would have to be given. The BPM area is constantly moving and new topics are bound to be identified. New relevant topics should be considered in the framework and in the evaluation method, so that they should be regularly updated. We defined our rating schema based on our own judgment of the relative importance of the criteria. In future work our rating schema could be validated by BPM experts and could allow different weights to be defined for the different criteria. Finally, it would be interesting to apply our method to other products than the ones used in the validation of the method, so that more feedback can be generated to improve the method.

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Appendix A: Selected Criteria

#	Criteria
1	Business Process Modelling [6-12], includes support for:
	I. Different business process modelling languages.
	II. Interoperability between different business process modelling languages.
	III. Interoperability between simple process modelling methods and business process modelling languages.
	IV. Different views when modelling a business process.
	V. Different perspectives of a business process.
	VI. Modelling with implicit business rules.
	VII. Modelling with explicit business rules.
	VIII. Modelling business processes using explicit business rules.
	IX. Facilitating the definition of explicit business rules.
2	Support for key performance indicators [4,5].
3	Development of executable business process models [7,11,13,14], includes support for:
	I. Business process execution languages.
	II. Manual translation between business process modelling languages and business process execution languages.
	III. Automatic translation between business process modelling languages and business process execution languages.
	IV. Linking the business process execution model the business process model.
4	Supported programming languages for implementing services/applications.
5	Designing input [10,15], includes support for:
	I. Separate applications for data entry.
	II. Portal technology.
	III. Activity list.
6	User management [16], includes support for:
	I. Describing roles (by names/description or by capabilities).
	II. Determining user capabilities based on organizational role.
	III. Importing organizational structure from other systems.
	IV. Determining user capabilities based on tokens (capabilities to execute certain functions, procedures or activities).
	V. Manually assigning a user to a role.
	VI. Automatically assigning a user to a role, based on his capabilities.
	VII. Activity permissions based on roles.
7	User information [16,17], includes support for:
	I. Active information.
	II. Passive information.
8	Support for technical monitoring and control [18].
9	Business-related monitoring [5,18-21], includes support for:
	I. Active monitoring.
	II. Passive monitoring.
	III. Various level of detail.
	IV. Different views of monitoring information.
10	Business-related control [16,18], includes support for:
	I. Process instance evolution.
	II. Changing business rules.
	III. Changing activities.
	IV. Changing the workload balance between users.