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**Comparative analysis of Business Process Management frameworks**

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# Abstract

Growing process maturity of Polish organizations, causes a growing demand for information technology to meet business expectations. The answer to these needs is Business Process Management. This article brings together the functionality of Business Process Management systems and the benefits of their implementation. Tools are compared according to certain criteria developed by the authors. Both open source and commercial tool are concerned.

**Keywords:** Busiess Process Management, tools, frameworks, comparison, open source, commercial

# Introduction

In the era of growing process maturity of Polish organizations, there is also a growing demand for information technology to meet business expectations. IT tools should support business and keep up with its ongoing development as mentioned in Gawin et al (2013), Jasiulewicz-Kaczmarek et al (2016, 2018), Piotrowski (2007), Drejewicz (2012) and Baeyens (2017). Businesses are increasingly empowered to increase employee productivity and improve information management to increase competitiveness, reduce costs and adapt to dynamic market and legal situations.

The answer to these needs are the Business Process Management (BPM) systems. They allow you to map business processes as workflow diagrams, automate tasks and improve their execution parameters. The essence of process automation is the transfer of control from humans to IT systems.

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Progressive globalization and the widespread development of the IT industry are contributing to the increasing availability of process management tools. The business software market is filled with modern and sophisticated solutions, so the choice of the right tool is becoming more and more difficult and raises a lot of questions and doubts among potential customers. Larger companies must organize tenders to collect comparable values for choosing the right system.

This article brings together the functionality of Business Process Management systems and the benefits of their implementation. Tools are compared according to certain criteria developed by the authors.

The BPM market in Poland has been growing at about the same pace as in other countries in Central and Eastern Europe, with initial systems being reminiscent of Document Management Systems (DMS) and projects focused on improving processes from the business logic point of view as described in Object Management Group (2017). Then, with the development of IT technology, the companies’ vision of the BPM benefits focused on seeking financial and temporary savings as part of the optimization of their internal processes. In the public sector, however, the focus was on implementing ISO standards. Currently, the Polish market follows trends from Western Europe and the United States, where BPM implementation projects focus on operational risk management.

The market sectors in Poland, where BPM systems are the most popular are:

* banking,
* telecommunications,
* energy,
* public administration,
* insurance industry.

The above sectors are mainly composed of large companies employing over 200 employees and corporations with many complex business processes requiring automation. The most common areas in organizations that implement BPM tools are:

* customer service,
* administration,
* accounting.

These are areas where interactions with customers (internal and external) as well as work flow must be under strict control.

# Analysis of process modeling capabilities

In order to compare their process modeling capabilities, each of the analyzed tools had been investigated to find a set of potential functional features that BPM tools can offer. The first analyzed feature is the ability to graphically model processes. The graphical environment in each tool can vary a lot from very modest to very sophisticated and eye-catching graphics. The next feature to check will be the presence of a process engine responsible for implementing and running the modeled processes. Some of the applications described offer not only the BPMN notation, which is currently standard in business process modeling, but also allow modeling using other notations like, for example, Unified Modeling Language (UML). If a framework offers its own notation, then this fact will also be noticed. In addition to the ability to draw a diagram, it will be shown whether these tools offer model validation. Flexible tools should offer the ability to export and import models created with other tools using MS Visio or XPDL. The data modeling context, which includes all the data required for a process, will also be analyzed. Process data like on-screen forms, documents, attachments, document repositories, or any external sources of information that may be required for execute the process at every possible stage will be considered. Another assessment criteria concerns the business rules, both defining and enforcing. A business rule is a rule that defines or constrains some aspect of business and always resolves to either true or false. Business rules are intended to assert business structure or to control or influence the behavior of the business. A useful option or extension of the BPMN diagram is the ability to simulate the process. Simulation is used to trace the process flow, find bottlenecks, and test the continuity of the process. More advanced tools also allow you to estimate the time and costs of processes, which may help you in forecasting your budget, but will not replace Business Intelligence. The last element analyzed is whether the framework is provided with ready-to-modify template processes.

According to Activiti (2017), Github Activity (2017), Bonita (2017), Github Bonitasoft (2017), Github:

jBPM (2017), Documentation jBPM (2017), Camunda (2017), Github: Camunda (2017), Orchestra code

(2017), Orchestra User Guide (2017), OW2 Orchestra (2017), Yaoqiang (2017), Code Yaoqiang (2017), Table 1 shows the results of the analysis of open source tools covering the above-described scope of features.

### Tab. 1 Process modeling capabilities – open source tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Activiti BPM** | **Bonita BPM** | **jBPM** | **Camunda BPM** | **Orchestra** | **Yaoqiang BPMN**  **Editor** |
| Graphical modeling | YES | YES | YES | YES | YES | YES |
| Built-in process engine | YES | YES | YES | YES | YES | NO |
| Supported notations |  | | | | | |
| BPMN | YES | YES | YES | YES | YES | YES |
| BPEL | NO | NO | NO | NO | YES | NO |
| UML | NO | NO | NO | NO | NO | NO |
| Own | NO | NO | NO | NO | NO | NO |
| Model validation | YES | YES | YES | YES | YES | YES |
| Model import | YES | YES | YES | YES | YES | YES |
| Model export | YES | YES | YES | YES | YES | YES |
| Data modeling | YES | YES | YES | YES | NO | NO |
| Forms | YES | YES | YES | YES | NO | NO |
| Document repository | YES | YES | NO | YES | NO | NO |
| Business rules | NO | YES | YES | YES | NO | NO |
| Process simulation |  | | | | | |
| Process flow animation | NO | YES | YES | NO | NO | YES |
| Time/Cost estimation | NO | YES | YES | NO | NO | NO |
| Process templates | NO | YES | NO | NO | NO | YES |
|  |  |  |  |  |  |  |
| YES | 9 | 13 | 11 | 10 | 7 | 7 |
| NO | 7 | 3 | 5 | 6 | 9 | 9 |

Based on the table above, all of the open source tools analyzed have a graphical interface that enables modeling using the BPMN notation, validation of modeled processes, as well as options for importing and exporting process models. The process engine that enables them to be implemented in enterprises is available in almost every application except the Yaoqiang BPMN Editor, which is used exclusively for modeling. Only Orchestra allows you to map the BPMN process to BPEL, while the rest of the analyzed applications only support BPMN.

Based on the above results, Bonita BPM not only provides an easy-to-read graphical and user-friendly interface, but it is also a fully-featured solution for complex process modeling.

According to Aurea BPM (2017), Bizagi (2017), IBM Blueworks (2017), iGrafx (2017), K2 blackpearl (2017), Oracle BPM (2017), Table 2 summarizes the results of the process modeling capability analysis for commercial tools and is subjected to the same evaluation criteria as the open source tools.

### Tab. 2 Process modeling capabilities – commercial tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Aurea BPM** | **Bizagi BPM Suite** | **IBM**  **Blueworks Live** | **iGrafx FlowCharter** | **K2**  **blackpearl** | **Oracle BPM Suite** |
| Graphical modeling | YES | YES | YES | YES | YES | YES |
| Built-in process engine | YES | YES | YES | NO | YES | YES |
| Supported notations |  | | | | | |
| BPMN | YES | YES | YES | YES | YES | YES |
| BPEL | NO | NO | NO | YES | NO | YES |
| UML | NO | NO | NO | YES | NO | NO |
| Own | NO | NO | NO | NO | NO | NO |
| Model validation | YES | YES | YES | YES | YES | YES |
| Model import | YES | YES | YES | YES | YES | YES |
| Model export | YES | YES | YES | YES | YES | YES |
| Data modeling | YES | YES | YES | NO | YES | YES |
| Forms | YES | YES | YES | NO | YES | YES |
| Document repository | YES | NO | YES | YES | YES | YES |
| Business rules | YES | YES | YES | NO | YES | YES |
| Process simulation |  | | | | | |
| Process flow animation | YES | YES | YES | NO | NO | YES |
| Time/Cost estimation | YES | YES | NO | NO | NO | YES |
| Process templates | NO | NO | YES | YES | YES | YES |
|  |  |  |  |  |  |  |
| YES | 12 | 11 | 12 | 9 | 11 | 14 |
| NO | 4 | 5 | 4 | 7 | 5 | 2 |

By analyzing the above table, it can be seen how small differences in their capabilities appear among commercial tools. All analyzed tools have a graphical environment for process modeling in BPMN notation, and also allow you to import and export modeled processes. Except for iGrafx FlowCharter, all standard tools are equipped with a model validator that can capture potential errors in the process. Similarly, screen forms support, the ability to model data and bind them to process elements, and the ability to model and execute business rules are present in all evaluated tools. The only tool out there that is suitable only for modeling is the iGrafx FlowCharter. It does not have a process engine, but includes the UML modeling feature and converts modeled processes into BPEL.

The differences in modeling capabilities between the analyzed commercial solutions are negligible. The tool with the best process modeling capabilities seems to be the Oracle BPM Suite, but the Aurea BPM competes with all the features but the ready-made diagram templates.

# Analysis of end-user interface and business analyst interface

This section analyzes the interfaces available to end users of the application and to business analysts. Access options have been defined that reflect the various forms of work on the systems under consideration. The first will be web browser access for process modeling, task management, or process monitoring. The four most popular browsers are: Internet Explorer (Edge), Mozilla Firefox, Google Chrome and Opera. The next criterion is to check whether the system can work in the cloud and whether it has a mobile application or desktop application. It will show on which operating systems you can use the tool, and whether it is a cross-platform application that is independent of the operating system. The comparison will also take into account the language versions of the tool and whether the application has a

Polish version. The final element will be the interface for developers i.e. plugins for popular development environments, such as Eclipse or Microsoft Visual Studio.

According to Activiti (2017), Github Activity (2017), Bonita (2017), Github Bonitasoft (2017), Github:

jBPM (2017), Documentation jBPM (2017), Camunda (2017), Github: Camunda (2017), Orchestra code

(2017), Orchestra User Guide (2017), OW2 Orchestra (2017), Yaoqiang (2017), Code Yaoqiang (2017), Table 3 below shows the results of the analysis of open source tools that indicate the available user interfaces.

### Tab. 3 Available user interfaces – open source tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Activiti BPM** | **Bonita BPM** | **jBPM** | **Camunda BPM** | **Orchestra** | **Yaoqiang BPMN**  **Editor** |
| Web browser interface: | YES | YES | YES | YES | YES | NO |
| Internet Explorer | YES | YES | YES | YES | YES | NO |
| Mozilla Firefox | YES | YES | YES | YES | YES | NO |
| Google Chrome | YES | YES | YES | YES | YES | NO |
| Opera | YES | YES | YES | YES | YES | NO |
| Cloud/SaaS | NO | NO | NO | NO | NO | NO |
| Desktop application | YES | YES | NO | YES | NO | YES |
| Operating systems |  | | | | | |
| Windows | YES | YES | YES | YES | YES | YES |
| Linux | YES | YES | YES | YES | YES | YES |
| Unix | YES | NO | YES | YES | YES | NO |
| Mac OS | YES | YES | YES | YES | YES | YES |
| Multi-platform application | YES | NO | YES | YES | YES | NO |
| Mobile application | NO | YES | NO | NO | NO | NO |
| Polish version | NO | NO | NO | NO | NO | NO |
| Plug-ins | YES | YES | YES | YES | YES | YES |
|  |  |  |  |  |  |  |
| YES | 8 | 7 | 7 | 8 | 7 | 5 |
| NO | 3 | 4 | 4 | 3 | 4 | 6 |

By analyzing the above table, you can see that the poorest tool is the Yaoqiang BPMN Editor again - it's a desktop application, it does not require installation, and it is available in three versions for Windows, Linux and Mac. The remaining five tools offer access via all considered web browsers. None of the tools offer a Cloud or SaaS (Software as a Service) model, which may be understandable for community- driven solutions. The vast majority of solutions are cross-platform applications that have one version regardless of the operating system on which they are deployed. The distinctive tool is Bonita BPM, which is the only one with a dedicated mobile application.

Among the open source tools, the largest range of interfaces have Alfresco and Camunda BPM, but these are minor differences compared to the Bonita BPM, jBPM, and Orchestra, that took the second place.

According to Aurea BPM (2017), Bizagi (2017), IBM Blueworks (2017), iGrafx (2017), K2 blackpearl (2017), Oracle BPM (2017), Table 4 below summarizes the results of analysis of available user interfaces for commercial tools and is subjected to the same evaluation criteria as the open source tools.

### Tab. 4 Available user interfaces – commercial tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Aurea BPM** | **Bizagi BPM Suite** | **IBM**  **Blueworks Live** | **iGrafx FlowCharter** | **K2**  **blackpearl** | **Oracle BPM Suite** |
| Web browser interface: | YES | YES | YES | NO | YES | YES |
| Internet Explorer | YES | YES | YES | NO | YES | YES |
| Mozilla Firefox | YES | YES | YES | NO | YES | YES |
| Google Chrome | YES | YES | YES | NO | YES | YES |
| Opera | YES | YES | YES | NO | YES | YES |
| Cloud/SaaS | YES | YES | YES | NO | YES | YES |
| Desktop application | NO | NO | NO | YES | YES | YES |
| Operating systems |  | | | | | |
| Windows | YES | YES | YES | YES | YES | YES |
| Linux | YES | YES | YES | NO | NO | YES |
| Unix | YES | YES | YES | NO | NO | YES |
| Mac OS | YES | NO | YES | NO | NO | YES |
| Multi-platform application | YES | NO | YES | NO | NO | YES |
| Mobile application | YES | YES | YES | NO | YES | YES |
| Polish version | YES | YES | NO | YES | NO | NO |
| Plug-ins | NO | NO | NO | NO | YES | YES |
|  |  |  |  |  |  |  |
| YES | 9 | 7 | 8 | 3 | 6 | 10 |
| NO | 2 | 4 | 3 | 8 | 5 | 1 |

From the table above, most commercial tools offer web browser access and cloud computing, with the exception of the iGrafx solution, which only works with a desktop application running on Microsoft Windows. Also K2 Blackpearl and Oracle BPM Suite offer a desktop application. All applications support MS Windows operating system, while it is the only supported operating system for the K2 Blackpearl. The Linux and Unix OSs are supported by four tools: Aurea BPM, Bizagi BPM Suiute, IBM Blueworks Live and Oracle BPM Suite. Bizagi does not support Apple Mac OS and does not offer a cross-platform application-independent system.

# Process monitoring capabilities analysis

One of the key elements of business process management is the ability to monitor them. It is called the Business Activity Monitoring (BAM). They continuously gather information about Key Performance Indicators (KPIs). This section outlines the capabilities of BAM tools delivered with the analyzed BPM systems.

A set of four predefined reports will be analyzed. Potentially reports should show process execution statistics (such as execution time or iteration amount), allow review of executed processes, provide detailed data about individual activities in the process, and provide a view of process participant statistics. It will be investigated whether the tools have the ability to define their own reports using the wizard. When creating your own reports, it will be helpful to define your own KPIs for the process. Next, it will be verified whether the tools enable working with data from external sources together with with process flow data. Next, you will be able to compare the capabilities of defining dashboards, drawing charts, and data operations (filtering, selection, and multi-layered data collapsing and expanding). It will be determined which tools have the ability to define system notifications when the indicator reaches a limit value. At the end, data import and export capabilities will be investigated.

According to Activiti (2017), Github Activity (2017), Bonita (2017), Github Bonitasoft (2017), Github:

jBPM (2017), Documentation jBPM (2017), Camunda (2017), Github: Camunda (2017), Orchestra code

(2017), Orchestra User Guide (2017), OW2 Orchestra (2017), Yaoqiang (2017), Code Yaoqiang (2017), Table 5 below summarizes the results of the analysis of business process monitoring capabilities for open source tools.

### Tab. 5 Business process monitoring capabilities – open source tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Activiti BPM** | **Bonita BPM** | **jBPM** | **Camunda BPM** | **Orchestra** | **Yaoqiang BPMN**  **Editor** |
| BAM | NO | YES | YES | NO | NO | NO |
| Predefined reports: | NO | YES | YES | NO | NO | NO |
| Process execution statistics | NO | YES | YES | NO | NO | NO |
| Process review | NO | YES | YES | NO | NO | NO |
| Process activity statistics | NO | YES | YES | NO | NO | NO |
| Process participants statistics | NO | YES | YES | NO | NO | NO |
| Report wizard | NO | NO | YES | NO | NO | NO |
| KPI | NO | YES | YES | NO | NO | NO |
| External data | NO | YES | YES | NO | NO | NO |
| Management dashboards | NO | YES | YES | NO | NO | NO |
| Charts | NO | YES | YES | NO | NO | NO |
| Data manipulation: |  | | | | | |
| Filtering | NO | YES | YES | NO | NO | NO |
| Selecting | NO | YES | YES | NO | NO | NO |
| Multidimensional | NO | NO | YES | NO | NO | NO |
| Alert system | NO | NO | NO | NO | NO | NO |
| Data export | NO | YES | YES | NO | NO | NO |
| Printing to file | NO | YES | YES | NO | NO | NO |
|  |  |  |  |  |  |  |
| YES | 0 | 14 | 16 | 0 | 0 | 0 |
| NO | 17 | 3 | 1 | 17 | 17 | 17 |

As you can see in the table above, BAM is not an open source domain for process management tools - only two of them offer this functionality. The jBPM, which offers a rich, built-in BAM module, is the best in the list. A set of predefined reports fulfills the criteria. It has a graphical report generator that allows you to create reports for business users. It supports process KPIs and allows you to create new indicators. The other solution, Bonita BPM, does not have a built-in report wizard, but is integrated with another open source tool that has such a wizard. Although because it is another project, it was not included in the list. The Bonita BPM reports do not have a multidimensional construction, which prevents aggregation and drilling up/down of data.

According to Aurea BPM (2017), Bizagi (2017), IBM Blueworks (2017), iGrafx (2017), K2 blackpearl (2017), Oracle BPM (2017), Table 6 summarizes the results of the analysis of the business process monitoring capabilities for commercial tools, and is subjected to the same evaluation criteria as the open source tools.

### Tab. 6 Business process monitoring capabilities – commercial tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Aurea BPM** | **Bizagi BPM Suite** | **IBM**  **Blueworks Live** | **iGrafx FlowCharter** | **K2**  **blackpearl** | **Oracle BPM Suite** |
| BAM | YES | YES | NO | NO | YES | YES |
| Predefined reports: | YES | YES | YES | NO | YES | YES |
| Process execution statistics | YES | YES | YES | NO | YES | YES |
| Process review | YES | YES | YES | NO | YES | YES |
| Process activity statistics | YES | YES | YES | NO | YES | YES |
| Process participants statistics | YES | YES | YES | NO | YES | YES |
| Report wizard | YES | YES | NO | NO | YES | YES |
| KPI | YES | YES | NO | NO | NO | YES |
| External data | YES | NO | NO | NO | NO | YES |
| Management dashboards | YES | YES | NO | NO | YES | YES |
| Charts | YES | YES | YES | NO | YES | YES |
| Data manipulation: |  | | | | | |
| Filtering | YES | YES | YES | NO | YES | YES |
| Selecting | YES | YES | NO | NO | YES | YES |
| Multidimensional | YES | YES | NO | NO | YES | YES |
| Alert system | YES | YES | NO | NO | YES | YES |
| Data export | YES | YES | YES | NO | YES | YES |
| Printing to file | YES | YES | NO | NO | YES | YES |
|  |  |  |  |  |  |  |
| YES | 17 | 16 | 8 | 0 | 15 | 17 |
| NO | 0 | 1 | 9 | 17 | 2 | 0 |

By analyzing this table, you can see that the IBM Blueworks Live and iGrafx FlowCharter tools do not provide common process monitoring modules. The IBM tool has a set of predefined statistics, which, using graphs with the ability to navigate through predefined filters, covers the scope of the report. Graph data can be exported to MS Excel. The other four tools, depending on the requirements of the enterprise, can meet the needs of process monitoring reports. Bizagi BPM Suite and K2 Blackpearl tools do not offer reports that include data imported from external systems. The other two systems, Aurea BPM and Oracle BPM, meet the complex scope of business process monitoring. It should be borne in mind that while Oracle fully supports BAM with its own resources, Aurea BPM is supported by an external analytical tool OEM (Original Equipment Manufacturer), which sells it under its own brand as a BAM module.

# Analysis of integration possibilities

The tools that are used to implement the process management system should allow integration with existing infrastructure in the enterprise. Such integration enables full automation of business processes. In the first place, you will be able to integrate with the two popular tools: Sharepoint and Outlook and their ability to be used as client applications. Next, the capabilities of external access to process engines will be examined, as well as the capability of API or Web Service integration. Finally, you will be able to see which applications allow you to integrate processes with database objects.

According to Activiti (2017), Github Activity (2017), Bonita (2017), Github Bonitasoft (2017), Github:

jBPM (2017), Documentation jBPM (2017), Camunda (2017), Github: Camunda (2017), Orchestra code

(2017), Orchestra User Guide (2017), OW2 Orchestra (2017), Yaoqiang (2017), Code Yaoqiang (2017), Table 7 below summarizes the results of the analysis of the ability to integrate BPM tools with existing enterprise infrastructure for commercial tools.

### Tab. 7 Integration capabilities – open source tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Activiti BPM** | **Bonita BPM** | **jBPM** | **Camunda BPM** | **Orchestra** | **Yaoqiang BPMN**  **Editor** |
| MS SharePoint | NO | YES | NO | NO | NO | NO |
| MS Outlook | NO | NO | NO | NO | NO | NO |
| API/Web Service – engine | YES | YES | YES | YES | YES | NO |
| API/Web Service – modeler | YES | YES | YES | YES | YES | YES |
| Database objects | YES | YES | YES | YES | YES | NO |
|  |  |  |  |  |  |  |
| YES | 3 | 4 | 3 | 3 | 3 | 1 |
| NO | 2 | 1 | 2 | 2 | 2 | 4 |

By analyzing the results from Table 7, you can see a certain standard for open source software. All have APIs or Web Services to communicate with other software. This allows, for example, to run specific processes or remodel them using external software. The exception is, of course, Yaoqiang BPMN Editor which does not have its own engine nor external database access. None of the tools support integration with the popular MS Outlook e-mail program. Only Bonita BPM supports integration with the Sharepoint application platform.

According to Aurea BPM (2017), Bizagi (2017), IBM Blueworks (2017), iGrafx (2017), K2 blackpearl (2017), Oracle BPM (2017), Table 8 shows the results of the analysis of the integration capabilities of commercial tools, and they were subjected to the same criteria for evaluation as open source tools.

### Tab. 8 Integration capabilities – commercial tools

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Aurea BPM** | **Bizagi BPM Suite** | **IBM**  **Blueworks Live** | **iGrafx FlowCharter** | **K2**  **blackpearl** | **Oracle BPM Suite** |
| MS SharePoint | NO | YES | NO | YES | YES | YES |
| MS Outlook | NO | NO | NO | YES | YES | YES |
| API/Web Service – engine | YES | YES | YES | NO | YES | YES |
| API/Web Service – modeler | YES | YES | YES | NO | YES | YES |
| Database objects | YES | YES | NO | NO | YES | YES |
|  |  |  |  |  |  |  |
| YES | 3 | 4 | 2 | 2 | 5 | 5 |
| NO | 2 | 1 | 3 | 3 | 0 | 0 |

The data in Table 8 show that the analyzed commercial tools are mostly adapted to integrate with existing systems in enterprises. Four of them (Bizagi BPM Suite, iGrafx Flowcharter, K2 Blackpearl, Oracle BPM Suite) support integration with Sharepoint platform, three of which integrate with MS Outlook. Due to its purpose, iGrafx FlowCharter does not provide programming interfaces to communicate with external software. Systems K2 and Oracle in the above table meet the full scope of the tested integration possibilities.

# Conclusions

By analyzing the statements in this article, you will notice that some of the tools are used exclusively to create process models and draw process diagrams. On the other hand, the rest can be a complete set of tools for implementing enterprise process management systems.

Table 9 summarizes the results of the previous four areas of analysis. The first column shows the tools tested, while the next four columns show all the criteria met, and then in the "Sum" column they are added together. A total of 49 properties were verified, as referred to in the last column showing the percentage of all the features for the tool. The tools are divided into commercial and open source.

### Tab. 9 Analysis summary

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Process modeling  capabilities | GUI | Process monitoring  capabilities | Integration possibilities | SUM | %  features fulfilled |
| open source | Activiti BPM | 9 | 8 | 0 | 3 | 20 | 41% |
| Bonita BPM | 13 | 7 | 14 | 4 | 38 | 78% |
| jBPM | 11 | 7 | 16 | 3 | 37 | 76% |
| Camunda BPM | 10 | 8 | 0 | 3 | 21 | 43% |
| Orchestra | 7 | 7 | 0 | 3 | 17 | 35% |
| Yaoqiang BPMN Editor | 7 | 5 | 0 | 1 | 13 | 27% |
| commercial | Aurea BPM | 12 | 9 | 17 | 3 | 41 | 84% |
| Bizagi BPM Suite | 11 | 7 | 16 | 4 | 38 | 78% |
| IBM Blueworks Live | 12 | 8 | 0 | 2 | 22 | 45% |
| iGrafx FlowCharter | 9 | 3 | 0 | 2 | 14 | 29% |
| K2 blackpearl | 11 | 6 | 15 | 5 | 37 | 76% |
| Oracle BPM Suite | 14 | 10 | 17 | 5 | 46 | 94% |

The above analysis summary table clearly indicates that only two open source tools fulfill more than 75% of the analyzed features, Bonita BPM and jBPM deserve attention in this segment. Among the commercial tools, the most fulfilled features has the Oracle BPM Suite with the result of 94%. It should be noted that aside from the worldwide software giant, the Aurea BPM, which covers 84% of the measured range of functions, is exceptionally well presented. The other two commercial tools that fulfill more than 75% of the surveyed features are Bizagi BPM Suite and K2 blackpearl.

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