

AN EVALUATION OF BUSINESS ACTIVITY MONITORING TOOLS

Natia Sirbiladze

Viana do Castelo Polytechnic Institute, Portugal

natia.natisun@gmail.com

Sara Paiva

Viana do Castelo Polytechnic Institute, Portugal

sara.paiva@estg.ipv.pt

Rui Gomes

Viana do Castelo Polytechnic Institute, Portugal

rgomes@estg.ipv.pt

Abstract :

In current competitive times, it is crucial to every organization to have the ability to sense changes in business conditions in order to allow decision makers to provide the necessary changes to the business so it remains competitive in the market. Business Intelligence provides the ability to analyze data and deliver important information to managers. As it works only with historical data, Business Activity Monitoring tools appeared so more current data can also be used to support the decision making process. As a wide variety of organizations could benefit from these tools advantages, in this paper we focus on studying proprietary and also open source tools, regarding their functionalities, advantages and disadvantages so we can conclude on which one is best in a given scenario.

Keywords : *BAM, business process, dashboards, alerts.*

I. INTRODUCTION

Currently, we are all surrounded by an enormous amount of data. As a consequence, organizations must find a way to handle data quickly and efficiently or the organization success can be compromised. As Drucker states, knowledge has become a key economic resource [1]. Business Intelligence (BI) aroused as a way to transform several types of information into knowledge, providing the consolidation and analysis of raw data, and the capacity of processing raw data into the executable decision-making information [2]. As a tool, BI can present information which facilitates the decision making process for management improving customers' satisfaction and the strategic goals of business. BI typically works with data from a data warehouse, which means it tends to be historical data. This can be seen as a limitation nowadays as data from yesterday can be important to a decision for tomorrow. Regarding this matter, some refer that the real-time aspect assumes a great deal of importance when it comes to the decision making process [3]. Conscious of BI limitations, we have been assisting in these last few years to new solutions. In fact, enterprise information integration (EII),

enterprise application integration (EAI), and real-time data warehousing technologies are making it possible to deliver decision support data that is literally only minutes old [4]. Business Activity Monitoring (BAM) also appeared in this context. The term was invented by Gartner Group in 2002 [5] and the main difference to traditional BI is that it anticipates business trends from current happenings [6]. As BAM tools are greatly aligned with the organization strategy, and in order to lead and diagnose the organization, managers define and concentrate on Key Performance Indicators (KPI) [7].

In this paper, we present an evaluation of BAM tools, proprietary and open source, in order to conclude about the difficulties organizations can feel in their adoption.

The rest of the paper is organized as follows. In the next section we detail some important concepts of BAM, namely dashboards and alerts. Section 3 presents the case study starting with the research methodology explanation and afterwards the detail of each stage of action research.

II. BUSINESS ACTIVITY MONITORING

BAM has become a fundamental tool for every organization because of its efficiency on analyzing current data. To support the achievement of KPI, dashboards and alerts are two important features of BAM tools. A dashboard is a user interface that organizes and presents information in a way that is easy to read. Depending on real-time data, dashboard automatically updates and displays relevant data to users from multiple sources [8]. Additionally, BAM uses real-time data from multiple sources to provide alerts, which are provided to make reaction/action in real-time if something is changed during the process.

The benefits of BAM can be reflected to organizations of different nature such as a hi-tech manufacturer [9], logistics [10] or airplane companies [11]. The Continental Airlines is an excellent example to demonstrate the importance of real-time BI. With a real-time data warehouse that stores data related to flight manifests, customer profitability, customer reservation, real-time flight data from the plane and current gate and departure time data, the Airline can identify passengers who are at risk of missing a connection and make arrangements to get those passengers and their luggage to their connecting flights on time [11]. Continental's President and COO, Larry Kellner describes the impact of real-time BI has fundamental to accomplishing the organization strategy and also to increase business benefits [11].

III. THE CASE STUDY

A. *Research methodology*

The methodology we used in this study was action-research, as proposed by Olesen and Myers [12]. This type of research is characterized by some form of collaboration by researchers and practitioners of which should emerge some new knowledge important for both parts. The authors also refer, as an important aspect of the method, the analysis of the results it provides, even in case of failure. In order to implement the action research proposed by Olesen and Myers [12], the following steps should be followed:

- Diagnosis: identify the problem;
- Action Planning: determine the actions to solve the problem;
- Actions taken: choose and implement a given course of action;
- Evaluation: analyze and study the consequences of the course of action;
- Learning obtained: document the knowledge obtained during the project.

B. Development stages

1) Diagnosis

Motivated by the importance of a BAM tool for every organization because of its efficiency on analysing current data, this research intends to make an analysis on proprietary and open source platforms. The product cost appears as an important and decisive factor for organization nowadays so it is relevant to know what functionalities and advantages proprietary tools have and if they justify the costs they demand. By studying open source tools, we can also conclude if there is any that can satisfy the same requirements with less cost.

On another hand, as organizations feel the need to measure the efficiency of their activities, they define KPIs that need to be easily analyzed and its consequences almost immediate. BAM tools, for this purpose, provide dashboards and alerts. As such, with this research we also intend to understand specifications, how easy they can be implemented in different platforms and, in the end, the type of view they provide in order to help decision makers.

2) Action Planning

With the definition of the goal, we started to think of how to address the problem. As costs are always an important aspect to bear in mind to any organization, we thought it would be important to first study proprietary and open source BAM tools so we could be able to understand the advantages and disadvantages of each. After this study, we should choose one tool of each to move on to the implementation part so, in the end, we could conclude about the difficulties each type of tool would present to any organization that decided to adopt it. In concrete, with this study we want to be able to conclude on the difficulty that an organization would have on the creation of dashboards and alerts over business processes in order to help decision makers and also to act in a preventive way. To perform the tools evaluation, we will use the Academic Services of a High Public Educational Institute, namely to address the KPI of number of launched grades by teachers regarding the subjects they teach.

3) Actions Taken

As described in the Action Planning stage, the first task was to make a study on proprietary and open source BAM tools. Regarding proprietary tools, we studied Oracle and IBM and, regarding open source tools, we chose WSO2BAM and Chroniker.

International Conference on Computing, Communication System and Informatics
Management (ICCCSIM)

Venue : Hotel RAMADA , Bur Dubai, UAE

Date : 29 – 30 July, 2012

a) *Selection of tools*

In this section we describe the proprietary tools we studied (Oracle and IBM) and also open source (WSO2 BAM and Chroniker).

PROPRIETARY TOOLS

Oracle BAM ¹ [13] is a component of Oracle SOA Suite [14] and it gives ability to build interactive, real-time dashboards and alerts to monitor business processes and services. For this reason, it is the key of success for managers, as it provides essential information to make better decisions and correct actions if something changes during business processes. Oracle BAM empowers organizations to benefit from real-time information with the help of pre-designed dashboards. The analyzed information, provided by dashboards, enables managers to monitor performance continuously according to the goals of enterprise, analyze exceptions and take corrective action.

IBM WebSphere Business Monitor ² provides visibility into the performance of business activities by processing events, calculating business metrics, and presenting KPIs through business dashboards. Users are able to compare current business performance with expectations and analyze flows over time. It gives the ability to provide alerts, KPIs and real-time, end-to-end view of business process performance with configured dashboards on mobile devices and on desktop as well [15].

When comparing both tools, we could start by saying that IBM BAM comprises much more products than Oracle SOA Suite, what makes IBM require higher IT personnel, more training costs and a more difficult insight of the business to the customer. Oracle has revealed to us much simpler and easier to use and implement, requiring less time and less configuration steps in order to perform the main tasks, such as dashboard creation or receiving data for report generation. Finally, it is important to mention the costs of IBM product are much higher than Oracle. For these reasons, we chose Oracle BAM for the implementation work.

OPEN SOURCE TOOLS

WSO2 ³ was founded in 2005 by acknowledgement leaders in XML, Web Services Technologies and Standards and Open Sources. It is a middleware platform 100% open source under Apache License, based on the enterprise-class SOA functionality of WSO2 Carbon ⁴. WSO2 BAM is designed to execute the principles of BAM. It serves business and IT experts to monitor and analyze business activities within or without a SOA deployment, or Cloud Deployments. WSO2 BAM makes current data available immediately or with zero latency, which means data is available immediately, as the gap between the data time collection and the time of data availability for decision making is defined as latency in the context of WSO2 BAM.

¹ <http://www.oracle.com/technetwork/middleware/bam/overview/index.html>

² <http://www-01.ibm.com/software/integration/business-monitor/>

³ <http://wso2.com/products/business-activity-monitor/>

⁴ <http://wso2.com/products/carbon/>

Chroniker⁵ is an open source monitoring suite for fundamental monitoring and reporting on network components, websites, databases, crucial user tasks, system health, and application transaction response times. It provides some types of dashboards and it is organized by modules which have their own tasks for monitoring. The tool enables alerts, graphical forms and different monitoring issues connected to system or network.

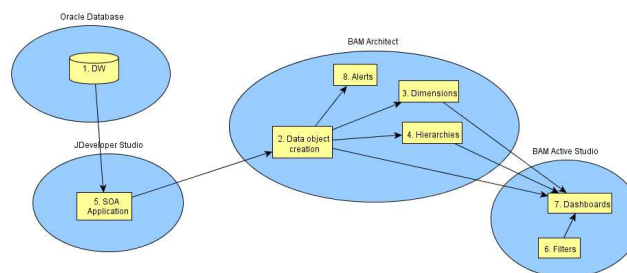
When comparing both tools, the main aspect to mention relates to the tool support. Although it is not much, it is better in WSO2 BAM as in Chroniker the difficulties were big as almost no information was found in forums or in the official site itself. We also concluded that both products require programming skills, which is important information in the moment of BAM tool adoption. Mostly for the support, we chose WSO2BAM for the implementation work.

b) Implementation work

ORACLE BAM

In order to create a prototype for Oracle BAM, the steps illustrated in Figure I were followed. Firstly, the data source was created in order to hold data of courses, teachers, subjects, etc. This step involves the DW (Figure II), view and trigger creation. Next, the necessary BAM data objects were created in BAM Architect. In addition, dimensions and hierarchies were also created as they are needed for dashboards drilling options. The fifth step refers to the creation of the SOA application in order to make a connection between real data source database to the data object of BAM. Finally, after all data is transferred to the BAM data container, dashboards and alerts can be created. Filters can also be created to provide more options to the dashboard.

FIGURE I . ORACLE BAM IMPLEMENTATION STEPS



When data is inserted or updated in the fact table, a trigger automatically sets the value of field “status” to “modified”. BAM uses only modified rows to fill BAM Data Object with general information (Figure II).

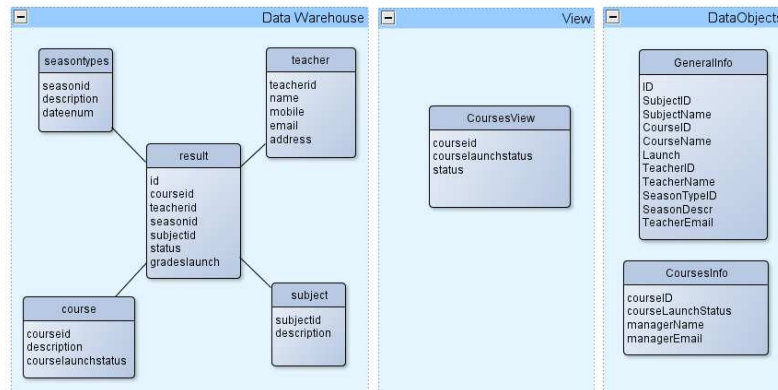
⁵ <http://www.nrglobal.com/system-and-network-monitoring/availability-monitoring-it-system-management-chroniker.html>

International Conference on Computing, Communication System and Informatics
Management (ICCCSIM)

Venue : Hotel RAMADA , Bur Dubai, UAE

Date : 29 – 30 July, 2012

FIGURE II . DW, VIEW AND DATA OBJECTS

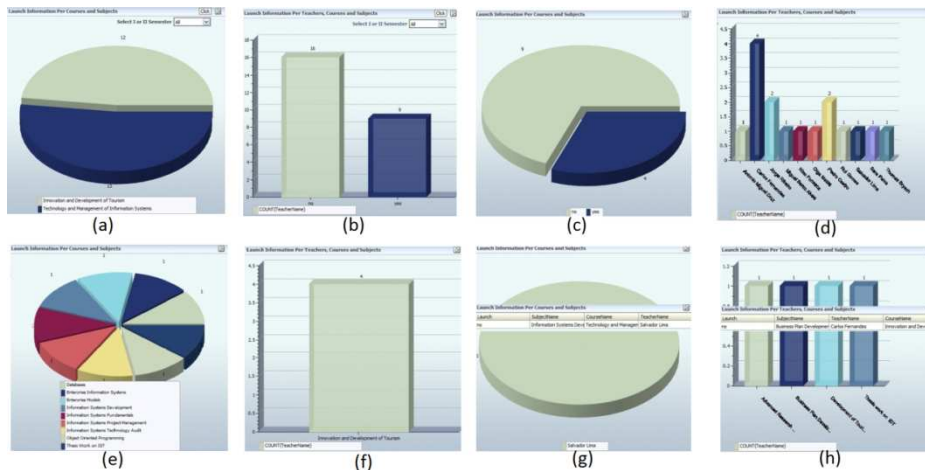


The “CourseView” (Figure II) is then used to obtain information of the launch status of each course which depends on the launch status of its subjects. This information will be used to feed the dashboards. In this prototype, two dashboards were created in one report, with the ability to drill down through hierarchies of courses, subjects and teachers and filter according to the semesters. The filter was set on *seasontypeid* field. The first created dashboard (first row of Figure III) shows the number of subjects per courses, on a given semester (a). Drilling down through course we can see the number of launched and not launched subjects (b). Drilling down, the subjects according to the chosen option are shown (c). Finally, after choosing one subject it shows teacher who teaches this subject and other information available (d). The second dashboard shows the launch status per semester (e). Drilling through status we can see the information on teachers and number of subjects they teach (f). Choosing one teacher it drills down through the courses he lectures too (g). Finally, after choosing the course it drills and shows subject per which the teacher has launched or has not launched (h). Regarding the alerts, the following were created:

- Notify teacher on a preconfigured date for first semester
- Notify teacher on a preconfigured date for second semester
- Send emails to the School Board when all grades of a given course are launched

For the first two alerts the event used was “every date interval starting on a certain date at a specific time”. The dates defined for this case study was February 11th, for the 1st semester, and July 15th, for the 2nd semester. The condition/action defined was “Send a parameterized message for matching row in a data object“. In order for the alert to be fired only for teachers who have grades not yet launched, the following filters were defined: 1) choose only rows (from the BAM data object on the right of Figure II, namely in table “Data Object for Courses”) with field launch equals to No and *seasontypeid* with value 1 or 2 (depending on the semester). For the third alert the event used was also “when a data field in a data object meets specified condition”. This alert is fired when the BAM data object for courses is updated. The *managername* of the *courseID* that had the field *courselaunchstatus* changed to updated will receive an email informing that all grades of the course were launched.

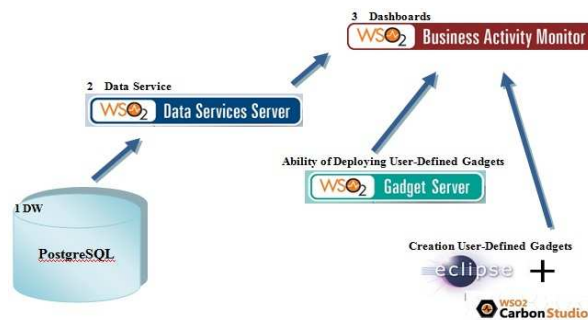
FIGURE III. DASHBOARDS



WSO2BAM

The implementation for WSO2BAM followed the same goals and principles as the Oracle BAM implementation. The structure of data is the same, although in this case PostgreSQL was used. In order to create a prototype for WSO2BAM, the steps illustrated in Figure IV were followed.

FIGURE IV. WSO2BAM IMPLEMENTATION STEPS



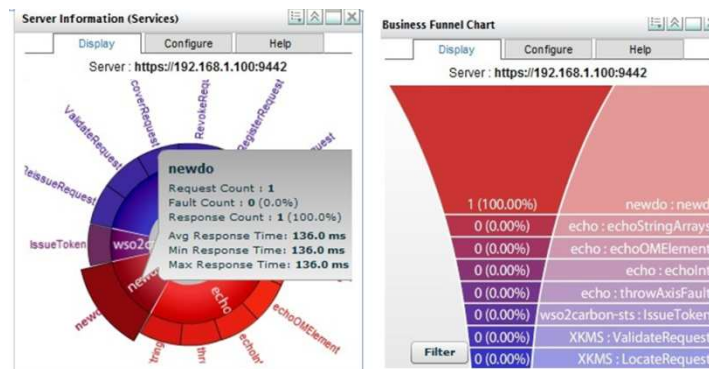
Data services are web services that provide access to all data stored in databases so integration of data into business processes or gadgets is possible. Data Services Server provides support for the following data sources: RDBMS, Excel, CSV, RDF, Web Resource and Google Spreadsheet. We used RDBMS to connect to PostgreSQL. As we started the creation of dashboards, we verified that WSO2 BAM has already defined the following dashboards:

- Main Dashboard
- Service Data Dashboard
- Mediation Data Dashboard
- Service Analytics Dashboard

- Mediation Analytics Dashboard

The main dashboard consists of different gadgets. In order to monitor the created data source, we uploaded it to the data server on WSO2 BAM. Figure V shows some of the main, already defined dashboards which show statistical information of each web service on the data server. In particular, the dashboards show all information as average, maximum, minimum response with percentage rates and so on.

FIGURE V. DASHBOARDS



WSO2 also allows users to create their own gadgets. To do so, the WSO2 Gadget Server should be used. Along with Carbon Studio and Eclipse_Based IDE, it is possible to customize dashboards and organize gadgets using tabs. Although WSO2 provides variety of abilities to change everything in a desirable way, it requires a special knowledge of programming in such areas. The dashboards created were enough for us to conclude the much more complexity when compared to Oracle BAM creation.

4) Evaluation

In order to evaluate the two products that we studied with more detail, we defined six main key aspects:

1. Installation: so it is possible to conclude about the difficulties of this process.
2. Integration: so it is possible to conclude how easy it is to access existent and heterogeneous data.
3. Dashboards: so it is possible to conclude the existent variety and difficulty in the creation of dashboards and in what way they can help managers.
4. Alerts: so it is possible to conclude and difficulty in the creation of alerts and in what way they can help preventing some problems.
5. Cost: so it is possible to conclude if a higher cost means more functionalities, flexibility and versatility.
6. Support: so it is possible to conclude if documentation and help are specific of a given type of tool (proprietary or open source).

In Table 1 we summarize the main aspects regarding the evaluation of BAM tools, according to the developed implementation work described above.

TABLE I. EVALUATION OF BAM TOOLS

| | Oracle BAM | WSO2BAM |
|---|-------------------------------|------------------------------------|
| Level of difficulty of installation | Medium | Medium |
| Integration with existing data / Configuration data sources | Good and easy | Good and easy |
| Variety and difficulty of creation of dashboards | Much variety Easy creation | Much variety Difficult creation |
| Variety and difficulty of creation of alerts | Much variety Easy creation | Some variety Difficult creation |
| Cost | High | Low or none |
| Support | Very good | Almost inexistent |

5) *Learning obtained*

With the implementation of the prototype and the feedback received, we gathered some important knowledge. We verified that there is a huge difference when creating dashboards/alerts as with a proprietary tool it was much easier. Open source BAM tools require programming skills to create those objects so an organization that chooses to use an open source BAM tool has to be aware of this so someone with the necessary knowledge is assigned to this type of task. On the contrary, if Oracle BAM is adopted, someone with a superficial IT knowledge can be suited. In this sequence, we refer the lower necessity for investment in training when adopting Oracle BAM.

Regarding the main disadvantages of using Oracle BAM, we point out the lower performance of other applications after the installation of Oracle environment. It is, therefore, strongly advised to use computers with high resources for receiving effective results.

Regarding WSO2 BAM, when its adoption is considered by a given organization, the less reliability or the inexistence of support for the tool should be considered. On the other hand, as an advantage, it is free of charge, under Apache License and additionally, it does not require computers with high resources.

With all this being said, the best choice for an organization depend on several factors of which we point out the availability for investment in the product, the necessity for training and the need for support. For example, smaller organizations or projects might prefer open source solutions as it includes low-cost high control which is considered to be the main benefit for some customers. They also give ability to users to change the source code. On the other hand, proprietary tools are reliable, easily updated and involve professional support and the ability for training courses

IV. CONCLUSIONS AND FUTURE WORK

In this paper we described a case study regarding the adoption of business activity monitoring tools to a high public educational environment, namely to an administrative department responsible for grade launching. We researched proprietary and open source so we could take conclusions about the benefits and disadvantages of each one in the scenario chosen.

As BAM tools monitor how well the business is doing, we started by choosing one KPI from Academic Services for our prototype, where our main goal was to define dashboards and alerts so the organization could take benefits from them.

Regarding the proprietary tool chosen - Oracle BAM – it quickly demonstrated its usefulness, in order to handle and analyze real-time data to help in the decision making process. It provides a great variety of views, which we used to demonstrate the benefit for the defined case study. In addition, the tool has brilliant option of alerts. As soon as some changes take a place in business process, the alert notifies the user. Therefore, the decision maker has ability to react on time in case of necessity.

Regarding open source tools in the area of BAM, they are not common and widely spread. WSO2 BAM presents to be one of the most known and with future perspective tool. The tool provides an easy way to create data/web services and has some already defined dashboards, which are mainly focused on displaying statistical dashboards. However, it requires bigger coding skills when it comes to personalized dashboards and also alerts, which makes the implementation harder than in Oracle BAM. The support is obviously less than in the case of Oracle BAM what doesn't help in the implementation process. Summarizing, proprietary tools provide a better support and make implementation of dashboards and alerts easier that with open source tools.

As a continuation of this work, we intend to continue our exploration of proprietary and mainly open source tools as these last ones can be a good alternative to proprietary tools for organizations that do not want or simple cannot make big investment but still want to monitor their business processes efficiently to make better decisions.

REFERENCES

1. P. F. Drucker, *Managing in a Time of Great Change*. Harvard Business Press, 1995, p. xxvii, 310 p.
2. Y. Feng, Y. Liu, X.-xin Li, C. Gao, and H.-yan Xu, "Design of the Low-Cost Business Intelligence System Based on Multi-agent," 2010 International Conference of Information Science and Management Engineering, no. 3, pp. 291-294, Aug. 2010.
3. B. Kang, S. K. Lee, Y.-B. Min, S.-H. Kang, and N. W. Cho, "Real-time Process Quality Control for Business Activity Monitoring," 2009 International Conference on Computational Science and Its Applications, pp. 237-242, 2009.
4. H. J. Watson and B. H. Wixom, "The Current State of Business Intelligence," *Computer*, vol. 40, no. 9, pp. 96-99, 2007.

International Conference on Computing, Communication System and Informatics
Management (ICCCSIM)

Venue : Hotel RAMADA , Bur Dubai, UAE

Date : 29 – 30 July, 2012

5. J. G. Kang and K. H. Han, "A Business Activity Monitoring System Supporting Real-Time Business Performance Management," 2008 Third International Conference on Convergence and Hybrid Information Technology, vol. 1, pp. 473-478, 2008.
6. V. R. Kanagavalli, "Graduated Granulation of Spatial Information for Efficient , Effective Business Activity Monitoring," Fuzzy Sets and Systems, pp. 99-101, 2010.
7. M. Seify, "Importance of KPI in BI System, Case Study: Iranian Industries," 2010 Seventh International Conference on Information Technology: New Generations, pp. 1245-1246, 2010.
8. J. Julien, "Business Intelligence Meets ECM," Aiim EDoc, vol. 22, pp. 109-111, 2008.
9. Techlogix, "Business Activity Monitoring: A Case Study." [Online]. Available: <http://www.techlogix.com/PDFs/BAM.pdf>. [Accessed: 14-Nov-2011].
10. WebMethods, "Business Activity Monitoring (BAM) The New Face of BPM," 2006. [Online]. Available: http://www.bpminstitute.org/uploads/media/BAM-The_New_Face_of_BPM_1106.pdf. [Accessed: 14-Nov-2011].
11. R. Anderson-Lehman, H. J. Watson, B. H. Wixom, and J. A. Hoffer, "Continental Airlines Flies High with Real-time Business Intelligence Continental Airlines Flies High with Real-time Business Intelligence Introduction," MIS Quarterly Executive, vol. 3, no. 4, pp. 163-176, 2004.
12. K. Olesen and M. D. Myers, "Trying to improve communication and collaboration with information technology: An action research project which failed," Information Technology People, vol. 12, no. 4, pp. 317-332, 1999.
13. Oracle, "Oracle Business Activity Monitoring - An Oracle White Paper," 2009. [Online]. Available: <http://www.oracle.com/technetwork/middleware/bam/overview/oracle-12.pdf>.
14. Oracle, "Oracle White Paper - Oracle Soa Suite 11g," 2009. [Online]. Available: www.oracle.com/us/technologies/soa/soa-suite/oracle-soa-suite-11g-198758.pdf.
15. I. Redbooks, Business Activity Monitoring With Websphere Business Monitor V6.1. Vervante, 2008, p. 840