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BUSINESS ACTIVITY MONITORING ADOPTION IN HIGH PUBLIC EDUCATIONAL INSTITUTION

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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 Activity Monitoring tools appeared as a natural evolution of Business Intelligence tools so more current data can also be used to support the decision making process. As a wide variety of organizations could benefit from BAM tools advantages, this paper presents a case study applied to a High Public Educational Institution, namely to an administrative department - the Academic Services – where several important Key Performance Indicators (KPI) can be defined to measure the business process efficiency. The main conclusions regarding School board members are the common opinion that the BAM tool can help improving the academic process.

Keywords: *BAM adoption, business processes, 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 seriously 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 makes easier to make decision for management, additionally improving customers' satisfaction and, as a consequence, 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, Kang et. al 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 that can be pointed out when comparing to traditional BI is that it anticipates business trends not only from the historical facts but also the current happenings [6]. BAM tools are greatly aligned with the organization strategy. In order to lead and diagnose the organization, managers define and concentrate on Key Performance Indicators (KPI) [7]. In this paper, we present a case study on the adoption of BAM tools to a High Public Educational Institution, namely to the Academic Services – an administrative department.

The rest of the paper is organized as follows. In the next section we detail some important concepts of BAM, namely dashboards and alerts. In Section 3 we present the case study namely the research methodology and the several development stages. In Section 4, we present the conclusions and future work.

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 applied to organizations of different nature such as a hi-tech manufacturer [9], [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. 3 THE CASE STUDY

In this chapter we present the research methodology and the several development stages.

A. 3.1 *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. 3.2 Development stages

In the next subsections we present the several development stages.

1) 3.2.1 Diagnosis

The Polytechnic Institute of Viana do Castelo (IPVC) is a high public educational institution, which has its own Academic Services. It implemented a Quality Management System (QMS) that allowed ensuring the ISO 9000 certification. The QMS covers IPVC main activities materialized in many processes. IPVC integrates seven organizational structures, namely, five schools (Education School, Agricultural College, Technology and Management School, Management Sciences School, Health School), Social Services and Central Services. The high schools are oriented for teaching projects and the Social Services oriented for the social services rendered to the students. The central services assure the institutional coordination of the personnel administration activities and the coordination of many departments as: patrimonial, administrative, financial, global planning and technical [13]. Regarding the Academic Services, the most important department for this paper, its mission concerns on issues connected with:

- Providing support for undergraduate, master and postgraduate programs.
- Providing administrative support for research and academic recruitment.
- Organizing the applications, admissions and reception for new students and staff.
- Enrolment and registration of all students and eligible candidates.
- Organizing and maintenance of academic programs and student records.
- Issuance of transcripts, certificates and diplomas.

Academic Services Department deals with data that is important to analyze. Therefore the following KPIs could be defined on the benefit of the department:

- Rate of online subscriptions per academic year
- Number of issued diplomas per year

- Number of programs in the Institute per academic year
- Number of publications and activities per departments
- Rates of enroll of students per subjects
- Number of regularized subject, regarding launch grade

For the remainder of this paper, we will focus on the last defined KPI which we detail next. To receive on time updated information about teachers who launched/not launched grades, represents a highly important requirement in order to measure successful performance of Academic This department should keep updated information in order to provide current, efficient and needful report in case of necessity. On another hand, it represents a requirement for students in order to get their diploma or, for instance, make an inscription for retaking a test. As BAM gives ability to display fresh real-time information in a friendly view, it gives ability to the Academic Services Department to analyze the current situation. Additionally, BAM alerts can be used to react on specific times. For example, generating and sending emails to school board about grades launch status, or reminding teachers to launch their grades. Summarizing, currently there is no adequate information in the Academic Services regarding grades launch. As one of the benefits of BAM tools is to help in current data analysis, our purpose is to see how well these tools adapt in this concrete scenario.

2) *Action Planning*

With the definition of the goal, we started to think of how to address the problem. Two main tasks need to be performed: implement the system and then evaluate it in order to conclude how well it suites the scenario. Before starting the implementation work, we first needed to choose the tools to use bearing in mind that costs are always an important aspect to any organization. After that, we could move on to implementing a BAM solution for improving the grades launch process. To learn about the real benefits of the adoption of this kind of tool to a school environment, we ran a questionnaire on the most important parts involved.

3) *Actions taken*

a) *Tools selection*

The tool choosen for implementing the prototype had to be one with already reliable and comproved results as it is out of the scope we defined for this particular study an exhaustive tools comparison. Having said this, we chose Oracle BAM for the comproved efficiency in process monitoring and also for several demonstrated features such as the ability it provides to executives to monitor their business services and processes in an enterprise or organization, KPI's correlation and the ability to change business processes quickly and to take corrective actions. Although for this prototype implementation we do not make use of all of these features, they could be important for the continuation of the project.

b) *Implementation work*

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, 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.

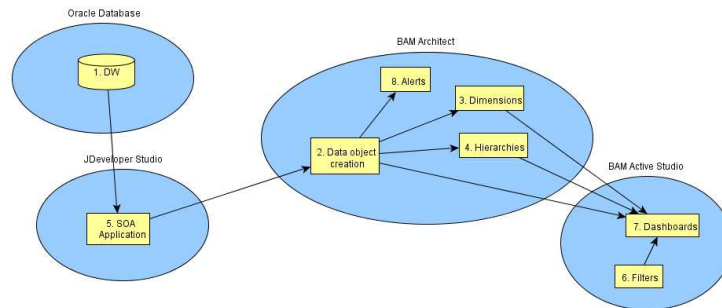
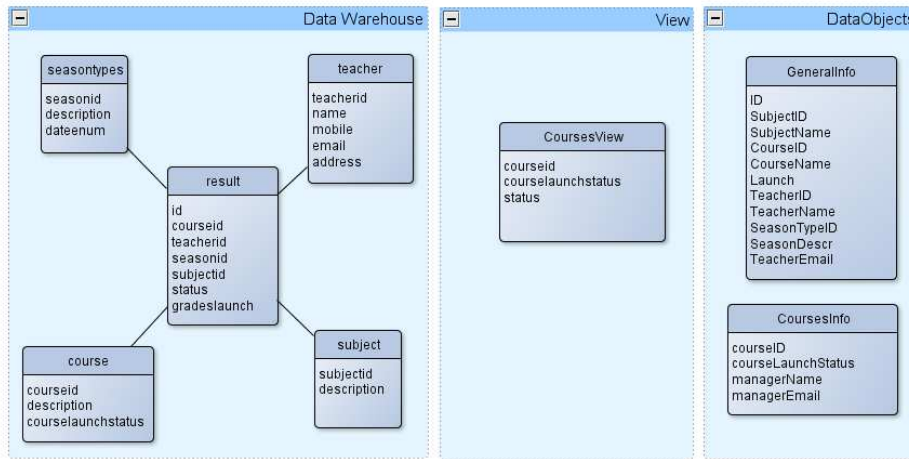


FIGURE I. ORACLE BAM IMPLEMENTATION STEPS

Regarding the DW model, a star model was used and is illustrated in Figure II. It has one fact table – result table - and four dimensions - teacher table, subject table, season type table and course table. When data is inserted or updated in the fact table, a trigger automatically sets the value of field to modified. BAM uses only modified rows to fill BAM data object for general information, composed of the fields illustrated on Figure II. A view is then created to display information on the launch status of each course which depends on the launch status of its subjects. This information will be used to feed the dashboards. The view has the following fields: *courseid*, *courselaunchstatus*, and *status*. When all subjects of a specific course are launched, the field *courselaunchstatus* is assigned the value “yes”. In addition to this information the field *status* will get the value “updated”. This field will be used to know which records should be migrated to BAM, to the data object of courses, presented on Figure II.

FIGURE II. DW, VIEW AND DATA OBJECTS

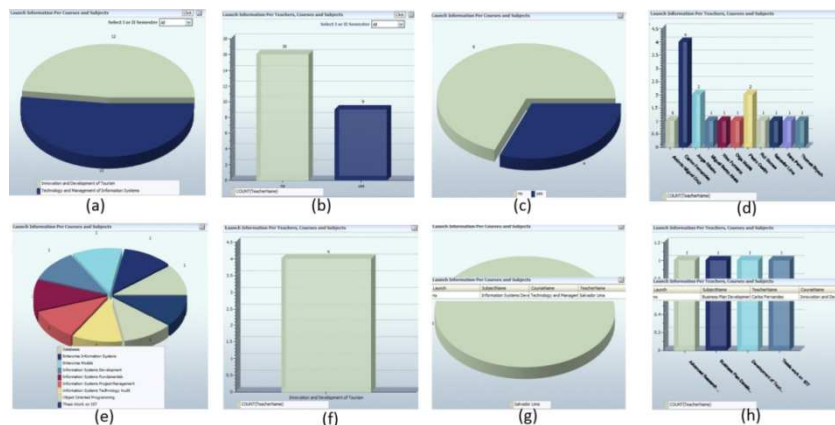


After all data is migrated, dashboards and other visual forms were created in Active Studio. In this prototype, two dashboards were created in one report, with the ability to drill down through hierarchies of courses, subjects and teachers and filter according to the semesters. The filter was set on `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).

FIGURE III. DASHBOARDS



Regarding the alerts, the following were created:

- Notify teacher on a preconfigured date for first semester

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- 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 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.

4) Evaluation

In order to obtain relevant feedback regarding the pertinence of the adoption of a BAM tool in scholar environment, namely the functionalities of the prototype developed, some questionnaires were made to the two main parts involved in the launch grades process of four different schools: board members and academic services personnel.

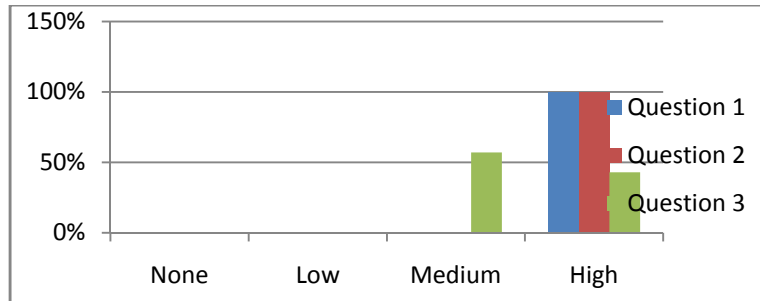
School board members

Regarding the school board members, the following questions were made:

- [Question 1] How do you classify the importance of the School Board knowing the launch grade status?
- [Question 2] How do you classify the relevance of an automatic mechanism for notifying teachers of deadlines for launching grades?
- [Question 3] How do you classify the importance of providing graphics by course/teacher/subject regarding the number of launched grades?

Four distinct answers could be given: none, low, medium and high. The received answers are expressed in Figure IV.

FIGURE IV. SCHOOL BOARD QUESTIONNAIRE ANALYSIS



Academic services personnel

Regarding the academic services personnel, the following questions were made:

- [Question 1] How do you classify the importance of the launch grade process, in proper time? (Possible answers are none, low, medium and high)

We received the same answer to this question – High.

- [Question 2] Name some situations/consequences of the delay of this process.

The situations pointed out by academic services personnel, and also the percentage of personnel that indicated it, are expressed in Table I.

TABLE I. CONSEQUENCES OF NOT LAUNCHING GRADES

Problem	%
Problems in school year planning: delay in generation of lists of enrolled students per subject and semester	16,7%
Delay in the analysis of situations of students for granting scholarships	33,3%
Delay in the analysis of situations of students for special season inscription	66,7%
Delay in the analysis of situations of students for inscription renewal	50%
Delay in diploma issuing	50%

According to academic services personnel, there are five main consequences of not launching grades on time.

- [Question 3] How many cases exist, in average per semester, of pending situations because of grades that are not launched? (Possible answers are: none, 1 or 2, around 12, more than 12)

We received three answers with the option “None”, one with the option “1 or 2” and another one with the option “more than 12”.

5) *Learning obtained*

Important knowledge was acquired from this work regarding the pertinence of adopting a BAM tool to a school environment.

On one hand, the answers received by the school board members traduces the importance recognized by management people of receiving information on grades launch. Only one question didn't have a 'high' response from everyone – the one that has to do with the availability of graphics with statistics. This reflects that the most important thing, from the management perspective, is that the launch process works, rather than having feedback on it.

On another hand, regarding the academic services personnel answers, we learned that great importance is given to the launch grade process on time, which confirms the importance of this solution from the perspective of those who deal directly with students grades. Regarding the situations or consequences of delays in the grades launch process, five main aspects were pointed out and three of them are mentioned out by half or more of the respondents. Finally, regarding the number of pending situations for grades not launched, we obtained different answers and, crossing this information with the dimension of schools, we can conclude the number of situations grow with the number of students what can indicate us that the pertinence of the automatization of this process is related to the dimension of the High School Public Institution.

IV. CONCLUSIONS AND FUTURE WORK

In this paper we described a case study regarding the adoption of business activity monitoring tools to a scholar environment, namely to an administrative department responsible for grade launching. In order to conclude about the usefulness and pertinence of this adoption, we choose Oracle BAM, a tool with recognized success for monitoring processes, and implemented a prototype with each which allowed us to understand the strong and weakest aspects of the implemented solution.

The prototype was used as the basis of questionnaires made to the most relevant actors that interact with the grades launch process – school board members and academic services personnel – which allowed us to take important conclusions about the pertinence of adopting a BAM tool in a school environment.

The main conclusions regarding school board members are the common opinion that the tool can help improving the process. Academic service personnel's feedback allows us to conclude that this need can depend on the dimension of the school as with fewer students, BAM tool adoption might not be so relevant.

As a continuation of this work, we defined three main aspects. First, we intend to extend both prototypes so they can support other KPIs important to the Academic Services Department. The second aspects relates to the extension of the prototype's domain, analyzing the relevance of other departments beside the Academic Services where a BAM tool can also be of use. Finally, the third aspect is to extend the questionnaire to the students as we believe we can obtain important feedback from them.

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