Business Intelligence Framework in Higher Education Admission Center (HEAC)

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Abstract:- In recent year found that many organizations used Business Intelligence (BI) in most of sectors in order to gather, consolidating, analyzing , and providing access to data to provide better decision-making to be faster than ever before by providing the right information to the right people at the right Time. This paper proposes Business Intelligence (BI) framework for Higher Education Admission Centre (HEAC) to simplify and integrate business critical data of a multi-schema database by using an Active database approach uses active rules, called Event-Condition-Action (ECA) rules. This paper explores the problem in HEAC, BI overview, BI component, BI features, BI framework, active DB.

Keywords – Business Intelligence, Active Database, BI framework

I.   INTRODUCTION

In 2006, Higher Education Admission Centre (HEAC) designed and established an electronic admission system where students could apply to Higher Education Institutes (HEI). Since then, HEAC had a production database which contains different schemas. Each schema is built yearly based on the received data from Ministry of Education (MOE), this data is used basically to allow students to register and then to do other procedures which is related to their choice in higher education study.

With the emergent volume of student data handled by HEAC in fast system structure changing environment to each schema based on the yearly requirements. However, the emergence of the project idea came from the difficulties and obstacles experienced by database management specialists during report generation required by other departments and staff; such reports are needed for decision making on issues related to students.

The purpose of this research is to propose a Business Intelligence (BI) framework for Higher Education Admission Center (HEAC) to simplify and integrate business critical data of a multi-schema database. The advanced built- in BI analytical abilities enforce faster strategic decision making and helps forecast the total number of graduates from the General Application Diploma or equivalent; and assess their admission needs.

Moreover, the research intends to solve the differences in schema structures that result in database queries variationwritten by HEAC's data management specialists to produce irrational outputs .An active database approach along with a BI framework are suggested, in order to improve HEAC services, achieve better operational efficiency, and foster students' relationship in Oman.

II.   BUSINESS INTELLIGENCE OVERVIEW

Today's one of the top priority in the world organizations by using Business Intelligence (BI) for higher qualitative decision making. The concept of BI refers to the technology , which are used to gather ,storing , provide access and analyze the data into information and turn it into knowledge in order to help the decision - maker to provide better decision making to guide their organizations (ZHANG, Liyi and Tu, Xiaofan , 2009).

In addition, Arnott (2004) expressed the role of BI is to extract the information which are important in the work environment and present that data into information to be more useful in management decision-making (ARNOTT, David et al., 2004).

The BI philosophy is about management and analytical tool that used to manage and refine the information to deliver more effective decision at the right time. (PIRTTIMÄKI, Virpi et al., 2005)

III.   BUSINESS INTELLIGENCE COMPONENTS

The beginning point of this research is to identify the key components of BI. In many research works, found that online analytical processing (OLAP) and Data warehousing (DWH) considered as component of BI. However, OLAP and DWH are the technologies or set of concept arrived priors to the real generation of BI. Further, BI tool systems are built on the concept of OLAP and DWH, but they have their own framework and set of components to produce a BI system Business intelligence system (BIS) described that can help HEAC to have more overall about knowledge of the factors that affecting the work environment example, like enrolled students, applicants , applicants who got offers and accepted offers. Thus, BIS uses to exploit information in order to help the top managers to make better decision and solve the problems whether structured and unstructured.

Olszak & Ziemba (2007) expressed that each BIS component represents task used to exploit information in order to perform five actions in decision-making which include acquiring, searching, gathering, analyzing and delivery of information's (OLSZAK, Celina M. and Ziemba, Ewa, 2007). The following are the key components of BIS:

1. Historical Data
2. Master Data Management
   • Data Aggregation
3. Business Intelligence Management
   • Data Quality
4. Cubes
5. Report
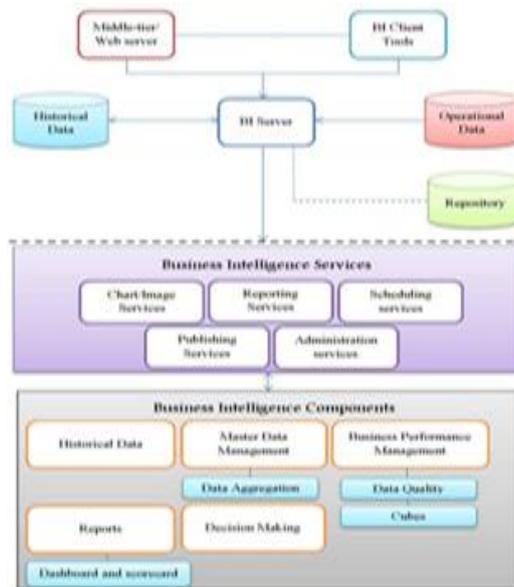   • Dashboard & Scorecard
6. Decision Making.

Figure 1: BI Components and BI environment

III.   BUSINESS INTELLIGENCE FEATURES

BI is a set of technology and tools that provide many features to organize which are used to collect, integrate data, report on, analyze and improve the operations performance. Further, BI is designed to fulfill the requirement of the HEAC's employees, by using BI in their daily operation and take decisions based on BI reports produced from the different schemas. However, BI tool provides many features for HEAC users as follows:

• Reduce the time spent in producing reports, increase performance.
• Enable employees to collect accurate information for the decision process (NEGASH, Salomon, 2004).
• Improve the quality of work by achieving larger strategic and tactical initiatives.
• Allow users to gather information more quickly and respond to changes constantly.
• Faster decision making based on analytical report information.
• It supports forecasting future requirements with respect to time series using analytical data reporting and have an in depth knowledge about the students' details.
• Provide key performance indicators (KPIs) to identify the present data status in HEAC and determine a course of action. (RANJAN, JAYANTHI , 2009)
• BI system helps HEAC employee's work more effectively as a team, to achieve the goals. (OLSZAK, Celina M. and Batko, Kornelia, 2012).

IV.   BUSINESS INTELLIGENCE FRAMEWORK USING ACTIVE DATABASE APPROACH

In this paper proposed a framework with BI solution using an active database approach to HEAC users, and IT department is depicted in *Figure 2*
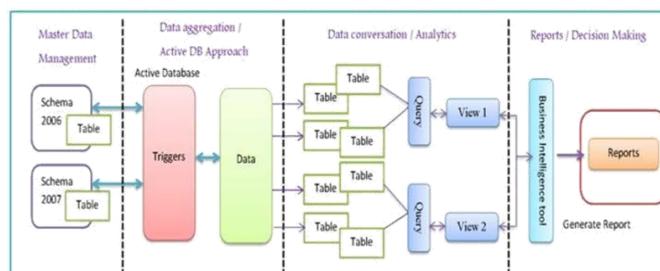

Figure 2: Business Intelligence framework using Active Database Approach

The proposed framework empowers to monitor, integrate, retrieve and store information needed by the form .As the name suggests, the framework format consists of four categories .These four categories are described in details in the following subsections.

1. Master Data Management: The data stored in the central database repository. The database contains of different schemas. Each schema is built yearly based on the received data from MOE.
2. Data aggregation / Active DB Approach: The active database support mechanisms that perform operation automatically based on the particular events in the database. The active behavior (Triggers) of the database defined by ECA rules (Event-Condition-Action)in order to aggregate the data to get more information in particular groups to produce statistical analysis.
3. Data conversation / Analytics: is processed to convert the data from tables to views by writing SQL queries
4. Reprots /decision making: is final stage used by the end-users to generate reports to analyze the information supported by BI tool to help them in making more effective decisions.

V. ACTIVE DATABASE APPROACH

The Database Management systems provide an active mechanism for database operation. An active database isMechanisms that perform operation automatically based on the particular events in the database. (XIANG, Shang , 2009)

The active databases are organized by a set of active rules and each rule defines various states of the database. These rules include three sections: Event, Condition, and Action (ECA). (NAJAFABADI, Hamid and Navin, Ahmad, 2012)

VI. EXTRACTING DATA

ECA rules refer to active database structure, each rule determine specific task. In this part, According to figure 3.0 briefly describe when the specific event is occurring in the body of the rule, then the condition section evaluated, if its correct then the action part will be executed and the transaction is generated. Once the active database rules are defined , then will be used automatically during execution.

```
CREATE OR REPLACE TRIGGER "HEAC13".TRG_BI_CAS_M_SUBJECT
BEFORE INSERT
ON CAS_M_SUBJECT
REFERENCING NEW AS NEW OLD AS OLD
FOR EACH ROW
DECLARE
l_NextVal NUMBER;
BEGIN
    l_NextVal := 0;

    SELECT SEQ_CAS_M_SUBJECT.NEXTVAL INTO l_NextVal FROM dual;
    :NEW.SUBJECT_ID := to_char(sysdate,'rrrr') || l_NextVal;

    EXCEPTION
        WHEN OTHERS THEN
            -- Consider logging the error and then re-raise
            RAISE;
END ;
/
```

Figure 3: Show ECA rule applied as a trigger

VII. DATA ANALYSIS

The reasons behind to implement the BI in HEAC are:-

1. Data protection: - it allows the users to access the data stored from different schemas by using single point and give authorization privilege's to an appropriate level.
2. Allow the HEAC users to access any type of data faster and easier process in order to provide better decision making.
3. To be more improvement ,efficiency by allowing the Higher Education Institution (HEIs) users to access to certain data.
4. To be more efficiency improvement by allowing the Higher Education Institution (HEIs) users use BI tools to have easy access to student data and they can create reports based on Institution, program, year.
5. Improved decision-making and monitoring in all departments in HEAC.

VIII. CONCLUSION

To summarize, it can be stated that, the Higher Education admission center has a deeper data in different schema in the database. However, without the system that make the data aggregation will not be able to use these data in practices and it can be rich data but poor in information.

Moreover, HEAC are realizing that the data and Business Intelligence (BI) systems are crucial in making decision process that will improve the decision process in solving every day and quality of generate statistical reports.

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