

E-government Supported by Data warehouse Techniques for Higher education: Case study Malaysian universities

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Abstract:-

The education in Malaysia is on the right way to be one of the best education systems in the world. The goal is to make the Malaysian education in centre of the global map by enhancing the academic excellence; it's one of 2020 plan in Malaysia that has been made by Mahathir Mohammad in 1991. That plan focuses on finance and banking, biotechnology, information and communication technology (ICT), information technology (IT), multimedia content development, advanced manufacturing and industrial design. Within short time Malaysia has now more than 50 universities (public and private). However, all of these universities use the e-government to connect with ministry of higher education, but this plan will attain success in only one university, it won't be shared with others. Our case study is APEX (Accelerated Program for Excellence) that has been used in *Universiti Sains Malaysia* (USM) in 2008. This idea was focused only on one university in Malaysia, because there is no sharing for knowledge between Malaysian universities. This paper create a framework that uses data warehouse platform to merge the universities' databases in one common warehouse with e-government Technologies, which increases sharing information among the university's department itself and with other universities' departments.

Keywords

E-government, G2G, information sharing, Data warehouse, Apex University

1- Introduction

E-government uses information communication technology (ICT), information technology and internet to connect all government's departments with citizen to give them the best services wherever and whenever they are [1].

Generally E-government has made government more active especially with the citizen. There are many types of E-government such as Government-to-Government (G2G), Government-to-Citizen (G2C) and Government-to-Business (G2B), the most important in these types is the sharing of information because it aims at the cooperation among government's agencies [2]. G2G issue is about sharing limited information among agencies [3]. Even if the government use more computerized and networked between their departments by internet and mail that makes the information available in one department, and might not be obtainable to other department [4].

1.1- Apex University (AU)

National Higher Education Action Plan (NHEAP) defines AU to be the centre of academic distinction, headed by visionary, motivated and committed leaders, comprising of talented and renowned academicians, filled with local and international students who possess a high standard of academic excellence, and equipped with state-of-the-art facilities. The aim is to become a melting pot that combines the best education while nourishing the minds of scholars from a diverse background. An APEX University (AU) was further introduced in 2008 with Universiti Sains Malaysia (USM) being chosen as the trailblazer in this new education revolution. The development of AU aims to fulfill Malaysia's thirst in having a world class university. It has increased research, development and commercialization activities, the number of post-graduate and post-doctoral graduates, the number of academicians with PhD, number of international students, solid centers of excellence, and improved university ranking in THE-QS in 2010 [5].

1.2- Information Sharing

In recent ten years, information sharing has been used in the acceptance of partnership for business, government and non-profit organizations issues and tried to solve social and environmental problems. In the 9/11 scrutiny of terrorism events, countries started to think about sharing the information among their agencies. In our current age of high mobility and increasing availability of technology, there is still limited information sharing among government agencies that reduces the likelihood of getting caught when they exchange it [6]. In current time, we are witnessing the birth of "Federations of Universities", to make integrated learning environment for students by sharing resources [7]

1.3- Government-To-Government (G2G)

It's one of e-governments parts. (G2G) describes internal operations for the government agents in the government itself. Government-to-government tries to enhance sharing information and improve interaction among the government's departments. Information sharing in G2G between government agencies is one of the most active part which uses to development government architecture. With efficient information sharing solutions, government agents can be able to share their successful idea and knowledge [8].

1.4- Data Warehouse (DW)

According to Bill Inmon [9] a data warehouse is "a subject oriented, integrated, non volatile and time-variant to gathering collection of data that uses to support making the decisions". The common warehouse gets the different data which are distributed in heterogeneous resources. Moreover DW extracts useful information from heterogeneous data sources and loads them to a common warehouse. There is no delete and update to warehouse's information because there is place for historical data. Also data warehouse has many tools such as (Online

Analytical Process, Data Mining and Decision Support System). These tools use to analyze and mining the information for DSS to make a best decision [10][11][12].

2- Summary Of Related Work

The main issue for the e-governance is the limited sharing of the information which means that the data won't be available in every department. This leads to weaknesses in making decisions, slow in developing and difficulty in solving the problems as well as the unreal in result. To meet these needs, there is a new kind of technique that has evolved and matured in the last few years.

2.1. E-Governance and Data Warehousing

Data warehouse can be explained as a subject-oriented, integrated, time-variant, non-volatile collection of data, cutting across the enterprise. Application of mining tools to examine and help in strategic government decisions is unattainable unless there is a storage area of exact data across the enterprise value chain.

A lack of resources in one department and overabundance of resources in the other is sometimes encountered by the government's departments. The reason behind could be due to non-availability of correct data and ease to scatter information. The information available in one department (which possesses the data) might not be used by other sectors though the government departments are more computerized and networked for the purpose of Internet usage and mail transfer.

This is because of the fact that the information is kept in various formats, in different platforms and in heterogeneous data base systems. A pattern is shown at the information requirements at each level and the information flow across levels. Eventually, information that flows from top (fund sanction, allocation and disbursement details) is detached to generate information for lower levels. However, information that flows from grass root level (such as expenditure details, benefits details, beneficiary

details etc.) is solidified to generate information for higher levels. As such, the pattern provides the entire vertical domain of e-Governance framework with an ideal domain for the development of data warehousing and use of data mining applications is shown in figure1[13].

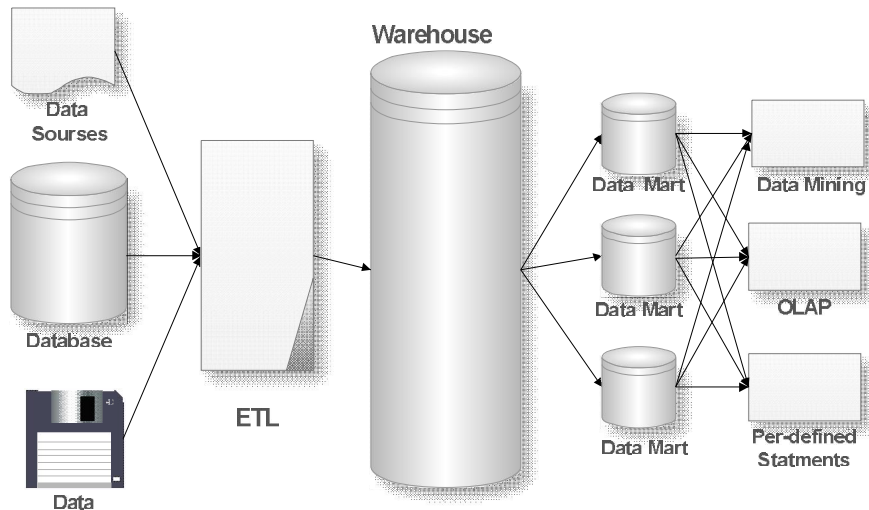


Figure1. Architecture of e-government data warehouse

2.2. Data Warehouse In Higher Education

Recently data warehousing has become aware about the profits for public administration. Data warehousing technologies have boosted in interaction between data analysis and reporting (INMON 1996) [14]. Moreover, it provides categorical structure for static data and variable data.

Any increase in variable data to static data might lead to an automatic conversion of the static data to control data. Data structure would further enable automatic modification of relevant database. The database structure should have multidimensional processing pattern not only to the need of the departments but also the end clients i.e. the citizens.

Many universities in the world work independently. The data process can be made automated or time bound with the help of e-governance application. All details needed for the approval of information can be fetched by a data warehouse. A fair allocation of available information is provided by the help of a data warehouse.

Similarly, E- Governance system, by using centralized database can help university bodies to provide opportunity for universities. The departments can provide a common platform for best performing government and industry seeking employees to interact for projects and researches. The universities' departments can very easily get the details of universities in various fields with the help of data warehouse[15].

3- Data warehouse e-government framework for universities in higher education

A data warehouse brings together data from multiple internal and external data sources into common warehouse (INMON, 1996).

The main purpose of the Data Warehouse is to serve as a central reporting and data distribution environment for regulating data and information. The Data Warehouse acts as a hub, to facilitate the exchange of information between systems and therefore serves as the enterprise information infrastructure [16] [17].

The accessibility, transparency, efficiency and impact of e-governance service will be automatically evaluated, which will produce a large amount of data. We will propose a framework of data warehouse which is expected to meet the demand of the data storage needed by e-governance application.

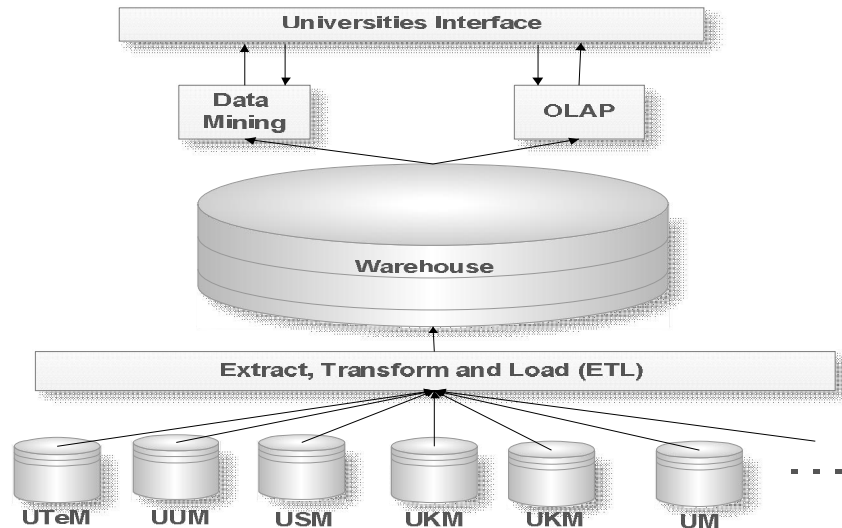


Figure2. E-government data warehouse framework for Malaysian Universities

3.1- The Database Layer

In this layer data, information and documents should collect from universities' data sources such as USM's, UTeM, UUM, UKM, UM, UTM and so on.

3.2- The ETL Layer

Extract, Transform and Load tool this tool gathers the clear information from universities' databases then fit these information with operational needs after that load the collected information into common warehouse.

3.3- The Warehousing Layer

Warehouse in data warehouse saves the universities' information depend on the type and time (current information and historical information). Common warehouse leads to increase information sharing between university's departments. And it develops the interaction among agencies in these different universities. Also easily respond to staff's queries because of universities information save in huge warehouse.

3.4- The Tools Layer

Online analytical processing (OLAP) it analyses information to make valuable reports to the universities' departments. Moreover, it supports multidimensional view to analyze the data. On another hand Data mining (DM), it mines information in the warehouse to supply statistics information for universities.

3.5- The Interface Layer

E-government application applies to get analyses and mining information to agencies in universities from the common warehouse by internet and network connections.

4- Conclusion

We investigated the application of the data warehouse for the e-government, from the point of view of providing the information sharing and interaction between universities in higher education. By extending the depth and width of information sharing from building the data warehouse in the e-government, we proposed framework to increase information sharing and enhance interaction between the agencies in universities, combining the practical example of Malaysian universities. The proposed method is much more important to improve the standard and quality for the e-government to share knowledge, ideas and information.

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