Metadata Technique with E-government for Malaysian Universities

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Abstract

The universities in Malaysia have made a good plan in their education layout to achieve the top educational rank. 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, information technology, multimedia content development, advanced and manufacturing. Recently in Malaysia there are more than 50 universities. All the public university has its own e-government application to give the staff online connection and to provide best service to people. But there is no sharing with other public universities. Therefore if there is plan will attain success in only one university, it won't be shared with others. In *Universiti Sains Malaysia* (USM) they use APEX (Accelerated Program for Excellence) that has been used in 2008. This idea was focused only on USM in Malaysia, because there is no sharing for knowledge between Malaysian universities. This paper creates a framework that uses data warehouse techniques such as metadata common warehouse to support the universities' e-government. As such it increases sharing information among the university's department itself and with other universities' departments and gives better understanding which can reduce delay and strengthen the efficiency of sharing the information for government.

Keywords: *E-government, USM Succeeded Plan, information sharing, E-Government information sharing, Data warehouse, and Metadata for Information Sharing.*

1. Introduction

E-government provides e-services to people by using information communication technology (ICT), information technology as interfaces and internet to connect all government's departments with each other and with citizen to give them the best services wherever and whenever they are [1].

Actually, E-government has made government more active especially with the people. There are many types of E-government such as Government-to-Government (G2G), Government-to-Citizen (G2C), Government-to-Business (G2B), Government-to-Employee (G2E) and Government-to-Visitor (G2V). The most important in this kind of e-government is sharing of information and knowledge in one hand and interaction in another hand. Information sharing aims to cooperation between government's agencies or with citizen [2]. G2G issue is about sharing limited information among agencies [3]. Even if the government use more computerized and networked between their departments by interment and mail that makes the information available in one department, and might not be obtainable to other department [4].

1.1. USM Succeeded Plan

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

It is a concept of sharing the information and knowledge among employees, agencies and people. Since decade, business, non-profit organization and government have been facing hurdles due to information sharing. In the 9/11 scrutiny of terrorism events, the theory of information

sharing has been considered to be their priority to solve their issues [6].

1.3. E-Government information sharing

Countries started to think about sharing the information and create interaction between their agencies to get high performance and good services. 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 [7]. In current time, we are witnessing the birth of "Federations of Universities", to make integrated learning environment for students by sharing resources [8].

In e-governments there is part called government to government (G2G). It 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 [9].

1.4. Data Warehouse (DW)

Data warehouse is "a subject oriented, integrated, non volatile and time-variant to gathering collection of data that uses to support making the decisions"[10]. The common warehouse collects clean data from difference heterogeneous resources. Moreover DW extracts useful information from heterogeneous data sources and loads them to a warehouse. There is no delete and update to warehouse's information because it's huge repository therefore there is place for historical data. Data warehouse has tools use to control or make a report, analysis and answer queries such as (Online Analytical Process, Data Mining, Decision Support System and ad-hoc)[11][12][13].

1. Relevant literature

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.

1.1. Data warehouse techniques supports E-government technology

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[14].

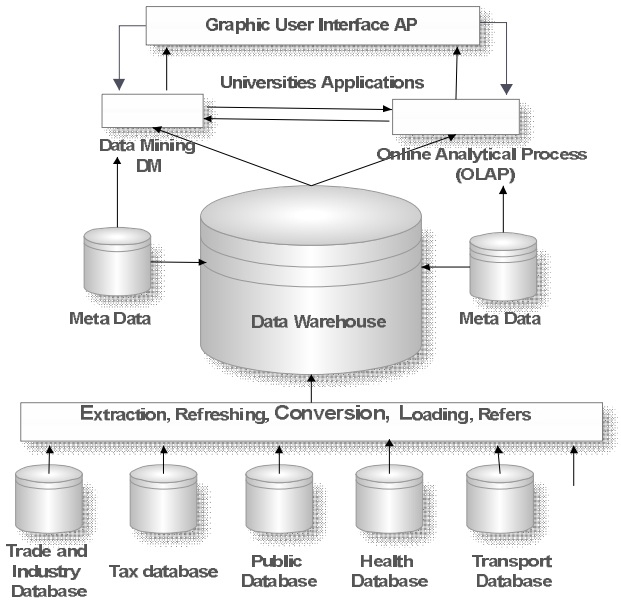

Figure1. The role of the data warehouse information in e-government integrated management

1.2. Higher Education Uses Data Warehouse techniques

Recently data warehousing has become aware about the profits for public administration. Data warehousing technologies have boosted in interaction between data analysis and reporting [15]. 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 [16].

1.3. Meta-data Tool for Information Sharing

Meta data is "data about data". That means we can get useful data from the data itself. Therefore it will make a difference in information sharing for better understanding which can reduce delay and strengthen the efficiency of sharing the information. Moreover, metadata is one of data warehouse tools which are found in the warehouse. Thus, when organizations use DW techniques it definitely makes a difference in information sharing [17].

1.4. MOHE Data Warehouse System in Malaysia

Data Warehouse for the MOHE in Malaysia it is connected data sources in the transactional system of the universities. Therefore, it's consisted of universities' databases and Data Warehouse tools. A staging database is situated between the database and the multi-dimension database (MDDB); it contains one relational database for each university (20 universities). Here, all the data will be extracted and collected from each university separately to its own database at the end of each semester, cleansed, and prepared. Then it will be loaded into MDDB. The portal on the web server1 uses to update the new data in multi-dimension databases. Thus, it provides huge numbers of reports and statistics to help the administrators and data monitor. After this step, MDDB data will be loaded into Multidimensional On-Line Analytical Processing (MOLAP). At last, MOLAP server refreshes data from MDDB and MOHE users can query MDDB or MOLAP by using web server2 [18].

3. E-government Data warehouse framework for Malaysian universities

A data warehouse has ability to collect data from multiple inside and outside data sources into common warehouse through Extract, Transform and Load (ETL) tool.

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 [19] [20].

Moreover, metadata tool in data warehouse gives better explanation and useful information from the data itself. Therefore, metadata is created to provide advanced understanding for information that is shared [21].

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

3.1. The Database Layer

In this layer data, information and documents collect from Malaysian 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 transform this information after all the collected information will be loaded into common warehouse.

3.3. The Warehousing Layer

The storage in data warehouse contains historical and current data. Because of the huge warehouse doesn't include

delete and update for its data and information. This common repository 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. Moreover, the metadata inside this storage gives better understanding for the information that is shared between agencies in the government when they use e-government applications.

3.4. The Tools Layer

Online analytical processing (OLAP) or MOLAP it makes valuable reports to the universities' departments by analyze their data and information. 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. Also there are many tools in DW such as DSS and ad-hoc to make a decision and quires

3.5. The Interface Layer

It can also be called as E-government application layer because in this layer e-government application can be used to access the information and to send queries and receive responds. From this interface information can be shared and exchanged between agencies and also can enhance the interactions among them.

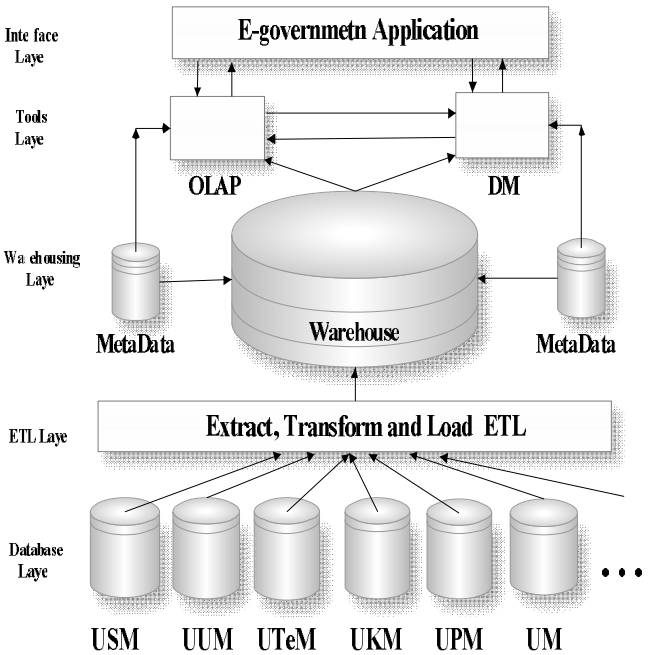

Figure2. E-government data warehouse framework for Malaysian Universities

4. Conclusion

We investigated the application of the data warehouse for the e-government; from this point of view information sharing and interaction issues are provided between public universities in Malaysia. However, there is issue for sharing information and interaction between agencies in the ministry of education and higher education. Nevertheless, by extending the depth and width of information sharing from building the data warehouse in the e-government, we proposed a framework to increase information sharing and enhance interaction between the agencies in universities. Furthermore, it makes better understanding for information that will be shared by using metadata tool. The proposed method is much more important to improve the standard and quality for the e-government to share knowledge, ideas and information. However, our paper can help all the higher education in developing country in Asia. Because according to AlMobhouh, data warehouse systems can solve higher education separate database issues [22]. And it will improve e-government universities system.

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