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A Survey of Data Warehouse Implementation for E-Governance Systems

KEYWORDS

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ABSTRACT *Data Warehouse is widely adopted concept by private enterprises around the world. The Data Warehouse implementation provide several advantages such as "better analysis of data", "integration of data from various sources", "ad hoc reporting", "improving quality of data", "reduce cost and time to access historical data" and many more. In last decade, the Data Warehouse is successfully implemented in private sector. Similarly, the government bodies and researchers around the world have also realized its potential and started exploring opportunities to design and implement Data Warehouse for e-governance systems. This paper explores Data Warehouse design and its implementation for various e-governance data.*

1 Introduction

The survey provides sound foundation to carry out research work in any discipline. Considering its immense importance, the survey on data warehouse and its implementation on e-governance data are discussed. This is very essential as survey will provide knowledge about past studies and different methodology adopted by researchers around the world. The survey include "Data Warehouse" concepts and its implementation in various fields like "personalized information service", "travelling", "National Social Security Fund", "Education", "Agriculture", "Criminal Information" and "Police department".

2 Survey of data warehouse for e-governance data

Xilin Liu et al. study the application of data warehouse in e-government for the personalized information service. They provided comparison between tradition database management system and data warehouse. Furthermore, they discussed about related department and concerned information considering subject "Tour". They discussed about travel types, the scene spot and price, weather information, bus schedule information etc…Considering these information and departments related to them, they proposed star model for tour subject. Their study showed that proposed data warehouse star schema design is important to improve the standard and quality for the e-government personalized information services [1].

Mohamed Salah GOUIDER et al. discussed about building data warehouse using National Social Security Fund's data of Tunisia. They used Oracle's ETL tool for data extraction, transformation and loading. They integrated data from various sources such as CICS system, Insured Persons management system, Oracle database, excel files etc…. In addition to Oracle ETL tools, they also developed their own ETL tools to build data warehouse. After identification of various data sources, they designed data warehouse using star schema. They created OLAP and performed roll up, rotate and slice operations on various N-dimensions cubes for the knowledge retrieval. They produced very useful reports such as distribution of social benefits, social benefits to insured person, social benefit balance amount, etc… using Oracle business intelligent studio, Their finding proved that data warehouse is very useful and essential for e-governance [2].

Laila Mohamed ElFangary applied data mining techniques on students' databases in educational institutions. Their research showed that data mining can be used to predict and improve students ' retention rates. They followed step like business understanding, data understanding, data preparation, modeling, evaluation and deployment in their research methodology. The data was extracted from the mission database for the practical implementation. From the mission database, subset of data, like the missioners and the mission's data, countries, specialties, departure date, arrival dates, extension requests from the missioners etc…were taken. These data were extracted into a data warehouse for the analysis purpose. Their research work demonstrated several results in the form of charts and tables that end user can easily understand and use for further analysis. Their research results showed various reports such as, the missioners achievements and their marital status, the percentage of delayed missioners in each country, missioners specializations in Austria, the percentage of succeeded missioners in each country etc… Their research work demonstrated that data mining can be extremely useful to understand historical trends and predict future trends [3].

Sonali Agarwal et al. proposed a nationwide data warehouse. In their proposed conceptual model, district level data warehouses are connected to state level data warehouse. Similarly, many state level data warehouses are connected to national level data Warehouse. Their conceptual model shows that state level data warehouse is connected with several type of databases like RTO, election commission, passport, citizen database, income tax, bank etc…Their proposed data warehouse model suggested many advantages of using data warehouse at national, state and district level. However, it also suggested that there are many bottlenecks for practical implementation. In the same research paper, they demonstrated use of data mining in the field of agriculture. In their case study, they used rice data, sugarcane data, and temperature data for empirical analysis. They performed various experiments using Weka data mining software. Their research work showed that many interesting patterns are discovered using data mining techniques [4].

Prateek Bhanti et al. proposed logical architecture of data warehouse and data mining model with special reference to e-governance for higher education system. They proposed logical data warehouse architecture for university system. They discussed star schema design and its advantages for university system. They concluded that there are several advantages of using data warehouse and data mining in higher education. According to their study, the key advantages were better understanding the citizen needs, effectiveness in operations, performance monitoring, effective strategies and better policies for citizens [5].

S S Suresh et al. highlighted the use of data warehouse with student information in e-governance system. They proposed conceptual design of student performance e-governance

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data warehouse. They designed data warehouse with multidimensional data model within e-governance architecture. They proposed star schema design for student performance analytics. They considered various dimensions like student, academics, course, internship, hr, placement, college, student skills etc…Their research paper concludes that, student dimension can be used to understand different attributes like skills, marks and link them to measure the performance of a college. They suggested that student placement process can be improved, recruiter can easily find students, and government can monitor colleges and students [6].

Juan C. Rivera-Vázquez et al. proposed data warehouse to store criminal information that will be helpful in crime prevention and locating criminals for the Police department of Puerto Rico. Their suggested architecture uses various data sources like vehicle, sexual offenders, weapon registry, drugs etc…Their proposed approach uses various data sources and integrate it using Microsoft SQL Server and create data marts and data warehouse. They suggested generation of various data cubes and display reports as charts, web application and end user applications. They used "Criminal Incidents Management" and "Coplink" system for conceptual design. [7].

V. V. Subrahmanyam et al. proposed a data mart approach for a centralized e governance data warehouse for central government of India. V. V. Subrahmanyam et al. discuss about need and advantages of Data Warehouse for e-governance and major benefits for the decision makers and citizens. They proposed various subject areas for data warehouse. These subject areas are population census data, rural development sector, healthcare sector, planning commission, essential commodities price, agriculture sector, education sector, tourism sector, commerce and trade, revenue etc…Furthermore, they also discussed about case study of Data Warehouse implementation of Andhra Pradesh [8].

Marius discussed regarding business intelligence and e-governance. Marius explained about the Government to Government (G2G), Government to Citizens (G2C), Government to Business (G2B) and Citizen to Government (C2G). Marius explained about relationship about business intelligence and e-governance and suggested that effective and reliable data warehouse implementation is required for successful implementation of business intelligence [9].

3 Conclusion:

The survey suggest that data warehouse concepts are adopted in many government sectors like healthcare, agriculture, education, social security fund, pollution control, electronic voting, rainfall prediction, customer complain, road traffic violation, crime control, etc… The Table 1 provides summary of the survey.

Table 1 Summary of survey on data warehouse on e-governance data

Authors	Year	Research Area	Country	Practical Implementation?	Remarks
Xilin Liu et al. [1]	2009	personalized information service, travelling	China	NO	Conceptual data warehouse design using star schema
Mohamed Salah GOUIDER et al. [2]	2010	National Social Security Fund	Tunisia	YES	Data warehouse implemented using star Schema design
Laila Mohamed ElFangary [3]	2009	Education	Egypt	YES	Practical implementation of data warehouse and knowledge discovered using Classification and Clustering
Sonali Agarwal et al. [4]	2011	Agriculture	India	YES	Conceptual discussion regarding data warehouse and practical implementation of clustering
Prateek Bhanti et al. [5]	2011	Education	India	NO	Conceptual discussion of data warehouse design using Star schema and data mining
S S Suresh et al. [6]	2011	Education	India	NO	Conceptual data warehouse design using Star schema
Juan C. Rivera-Vázquez et al. [7]	2011	Criminal Information, Police department	Puerto Rico	NO	Conceptual discussion regarding data warehouse
V. V. Subrahmanyam et al. [8]	2011	Data Mart approach	India	YES	Conceptual design of centralized data warehouse and practical implementation data warehouse implementation of Andhra Pradesh state
Marius COMAN [9]	2009	Business intelligence for e-governance	-	NO	Conceptual discussion regarding data warehouse and business intelligence

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The survey confirmed that many researchers and government bodies have already implemented data warehouse and data mining. There are many research papers that provided conceptual idea and benefits of implementing data warehouse in government sector.

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