

Discussion on Airport Business Intelligence System Architecture

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Abstract

Domestic airports are accelerating the construction of information systems, and business intelligence is core of the airport decision-making system. On the background of Shanghai Airport, this paper analyzes the key demands of airport business intelligence, discusses the application blueprint of airport business intelligence, and explores the function architecture of airport business intelligence system and the key functions of the modules. This paper aims to provide the reference and help for the research and planning of relevant airport projects.

Keywords: Business intelligence; Architecture; Airport; Data mining

Introduction

Business Intelligence concept was first proposed by Howard Dresner in 1989. BI is trying to transfer the existing data into knowledge to help companies make correct business decisions. Operational systems will produce large amounts of data, such as orders, customers, financial data, how to use these data to enhance the understanding of customer behavior, supply chain partners, and business conditions, and can accurately forecast the trend of corporate business development is a business intelligence questions need to be resolved.

With the constant expansion of the operational information systems for airports in China, the source of information is dispersed, the adverse effects of Information silos is even more prominent. This paper analyzes the airport business intelligence application architecture blueprints, system functional architecture and application analysis theme based on the application background of business intelligence system construction of the Shanghai Airport Group.

1. Application Blueprint of the Airport Business Intelligence Systems

The airport business intelligence system architecture can be divided into the data layer, application layer and presentation layer. Airport information system blueprint shows as Fig.1.

The data layer organizes data according to the analysis needs of business and management of airport, and complete access to different data sources such as Oracle, Microsoft SQL Server and some modern data source like XML and JDBC. In this case, data source can be divided into internal data sources and external data sources. The internal data sources include the airport within a variety of database systems, data files. External data sources include airport regulatory authorities, Air Traffic Control Bureau and other external database systems. After extraction, transform, load (ETL) of source data used to build a data warehouse to provide support for decision-making of the airport.

From the perspective of services, the application layer can be divided into the presentation services, security services, scheduling services, events services, data integration, operating services, audit services and reporting services. Airport application system functions can be divided into business operational information systems and management information systems.

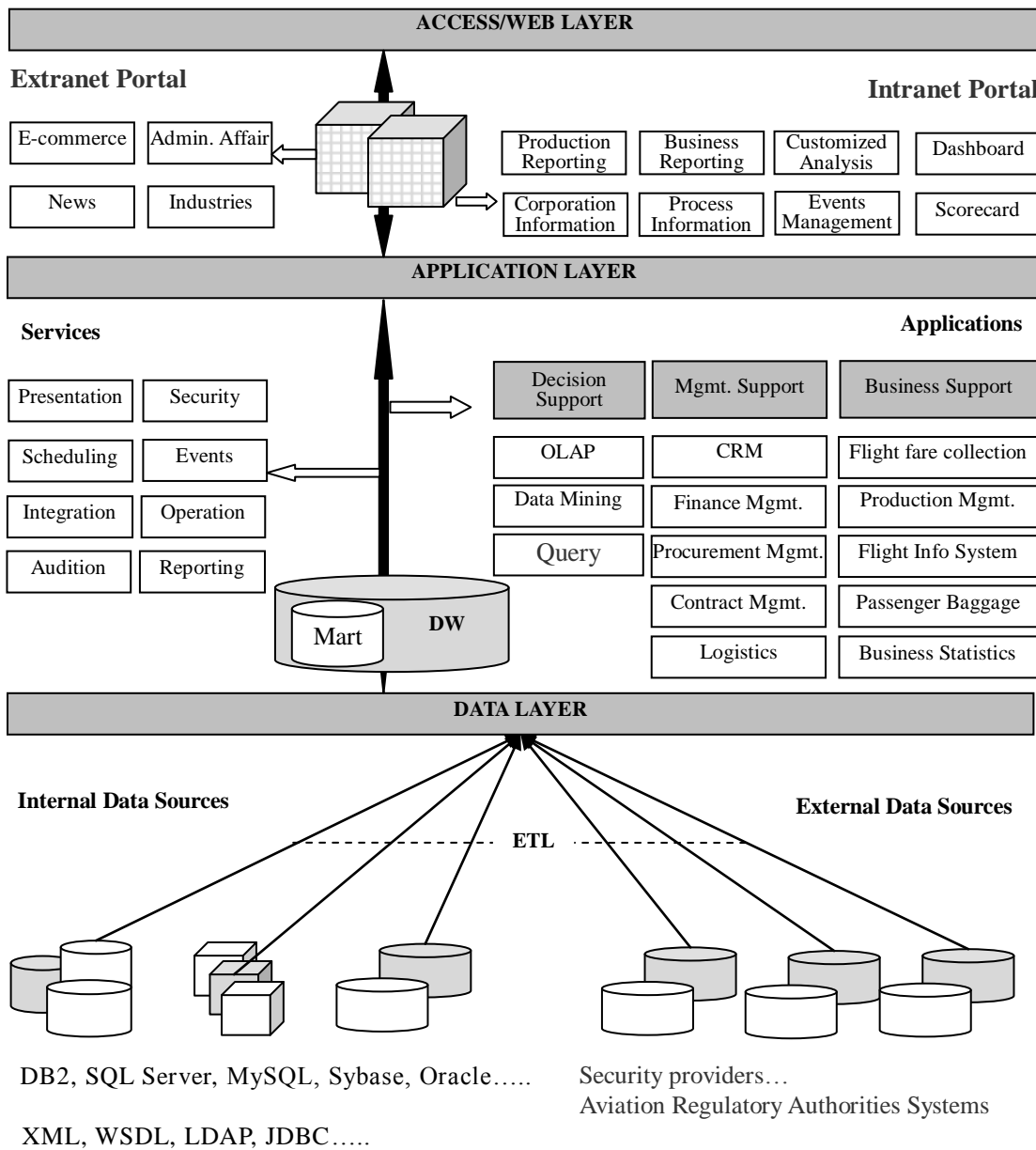


Fig.1 Airport information system blueprint

Business support systems means the system act as the leading information systems while aircraft’s takeoff, landing and passengers’ departure, arrive, which include flight control systems, production management systems, passenger baggage system, business statistics systems, departure systems, aircraft significantly systems, broadcast systems, etc.; Management support system focus management of people, financial, and material, which include customer relationship management, financial management, procurement management, contract management system, logistics management systems, etc. [1-3].

Data / Web layer are divided into intranet portal and extranet portal according to different data sources. Extranet portal is the external display platform of Airport Group, including e-commerce, news announcements, industry information and other content. The intranet portal is a need for operating at airports, providing queries, reports, dashboards, scorecards, graphic display functions. Users can submit the required form of inquiry and analysis to a WEB server.

2. Airport business intelligence functional structure

Based on the analysis of the airport business intelligence needs and the existing analysis capabilities, we proposed the Airport business intelligence functional structure, shows as Fig. 2.

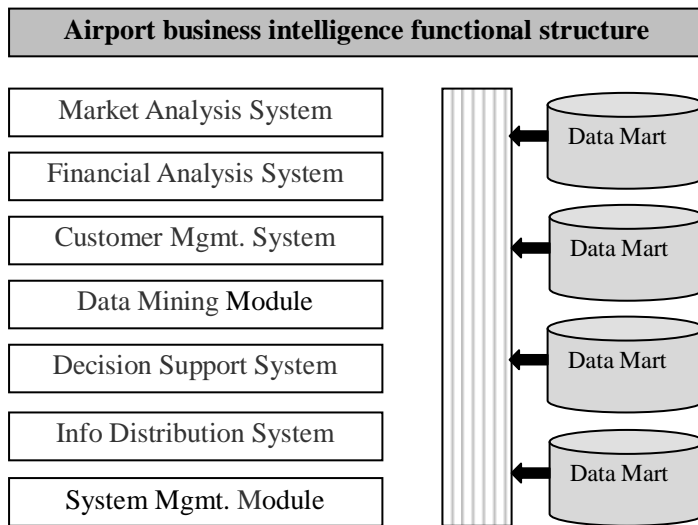


Fig.2 Airport business intelligence functional structure

Market Analysis System: This module is mainly used to analyze the forecast demand for airport products and services, analyze the supply of products in the market to determine the size of the market, estimates the economic benefits. At the same time, it provides customer classification and data mining capabilities for marketing department, including retail, based airlines, non-based airlines, business information, freight and passenger information etc., which can improve market monitoring and sales decision-making, and provide real-time aviation market information services.

Financial Analysis System: Provide key financial information, reports, statistical data, such as profit, energy consumption for the relevant authorities; Provide financial operations, financial policy analysis, management analysis, investment and financing management analysis. Indicators include solvency capability (Current ratio, quick ratio), operational capability (accounts receivable turnover, inventory turnover rate) and profitability (sales margins, capital maintenance and increment ratio).

Customer Management system: Including the management of the based airlines, non-based airlines passenger information; Provide feature analysis on airlines and passengers information, behavioral analysis, benefit analysis based on two aspects of aviation business and non-aviation business; At the same time, provide a valid distinction between potential and intention to customers and customers with feature clustering, development trends, analysis of the spending power consumption characteristics.

Decision Support System: This feature is mainly for airport decision-making. Using charts, table and other intuitive way to provide a report of management and decision-making for the airport upper management; through the data warehouse to integrate and analyze information from the operational systems and improve the existing statements of efficiency and access to key performance indicators to achieve a comprehensive assessment and management.

Data mining module: Data mining capabilities provide the necessary data, environment and tools for analysis. Analyst can conduct analysis and forecasting by making good use of regression analysis, time series models, neural network models, Bayesian methods, seasonal models as well as customer models, such as customer classification model, business data analysis and prediction models, risk management analysis model, etc.

Information distribution system: Information management functions provide news, announcements, events, schedule, warnings, etc. Users can extract and release the relevant indicators in accordance with rights control.

System Management Module: Including loading and backup of data, rights management, user management, security management, and other content.

3. Subjects analysis of the airport

The data warehouse is subject-oriented applications, which allow the analysis and demonstrate the operation of the business from different angles. The subjects represent analysis of a macro-areas, it is an abstract concept that refers to the integration, classification and analysis of enterprise information system data at a higher level. The data warehouse provides the specific report view through ETL processing. To some extent, the subjects can be determined according to the KPI targets and the needs of business and management of the airport. This article conducts some analysis subjects based on comprehensive understanding of airport information systems and its business needs.

1) Air traffic forecasting

Aircraft movements, passenger throughput and cargo throughput are main factors affects the airport aviation revenue. The forecasts of aircraft movements, passenger throughput is relatively easy, but the prediction of cargo and mail traffic is much difficult. The forecast of cargo and mail should be established on a lot of historical data, and take full account of seasonal factors. The forecast based on multidimensional data warehouse has a better performance on flight scheduling management.

2) Risks Analysis and Management

This subjects focus on the business risks analysis and management of airport operational risk. The financial and macroeconomic risks are also key risk points in the airline business, which we should take measures to predict it. As for non-airline business risks, such as the risk of the development of new customers, credit risk, etc., we need to identify high-risk customer base, understand the credit status of a variety of products and services, discover customer base credit mode, help customers avoid credit problems occur as soon as possible and reduce the credit risk losses.

3) Customer Value Analysis

For managers, we need to divide passengers and airlines with common features into different customer base, and familiar patterns of demand for their products and services. For example, the based airlines are the main clients of the airport service. We can have a choice on based airlines according to the size of the airline's passengers, consumption habits and other content and have a quantitative classification analysis on airline passenger group service costs and benefits. In this way, we have a chance for different customers different management and develop potential customers in specific areas.

4) Financial Analysis

Financial end users can process data through a variety of statistical analysis tools, data mining tools, which are Storage and management in the data warehouse. Financial analysis includes financial operations, financial policy analysis, management analysis, investment and financing management analysis. Financial analysis indicators include: the solvency indicators (current ratio, quick ratio, interest coverage ratio), the operational capacity indicator (accounts receivable turnover, inventory turnover rate), the profitability indicators (sales, margins, capital maintenance and increment ratio), etc.

5) Performance Management

In performance analysis, indicators can be classified as: resource, management behaviors, results of operations. Performance indicators are divided into quantitative and qualitative indicators. Quantitative indicators include financial indicators, ACI, safety indicators, flight production indicators, and qualitative indicators include the task indicators and some party-related indicators. The two indicators account for 50 % respectively.

6) Personalized Marketing

Non- aeronautical revenues are a major aspect of airport revenue growth. The data warehouse-based marketing can analyze customer historical data from different angles, and have a good understanding of different preferences for different products and services. This will lead to form a consumer- driven marketing, thereby improving the airport non-aeronautical revenue.

4. Conclusion

Business intelligence system provides a feasible way for scientific decision-making of Shanghai Airport based on comprehensive utilization of business and management data. In this article, we discussed the functional architecture according to the established airport business intelligence systems applications blueprint and carry out a detailed analysis on business subjects. This study can provide theoretical support for the implementation of the airport business intelligence system, but also has a certain degree of universality can learn from other BI construction.

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