

Architecture for Business Intelligence in the Healthcare Sector

Sang Young Lee¹

¹Department of Health Administration Namseoul University, Korea

Abstract. Healthcare environment is growing to include not only the traditional information systems, but also a business intelligence platform. For executive leaders, consultants, and analysts, there is no longer a need to spend hours in design and develop of typical reports or charts, the entire solution can be completed through using Business Intelligence software. The current paper highlights the advantages of big data analytics and business intelligence in the healthcare industry. In this paper, In this paper we focus our discussion around intelligent techniques and methodologies which are recently used for business intelligence in healthcare.

1. Introduction

Business intelligence (BI) and healthcare analytics are emerging technologies that provide analytical capability to help healthcare industry improve service quality, reduce cost, and manage risks [1]. However, such component on analytical healthcare data processing is largely missed from current healthcare information technology (HIT) or health informatics (HI) curricula [2, 3]. Recently the term BI means two main components, namely; data-centric and process-centric [4, 5]. The data-centric uses BI systems to combine operational data with analytical tools to present complex and competitive information to planners and decision makers. Therefore BI is mainly used to understand the capabilities available in the organization. The process-centric component notes a major shortcoming in this inherent data-centricity. BI therefore should be used to integrate the information world with the process world in order to facilitate decision making with an all-embracing information basis In this paper we focus our discussion around intelligent techniques and methodologies which are recently used for business intelligence in healthcare.

2. BI applications for healthcare sector

BI applications in healthcare can be categorized in two major sets of solutions. Technology Solutions are as follows [6, 7].

- Decision Support Systems (DSS): Support managerial decision making, usually day-to-day tactical.
- Executive Information Systems: Support decision making at the senior management level which provide and consolidate metrics-based performance information.
- Online Analytical Processing (OLAP): Support analysts with the capability of perform multi-dimensional analysis of data.
- Query and Reporting Services: Provide quick and easy access to the data with predefined report design capabilities.
- Data Mining (Predictive Model): Examines data to discover hidden facts in databases using different techniques
- Operational Data Services: Collect data from end users, organizing data, establishing solid data structures and store them in different databases, retrieve data from multiple databases.



- Integration Services: Design and implement of process flow of data extracting, transforming, and loading to the data warehouse.

Business Solutions: Business focused analytical applications, as follows:

- Patient Analysis: Focuses on analysis of patients’ demographic and satisfaction processes.
- Electronic Health Record Analysis: Focuses on analysis of the quality of clinical data
- Performance Analysis: Streamline and optimize the way that a business uses its resources.
- Fund Channel Analysis: Devise, implement, and evaluate fund strategies, then use the corporate metrics to continuously monitor and enhance the fund process
- Productivity Analysis: Focuses on building business metrics for activities such as quality improvement, risk mitigation, asset management, capacity planning, etc.
- Behavioural Analysis: Understanding and predicting trends and patterns that provides business advantage.
- Supply Chain Analysis: Monitor, benchmark, and improve supply chain activities from materials ordering through service delivery.
- Wait Time Analysis: Focuses on the factors that are associated with longer waiting times and the effects of delays in scheduling and operation.

3. Business intelligence architecture

Figure 1 represents the essence of BI with the proper workflow of the interdependent components as follows:

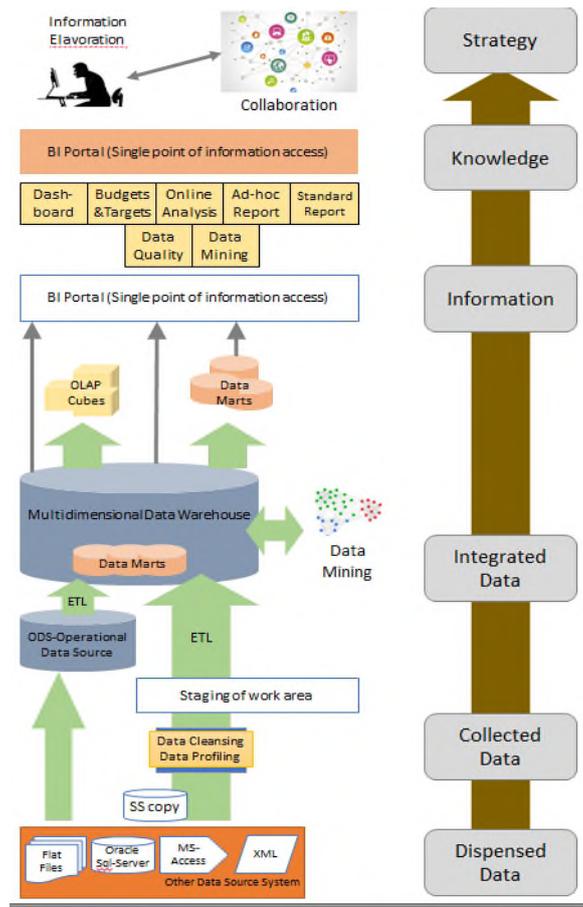


Figure 1. BI architecture.

The initial proposed coverage of BI within Healthcare IT is based on the conceptual analysis of general BI systems and processes. The application of BI in healthcare sector is expected to correspond to the full spectrum of business intelligence system (data management, analysis, presentation, and

delivery) from both technical and healthcare perspectives. The technical focus emphasizes healthcare BI system development, deployment, and administration. The healthcare focus emphasizes healthcare service provider performance management, healthcare business analysis, and usage of user oriented reporting applications. Figure 2 illustrates the traditional solution architecture and workflow.

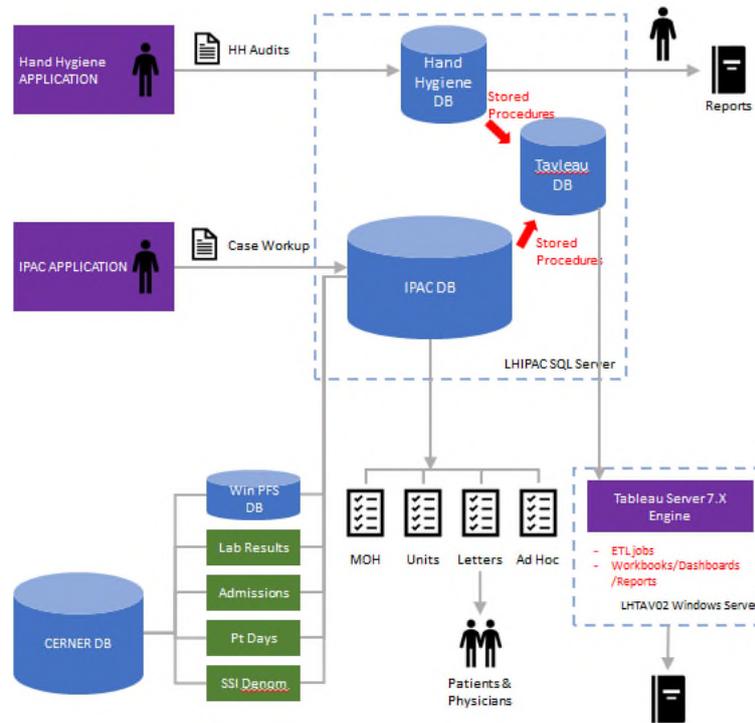


Figure 2. Diagram of data systems and infrastructure of the healthcare sector.

Healthcare processes. For example, the advanced analytics may help suggest treatment options to doctors, based on medical records, patient history, research databases and other sources, and predict whether patients with chronic conditions like diabetes are following doctors' orders based on patient records and claims histories. Systems like these need a complete solution from data collection to results delivery. Many care providers can also use BI system to identify and monitor who is at risk of a hospital admission. Effective prediction of who was going to be hospitalized could reallocate resources to prevent unnecessary hospitalization and put the resources to use for cure rather than care.

4. Conclusion

Many healthcare organizations struggle with the lack of access and ability to utilize data collected through nonintegrated traditional systems for data mining and decision making. For successful healthcare organizations, it is important to empower staff and management for strategic decision making through data warehousing based on critical thinking. In this paper, the general architectural approaches for BI solution have been outlined and its major development components have been introduced in order to give the reader a high level picture with some important details regarding healthcare informatics.

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