

Simulating Instinct Analytics in Healthcare Domain Through Data Marts

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Abstract

As information systems and technology continue to revolutionize the healthcare delivery process, wealth of electronic data are becoming more available and more accessible for analytical purposes. The virtual explosion in data warehousing in many industries, including healthcare, underscores the increased recognition of the potential value of corporate data for purposes of improving managerial decision making. Recently, there has been a realization that enterprise wide data warehousing projects can be daunting and are often fraught with potential budget and timeline overruns. A more pragmatic approach of creating smaller, departmental data marts to address specific business processes or problems has gained popularity in practice. A database, or collection of databases, designed to help managers make strategic decisions about their business. Whereas a data warehouse combines databases across an entire enterprise, data marts are usually smaller and focus on a particular subject or department. Some data marts, called dependent data marts, are subsets of larger data warehouses. In other words a data mart (DM) is the access layer of the data warehouse (DW) environment that is used to get data out to the users. The DM is a subset of the DW, usually oriented to a specific business line or team.

Keywords

Data Mart, Data Warehouse, Healthcare.

I. Introduction

The increasing availability of information technology (IT) enables the implementation of a fast growing variety of applications and heterogeneous information processing systems also in the medical domain [1]. We find them often disconnected and distributed across several departments. On the other hand it is more and more recognized that those huge data collection can be very valuable if properly maintained and consolidated. From the scientific viewpoint a prospective, double blind, randomized study is the best method to gain new insights, but it is also the most expensive and time consuming procedure. Since medicine is a rather mature discipline, progress is often made in fields with very subtle interactions and rare constellations. This requires the collection of large data sets. The healthcare systems face strong competitive pressures that will likely continue for the foreseeable future. The rapid developments in IT that have occurred over the last thirty years may not continue over the next thirty years, but many healthcare organizations have only begun to experience the marvel and facility of the information age. Data are used increasingly by a wide variety of employees, patients and other stakeholders in the healthcare industry. Data access and management have become some of the prime areas of importance in healthcare management and consumers are increasingly accessing organizational information. As healthcare delivery has become firmly intertwined with its financing mechanisms,

payers and providers rely fully on financial and operational data for making appropriate decisions. This array of users has created a nearly endless set of circumstances and applications for managing the information desires of both the organization and its constituents. The healthcare systems can be benefited with the data marts such as easy comprehensive medical research, quality assurance, preoperative risk assessment, hospital management (risk adjusted inter and intra clinical comparison) etc.

II. Data Marts

A data mart is a collection of subject areas organized for decision support based on the needs of a given healthcare department or office. Each healthcare department within a larger organization may have its own requirements for a data mart and each department's data mart will be unique to and specific to its own needs. Many times, a data mart will serve as the reporting and analytical solution for a particular department within an organization, such as accounting, sales, customer service, and/or marketing. The data mart contains only a modicum of historical information and is granular only to the point that it suits the needs of the department. The data mart is typically housed in multi-dimensional technology which is great for flexibility of analysis but is not optimal for large amounts of data.

Typically designed for more tactical and quick-strike purposes, data mart implementations are commonly focused on solving a particular business issue or meeting an individual department's needs. The data mart also usually contains data feeds from a small number of source systems, includes a manageable volume of data, and is exemplified by a rapid development and deployment schedule (usually 3-6 months). For the most part, data marts are designed with just enough data entities, fields, and records to satisfy one department's requirements.

There are two kinds of data marts that exist – dependent and independent:

1. A dependent data mart is one whose source is another data warehouse, and all dependent data marts within an organization are typically fed by the same source – the enterprise data warehouse.
2. An independent data mart is one whose source is directly from transactional systems, legacy applications, or external data feeds.

III. As Is Analysis

In the healthcare domain, companies that includes providers, payers, integrated delivery networks[IDNs], pharmacy benefit managers [PBMS], drug companies and other players often concern for their information infrastructures which are fragmented into multiple data sources called as data silos or data marts. These data marts focuses on single business-user domain or subject area, such as supply chain, sales, marketing, clinical research, member/provider services or even

call center. Data integration in a soloed environment, where it is aggregated, produce summarized data with a scarcity of details along with timeliness and latest updates. Adopting EMRs, more data silos are being created around clinical data, such as for prescriptions, lab, radiology, and medical history which tend to proliferate quickly as they're easy to build, and there is usually minor corporate involvement. Since individual departments can manage their own budgets, creating another data silo is easier than pursuing a special request through corporate IT or another internal analyst group. Creating a data silo or mart is also presumed to be less expensive in the short term.

IV. Integrating Data

At an extreme level, we can consolidate data marts in two ways.

1. Re-host the existing data marts in an interconnected platform to in an interconnected environment to abolish superfluous software and hardware and the allied support and maintenance costs. Consolidating platforms can fetch some cost savings to the organization. However, the data is not integrated; but data marts simply coexist on a unified system.
2. Cavernous data amalgamation and the formation of a single physical and logical data model to maintain the enterprise. It delivers the production and also drives cost savings that comes from an incorporated, cross-functional outlook of the enterprise. When data integration is added to the blend, organizations can eradicate data redundancy and diminish operational intricacy. Henceforth, Data consolidation can be tackled as a two-step process, first bringing data marts (i.e., structure) together on a centralized system, and then data model integration.

V. Web Based Information Portal

Registered user can access the data mart system via a web-based information portal in the intranet. Three main categories are available: data export for medical research, online reports and performance visualization for clinical reporting.

1. Subsets of the consolidated data set can be selected and are exported after authorization from the data mart administration. Here the patient pseudonym is replaced with a cryptographic one-way hash code in order to fully anonymise the data set. Hence the time and effort consuming collection, preparation and consolidation steps for retrospective, more comprehensive studies are no longer hindering medical research.
2. For performance monitoring various online reports can be generated.
3. Risk adjusted temporal performance graphs in selected subgroups are dynamically generated, and can be visualized.



Fig. 1: An Integrated 360 degree layout of patients, members and provider

VI. Conclusion

Through the visualization technique even the common man can understand what the data is trying to present. So through visualization technique it is not only easy but simple way to analyse the data and give the results in the smooth and simple way. Healthcare domain system today needs the simulator having instinct analytical intelligence which is required to improvise its operations. There is a need to eliminate inefficiency in operational factors, improve quality and patient cure, focus on prevention and wellness, and equally as important, embrace information technology. As per the analysis of the current Healthcare industry the need for real-time decision making is extensively in demand which needs to be evidence based, data-driven. Adopting electronic medical records EMR's and other electronic data capture techniques and further digitizing clinical information across the various domains of Healthcare and Patients can provide cost effective solutions thereby enhancing quality, outcomes and security.

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