The Strategic Importance of OLAP and Multidimensional Analysis

IBM

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Abstract

To get more value from large stores of corporate business information, many organizations are employing new multidimensional analysis techniques to turn their raw data into actionable intelligence. These techniques — including online analytical processing (OLAP) and dimensionally aware relational schemas — help organizations make the most of their available data. And they are a key part of IBM Cognos® Business Intelligence solutions.

Overview

Multidimensional analysis helps organizations extract the maximum value from their corporate data. It transforms volumes of that data into useful information, allowing users to analyze it in a business context — comparing such things as product or channel performance in light of important factors like region, customer, and time period. With a multidimensional view, users can quickly gain insight into business performance and trends.

Multidimensional analysis helps companies improve their performance by:

- Presenting complex data in business terms that are easy to understand.
- Helping people stay on top of changing business conditions — market shifts, mergers and acquisitions — and providing trending analysis.
- Reducing the burden on IT by providing self-service access to corporate information.
- Employing efficient, scalable technology that is quickly refreshed with current data.

The delivery of information within a dimensional framework that users can readily understand means that they can conduct their own analysis quickly and easily. Organizations can also extend the reach of their analysis and share findings company-wide, with effective reporting that helps them know sooner, understand faster, and react more quickly than the competition.

And with the advent of the IBM Cognos 10 platform, users can now access a wider range of information within a unified workspace, to simplify and streamline the process of searching and assembling different perspectives of your business.

Business problems

What is multidimensional analysis?

Multidimensional analysis takes data and formats it into highly explorable structures sometimes called cubes. These structures provide a "multidimensional" view of the data — showing, for example, not only what product sold best, but what product sold best in a specific region, during a particular time period, through a specific sales channel. This expanded view gives you greater insight into the business and helps you make more informed decisions.

Providing quick answers to commonly asked business questions is the primary function of multidimensional analysis. Because it is designed around key business factors, the quality of answers obtained from this type of analysis is very high.

Key concepts

The first key concept in multidimensional analysis is **dimension**. A dimension is some distinguishing characteristic of an activity, and represents one of several ways in which people measure results in an organization.

For example, you may have a sales cube with the following dimensions:

Time: Questions that companies must answer include:
- How did we do this month versus last month?
- How did we do this month versus the same month last year?
- This year versus last year?

Product: Analysts need to know things like:
- What percentage of overall revenue comes from product line A?
- Has the revenue mix changed between product lines?
- Which product is most profitable?

Location: Large organizations have sales territories, branch offices, and individual sales reps. Sales managers may want to know:
- How does sales growth in Europe compare to North America?
- What are the top 10 branch offices in terms of revenue generation?
- What regions have the most pipeline and do we have enough sales people to pursue all of our leads?

Customer: Everyone needs to track their customers in a variety of categories:
- Which customers are the most profitable?
- Who are our most frequent repeat customers?
- What percentage of customers buy a specific product or combination of products?

Sales Analysis

TIME PERIODS	ORGANIZATIONS	PRODUCTS	CUSTOMERS	INDICATORS
Years	Sales Divisions	Product Lines	Sales Rank Range	Ordered Units
Quarters	Sales Districts	Brands	Top 10	Change orders
Months	Sales Reps	Products	Top 11–100	Sold Units
YTD		SKUs	Etc.	Revenue
Prior YTD			Customers	Discount
QTD				Discount %
Prior QTD				Average Selling Price
Current Month				Inquiries
Prior Month				% Order to Inquiries
Rolling 12 Months				

Sales analysis makes it easier to determine what is driving the business. It can dramatically improve sales force productivity and enable fact-based selling.

Customer & Product Profitability

TIME PERIODS	ORGANIZATIONS	PRODUCTS	CUSTOMERS	EXCEPTION DIMENSION	INDICATORS
Years	Sales Divisions	Product Lines	Sales Rank Range	Gross Profit %	Units Sold
Quarters	Sales Districts	Brands	Top 10	Ranges	Revenue
Months	Sales Reps	Products	Top 11–100		Discount %
YTD		SKUs	Etc.		Commission %
Prior YTD			Customers		Material %
QTD					Shipping %
Prior QTD					Claims %
Current Month					Gross Profit
Prior Month					GP % of Sales
Rolling 12 Months					

Customer and product profitability is an important area of analysis for users who wish to transform their sales force from a revenue-centric to a profit-centric department.

The second key concept is **category**. These are the individual data points within dimensions. For example, categories in the time dimension could be "2010" or "2011." In the location dimension, categories might include "Singapore," "Paris," or "Chicago." Note that some categories are subsets of others—the category "Chicago" could be a subset of "U.S. Midwest." This hierarchical organization makes it possible to roll up or aggregate values for groups of categories into higher levels.

The third key concept is **measure**. These are the quantities used to build reports and perform analysis. For sales, typical measures could be revenue, cost, discounts, and returns. Multidimensional analysis can also handle complex models that require allocations of measures like revenue or costs. Because of the way multidimensional analysis manages measure values, users do not have to worry about the math behind things like allocations. Users can simply slice-and-dice to examine the trends and values important to them.

Exploring data structures

Three basic actions allow you to explore multidimensional data structures:

- **Drilling down**. You can navigate from lesser to greater detail. For example, when you see a data value for revenue for first quarter sales across your company, you can drill down into that data to see a breakdown of monthly sales within the quarter. Depending on how the data is structured, you can then further drill into weeks and even into daily sales.
- **Slicing and Dicing**. You can change active dimensions to get other views of the data. For example, a report of quarterly revenue by location can be easily changed into a report of quarterly revenue by product line.
- **Changing Displays**. You can view data in different formats including tables, charts, and graphs. Regardless of format, users can continue their analysis by interacting with charts by drilling down, slicing and dicing, or further changing the display.

Business drivers

Analysis technologies

The technologies most frequently used for multidimensional analysis are online analytical processing (OLAP) and dimensionally aware relational schemas. These technologies provide lower total cost of ownership (TCO) and higher return on investment (ROI) than other analysis methods or tools.

OLAP

Because of its simplicity and speed, OLAP continues to be the dominant technology choice for analysis. OLAP allows you to perform analysis very quickly by transforming data into a highly indexed, compact format that is purpose-built to optimize the performance of multidimensional queries.

Today, companies spend approximately $4 billion per year on OLAP technology. And this market will continue to thrive as companies deploy a greater variety of business intelligence (BI) applications to more business users, executives, partners and customers.

Analysis with Cognos Business Intelligence is based on the industry's best-selling OLAP software, Cognos PowerPlay. In addition, the new analysis capabilities of Cognos Business Intelligence version 10.1 expand previous Cognos functionality to cover a wider range of data sources and provide seamless navigation among reports, queries, and analysis. Along with these powerful capabilities, IBM SPSS solutions provide advanced statistics and data management for analysts researching business questions and problems. SPSS enables the collection, interpretation and presentation of statistical data, and offers insights for prediction and forecasting, driving greater confidence in your decisions and your results.

Dimensionally modeled relational data

Dimensionally modeled relational schemas have been used for multidimensional analysis for some time, but there have been problems with the use of structured query language (SQL) and aggregate functions, which have resulted in slower query response times. However, newer products on the market are using automatic summary tables, materialized query tables, and other features to improve processing efficiency and gain faster results— achieving dimensional analysis that is comparable to OLAP.

By leveraging relational database modeling systems (RDBMS), Cognos solutions provide analysis of relational data using two types of schemas:
- Dimensionally aware relational data includes IBM DB2® Cube Views, Oracle® Materialized Views, and Teradata Aggregate Join Indexes. In this approach, the hierarchy information is modeled in the target database environment. Cognos solutions read and process this information to provide dimensional analysis capabilities, such as drill-down and slice-and-dice.
- Star and snowflake schemas. In this approach, the hierarchy information is modeled in Cognos Framework Manager or using Cognos data integration. This type of solution is not as fast as using existing modeled data because it requires additional aggregation and query processing.

The solution

IBM for OLAP and multidimensional analysis

Cognos Business Intelligence is the leading multidimensional analysis solution. It allows users to analyze and navigate large data volumes using Cognos PowerCubes built from any data source to accelerate decision-making and information delivery across the enterprise.

IBM has become the standard for OLAP and multidimensional analysis for the following reasons:

Open data strategy

Cognos Business Intelligence provides access to a complete range of heterogeneous relational and OLAP data. With its extensive data adaptability, Cognos Business Intelligence provides a complete and consistent view of business information, regardless of the data source. The highly indexed data format also provides faster response times than conventional relational reporting solutions.
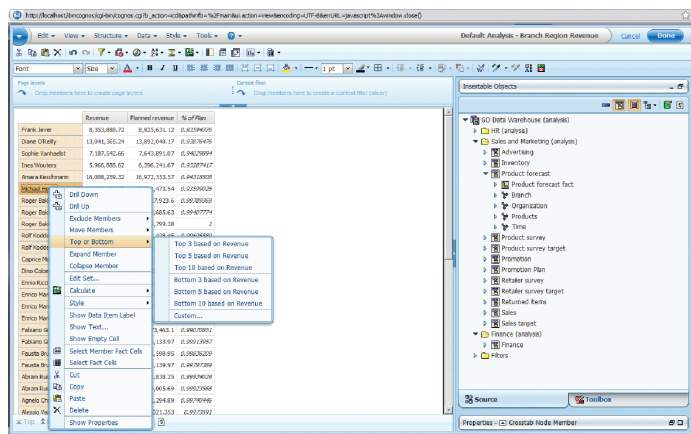
Analysis with Cognos Business Intelligence helps you recognize business issues and trends more easily

Cognos PowerCubes

Cognos PowerCubes can contain as many as one billion consolidated rows of data and two million different categories. Business rules and calculations can be built right into Cognos PowerCubes, and time series analysis is delivered automatically.

The built-in flexibility lets you move from summary to transaction level detail, or from one Cognos PowerCube to another so you can easily find the information you need.

Deep comparative analysis

Extensive features and functions simplify the complex analysis of data:

- Sophisticated filtering helps you focus on the most relevant information or show information based on specified criteria.
- Asymmetrical analysis allows you to integrate different rows and columns of data to recognize business issues more easily.
- Business-oriented calculations can exclude unimportant information.

Management of large data volumes

Advanced features such as searching and subsets allow you to easily handle large volumes of data. By keeping unimportant data hidden, you see only the information you need to see and aren't overwhelmed by unnecessary details.

Faster representation of business changes

Cognos analysis can reflect organizational changes such as HR transfers and mergers and acquisitions. Companies can see and understand the effect of changes quickly.

Web-based

A simple, zero-footprint Web interface provides a familiar platform for users. This encourages user adoption, lowers training costs, and speeds deployment. Organizations can realize the benefits of multidimensional analysis quickly and increase their ROI sooner.

Internet, extranet, and intranet ready

The Cognos solution provides the scalability, performance, security, and manageability to meet the needs of even the most demanding extranet environments. Because Cognos analysis is zero-footprint, you do not need to spend time or money deploying and updating downloads, applets, or plug-ins to maintain functionality.

The reporting-OLAP connection

Organizations can extend the reach of analysis and share findings with effective reporting that provides the details users need to extend their understanding of the business issue.

Analysis coupled with reporting lets users analyze trends and answer business questions by way of managed reports. This allows users to monitor changes in the business over time and understand what is causing them.

The Cognos solution also provides a sophisticated reporting infrastructure that delivers quality, enterprise-wide reports against OLAP data sources. The result is broader use of business information to accelerate and improve decision-making across the organization.

Conclusion

Multidimensional analysis can provide your organization with the insight it needs to make more informed decisions and build better business relationships with customers, partners and suppliers.

By consolidating summarized corporate information from volumes of heterogeneous data and presenting this data to users in a meaningful business context, multidimensional analysis offers great potential for improving and coordinating decision-making across the extended enterprise.

IBM enables companies to understand and improve business performance by delivering corporate data to everyone in the organization and giving them powerful ways to analyze it. Cognos Business Intelligence products support over 100 relational and OLAP data sources, and integrate with many enterprise applications, including IBM, Oracle applications, PeopleSoft®, and SAP®.

Choosing multidimensional analysis is a wise investment for your organization. And choosing Cognos Business Intelligence will bring the highest rewards.

IBM Cognos 10: Intelligence Unleashed
Smarter Decisions. Better Results.

Cognos 10 delivers a revolutionary new user experience and expands traditional business intelligence (BI) with planning, scenario modeling, real-time monitoring and predictive analytics. With the ability to interact, search and assemble all perspectives of your business, Cognos 10 provides a limitless BI workspace to support how people think and work. Cognos 10 enables organizations to outperform by providing:

- Analytics that everyone can use in a BI workspace that sharpens individual skills to answer key business questions

- Collective intelligence with built-in collaboration and social networking to connect people and insights to gain alignment

- Actionable insight everywhere in mobile, real-time and business processes to instantly respond at the point of impact

Built on a proven technology platform, Cognos 10 is designed to upgrade seamlessly and to cost-effectively scale for the broadest of deployments. Cognos 10 provides you and your organization the freedom to see more, do more—and make the smart decisions that drive better business results.

About IBM Business Analytics

IBM Business Analytics software delivers complete, consistent and accurate information that decision-makers trust to improve business performance. A comprehensive portfolio of business intelligence, predictive analytics, financial performance and strategy management, and analytic applications provides clear, immediate and actionable insights into current performance and the ability to predict future outcomes. Combined with rich industry solutions, proven practices and professional services, organizations of every size can drive the highest productivity, confidently automate decisions and deliver better results.

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