

Table of Contents

Introduction	3
What is Multidimensional Analysis?	4
Key concepts	4
Exploring data structures	5
Analysis Technologies	6
OLAP	6
Dimensionally modeled relational data	6
Cognos for OLAP and Multidimensional Analysis	7
Open data strategy	7
PowerCubes	7
Deep comparative analysis	7
Management of large data volumes	7
Faster representation of business changes	7
Web-based	7
Internet, extranet, and intranet ready	8
The reporting and OLAP connection	8
Summary	9
About Cognos	9

Introduction

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

Multidimensional analysis helps companies improve their performance by:

- Providing visibility into large volumes of corporate data.
- Presenting complex data in a business way so it is 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.
- Delivering a scalable, efficient technology that is quickly refreshed with current data.

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

This paper looks at how multidimensional analysis works, and provides an overview of the two types of multidimensional analysis technologies—online analytical processing (OLAP) and dimensionally aware relational schemas. It also highlights how Cognos solutions address multidimensional analysis requirements and why Cognos is considered the leading vendor in this area.

What is Multidimensional Analysis?

Multidimensional analysis takes data and turns it into highly explorable structures sometimes called cubes. These structures provide a multidimensional view of the data—for example, what product sold best in a specific region, during a particular time period for a specific sales channel. This 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 core value 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 is a dimension. Data structures are modeled dimensionally. A dimension is a classification of activity, and represents the ways in which people measure success or failure 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?

- This year versus last year?
- Today versus yesterday?
- Product. Analysts need to know things like:
 - What percentage of my overall revenue is brought in 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 are most often interested in divisional or branch performance:
 - How does sales growth in Europe compare to North America, or vice versa?
 - What are the top 10 branch offices in terms of revenue generation?
- Customer. Everyone needs to track their customers in a variety of categories:
 - Which customers are delivering the most profitability?
 - What percentage of customers have bought 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
			Etc.	Revenue
YTD		SKUs	Customers	Discount %
Prior YTD				Average Selling Price
QTD				Inquiries
Prior QTD				% Order to Inquiries
Current Month				
Prior Month				
Rolling 12 Months				

Sales analysis makes it easy to determine what is driving the business. It dramatically improves sales force productivity and enables 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 %
			Etc.		Commission %
YTD		SKUs	Customers		Material %
Prior YTD					Shipping %
QTD					Claims %
Prior QTD					Gross Profit
Current Month					GP % of Sales
Prior Month					
Rolling 12 Months					

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

The second key concept is a category. These are the individual data points within given dimensions. For example, categories in the time dimension could be “2004” or “2005.” In the location dimension, categories might include “London,” “Paris,” or “Chicago.” Note that some categories are subsets of others—the category “Chicago” could be a subset of “Midwest.” This hierarchical organization makes it possible to roll up or aggregate values for groups of categories to higher levels.

The third key concept is a measure. These are quantitative things used for analysis and to build reports. 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 see 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 the breakdown of monthly sales within that quarter. Depending on how the data is structured, you can then drill into weeks and further into daily sales.
- **Slicing and Dicing.** You can change active dimensions to get another view of the data. For example, a report of quarterly revenue by location is easily changed to a quarterly report of sales 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 via drilling down, slicing and dicing, and further changing the display.

Analysis Technologies

The technologies most frequently adopted to address multidimensional analysis are online analytical processing (OLAP) and dimensionally aware relational schemas. These technologies provide lower total cost of ownership and higher returns on investment than other analysis methods and tools.

OLAP

OLAP allows you to do analysis very quickly. The speed is achieved by the transformation of data to a highly indexed, compact format that is purpose-built to optimize the performance of multidimensional queries.

Because of its simplicity and speed, OLAP continues its dominance as the technology of choice for analysis. Today, it is an approximately \$4 billion market. And it will continue to thrive as companies deploy BI applications to more business users, partners, customers, and executives.

Cognos is an acknowledged leader in this market, according to reports such as the OLAP Survey 4. Analysis with Cognos 8 Business Intelligence is based on the industry's best-selling OLAP software, Cognos PowerPlay. The new analysis capability with Cognos 8 BI expands this functionality to cover a complete range of data sources and to provide seamless movement among reports, queries, and analysis.

Dimensionally modeled relational data

Dimensionally modeled relational schemas have been used for multidimensional analysis for some time, but there have been issues around the use of structured query language (SQL) and aggregate functions, which have resulted in slower query response times. However, more recent 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 comparative to OLAP.

By leveraging relational database modeling systems (RDBMS), Cognos provides analysis of relational data using two types of schemas:

- Dimensionally aware relational data, such as IBM DB2 Cube Views, Oracle Materialized Views, and Teradata Aggregate Join Indexes. In this case, the hierarchy information is modeled in the target database environment. Cognos reads and processes this information to provide dimensional analysis capability, such as drill down and slice-and-dice.
- Star and snowflake schemas. In this case, 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.

Cognos for OLAP and Multidimensional Analysis

Cognos 8 Business Intelligence analysis is the leading multidimensional analysis solution. It allows users to analyze and navigate large data volumes using PowerCubes built from any data source—to accelerate decision-making and information delivery across the enterprise.

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

Open data strategy

- Cognos 8 BI analysis provides access to a complete range of heterogeneous relational and OLAP data. With its extensive data adaptability, Cognos gives you a complete and consistent view of your business information, regardless of the data source.

The screenshot shows the Cognos 8 BI interface with a data cube analysis. The 'Insertable Objects' pane on the left lists categories like Years, Products, Staff, Sales Territory, Retailer, Order Method, Measures, and Currency. The main window displays a table with columns for 'Revenue', 'Prior YTD', and 'YTD'. The data is organized hierarchically by region (Americas, Asia Pacific, Central Europe) and product type (Tents, Packs, Sleeping Bags, etc.).

Revenue		Prior YTD	YTD
Tents		\$16,570,227.26	\$19,860,897.58
Packs		\$5,095,093.26	\$6,273,583.42
Sleeping Bags		\$4,094,981.02	\$4,987,198.60
Lanterns		\$3,742,032.68	\$4,405,527.42
Cooking Gear		\$1,871,272.24	\$2,341,848.56
Top 5 Products Worldwide		\$31,373,606.46	\$37,869,055.58
Americas	Cooking Gear	\$523,891.72	\$699,134.36
	Sleeping Bags	\$1,265,955.08	\$1,694,823.98
	Packs	\$1,681,693.88	\$2,212,748.38
	Tents	\$7,136,383.14	\$8,931,122.62
	Lanterns	\$1,168,830.68	\$1,499,253.72
	Local top 5	\$11,776,754.50	\$15,037,083.06
Asia Pacific	Irons	\$768,843.74	\$1,092,360.24
	Putters	\$301,264.10	\$452,720.82
	Woods	\$1,183,376.74	\$1,691,958.52
	Golf Accessories	\$83,166.32	\$114,057.44
	Binoculars	\$308,959.18	\$492,231.90
	Local top 5	\$2,645,610.08	\$3,843,328.92
Central Europe	Cooking Gear	\$660,303.06	\$794,323.36
	Sleeping Bags	\$1,349,470.92	\$1,539,017.58

Analysis with Cognos 8 BI helps you more easily recognize business issues and trends

- The highly indexed data format allows faster response times than with conventional relational reporting solutions.

PowerCubes

- Cognos PowerCubes can contain one billion consolidated rows of data and two million categories. Business rules and calculations can be built right into PowerCubes, and time series analysis is delivered automatically.
- The built-in flexibility lets you move from summary level to transaction level detail, or from one PowerCube to another so you can find the information you need.

Deep comparative analysis

- Extensive features and functions simplify the complex analysis of data:
 - Sophisticated filtering helps you focus on only the most relevant information or show information based on specified criteria.
 - Asymmetrical analysis allows you to integrate different rows and columns of data to more easily recognize business issues.
 - You can perform business-oriented calculations that 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 represents organizational changes such as HR transfers and mergers and acquisitions. Companies can understand the effect of changes more quickly than competitors who do not have this advantage.

Web-based

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

Internet, extranet, and intranet ready

- Cognos 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 and OLAP connection

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

Analysis coupled with reporting lets users analyze trends and then get answers to 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 enterprise-wide quality reports against your OLAP data sources. The result is broader consumption of business information to accelerate and improve decision-making across the organization.

Summary

A multidimensional analysis solution can provide your organization with the insight needed to make more informed decisions and build better business relationships with partners, suppliers, and customers.

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.

Cognos allows 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 BI 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 8 BI analysis will bring the highest rewards.

About Cognos

Cognos is the world leader in business intelligence and enterprise planning software. Our solutions for corporate performance management let organizations drive performance with planning, budgeting and consolidation, monitor it with alerts and scorecarding, and understand it with business intelligence reporting and analysis. Cognos is the only vendor to support all of these key management activities in a complete, integrated solution. Founded in 1969, Cognos now serves more than 23,000 customers in over 135 countries.