

# THE STRATEGIC IMPORTANCE OF OLAP ANALYSIS

A COGNOS WHITE PAPER



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## INTRODUCTION

Analysis is a valuable, necessary complement to reporting. With OLAP analysis it is possible to see trends that are not evident with other types of reporting. Whether they do so consciously or not, effective businesses analyze their performance in a multidimensional manner. Multidimensional analysis involves comparisons of things such as product or channel performance, which can be seen in light of other important business factors like regions, customers, and time. The technology most frequently adopted to address this kind of analysis is online analytical processing (OLAP). With OLAP, details are automatically categorized by the factors that influence decision-making. These factors are called dimensions.

OLAP allows managers and analysts to analyze information in the way that they think, across multiple dimensions at the same time. For example, what **product** sold best, in a specific **region**, during a specific **time period**, for a specific **sales channel**. Because it is inherently clear what specifically you are analyzing in each dimension, OLAP provides excellent visibility into the data. With OLAP users can quickly see business performance over time and, due to the way OLAP works, this can be done with very fast response times.

OLAP analysis helps companies improve their performance by:

- Providing quick response times. Conducting fast, concise analysis lets companies quickly get to the “why” behind business issues so they can address them in a timely manner
- Delivering powerful, built-in time trending analysis that let users spot trends quickly
- Aligning complex data with the business so it is easy to understand enterprise-wide
- Reducing the burden on IT by providing fast and easy self-service access to information
- Delivering a scalable, efficient technology that is quickly refreshed with current data, and economically scales to satisfy the informational needs of many users.

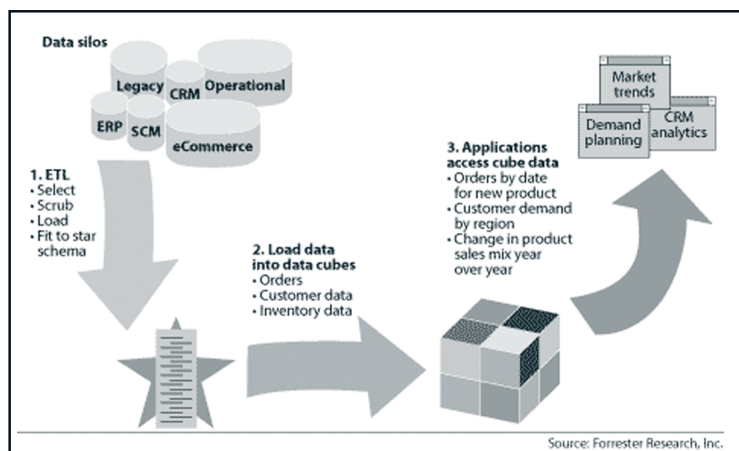
Providing quick answers to commonly asked business questions is the core value of OLAP. Because OLAP is designed completely around key business factors by using dimensions, the quality of answers obtained from OLAP analysis is very high. OLAP provides lower total cost of ownership and higher returns on investment than other, less organized methods of analysis.

The simplicity of OLAP, and the delivery of information within a dimensional framework that users understand, means they can conduct their own analysis quickly and easily. And, since OLAP scales to thousands of users at very little cost, it is an ideal technology to deliver information to a large number of users. Organizations can then extend this 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 the current state of the OLAP analysis marketplace, explores how OLAP works within a business intelligence and corporate performance management (CPM) context, and looks at some common use models for OLAP. It also highlights how Cognos solutions address OLAP analysis requirements and why Cognos is considered the leading vendor of OLAP software.

## AN OLAP OVERVIEW

The speed of OLAP analysis is achieved by the transformation of data to a highly indexed, compact format purpose built to optimize the performance of multidimensional queries. The figure below from Forrester Research's *Debunking the Death of OLAP* research paper gives an overview of the data process used in OLAP solutions<sup>1</sup>.



Based on defined dimensions and measures, OLAP tools take data from relational or non-relational data sources, and transforms this data into highly explorable structures called cubes. The explorable nature of cubes means that a single cube can deliver thousands of reports. Each report can then be saved for future use, and shared with other users. Cognos calls these PowerCube® data sources.

Cognos PowerPlay® draws information from a combination of relational databases, Excel spreadsheets, and flat files to model and build PowerCubes. PowerCubes are data sets that can contain billions of rows of data and over two million categories (members). Business rules and calculations (percentage growth and market share change, for example) can be built into them. Time

series analysis (quarter over quarter, year over year, year to date, and prior year to date, for example) is delivered automatically. Web, Windows, and Excel clients can all access PowerCubes and reports from the same application server.

Three basic actions allow users to explore PowerCubes:

**1. Drilling Down.** Data items in reports and PowerCubes are live, and can be drilled into for more information. 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.

**2. Slicing and Dicing.** If you are looking at any report or PowerCube, 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.

**3. Changing Displays.** You can view PowerCube 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.

<sup>1</sup> *Debunking the Death of OLAP*, Keith Gile, Forrester Research, March 16, 2004

## OLAP KEY CONCEPTS

The first key concept for OLAP is a dimension. OLAP data structures are modeled dimensionally. Users view data from the perspective of key dimensions. A dimension is a classification of activity in an organization, and they represent the ways in which people measure success or failure in an organization. For example, for a sales application, typical dimensions that businesses tend to track are:

- **Time.** This dimension is key in virtually all OLAP models. Questions that companies must answer include:
  - How did we do this month versus last month?
  - This year versus last year?
  - Today versus yesterday?
  - Over the past six months?
- **Products.** Products are often organized in product lines and types, down to specific products. 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?
  - What are my best-selling products?
  - Which product is most profitable?
- **Locations.** Large organizations have sales territories, branch offices, and individual sales reps. Sales managers are most often interested in divisional or branch performance—something an OLAP data structure is ideal for delivering.
  - 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?
- **Customers.** Everyone needs to track their customers in a variety of categories.
  - Which customers are delivering the most profitability?
  - What percentage of customers has 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
YTD		SKUs	Etc.	Revenue
Prior YTD			Customers	Discount
QTD				Discount %
Prior QTD				Average Selling Price
Current Month				Inquiries
Prior Month				% Orders to Inquiries
Rolling 12 Months				

Sales analysis provides “X-ray” vision for determining what is driving the business. It dramatically improves sales force productivity and enables fact-based selling. Note the prepackaged time options for easily tracking growth by year, quarter, or month. Also note the indicators for Discount, the first step on the road to evaluating customer profitability. These capabilities are provided by good OLAP solutions.

### Customer & Product Profitability

TIME PERIODS	ORGANIZATIONS	PRODUCTS	CUSTOMERS	EXCEPTION DIMENSION	INDICATORS
Years	Sales Divisions	Product Lines	Sales Rank Range	Gross Profit % Ranges	Units Sold
Quarters	Sales Districts	Brands	Top 10		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 & 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. Without a suitable OLAP model a sales force lacks the enabling technology to manage products mix and its impact on profitability at the customer level.

The second key concept in OLAP is a category, also commonly referred to as a member. These are the individual data points within given dimensions. Again, using sales as an example, categories in the time dimension could be “2002,” or “2003.” In the locations dimension, categories such as “London,” “Paris,” “Chicago,” “Europe,” or “USA” define the places in which the system tracks activity. Note that some categories are subsets of others. For example, the category “Chicago” could be a subset of the category “Midwest,” which in turn could be a subset of “USA,” and so on. This hierarchical organization of categories makes it possible to “roll up” or aggregate values for groups of categories to higher levels.

The third key concept in OLAP is a measure. These are the quantitative things businesses analyze and derive reports for across dimensions. Again, using sales as an example, important measures would be revenue, cost, units sold, discounts, and returns.

By simplifying complex raw data into business dimensions, OLAP makes it comprehensible to all users. Dimensions are broken down into levels of detail that allow users to deal only with the level of information appropriate for their questions. OLAP can also handle complex models that require allocations of measures like revenue or costs. Because of the way OLAP 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.

With such critical functionality and capabilities OLAP has become pervasive in the technology landscape of every department within the Fortune 1000. The following chart from Forrester Research’s *Debunking the Death of OLAP* shows many of the key functions that OLAP analysis can provide within the enterprise.

Finance	Sales	Marketing	HR
P&L analysis	Inventory management	Market segmentation analysis	Fringe benefit analysis
P&L reporting	Price/volume analysis	Customer profitability	Headcount analysis
Responsibility reporting/analysis	Sales analysis/forecasting	Product profitability	Salary forecasting
Budget analysis	Point-of-sale consolidation	Customer segmentation analysis	Travel & entertainment analysis
Activity-based costing	Sales pipeline reporting & analysis	Loyalty analysis	Career path reporting and analysis
Raw material cost analysis	Channel analysis	Campaign analysis	Compensation reporting and analysis
Balance sheet analysis	Sales performance reporting	Customer cross-sell analysis	Benefits administration reporting
Indicative & real cashflow analysis	Category performance analysis	Customer service analysis	Employee expense reporting
Asset & depreciation analysis	Inventory analysis	Customer scorecards	Time and labor management reporting
State & federal income tax analysis	Product scorecards	Call center analysis	
Sales & use tax analysis	Merchandising analysis	Competitor analysis	
Accounts receivable aging analysis	Discounts & promotions analysis	Customer acquisition, retention, and attrition analysis	
Vendor payment analysis	Category management fraud analysis and loss prevention		
Partner/shareholder equity analysis			

Source: Forrester Research, Inc.

*The Reporting and Analysis Connection*

Together, relational reporting and OLAP analysis meet the needs of all users. Users who need detailed reporting also benefit from the big picture view that analysis provides. Reporting extends the value of analysis by providing the details users need to extend their understanding of the business issue.

<b>ESSENCE OF ANALYSIS</b> <ul style="list-style-type: none"><li>• Big Picture View</li><li>• Explore and Navigate by Dimensions</li><li>• High User Interactivity</li><li>• Multidimensional OLAP Model</li></ul>		<b>ESSENCE OF REPORTING</b> <ul style="list-style-type: none"><li>• Detail View</li><li>• Report by Database Tables</li><li>• Sophisticated Formatting</li><li>• Relational Model</li></ul>
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Analysis provides better value when linked with reporting. With reporting, specific facts or details underlying the cause of a trend discovered using analysis can be identified and acted upon correctly.

OLAP analysis shows relationships and trends across key business dimensions, so users get answers quickly. Relational reporting combined with analysis lets users analyze trends and then get answers to specific ad hoc business questions, or by way of managed reports. This allows users to monitor changes in the business over time, and understand what is causing those changes.



## THE OLAP MARKETPLACE

OLAP continues its dominance as the technology of choice for analysis. Today, OLAP is an approximately \$3.5 billion market. It is an essential element of business intelligence to meet the needs of users, and a key component of the emerging requirement for companies pursuing corporate performance management. The consumers of OLAP information are decision-makers. OLAP analysis will continue to thrive as companies deploy BI applications to more business users, partners, customers, knowledge workers, and executives.

A commonly asked question is why OLAP is necessary when query and reporting tools can access and retrieve data directly from operational systems. There are two significant reasons that led to the development of OLAP as a means of performing analysis.

First, operational systems (such as legacy systems, supply chain management systems, and customer relationship management systems) organize data efficiently to serve their main function, which is capturing and updating high volumes of information. These systems are typically not designed to show trends or to perform multidimensional analysis, which is the exploration of summary information across many different key factors at the same time. Many business questions cannot be answered without a large investment in IT resources and custom programming using data found in operational systems, or even data marts and warehouses extracted from these systems.

Second, the language used to access and update data with operational systems is called structured query language (SQL). SQL is designed for operational systems, where data is stored in two-dimensional arrays or tables in an underlying RDBMS or relational database management system. However, there are inherent limitations with SQL when used to view data needed for multidimensional analysis.

To understand these shortcomings, it is necessary to think like a typical business user when analyzing data. No business user will ask “I wonder how many sales went into the sales database table last week?” Instead, they want to know the sales for a particular region, product or sales channel. To answer this question an operations system’s RDBMS must perform mainly database operations. Requesting simple aggregation of randomly selected factors requires complex SQL statements; bringing all of the underlying business factors together most often involves numerous different database tables that have to be linked together to get the right view.

Moreover, because data is often stored at a very low level of granularity—typically at the individual transaction level—it is necessary to create additional “aggregate” tables, both to join the multiple tables mentioned earlier, and to speed up the delivery of summary level data and achieve suitable performance. Creating aggregate tables requires that additional SQL be written to keep them up-to-date and synchronized with detail tables and all of this must be done without impacting or putting at risk to the operation of the operational system.

While extensions to the standard ANSI SQL and optimization techniques fashioned into RDBMS (such as materialized query tables or automatic summary tables) will help, these extensions only reduce the impact of inherent SQL limitations. Fundamentally, SQL is not designed to handle dimensional queries.

The limitations of SQL are the very reason that the OLAP technology was invented. All major RDBMS vendors including IBM, Oracle, and Microsoft offer OLAP products, including DB2 OLAP Server, Oracle OLAP, and SQL Server Analysis Services. These OLAP products were necessary to enhance their analytical capabilities in order to satisfy the business need for multidimensional constructs.

## COGNOS AND THE OLAP LANDSCAPE

With the highest market share, Cognos is the acknowledged leader in OLAP solutions. More organizations deploy Cognos PowerPlay for OLAP than any other vendor's product, according to reports such as *The OLAP Survey 3*. According to analyst reports such as these, more organizations deploy Cognos PowerPlay for OLAP analysis than any other vendor's product.

Cognos PowerPlay is the industry's leading solution with sales that have topped \$1 billion. Cognos PowerPlay allows users to analyze and navigate huge data volumes in PowerCubes built from any data source, as well as from third-party OLAP solutions. These cubes are integrated seamlessly with Cognos' industry-leading Enterprise Business Intelligence Series, which delivers critical business data to a broad range of users.

Cognos has become the de facto standard for OLAP for the following reasons:

### *The Right Client for the Right User:*

- A simple, zero-footprint intuitive Web interface provides a familiar platform for users. This heightens user adoption, lowers training costs, and speeds up deployment. These factors combined mean that enterprises can realize the benefits of OLAP quickly and increase their return on investment sooner
- The Excel plug-in lets users (especially in finance) stay with an interface they already understand
- The full functionality of the Windows client supports professional analysts who need to generate standard reports quickly
- All reports can be viewed with a Web browser. This lowers costs and creates a less cumbersome solution

than one that requires plug-ins for all users. This platform also supports mobile detached users using laptops, PDAs, tablets, and other devices, giving them information faster so they can act on important developments more quickly than the competition.

### *Faster Deployment and Quicker Results:*

- Cognos PowerPlay makes it easy and fast to represent organizational changes (HR transfers, reporting relationship changes, mergers and acquisitions). Such changes can be done much more quickly and easily than in a relational database environment. Companies can understand the effect of changes more quickly than competitors who do not have this advantage.

### *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 software is zero-footprint, users do not have to spend time or money deploying, maintaining, and updating plug-ins or downloads to maintain functionality. For a preview of a Cognos extranet solution, visit the following sites:

- The City of Albuquerque: <http://www.cabq.gov/onlinesvcs/crimestats/index.html>

- NASA: <http://naade02.msfc.nasa.gov/workforce/>

- The United States Office of Personnel Management: <http://www.fedscope.opm.gov/index.asp>

- Ohio Department of Mental Health: <http://www.mh.state.oh.us/index-dept.html>

- Australian Institute of Mental Health: <http://www.aihw.gov.au/dataonline/index.html>

## SUMMARY

An enterprise OLAP solution can provide your organization with the insight needed to make more informed decisions and build better business relationships, both internally and externally, with partners, suppliers, and customers.

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

However, to be truly deployable on an enterprise scale, an OLAP solution must meet certain key criteria before it can contribute to any gains in revenue or cost efficiencies.

A highly effective enterprise OLAP solution must:

- **Deliver Fast Response Times**—to large numbers of concurrent users who need to perform analysis and data exploration
- **Provide Fast Learning Times**—to decision-makers who have limited time or desire to learn new applications
- **Provide Wide Application Reach**—to adapt to the different OLAP analysis and reporting needs of all decision-makers across the extended enterprise

- **Reach Outside Your Organization**—so that decision-makers both inside and outside of your organization's intranet can take advantage of enterprise OLAP
- **Deliver Fast Time to Results**—to enable corporate decision-making to keep up with the dynamic business conditions needed
- **Handle Significant Data Volumes**—so that decision-makers have enough of the right information to affect the bottom line.

Fulfilling these requirements has made Cognos the number one choice for OLAP. By delivering corporate data to everyone in the organization and giving them powerful ways to analyze it, Cognos enables companies to coordinate decision-making across the enterprise. This helps improve the performance of the business. Cognos BI products support over 100 relational and OLAP data sources, and integrate with many enterprise applications, including Oracle Applications, PeopleSoft, SAP, and SSA.

Choosing OLAP is a wise investment for your organization. And, choosing Cognos will bring the highest OLAP rewards.



## ABOUT COGNOS

Cognos is the world leader in reporting, business intelligence, and enterprise planning software. Industry analysts and experts recognize Cognos' leadership in these fields and in the emerging field of corporate performance management. These analysts and experts point to the breadth and excellence of Cognos performance management software as the source of this leadership.

Cognos backs up this leadership with the highest awards for customer service in the industry. More importantly, the return on investment Cognos delivers to its customers is proven by independent industry watchers, and backed up by customers across all major verticals, around the world.

Founded in 1969, Cognos today serves more than 22,000 customers in over 135 countries. Cognos enterprise business intelligence solutions and services are also available from more than 3,000 worldwide partners and resellers.

Leaders choose leaders. Leaders choose Cognos.

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