Analysis and delivery tools

Business Intelligence, OLAP, and customer analytics

Architecture for Analytical CRM

Customer analytics

- Use BI tools and techniques to obtain customer intelligence
- BI technology
  - On-line analytical processing (OLAP)
  - query and reporting
  - Data mining
**Business Intelligence (BI)**

- BI - many definitions
- "a broad category of software and solutions for gathering, consolidating, analyzing and providing access to data in a way that lets enterprise users make better business decisions" Gartner(1994)
- Business intelligence is a product of analyzing business data using business intelligence tools. It emerges as a result of this analysis. (SAS institute, 1997)

**What is OLAP?**

- "a category of software technology that enables analysts, managers, and executives to gain insight into data..."
- "Derived from end-user requirements, OLAP enables end-users to perform ad hoc analysis of data in multiple dimensions, thereby giving them the insight and understanding they need for better decision-making"
- (OLAP council http://www.consortiuminfo.org/links/olap.php)

**OLAP**

- Isn’t a specific technology, it describes the rules for a technology
- "OLAP Council—a global consortium that was established in January 1995 to serve as an industry guide
- Codd’s 12 OLAP rules (1993)
What is OLAP?

- An objective of OLAP technology is to provide users with the opportunity to perform complex analysis of data in an intuitive and simple way.
- OLAP offers a set of graphical tools that provide multidimensional views of data and allow users to visualize, summarize, and analyze data and to explore patterns and trends.
- The results of OLAP analysis can be delivered using interactive analytical reporting.
- The presentation of the information in the reports is of paramount importance.

The Codd rules (some)

- **Multidimensional Conceptual View** (Original Rule 1)
  - The core of OLAP, Codd included 'slice and dice' as part of this requirement.
- **Intuitive data manipulation**
  - Dimensions defined should allow automatic re-orientation, drill-down, zoom-out, etc.
  - Interface must be intuitive.
- **Transparency**
  - OLAP server should shield the user from the complexity of the data and application.
- **Consistent reporting performance**
  - Despite size and dimensional increases, the ease of use and performance must be maintained.
The Codd rules

Flexible reporting
• Any possible orientation
• Rows and Columns be able to show from 0 to n dimensions

Unlimited dimensions and aggregation levels
• From 15 - 20 dimensions maximum
• Rare in reporting to go beyond 12 dimensions
• 6-7 is usual
• Unlimited aggregation

Unrestricted cross-dimensional operations
• Calculations are not singular dimensional even though they may appear to be

Multi-user support
• Access, Integrity, Security

OLAP Multi-dimensionality

• OLAP technology uses multidimensional data representation, called “cubes”, to provide rapid access to data warehouse data
• Cube metaphor- cubes, or hyper cubes, or n-cubes
• Easy to navigate

Slicing a data cube (McFadden et al 1999)
### Typical OLAP Operations

**Slice and dice**
- **Drill down**: from higher level summary to lower level summary or detailed data
- **Drill-up (roll-up)**: reverse of drill down, summarises data by rolling up hierarchy

**Pivot**: Rotate the cube

**Drill across**: drilling across more than one fact table

### Hierarchies

- Hierarchies within the dimensions are very important
  - Enable drill up and down
  - E.g. day, week, month, quarter, year

Example:  
- `store-country`
- `store-state`
- `store-city`
- `store-id`

### OLAP operations

- **Roll up**
- **Drill across**
  - **Hierarchy 1** (Customer)
  - **Hierarchy 2** (Salesperson)
  - **Hierarchy n** (Product)
- **Drill down**
- **Drill through**

Summary information  
(Net sales for the Western sales region)

Detailed information  
(Net sales for the salesperson 3742)

Detailed data  
(Sales units for salesperson 3742)
OLAP and dimensional models

- Star schema is compatible with OLAP systems
- Star schemas are efficient and easy to understand and use

Star schema and SQL queries

- DM organizes data into structures that correspond to the way analysts query data
- Textual attributes are used for constraining and grouping within data warehouse queries.

Example query (Kimball)
Find all the product brands that were sold in the first quarter of 1995 and display the total sales and number of units.

SQL
Select p.brand, sum(f.dollars), sum(f.units)
From salesfact f, product p, time t
Where f.productkey = p.productkey
And f.timekey = t.timekey
And t.quarter = '1 Q 1995'
Group by p.brand
Order by p.brand

Example Star schema
(from Kimball, 1998)

<table>
<thead>
<tr>
<th>Time key</th>
<th>Product key</th>
<th>Store key</th>
<th>Promotion key</th>
<th>Sales Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Product</td>
<td>Store</td>
<td>Promotion</td>
<td>Date sales</td>
</tr>
<tr>
<td>Subcategory</td>
<td>Category</td>
<td>Department</td>
<td>Brand</td>
<td>Sales Fact</td>
</tr>
<tr>
<td>SKU number</td>
<td>SKU description</td>
<td>SKU number</td>
<td>SKU description</td>
<td>Sales Fact</td>
</tr>
<tr>
<td>Units per retail case</td>
<td>Units per retail case</td>
<td>Date sales</td>
<td>Date sales</td>
<td>Date sales</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight unit of measure</td>
<td>Date sales</td>
<td>Date sales</td>
<td>Date sales</td>
</tr>
<tr>
<td>Units per ship case</td>
<td>Cases per pallet</td>
<td>Date sales</td>
<td>Date sales</td>
<td>Date sales</td>
</tr>
</tbody>
</table>

(from Kimball, 1996, p38)
Star schema and reports

- dimensions
  - provide a way of grouping the facts
  - appear as row headers in reports
  - Enable constraints and grouping within data warehouse queries.

- textual attributes in dimension tables are used as the source of row headers in a report (example from Kimba)
Analysis of Customer Data

OLAP, reporting, query
Allow exploration of existing customer data, typically by
- transaction
- location
- product
- time

OLAP and Visualisation

Example:
Clickstream analysis (from the OLAP Report: applications)
An example clickstream analysis application that uses OLAP invisibly at its core:
- visitor segmentation (browsers, abandoners, buyers) for various promotional activities

There are many dimensions to this analysis:
Where the visitors came from, the time of day, the route they take through the site, whether or not they started/completed a transaction, and any demographic data available about customer visitors.

For more on OLAP and applications read the OLAP report:
- http://66.40.99.72/about.htm

  Marketing and sales analysis
  Database marketing

  http://66.40.99.72/about.htm

CRM analytics using MicroStrategy:
- From Teradata Student network: www.teradatastudentnetwork.com password will be provided
- Go to MicroStrategy BI software
- Customer analysis module - provides OLAP style reports
- Exercises: Student are to explore customer analytics using the Customer Analysis Module and submit in week 11 (or before)
MicroStrategy CRM reports

- Customer analysis module, four groups of reports:
  - Acquisition, retention and attrition
  - Customer segmentation
  - Profitability and cross-sell analysis
  - Scorecards

Acquisition, Retention and Attrition module

- Acquisition, Retention and Attrition reports focus on understanding customer churn and its impact on overall revenue and profitability
- These reports provide an insight on trends and profiles of customers being lost, acquired and retained

Customer Segmentation module

Segmentation reports provide organizations the ability to analyze customer segments based on demographic, psychographic, geographic and profitability profiles
Profitability and Cross-Sell Analysis module

- Profitability and Cross-Sell reports provide insight on trends in customer profitability, product preferences, and products sold together.
- These reports identify who are the most profitable customers, what they are buying and products selling well.

Customer Segmentation module

- Segmentation reports provide organizations the ability to analyze customer segments based on demographic, psychographic, geographic and profitability profiles.

Scorecards module

- Contains personalized reports and dashboards that users view frequently to assess the overall situation within customer marketing.
Objective: Analyze customer profitability data to determine who your high revenue band customers are and the cities where they are located.

Business Case Summary: The company is rolling out a new customer relationship management system. The CEO would like the major players in the CRM project to personally visit a few high revenue band customers. The customer locations will help determine who visits which customer.

Drilling Down to Determine Customer Location

Example of drill-down.

Revenue Band report. This report only shows you totals and does not display any individual customer information. Select Drill.
### Revenue Band vs. Customers with Transactions

<table>
<thead>
<tr>
<th>Revenue Band</th>
<th>Customers with Transactions</th>
<th>Revenue 12/31/09</th>
<th>Profit</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>3</td>
<td>16,950.88</td>
<td>1,621.88</td>
<td>9.77%</td>
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<tr>
<td>Medium</td>
<td>11</td>
<td>14,601.17</td>
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<tr>
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You have identified the high revenue band customers and the cites where they are located. The CRM project players will gain a better understanding of customer needs.

References

Zikmund R., McLeod R., Gilbert F. “Customer Relationship Management, Integrating Marketing Strategy and Information Technology”


• OLAP Report http://www.olapreport.com/
• OLAP definitions http://altaplana.com/olap/glossary.html#PIVOT