Designing and Developing Business Intelligence Applications

BI Application Resource Planning

- Role of BI Application Developer

-must develop, maintain, enhance core set of BI applications

-must provide usable, working, documented solutions

- Who does the BI Applications Job?

Central group of BI developers creates and maintain BI applications

Lifecycle Timing

- BI application process is two stage process
- -Specification which is done after requirements gathering
- -Development which is done after data access tool is selected , initial database design and initial data loading is done

BI Application Specification

- Designing report template
- Identifying and specifying applications
- Designing navigation framework and portal
- Get customers involved in specification process

Five major activities in BI apps specification

- Create application standards and templates
- Determine the Initial Application Set
- Develop Detailed Application specifications
- Design the Navigation Framework and Portal
- Review and Validate the Applications and Model

Create application standards and templates

- **Determine Naming standards**

-covers areas like naming, formatting and common fields

- **Create the Application Templates**

people can find information quickly if presented in a consistent fashion.

Newspaper Example

- need to have own format and content standards and use them consistently
- standards at portal level and at individual document level

Standard elements needed in BI report or Application

- **Report name**
- **Report title**
- **Report body**
- Column/row layout of data, including:
- Data justification: Right justified for numbers, left justified for row headers, right justified or centered for column headers.
- Display precision: Dependent on data, so you must figure it out for all your numeric fields.
- Column and row heading format: Often bold, underlined, or colored to distinguish them from report data (and test this in print form).
- Background fills and colors.
- Formatting of totals or subtotal breakout rows.

- **Header and footer**
- Report name.
- Parameters and filters used.
- Navigation category.
- Report notes regarding any unusual definitions or content.
- Page numbering.
- Report run time and date.
- Data source(s): Which dimensional model(s) sourced the data in the report, and was it the relational or OLAP database.
- Confidentiality statement.
- DW/BI reference: Name and logo.
- **Report file name**

Example Standard Template

BigCo, Inc.

BCBI System
We're here to help

Report Title
Report Subtitle
<Primary Report Variable>
<Report Date or Date Range>

[Report Contents]

Report Information

Report Category: {Primary category in BI Portal to which this report belongs}
Report Name: {e.g.: Sales Performance Report – current vs. prior period by geography}
Source: {BCBI System – Standard Reports} Run on: {Run_Date} Page { 1}

Create Dashboard and Analytic Application Templates

- Dashboards and analytic applications are complex than simple standard reports
- You should create a standard template for these
- A typical dashboard or analytic application incorporates several different elements, including reports, charts, and special dashboard controls such as alert indicators.

Determine the Initial Application Set

- Once standards and templates are created, the next step in the BI specification process is to develop the target list of reports.
- A small set of high value reports is created that provide a range of report types
- Ten or fifteen reports may be enough to start with for some organizations
- some of these reports might be more complex analytic applications or might be grouped together for delivery through a dashboard
- The process of generating the target list involves three tasks:
- **Identifying report candidates**
- **Consolidating the candidate list**
- **Prioritizes the Report List**

Identify Report Candidates

- Depending on how well you documented your interviews with managers, each interview write-up may have a list of potential reports
- Requires involvement of core business users who are familiar with the initial business process.
- Use a spreadsheet like the one shown in Figure to make a list of individual report requests, one request per line.
- Include a name, type of report, row data elements, column data elements, measures, and additional attributes that might help in the consolidation process, such as listing the groups or departments that are interested in the report.

Sample Candidate Report List

Doc Title: Candidate Report List	Project: BBCBI System: Orders business process				Prepared By: Warren Thornthwaite			Date Prepared: 07/ 09/ 2008
#	Report Name	Short Description	Report Category	Primary Owner	Bus. Value	Level of Effort	Report Type	Date Elements	Comments
		rank for each year and the change in rank.							
2	Product Performance	Product Orderes and Market Share by Current Period vs. Prior for a specific geography.	Marketing Results	Joy	8	4	Matrix & Pie Chart	Product hierarchy, Date, Geography hierarchy, Order Dollars	This may be part of Prod Mgmt dashboard
3	Territory Orders Time Series	Last 13 months Actual Orders vs. Forecast by Territory.	Orders Analysis	Bob	7	3	Table & Line Chart	Month, Sales Territory, Order Dollars, Forecast Dollars.	NOTE: Forecast may not be in initial release.
4	Product Orders Time Series	Last 13 months Actual Orders vs. Forecast by Product level	Marketing Results/Orders Analysis	Joy	8	3	Table & Line Chart	Product Description, Order Quantity, Forecast Order Quantity	NOTE: Forecast may not be in initial release

Consolidate the Candidate List

- Once the list is reasonably complete, refocus the group on consolidating the list
- To identify those reports on the list that are essentially different versions of the same report
- Categorize according to the items in the spreadsheet — which data elements does each report contain in each section?

Prioritize the Report List

- Once you have the list of candidate reports, work with the users to assign a priority to each one.
- Some of the factors to consider include business value, data availability, degree of development difficulty, scope of use, and user importance.
- Sometimes the CEO's report comes first, regardless of its true business value.
- If you can't actually rank the reports, at least try to split them up into three groups: the As, Bs, and Cs.
- Reports that provide high business value and are relatively easy to create make the A list.
- Limit the A list to 15 reports or less
- keep the B list handy if you have extra time, or for the next iteration, and encourage your users to work on the C list if they feel strongly about it.
- The A list is what you plan to implement.

Develop Detailed Application Specifications

- involve the business users
- The specification process has two underlying Purposes
- first is to capture enough information
- second is to ensure that the DW/BI
- system is delivering something of value to the business community

- best ways to specify the individual report/applications is to divide and conquer.
- Split the target list of reports up among the available business and technical folks
- each person work for their subset of the target list and bring the results back for group review

Each report/application have following set of documentation:

- **Mock up.**
- It is a physical example of the report, including all the visual components.
- To create a mock up, start with your standard template and fill in the report-specific elements: rows, columns, calculations, and formatting.
- **User interactions**
- List all the points where the user can interact with the

  report, including variables, parameters, lists, limits, drilldown paths, and links.

- **Datasets.**
- Describe the datasets that fill the various sections and components of the report, including the report body and selection lists that support user interactions.
- **Algorithms, advanced calculations, and business rules.**
- Include descriptions of any advanced analytics or data mining models that will be needed in the application.
- **Interactions with other reports/systems.**
- Describe interactions between reports and systems

Specify Application Content

- The parameter-driven approach allows users to generate dozens or potentially hundreds of variations on the basic standard report.

Sample report mock up

BigCo, Inc.

BCBI System
We're here to help

Product Performance Report
<(Geography Name)>
<Period> Compared to <Prior Period>

Product Line Brands	Sales Units	Prior Sales Units	Sales Index	Market Share #Sd#	% Var Prior Share
<<Brand C>>	xxx,xxx	xxx,xxx	xx.x	xx.xx	x.x
Brand E	xxx,xxx	xxx,xxx	xx.x	xx.xx	x.x
Brand B	xxx,xxx	xxx,xxx	xx.x	xx.xx	x.x
Brand D	xxx,xxx	xxx,xxx	xx.x	xx.xx	x.x
Brand A	xxx,xxx	xxx,xxx	xx.x	xx.xx	x.x

[Mockup author: Jane Jetson]
[Date created: 7/22/2008]

Report Information

Report Category: {Sales Analysis}
Report Name: {Product Performance Report – current vs. prior period by geography}
Source: {BCBI System –Standard Reports}
Run on: {Run_Date} Page { 1}

- <> User entered parameter, typically selected from list
- «» Drillable field
- #Sd# Sort order indicator, (a)scending or (d)escending
- {} Application entered variable, either from the system or metadata
- \\\\ Link/URL to another report or documentation source
- () Page or section break field
- [] Report template comment

- There are two parts to each BI application specification: a mock up and a definition.
- The definition provides basic information about the report or application, and the
- mock up provides a visual representation of how the content will look on the page.

- The BI application definition includes the name, description or purpose, frequency,
- parameters and their associated pick lists, user interactions, and default constraints.

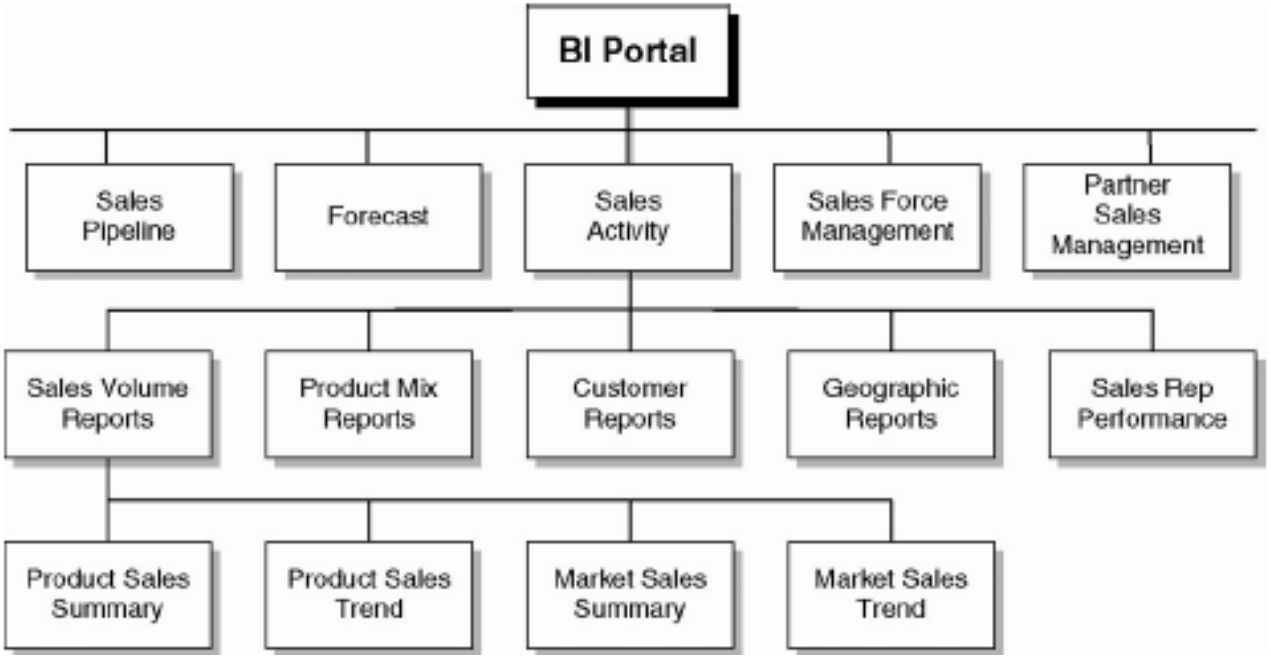
Example BI application definition

Doc Title: BI application definition	Project: BCBI System -- Orders business process					Prepared by: Warren Thornthwaite	Date Prepared: 7/9/2008
Report Num: 2	Report Name: Product Performance						
Report Description: The Product Performance report shows unit volume and market share by brand for a specific geography. This provides a snapshot of the volume movement.							
#	Report Element / Attribute	Page Location	Function Type	Default value(s)	Source	Generated In:	Query	Comments
1	Geography Name	Initial prompt screen	Page/ Section break	N/A	Initial prompt screen	Reporting tool	SELECT DISTINCT Geography_Name FROM Employee	Sales wants this at the region level, but it may be helpful to have a version that allows user selection of the geography level.
2	Product Line	Row header title	Pull down menu	Top Product Line	Initial prompt screen	Reporting tool		
3	Period	Initial prompt screen	Pull down menu	Current month	Initial prompt screen	Reporting tool		User can determine granularity of period (e.g., week, month, quarter, year).
4	Prior Period	Initial prompt screen	Pull down menu	Year ago month	Initial prompt screen	Reporting tool		Note: Prior period must be before current period and must be at same grain as Period.
5	Report Category	Footer	Application generated	N/A	Report metadata	Hard coded		See if the tool can read this from the metadata at execution time, otherwise, hard code.
6	Brand	Row headers	Report content / Drill down	Product Line Based	Data query	Reporting tool	See separate query doc for syntax	Note drill down on standard product hierarchy.
7	Sales Units	Column	Report content	N/A	Data query	Reporting tool	See separate query doc for syntax	Sum of Sales Units from Sales Fact table.

Design the Navigation Framework and Portal

- If users create as many reports as the warehouse team, you can easily end up with 100 standard reports or more before you know it.
- Even with meaningful naming standards, it would be difficult to navigate a list of 100 reports.
- This concludes requirement of navigation framework and portal
- It is a method for grouping and organizing these BI application objects.
- Figure shows a simple navigation framework with sales related business processes like sales activity and sales pipeline at the top level of the BI portal.

Simple application navigation framework



Review and Validate the Applications and Model

- The BI application specs provide a good way to logically test the dimensional model
- Take each report specification and verify that the attributes, constraints, hierarchies, measures, and appropriate grain all exist in the model.
- Look at each report, compare it to the model and think about how you would write the SQL or OLAP queries for the report
- **Review with the Business**
- The next step is to hold an official review session with the core users and all other interested stakeholders.
- Step through the documentation and any prototypes you put together that will help communicate the nature and content of the applications
- These specifications will inevitably change when you get to the application development phase

Business Intelligence Application Development

- The specific BI application development tasks vary according to your BI tools and the applications you are building.
- The application development process follows a standard software development flow:
- **Prepare**
- **Build**
- **Test**
- **Deploy**

Prepare for Application Development

- Install and Test the BI Tools
- Populate BI Tool Metadata
- Create Business Metadata
- Test the BI Tools
- Validate Your BI Application Interface Strategy
- Set Up User Security
- Set Up the Report Process Metadata System

Build the Applications

- **Follow the Core Process**
- Developing BI applications in most tools generally involves three major activities:

  1) Defining the user interactions,

  2) Creating the queries,

  3) Formatting the results.

Design and Develop Analytic Applications

- Typically targeted at a specific business process
- Provide a means for the user to feed changes back into the transaction system based on guidance from the analytic application
- To build this kind of application in the standard front end tool
- report building environment, it is to use a standard programming tool to weave the components together into a coherent application
- An analytic application may be a program that paints the user interface (UI), manages the user interactions, displays report and graph components from your BI tool via the tool's API, and directs certain user selections to an operational system.

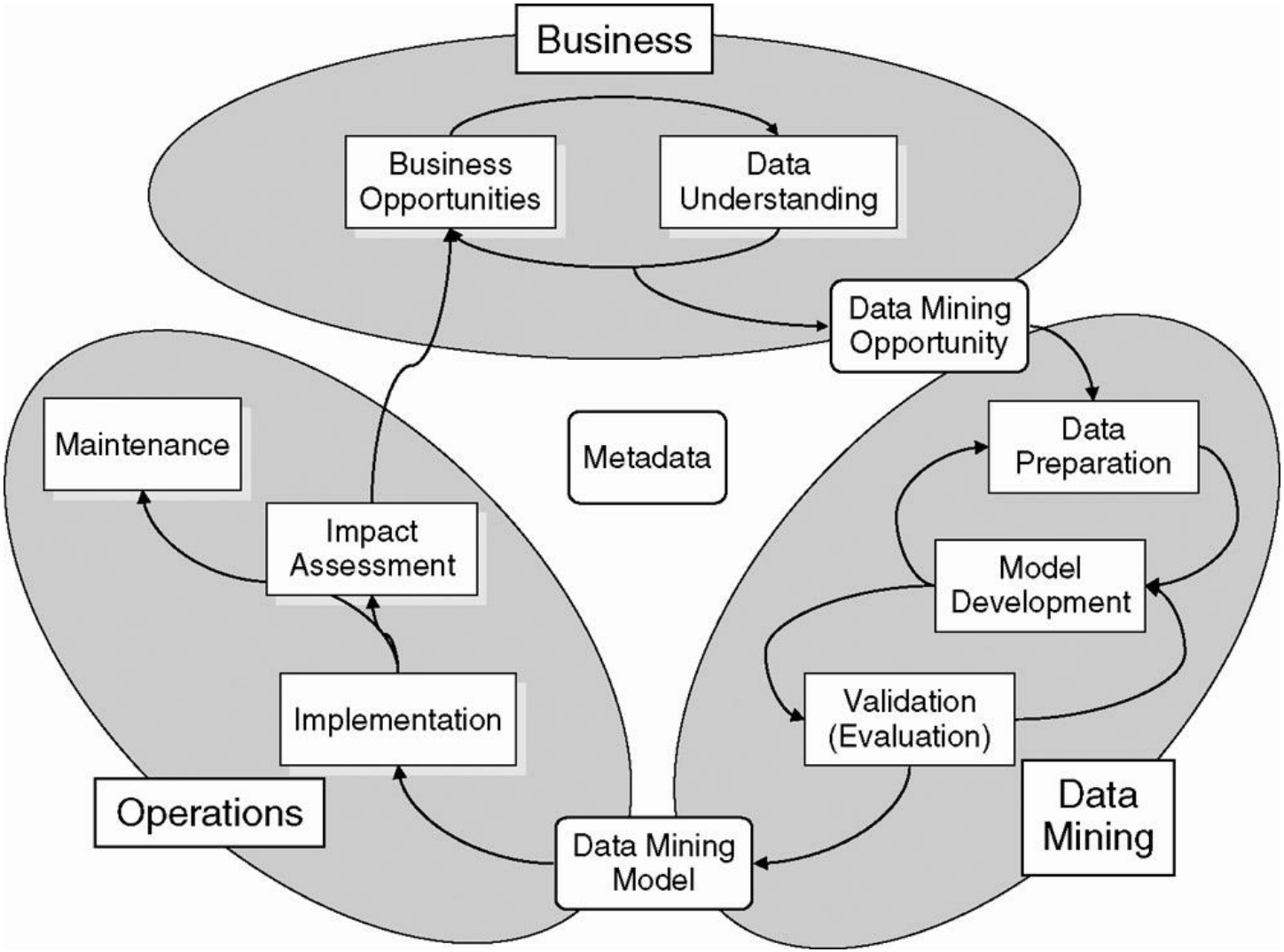
Design and Develop Operational BI Applications

- Operational BI applications are usually custom developed to query the data warehouse and the operational systems, and then enable the user to invoke transaction processes from within the BI application.
- These applications provide operations workers with a richer context for decision making and more directed guidance on which decisions might be best.
- Also called as closed-loop systems because they provide the user with the ability to act on that guidance immediately, usually by directly initiating an event in the transaction system.
- Operational BI must be available for 24/7
- operational BI applications can stress the performance levels of the DW/BI system
- Though the operational and low latency requirements add to the excitement, the process of developing operational BI applications is quite similar to developing the analytic applications

Include Data Mining Models

- It is one of the important potential component s in your BI applications
- From the application perspective, this typically takes pre-defined data mining model with specific parameters, such as customer attributes or purchase history and returns the appropriate values, such as product recommendations or a fraud alert.
- It starts with a business phase, exploring opportunities for applying data mining with business folks and verifying the existence of appropriate data to support those opportunities.
- In a highly iterative process, the data miner requests descriptive datasets called observation sets or case sets.
- These sets are fed into the data mining tool where the data miner selects different combinations of algorithms, parameters, and input variables.
- These combinations are called *models,* and the goal is to create models that appear to be most correlated or predictive.
- The best model (at least within the time allowed) is then moved into the operations phase.

Data mining model development and implementation process

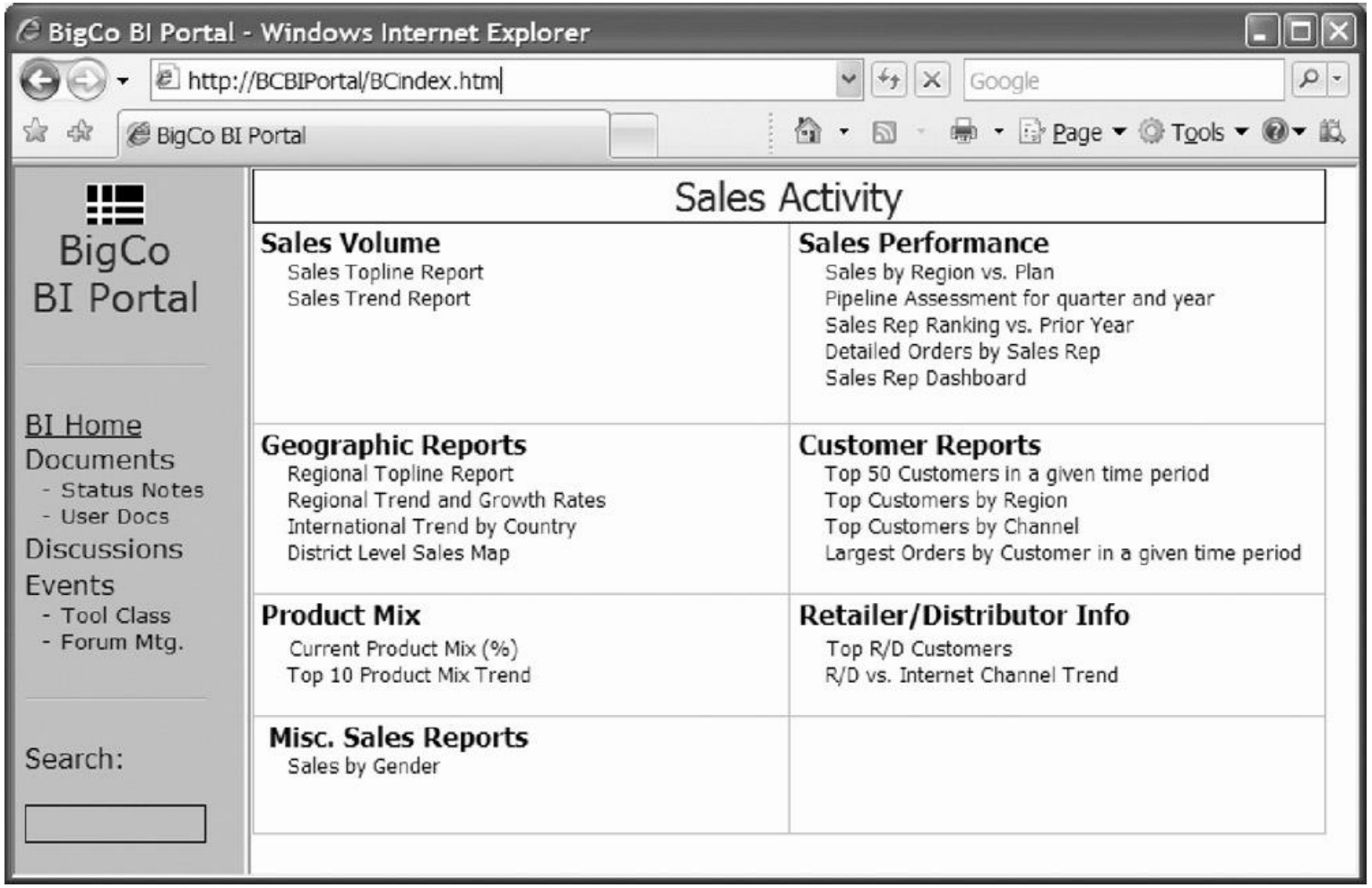


Create the Navigational BI Portal

- Once you have more than a couple of reports, you have to provide a navigation framework or BI portal that allows people to find the information they need
- The overall BI portal will have multiple levels, each with its own purpose and design.
- At the top level, the portal is primarily a navigation tool.
- Top level of a BI portal is devoted to a framework for organizing the standard BI applications and dashboards to help people find what they are looking for

  The indented items in Figure are links to the actual reports

Sample second level portal page for the sales business process



Test and Verify the Applications and Data

- Some of the most common issues you are likely to find include:
- **Meaningless descriptions**
- **Duplicate dimension information**
- **Incorrect dimensional relationships**
- **Data not balancing**
- **Performance tuning**
- The BI application developer must work closely with the ETL and database teams to work through these issues.

Business Intelligence Application Maintenance

- BI applications are not a one-time project. The initial set, and all subsequent additions, will need to be maintained and enhanced.
- This includes the following kinds of activities:
- Adding new BI applications built by both business users and the DW/BI team.
- Updating BI applications to include new data sources or changes to existing sources.
- Monitoring BI application performance.
- Removing unused BI applications based on the monitoring system, which should capture usage by report name in the process metadata.