Business Intelligence
Unit I

Definition, Brief History and Architecture of BI; Origins and Drivers of BI; A cyclical Process of Intelligence; Successful BI Implementation; Ethics and Business Intelligence.

Introduction

- The business environment is constantly changing and is becoming complex day by day.
- Organizations are now becoming agile to sudden changes hence now making frequent and quick strategic, tactical, operational decisions.
- Making such decisions require considerable amount of relevant data, information and knowledge.
- Decisions needs to be done in real time now.

Opening Case

- Magpie Sensing employs analytics to Manage a Vaccine Supply Chain Effectively and Safely.

Changing Business Environments and Business Support

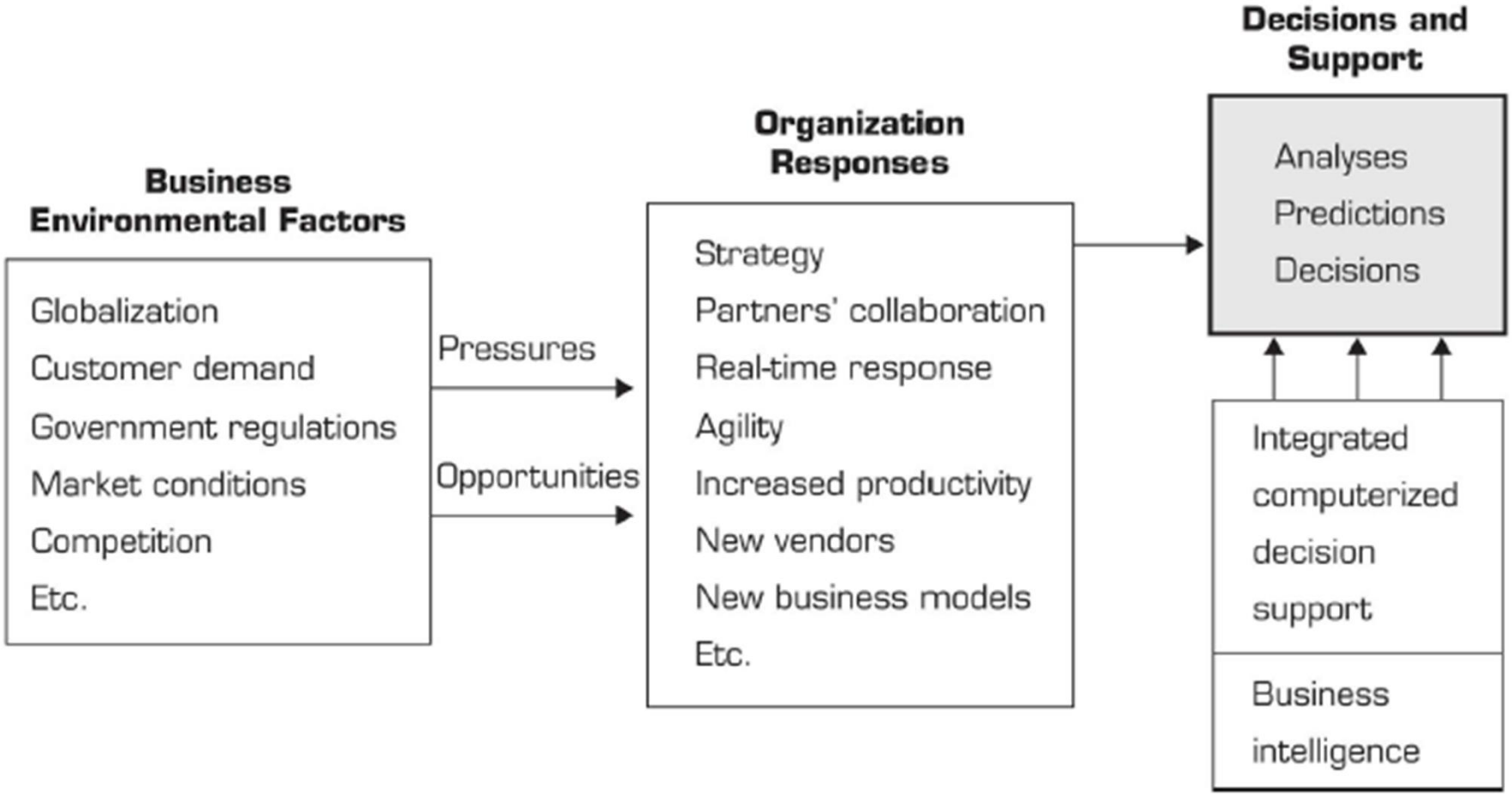


Figure 1.1 The Business Pressures–Responses–Support Model.

The Business Pressure-Responses-Support Model

1. The Business Environment

- The complex environment in which organizations operate creates opportunities on the one hand and problems on the other.
  - For e.g.: Globalization
  - Opportunities:
    - easily find suppliers and customers in many countries,
  - Problems:
    - more and stronger competitors.
- Business environment factors can be divided into four major categories: *markets*, *consumer demands*, *technology*, and *societal*.

Factor	Description
Markets	Strong competition Expanding global markets Booming electronic markets on the Internet Innovative marketing methods Opportunities for outsourcing with IT support Need for real-time, on-demand transactions
Consumer demands	Desire for customization Desire for quality, diversity of products, and speed of delivery Customers getting powerful and less loyal
Technology	More innovations, new products, and new services Increasing obsolescence rate Increasing information overload Social networking, Web 2.0 and beyond
Societal	Growing government regulations and deregulation Workforce more diversified, older, and composed of more women Prime concerns of homeland security and terrorist attacks Increasing social responsibility of companies Greater emphasis on sustainability

2. *Organizational Responses: Be Reactive, Anticipative, Adaptive, and Proactive*

Managers may take other actions, including the following:

- Employ strategic planning.
- Use new and innovative business models.
- Restructure business processes.
- Participate in business alliances.
- Improve corporate information systems.
- Improve partnership relationships.
- Encourage innovation and creativity.
- Improve customer service and relationships.
- Move to electronic commerce (e-commerce).
- Move to on-demand manufacturing and services.
- Use new IT to improve communication, data access (discovery of information), and collaboration.
- Respond quickly to competitors' actions (e.g., in pricing, promotions, new products and services).
- Automate many tasks of white-collar employees.
- Automate certain decision processes, especially those dealing with customers.
- Improve decision making by employing analytics.

Many, if not all, of these actions require some computerized support. These and other response actions are frequently facilitated by computerized DSS.

A Framework for Business Intelligence

- As the enterprise-wide systems grew, managers were able to access user-friendly reports that enabled them to make decisions quickly.
- These systems, which were generally called *executive information systems* (EIS), then began to offer additional visualization, alerts, and performance measurement capabilities.
- By 2006, the major *commercial* products and services appeared under the term *business intelligence* (BI).

Business Intelligence

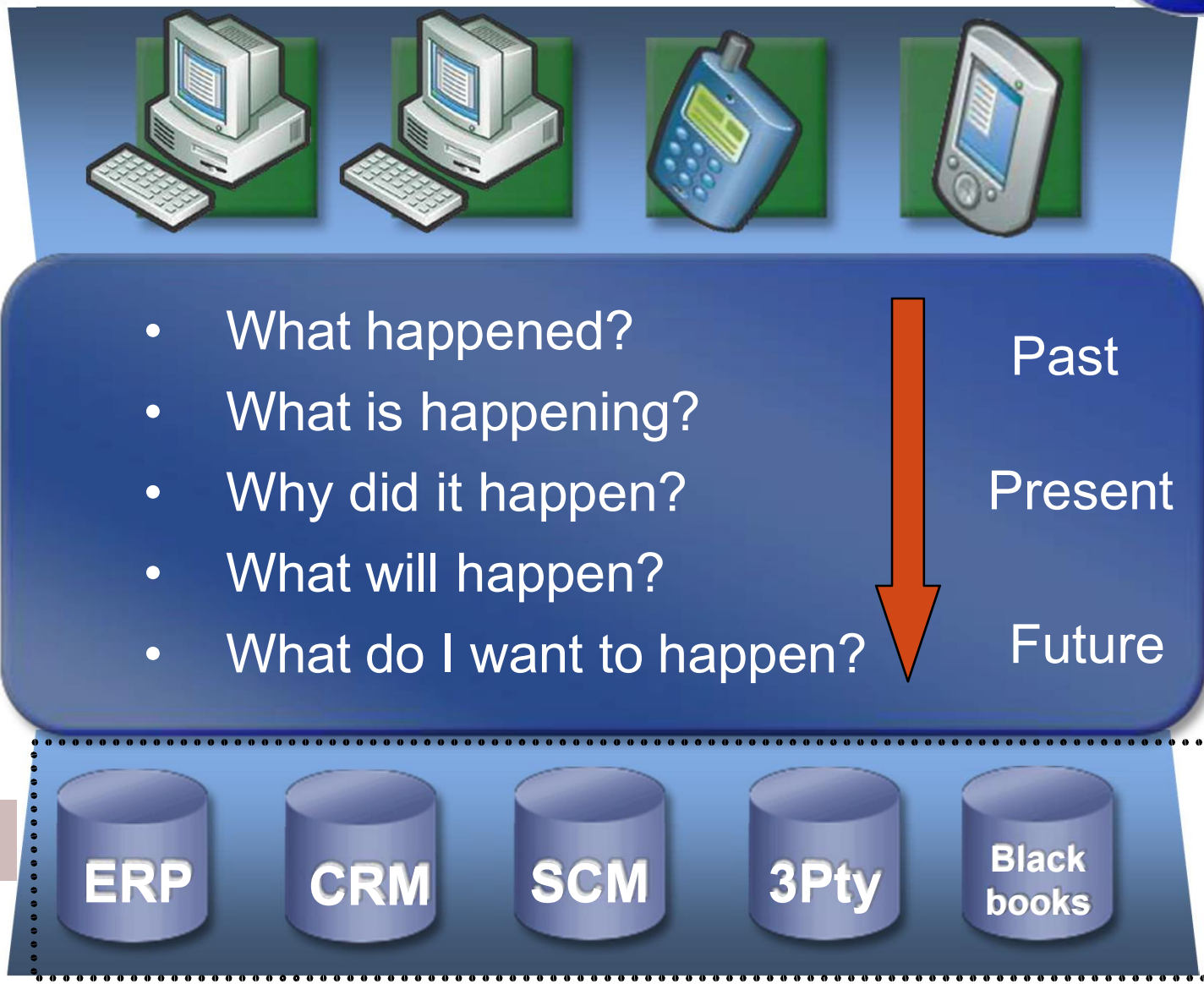
What is Business Intelligence

- Business Intelligence (BI) is about getting the right information, to the right decision makers, at the right time.
- BI is an enterprise-wide platform that supports reporting, analysis and decision making.
- BI leads to:
  - fact-based decision making
  - “single version of the truth”

Business Intelligence

- Making useful, actionable insight from stored data.
- Allows effective business decisions to be made.
- The act of using historical data to gain new information.
- Techniques include:
  - multidimensional analyses
  - mathematical projection
  - modeling
  - 'canned' reporting
  - Dashboards

Questions BI is Designed to Answer



Questions BI is Designed to Answer

- A BI solution, with the right data and features, should be able to take operational data and enable users to answer specific questions such as:
  - Sales and marketing
    - Which customers should I target?
    - What has caused the change in my pipeline?
    - Which are my most profitable campaigns per region?
    - Did store sales spike when we advertised in the local paper or launched an email campaign?
    - What is the most profitable source of sales leads and how has that changed over time?

Questions BI is Designed to Answer

- Operational
  - Which vendors are best at delivering on time and on budget?– How many additional personnel do we need to add per store during the holidays?
  - Which order processing processes are most inefficient?
- Financial
  - What is the fully loaded cost of new products?
  - What is the expected annual profit/loss based on current marketing and sales forecasts?
  - How are forecasts trending against the annual plan?
  - What are the current trends in cash flow, accounts payable and accounts receivable and how do they compare with plan?
- Overall business performance
  - What are the most important risk factors impacting the company's ability to meet annual profit goals?
  - Should we expand internationally and, if so, which geographic areas should we first target?

Business Intelligence Vision

Improving organizations by providing business insights to **all** employees leading to better, faster, more relevant decisions

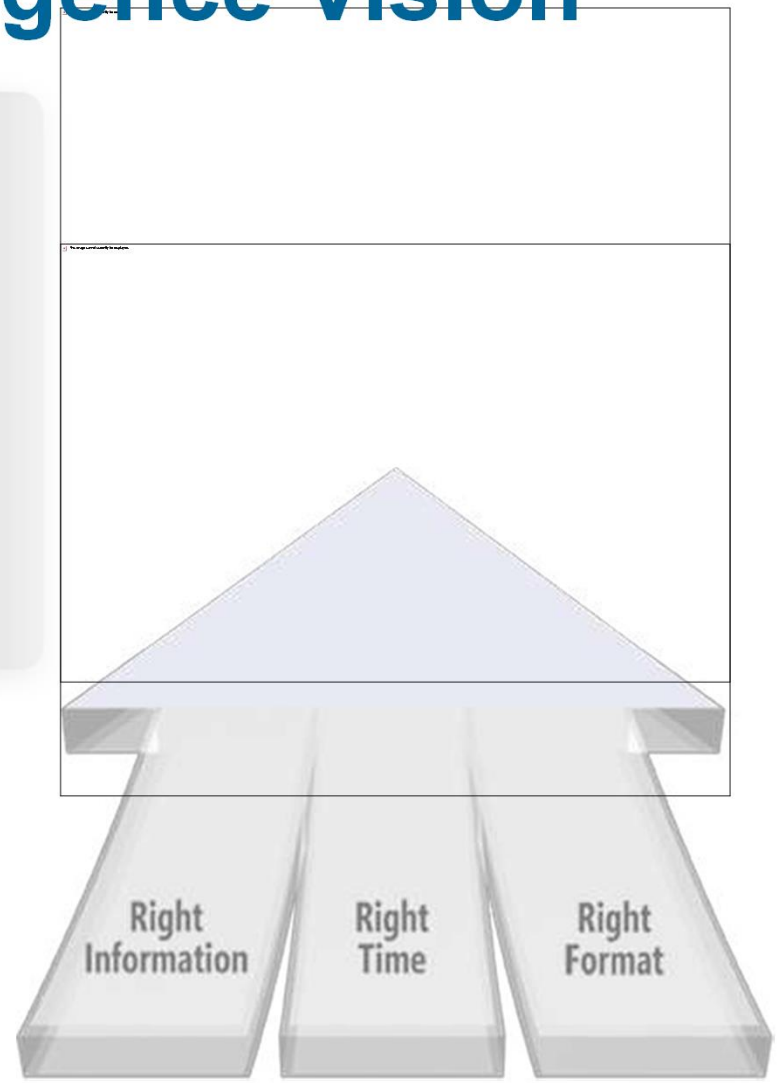
Advanced Analytics Self Service

Reporting End-User Analysis

Business Performance Management

Operational Applications

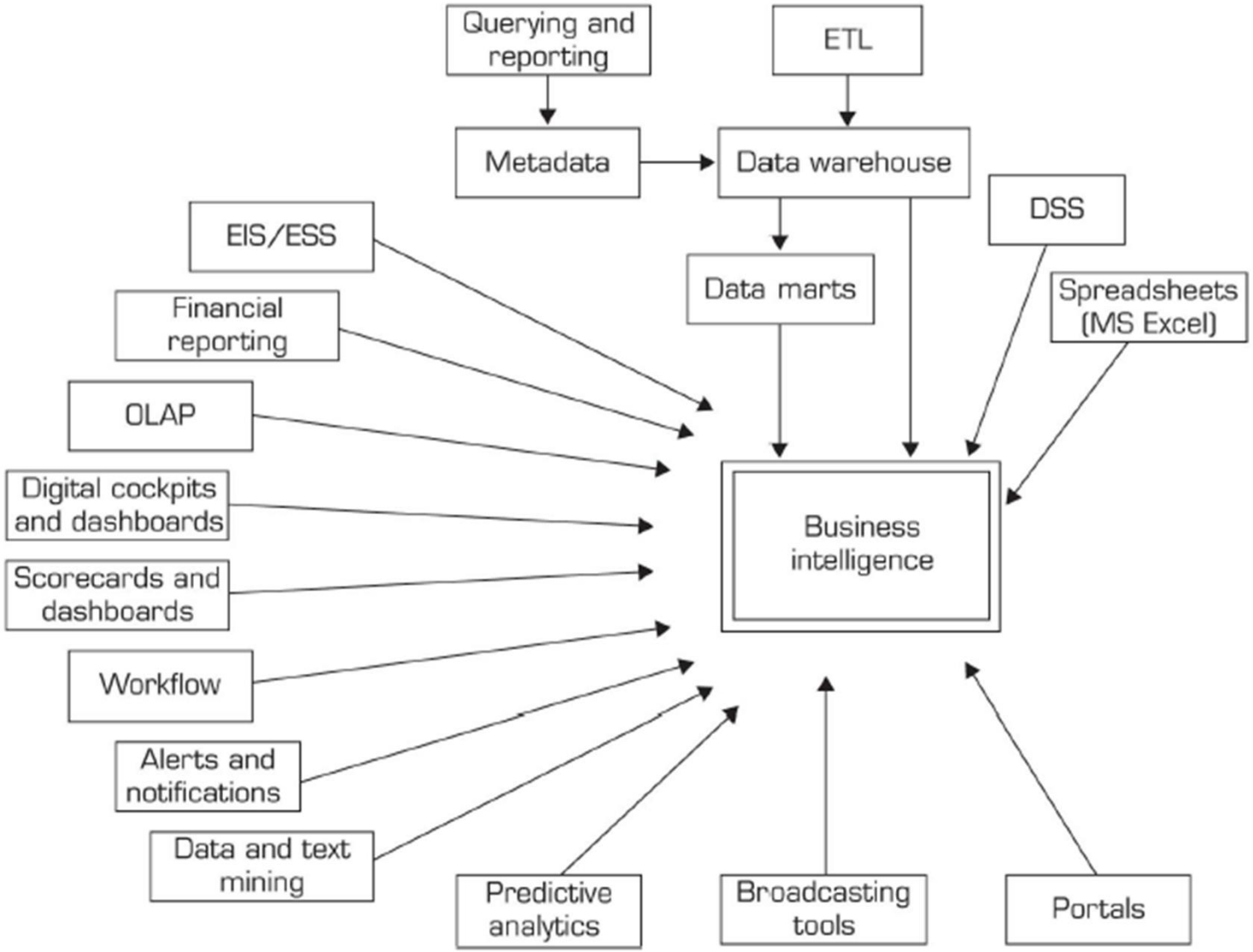
Embedded Analytics



Brief History of BI

- The term *BI* was coined by the Gartner Group in the mid-1990s.
- However, the concept is much older; it has its roots in the MIS reporting systems of the 1970s. During that period, reporting systems were static, two dimensional, and had no analytical capabilities.
- In the early 1980s, the concept of *executive information systems* (EIS) emerged. This concept expanded the computerized support to top-level managers and executives. Some of the capabilities introduced were dynamic multidimensional (ad hoc or on-demand) reporting, forecasting and prediction, trend analysis, drill-down to details, status access, and critical success factors.
- These features appeared in dozens of commercial products until the mid-1990s. Then the same capabilities and some new ones appeared under the name BI.
- Today, a good BI-based enterprise information system contains all the information executives need. So, the original concept of EIS was transformed into BI.
- By 2005, BI systems started to include *artificial intelligence* capabilities as well as powerful analytical capabilities.

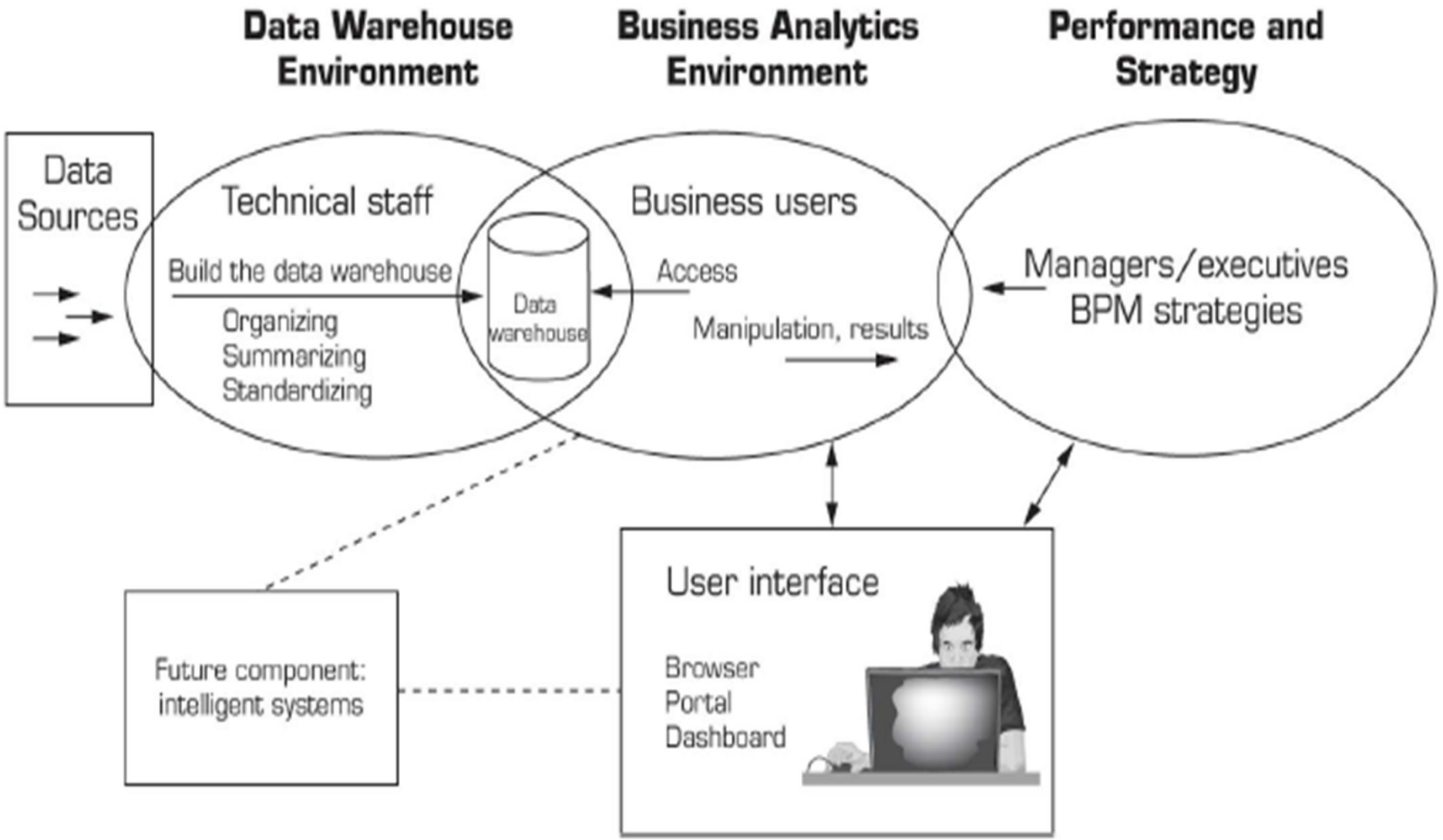
various tools and techniques that may be included in a BI system.



Architecture of BI

- A BI system has four major components:
  - a *data warehouse*, with its source data;
  - *business analytics*, a collection of tools for manipulating, mining, and analyzing the data in the data warehouse;
  - *business performance management (BPM)* for monitoring and analyzing performance; and
  - a *user interface* (e.g., a **dashboard**).

A High level Architecture of BI



The Origins and Drivers of BI

- Today's investments in information technology are under increased scrutiny in terms of their bottom-line impact and potential. The same is true of DW and the BI applications that make these initiatives possible.
- Organizations are being compelled to capture, understand, and harness their data to support decision making in order to improve business operations. Legislation and regulation now require business leaders to document their business processes and to sign off on the legitimacy of the information they rely on and report to stakeholders.
- Moreover, business cycle times are now extremely compressed; faster, more informed, and better decision making is, therefore, a competitive imperative. Managers need the *right information* at the *right time* and in the *right place*. This is the mantra for modern approaches to BI.
- Organizations have to work smart. Paying careful attention to the management of BI initiatives is a necessary aspect of doing business. It is no surprise, then, that organizations are increasingly championing BI.

Applications of BI

Analytic Application	Business Question	Business Value
Customer segmentation	What market segments do my customers fall into, and what are their characteristics?	Personalize customer relationships for higher satisfaction and retention.
Propensity to buy	Which customers are most likely to respond to my promotion?	Target customers based on their need to increase their loyalty to your product line. Also, increase campaign profitability by focusing on the most likely to buy.
Customer profitability	What is the lifetime profitability of my customer?	Make individual business interaction decisions based on the overall profitability of customers.
Fraud detection	How can I tell which transactions are likely to be fraudulent?	Quickly determine fraud and take immediate action to minimize cost.
Customer attrition	Which customer is at risk of leaving?	Prevent loss of high-value customers and let go of lower-value customers.
Channel optimization	What is the best channel to reach my customer in each segment?	Interact with customers based on their preference and your need to manage cost.

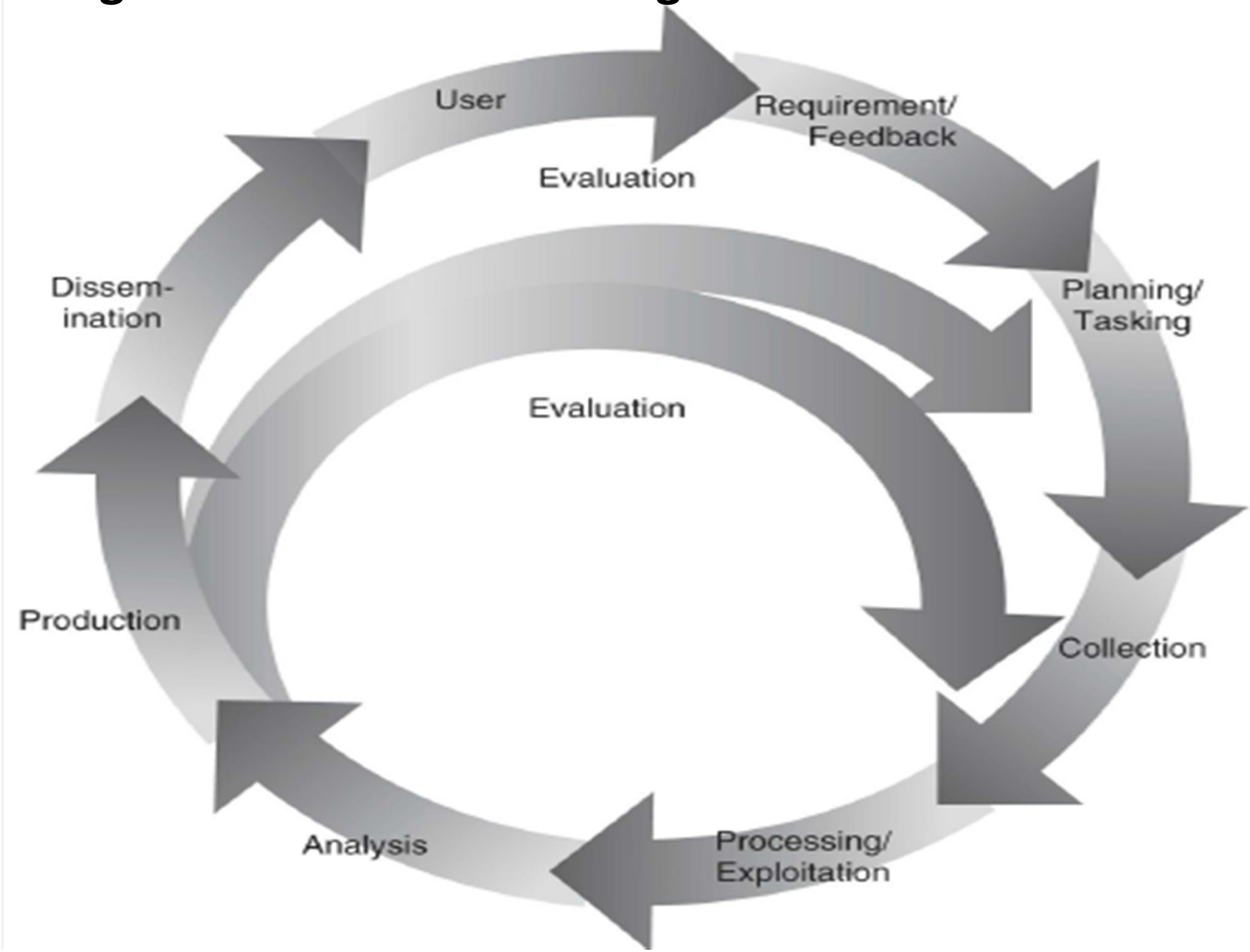
Application Case 1.2

- Sabre Helps Its Clients Through Dashboards & Analytics
  - It illustrates one such application of BI that has helped many airlines as well as, of course, the companies offering such services to the airlines.

A Cyclical Process of Intelligence Creation and Use

- Data warehouse and BI initiatives typically follow a process similar to that used in military intelligence initiatives.
- In fact, BI practitioners often follow the model depicted in Figure 1.4 . The process is cyclical with a series of interrelated steps.
- Analysis is the main step for converting raw data to decision-supporting information. However, accurate and/or reliable *analysis* isn't possible unless other steps along the way have been properly addressed.

Figure 1.4 Process of Intelligence Creation and Use



- Once a data warehouse is in place, the general process of *intelligence creation* starts by identifying and prioritizing *specific* BI projects.
- Some organizations refer to the project prioritization process as a form of **BI governance**
- A typical set of issues for the BI governance team is to address

(1) creating categories of projects (investment, business opportunity, strategic, mandatory, etc.);

(2) defining criteria for project selection;

(3) determining and setting a framework for managing project risk;

(4) managing and leveraging project interdependencies; and

(5) continually monitoring and adjusting the composition of the portfolio.

Intelligence and Espionage

- Although many believe the very term *intelligenc*e sounds like a cloak-and-dagger acronym for clandestine operations dedicated to stealing corporate secrets, or the government's, this couldn't be further from the truth.
- Although such *espionage* does, of course, occur, we are interested in how modern companies ethically and legally organize themselves to glean as much as they can from their customers, their business environment, their stakeholders, their business processes, their competitors, and other such sources of potentially valuable information.
- But collecting data is just the beginning. Vast amounts of that data need to be cataloged, tagged, analyzed, sorted, and filtered, and must undergo a host of other operations to yield usable information that can impact decision making and improve the bottom line.

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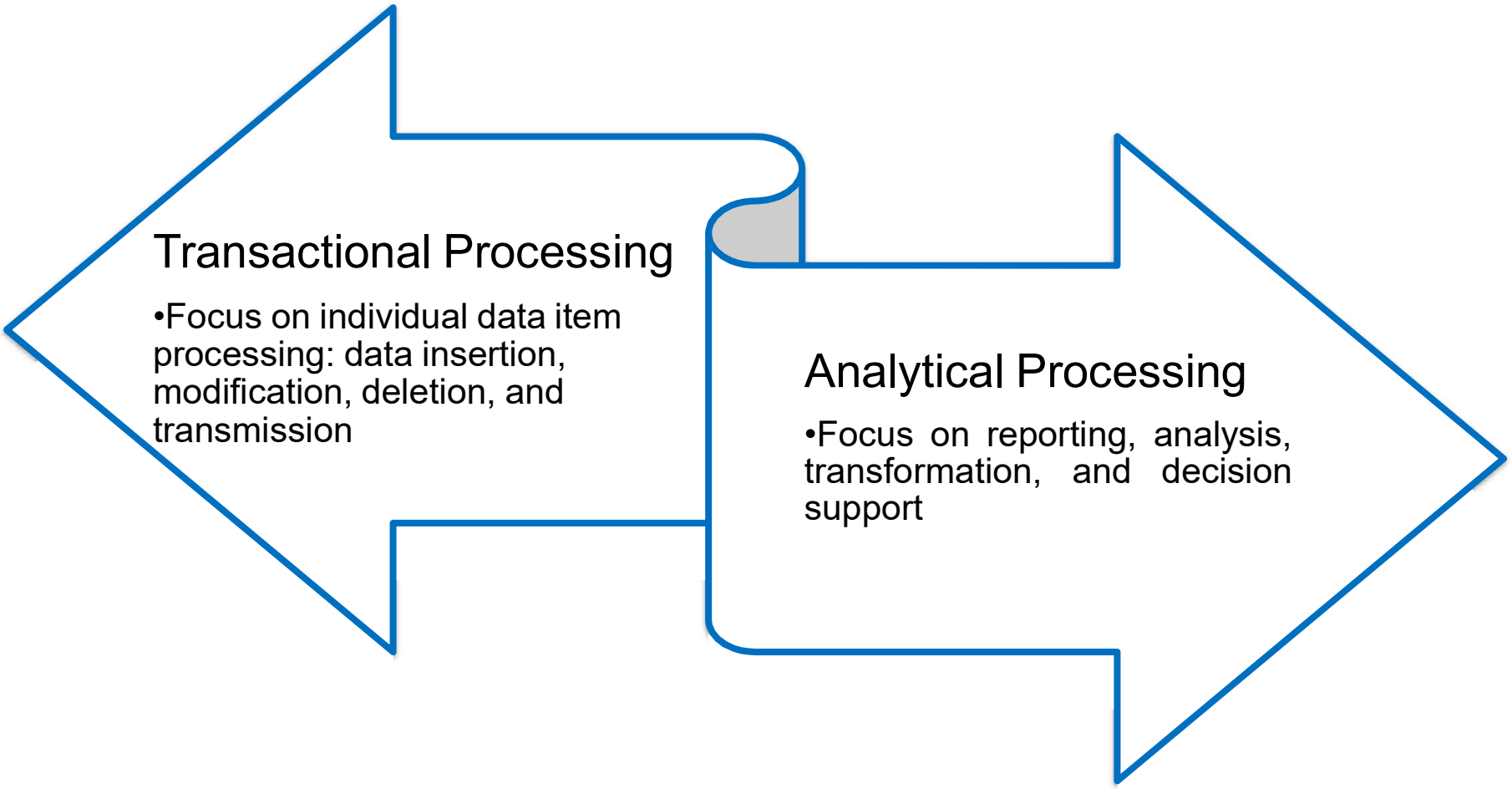
- The importance increases every day as companies track and accumulate more and more data.
  - For example, exacerbating the exponential growth in the amount of raw data is the emergence of sensor data including *radio-frequency identification* (RFID).
  - Applications based upon sensor and location data will likely be among the most exciting and fastest growing application categories for the next generation of BI specialists. That, coupled with new approaches to synthesize information from text sources through “text mining” and from the Web via Web mining, suggests that organizations are on the verge of an explosive new era of BI for decision support.
- BI has adapted a set of nomenclature, systems, and concepts that clearly distinguishes it from its espionage-oriented counterpart of national and international intelligence!
- There are many analogies between the two, including the fact that major effort must be expended to achieve the collection of reputable sources of intelligence.
- The processing of that intelligence for purity and reliability, the analysis of raw intelligence to produce usable and actionable information, and the mechanisms for the appropriate dissemination of that information to the right users.

Types of Information Processing



http://www.slideshare.net/fmhyudin/oltp-vs-olap-23317601

Transaction Processing VERSUS Analytic Processing

- To illustrate the major characteristics of BI, first we will show what BI is not—namely, transaction processing.
- We're all familiar with the information systems that support our transactions, like ATM withdrawals, bank deposits, cash register scans at the grocery store, and so on. These *transaction processing* systems are constantly involved in handling updates to what we might call *operational databases*.
  - For example, in an ATM withdrawal transaction, we need to reduce our bank balance accordingly; a bank deposit adds to an account; and a grocery store purchase is likely reflected in the store's calculation of total sales for the day, and it should reflect an appropriate reduction in the store's inventory for the items we bought, and so on.
- These **online transaction processing (OLTP)** systems handle a company's routine ongoing business.

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- In contrast, a data warehouse is typically a distinct system that provides storage for data that will be made use of in *analysis*.
- The intent of that analysis is to give management the ability to scour data for information about the business, and it can be used to provide tactical or operational decision support whereby, for example, line personnel can make quicker and/or more informed decisions.
- DWs are intended to work with informational data used for **online analytical processing (OLAP)** systems.

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- Most operational data in Enterprise Resources Planning (ERP) systems—and in its complementary siblings like *supply chain management* (SCM) or *customer relationship management* (CRM)—are stored in an OLTP system, which is a type of computer processing where the computer responds immediately to user requests.
- Each request is considered to be a *transaction*, which is a computerized record of a discrete event.
- In the 1980s, many business users referred to their mainframes as “the black hole,” because all the information went into it, but none ever came back.
- All requests for reports had to be programmed by the IT staff, whereas only “pre-canned” reports could be generated on a scheduled basis, and ad hoc real-time querying was virtually impossible.

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- Although the client/server-based ERP systems of the 1990s were somewhat more report-friendly, it has still been a far cry from a desired usability by regular, nontechnical, end users for things such as operational reporting, interactive analysis, and so on.
- To resolve these issues, the notions of DW and BI were created.
- *Data warehouses* contain a wide variety of data that present a coherent picture of business conditions at a single point in time. The idea was to create a database infrastructure that is always online and contains all the information from the OLTP systems, including historical data, but reorganized and structured in such a way that it was fast and efficient for querying, analysis, and decision support.

Successful BI Implementation

Implementing and deploying a BI initiative can be lengthy, expensive, and failure prone. Some of the issues involved.

1. The Typical BI User Community

- BI may have a larger and more diversified user community. The success of BI depends, in part, on which personnel in the organization would be the most likely to make use of BI.
- One of the most important aspects of a successful BI is that it must be of benefit to the enterprise as a whole. Not surprisingly, there are likely to be users who focus at the strategic level and those who are more oriented to the tactical level.
- The various classes of BI users who exist in an organization can help to guide how the DW is structured and the types of BI tools and other supporting software that are needed.
- Members of each group are excellent sources of information on assessing the costs and benefits of specific BI projects once a DW is in place. It is obvious that one important characteristic of a company that excels in its approach to BI is proper *appreciation* for *different classes* of potential users.

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2. Appropriate Planning and Alignment with the Business Strategy

- First and foremost, the fundamental reasons for investing in BI must be aligned with the company's business strategy. BI cannot simply be a technical exercise for the information systems department.
- It has to serve as a way to change the manner the company conducts business by improving its business processes and transforming decision-making processes to be more data-driven.
- Many BI consultants and practitioners involved in successful BI initiatives advise that a framework for planning is a necessary precondition.
- If the company's strategy is properly aligned with the reasons for DW and BI initiatives, and if the requisite user community is in place and has the proper motivation, it is wise to start BI and establish a BI Competency Center (BICC) within the company.

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3. Real-Time, On-Demand BI

- Another important success factor of BI is its ability to facilitate a real-time, on-demand agile environment. As a result, a category of products called *real-time BI applications* has emerged (discussed later). The introduction of new data-generating technologies, such as *radio-frequency identification* (RFID), is only accelerating this growth and the subsequent need for real-time BI.
- Traditional BI systems use a large volume of *static* data that has been extracted, cleansed, and loaded into a *data warehouse* to produce reports and analyses. However, the need is not just reporting, since users need business monitoring, performance analysis, and an understanding of why things are happening. These can assist users, who need to know (virtually in real time) about changes in data or the availability of relevant reports, alerts, and notifications regarding events and emerging trends in Web, e-mail, or *instant messaging* (IM) applications.
- In addition, business applications can be programmed to act on what these real-time BI systems discover. For example, a *supply chain management* (SCM) application might automatically place an order for more "widgets" when real-time inventory falls below a certain threshold or when a *customer relationship management* (CRM) application automatically triggers a customer service representative and credit control clerk to check a customer who has placed an online order larger than $10,000.

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4. Developing or Acquiring BI Systems

- Today, many vendors offer diversified tools, some of which are completely preprogrammed (called *shells*); all you have to do is insert your numbers. These tools can be purchased or leased. For a list of products, demos, white papers, and much current product information, see **information-management.com** .
- Almost all BI applications are constructed with shells provided by vendors who may themselves create a custom solution for a client or work with another outsourcing provider. The issue that companies face is which alternative to select: purchase, lease, or build. Each of these alternatives has several options. One of the major criteria for making the decision is justification and cost–benefit analysis.

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5. Justification and Cost Benefit Analysis

- As the number of BI applications increases, the need to justify and prioritize them arises.
- Both direct and intangible benefits need to be identified.

6. **Security and Protection of Privacy**

- Extremely important issue while developing any computerized system especially BI that contains data that may possess strategic value.
- Also the privacy of employees and customers needs to be protected.

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7. Integration

- With integration of some small applications, all BI applications must be integrated with other systems such as databases, ERP, CRM, E-com etc.
- Usually can be connected through internet and many time information systems of business partners.
- Sometimes need to be integrated among themselves to create synergy in the system.

Ethics and Business Intelligence

- Privacy is the claim of individuals to be left alone. The Internet poses new challenges to the protection of individual privacy because information can easily be monitored, captured, and stored as it passes through its network of computer system.

- Spyware is small applications that can secretly install itself on an Internet user's computer by piggybacking on larger applications. Once installed, the spyware calls out to Web sites to send banner ads and other unsolicited material to the user, and it can also report the user's movements on the Internet to other computers.

- Companies can record a user's on-line activities, such as what files were accessed or which Web sites were visited. Web sites can learn the identity of their visitors if the visitors voluntarily register at the site or they can capture information about visitors without their knowledge using "cookie" technology.
- Cookies are tiny files deposited on a computer hard drive when a user visits certain Web sites that track visits to the Web site. Some companies use Web bugs, which are tiny graphic files embedded into e-mail messages and Web pages to monitor who is reading the e-mail message or Web page.

- Some e-commerce sites add opt-out selection boxes to their privacy statement, which, when accepted by a visitor, permit the collection of personal information. Privacy advocates promote the wider use of an opt-in model of informed consent in which businesses are prohibited from collecting information unless specifically allowed by the consumer , and it`s actually a problem.

Solution

- New technologies are available to protect user privacy during interactions with Web sites, including encrypting email, anonymizing Web surfing, preventing cookies, and eliminating spyware. The Platform for Privacy Preferences (P3P) is a standard for communicating a Web site's privacy policy to Internet users to help them select the level of privacy they wish to maintain when interacting with the Web site.

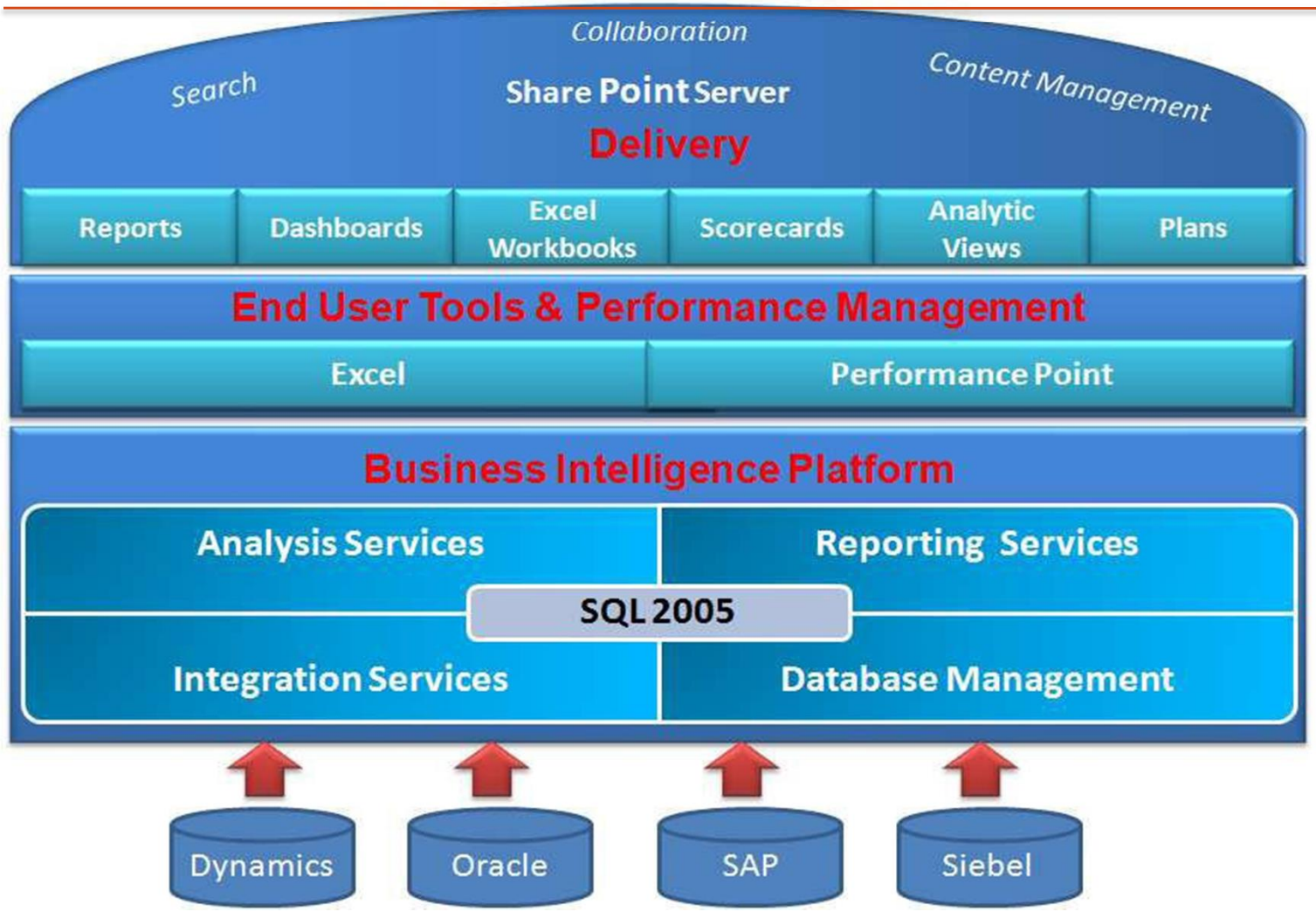
P3P Meaning

- P3P , developed by the World Wide Web Consortium, is emerging as an industry standard providing a simple, automated way for users to gain more control over the use of personal information on Web sites they visit. At its most basic level, P3P is a standardized set of multiple-choice questions covering all the major aspects of a Web site's privacy policies. Taken together, they present a clear snapshot of how a site handles personal information about its users.
- P3P-enabled Web sites make this information available in a standard, machine-readable format. P3P-enabled browsers can "read" this snapshot automatically and compare it to the consumer's own set of privacy preferences.

Additional Slides

(Not included in Sessional Syllabus)

Examples of BI



Microsoft BI Platform

Business Intelligence Users

4 Types of Users

Executives : Information is summarized and has been defined for them. Users have the ability to view static information online and/or print to a local printer.

- **Casual Users**

Casual users require the next level of detail from the information that is provided to viewers. In addition to the privileges of a viewer, casual users have the ability to refresh report information and the ability to enter desired information parameters for the purposes of performing high-level research and analysis.

- **Functional Users**

Functional users need to perform detailed research and analysis, which requires access to transactional data. In addition to the privileges of a casual user, functional users have the ability to develop their own ad hoc queries and perform OLAP analysis.

- **Super Users**

Super users have a strong understanding of both the business and technology to access and analyze transactional data. They have full privileges to explore and analyze the data with the BI applications available to them.

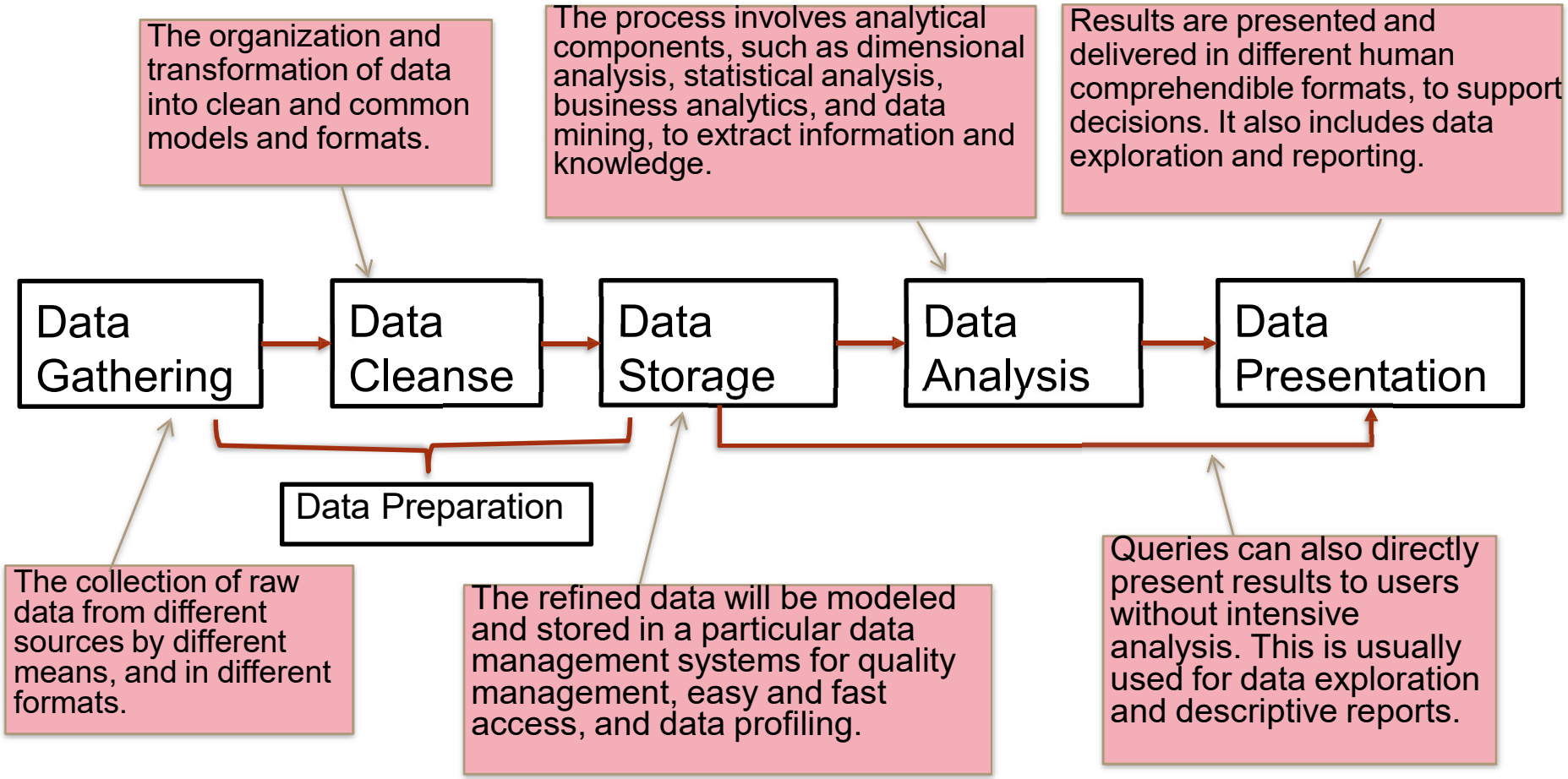
Business Intelligence

- Garbage in Garbage Out
- Transform data in to actionable insight.

Decision Making

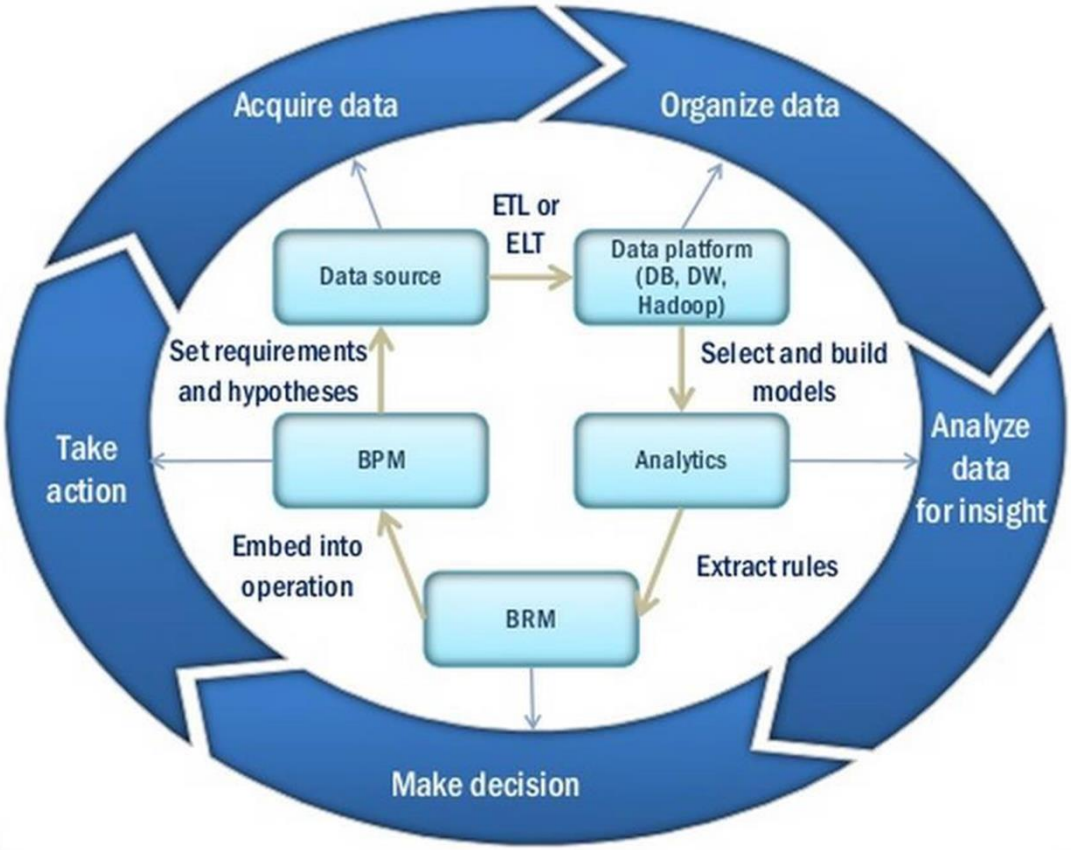
- Decisions can be made based on
  - Facts, or data
  - Simulation (models)
  - Intuition, perception, sense
  - Group negotiation
- Traditionally BI has been also understood as Decision Support System (DSS) – known as data driven DSS (data directly contributes to decision without intensive and advanced analytical techniques). Vs model driven DSS
  - A brief history of DSS: http://dssresources.com/history/dsshistory.html
- Problem
  - A gap between data and knowledge (useful information leading to a decision).
  - Management/operation by intuition
  - Lack of effective feedback and alignment systems, no improvement cycles
  - Need good analytical processing and models

BI: A General Process



BI in the Decision Process

Another view in the business decision perspective



KAIST Deloitte.

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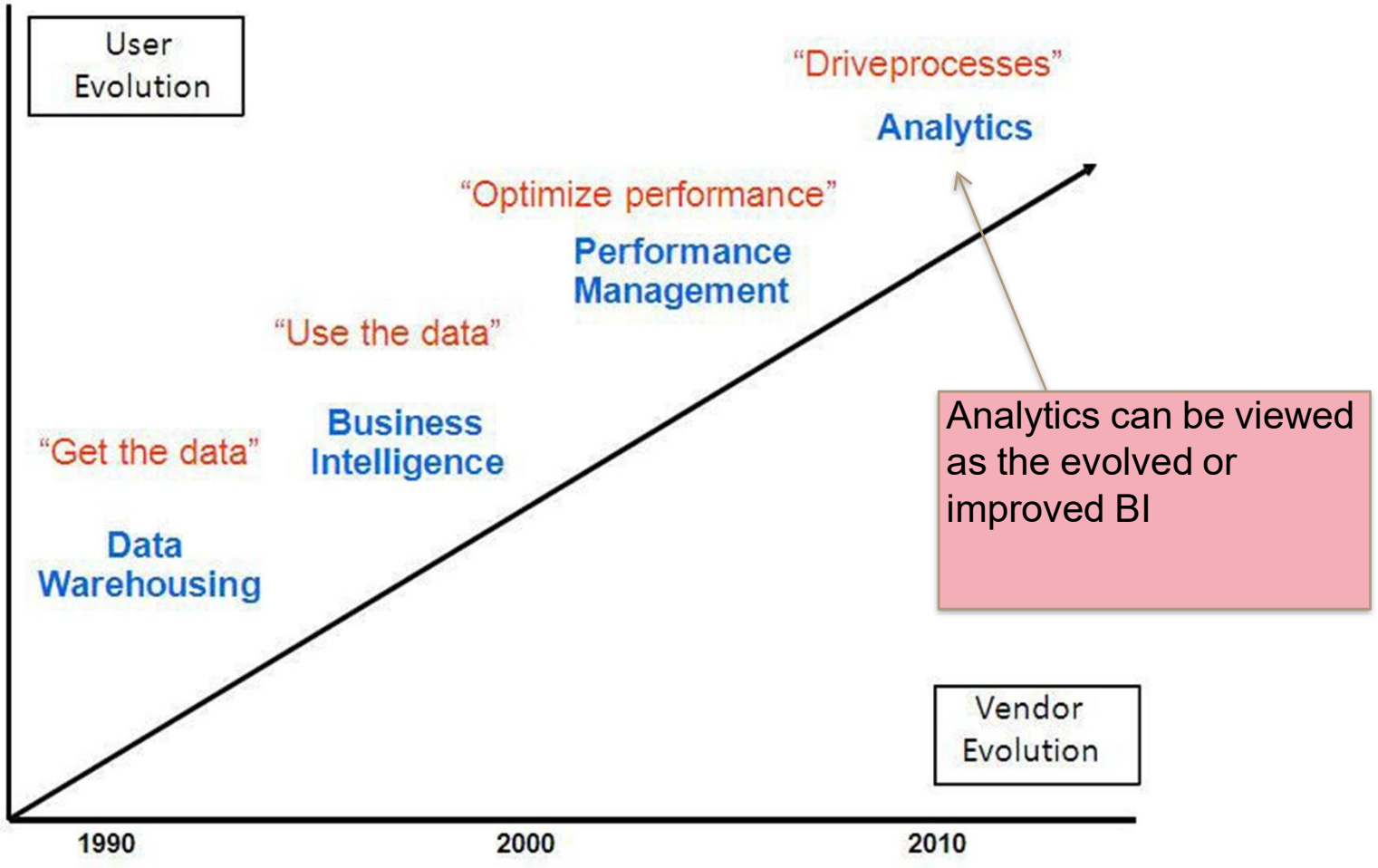
http://www.slideshare.net/junesungpark/business-process-based-analytics

The Evolution of BI Semantics



http://www.b-eye-network.com/blogs/eckerson/archives/2011/02/whats_in_a_word.php

Evolution of BI

- The search for the perfect "business insight system", from Performance Dashboard, by Wayne Eckerson, http://download.101com.com/pub/tdwi/files/performancedashboards.pdf

1980s	Executive information systems (EIS), decision support systems (DSS)
1990s	Data warehousing (DW), business intelligence (BI)
2000s	Dashboards and scorecards, performance management
2010+??	Analytics, big data, mobile BI, personal BI, in-memory, data science, …

"With each new iteration, capabilities increased as enterprises grew ever-more sophisticated in their computational and analytical needs and as computer hardware and software matured."

Solomon Negash (2004), Business Intelligence, CAIS (13)
https://www.researchgate.net/publication/228765967_Business_intelligence

BI Capabilities

This is consistent with the general BI or analytics process but more from an information behavior angle.

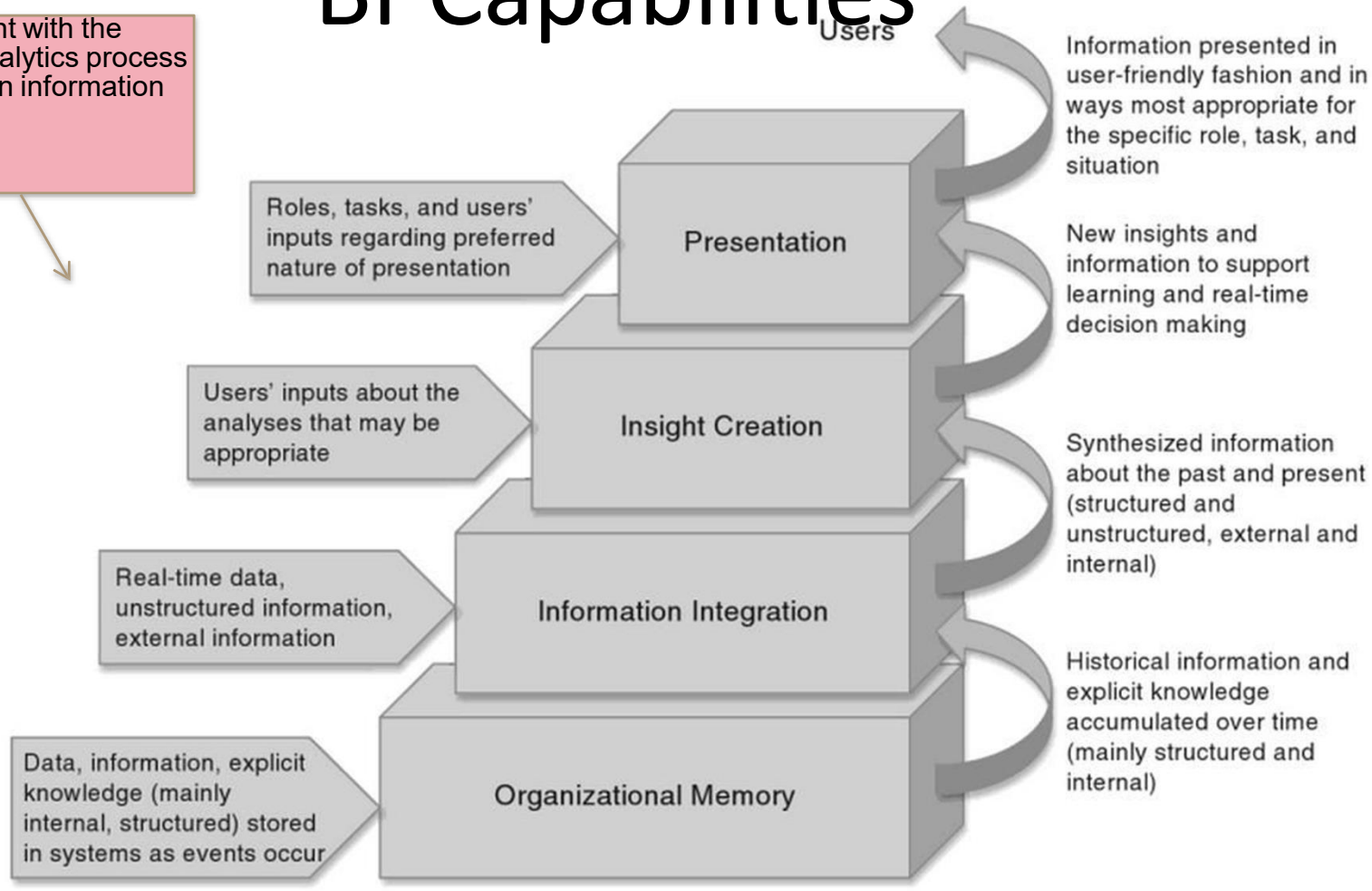


FIGURE 2.5 Inputs and Outputs of the Four Business Intelligence Capabilities

Figure from: Business Intelligence, Rajiv Sabherwal, Irma Becerra-Fernandez, John Wiley & Sons, 2011
http://books.google.com/books?id=T-JvPdEcm0oC

What is Business Intelligence?

Business Intelligence is a set of methods, processes, architectures, applications, and technologies that gather and transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making (to drive business performance).

Adapted from Forrester Report
"Topic Overview: Business Intelligence", 2008
https://www.forrester.com/report/Topic+Overview+Business+Intelligence/-/E-RES39218
More BI from Forrester
https://www.forrester.com/business-intelligence

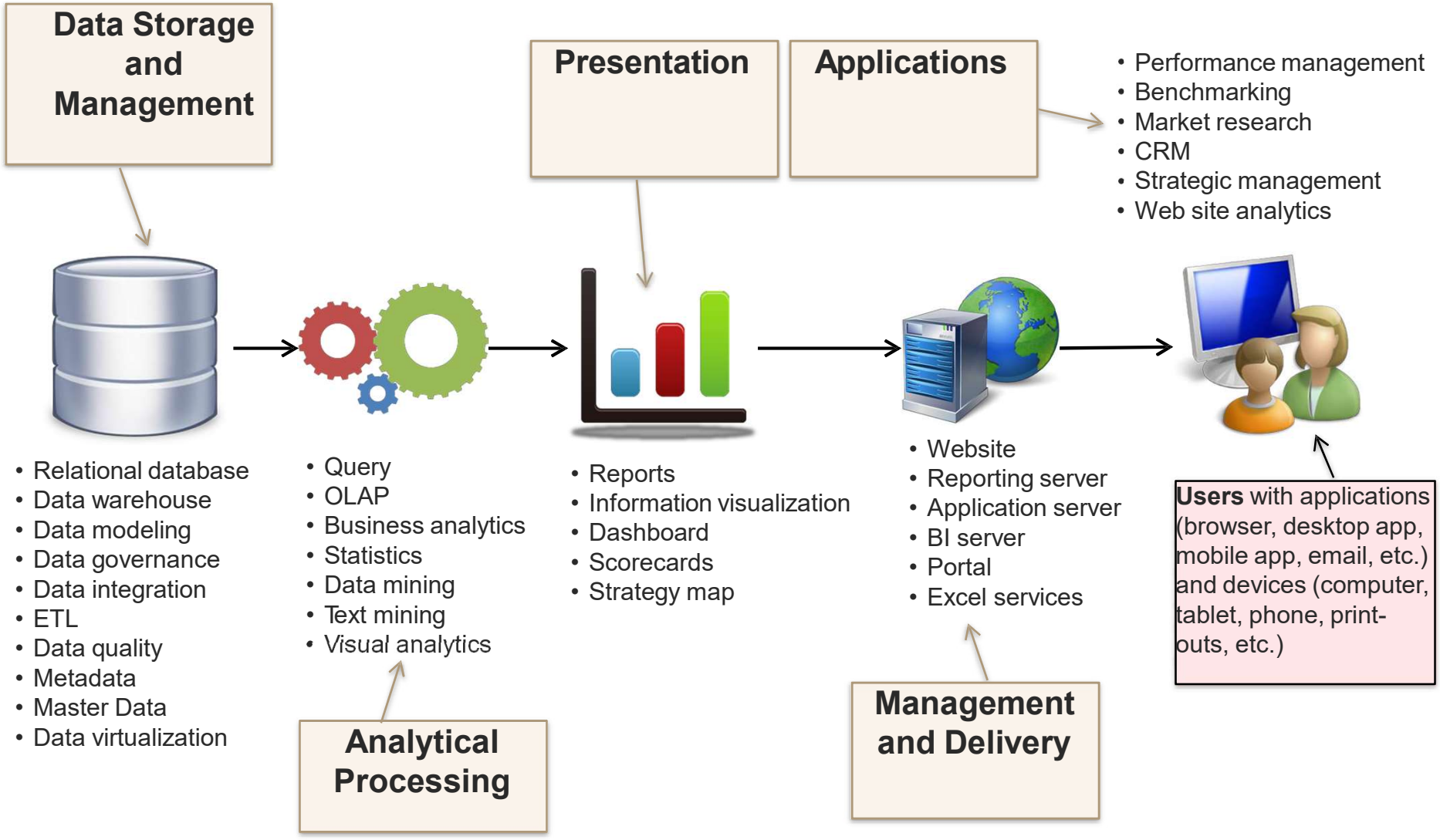
Additional Notes about BI

- BI is an umbrella term for a set of methods, processes, applications, and technologies used to
  - gather, provide access to, analyze, and report data and information
  - support understanding and decision making
- Broadly speaking, intelligence, or knowledge, comes from human experience and tacit knowledge, in various format like text, image, video, etc.
  - In this sense, BI is also related to *knowledge management* (either BI under KM or vice versa) http://capstone.geoffreyanderson.net/export/19/trunk/proposal/research/Knowledge_management.pdf
- Narrowly speaking, intelligence comes from data (facts). Traditional BI normally does not directly address other content types and formats (which usually falls under artificial intelligence).
  - In this sense, BI focuses on *analytical data processing*.

(Enterprise) BI Systems

- A BI system is a computer information system that implements (part or whole) BI capabilities and processes
- The value of BI Systems
  - Provide an integrated data (analytical) processing platform
  - Enable easy and fast access of data and information at all levels (raw data, analysis results, metrics, etc.)
  - Streamline a controlled and managed process of data driven decision making

BI System (Components) at a Glance



Examples of Analysis

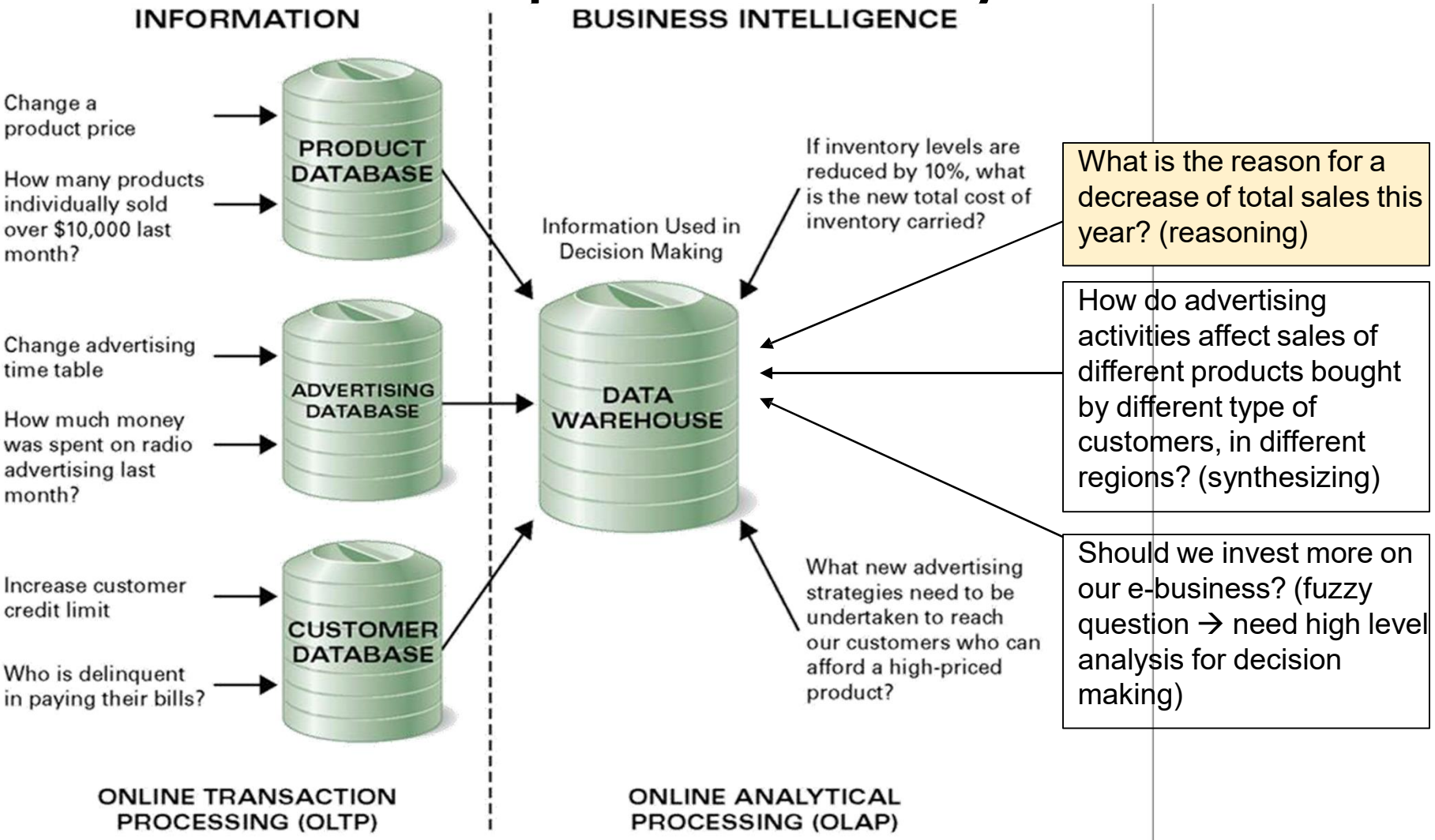


Figure from Database Processing, 13th Edition, by David Kroenke and David Auer

14 Critical Capabilities of a BI and Analytics Platform

Gartner Magic Quanrant Report 2016

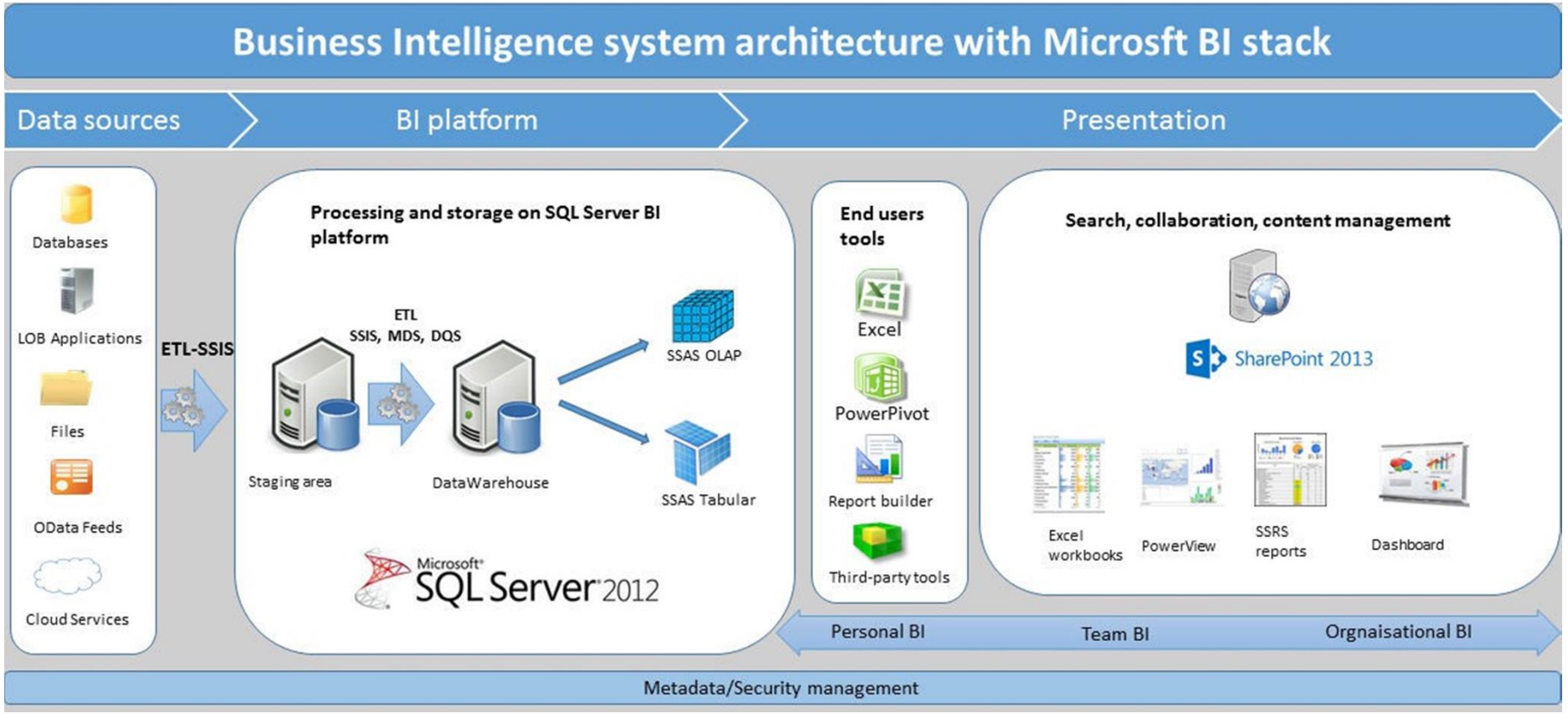
- **Infrastructure**
  - **BI Platform Administration.** Capabilities that enable scaling the platform, optimizing performance and ensuring high availability and disaster recovery.
  - **Cloud BI.** Platform-as-a-service and analytic-application-as-a-service capabilities for building, deploying and managing analytics and analytic applications in the cloud, based on data both in the cloud and on-premises.
  - **Security and User Administration.** Capabilities that enable platform security, administering users, and auditing platform access and utilization.
  - **Data Source Connectivity.** Capabilities that allow users to connect to the data contained within various types of storage platforms.

- **Data Management**
  - **Governance and Metadata Management.** Tools for enabling users to share the same systems-of-record semantic model and metadata. These should provide a robust and centralized way for administrators to search, capture, store, reuse and publish metadata objects, such as dimensions, hierarchies, measures, performance metrics/key performance indicators (KPIs) and report layout objects, parameters and so on.
  - **Self-Contained Extraction, Transformation and Loading (ETL) and Data Storage.** Platform capabilities for accessing, integrating, transforming and loading data into a self-contained storage layer, with the ability to index data and manage data loads and refresh scheduling.
  - **Self-Service Data Preparation.** The drag-and-drop, user-driven data combination of different sources, and the creation of analytic models such as user-defined measures, sets, groups and hierarchies. Advanced capabilities include semantic autodiscovery, intelligent joins, intelligent profiling, hierarchy generation, data lineage and data blending on varied data sources, including multistructured data.

- **Analysis and Content Creation**
  - **Embedded Advanced Analytics.** Enables users to easily access advanced analytics capabilities that are self-contained within the platform itself or available through the import and integration of externally developed models.
  - **Analytic Dashboards.** The ability to create highly interactive dashboards and content, with visual exploration and embedded advanced analytics.
  - **Interactive Visual Exploration.** Enables the exploration of data via the manipulation of visual properties and visual forms representing aspects of the dataset being analyzed. These tools enable users to analyze the data by interacting directly with a visual representation of it.
  - **Mobile Exploration and Authoring.** Enables organizations to develop and deliver content to mobile devices in a publishing and/or interactive mode, and takes advantage of mobile devices' native capabilities, such as touchscreen, camera, location awareness and natural -language query.

- **Sharing of Findings**
  - **Embedding Analytic Content.** Capabilities including a software developer's kit with APIs and support for open standards for creating and modifying analytic content, visualizations and applications, embedding them into a business process, and/or an application or portal. These capabilities can reside outside the application (reusing the analytic infrastructure), but must be easily and seamlessly accessible from inside the application without forcing users to switch between systems.
  - **Publishing Analytic Content.** Capabilities that allow users to publish, deploy and operationalize analytic content through various output types and distribution methods, with support for content search, storytelling, scheduling and alerts.
  - **Collaboration and Social BI.** Enables users to share and discuss information, analysis, and decisions via collaboration and social systems.

A Practical Architecture based on MSBI



[Image from https://bipointblog.wordpress.com/2014/05/28/implementation-of-a-bi-system-using-microsoft-bi-stack-introduction/](https://bipointblog.wordpress.com/2014/05/28/implementation-of-a-bi-system-using-microsoft-bi-stack-introduction/)