Business Intelligence Trends

Management Decision Support System and Business Intelligence

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2013-02-25
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<tr>
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<td>102/02/25</td>
<td>管理決策支援系統與商業智慧 (Management Decision Support System and Business Intelligence)</td>
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<td>個案分析一 (SAS EM 分群分析)：Banking Segmentation (Cluster Analysis – KMeans using SAS EM)</td>
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<td>商業智慧導入與趨勢 (Business Intelligence Implementation and Trends)</td>
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<td>商業智慧導入與趨勢 (Business Intelligence Implementation and Trends)</td>
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<td>期末報告1 (Term Project Presentation 1)</td>
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<td>18</td>
<td>102/06/17</td>
<td>期末報告2 (Term Project Presentation 2)</td>
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## Top 10 CIO Technology Priorities in 2013

<table>
<thead>
<tr>
<th>Top 10 Technology Priorities</th>
<th>Ranking</th>
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</thead>
<tbody>
<tr>
<td>Analytics and business intelligence</td>
<td>1</td>
</tr>
<tr>
<td>Mobile technologies</td>
<td>2</td>
</tr>
<tr>
<td>Cloud computing (SaaS, IaaS, PaaS)</td>
<td>3</td>
</tr>
<tr>
<td>Collaboration technologies (workflow)</td>
<td>4</td>
</tr>
<tr>
<td>Legacy modernization</td>
<td>5</td>
</tr>
<tr>
<td>IT management</td>
<td>6</td>
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<tr>
<td>CRM</td>
<td>7</td>
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<tr>
<td>Virtualization</td>
<td>8</td>
</tr>
<tr>
<td>Security</td>
<td>9</td>
</tr>
<tr>
<td>ERP Applications</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Gartner Executive Programs (January 2013)  
[http://www.gartner.com/newsroom/id/2304615](http://www.gartner.com/newsroom/id/2304615)
Top 10 CIO Business Priorities in 2013

<table>
<thead>
<tr>
<th>Top 10 Business Priorities</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing enterprise growth</td>
<td>1</td>
</tr>
<tr>
<td>Delivering operational results</td>
<td>2</td>
</tr>
<tr>
<td>Reducing enterprise costs</td>
<td>3</td>
</tr>
<tr>
<td>Attracting and retaining new customers</td>
<td>4</td>
</tr>
<tr>
<td>Improving IT applications and infrastructure</td>
<td>5</td>
</tr>
<tr>
<td>Creating new products and services (innovation)</td>
<td>6</td>
</tr>
<tr>
<td>Improving efficiency</td>
<td>7</td>
</tr>
<tr>
<td>Attracting and retaining the workforce</td>
<td>8</td>
</tr>
<tr>
<td>Implementing analytics and big data</td>
<td>9</td>
</tr>
<tr>
<td>Expanding into new markets and geographies</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Gartner Executive Programs (January 2013)
http://www.gartner.com/newsroom/id/2304615
Decision Support and Business Intelligence Systems

Chapter 1:
Decision Support Systems and Business Intelligence

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Changing Business Environment

• Companies are moving aggressively to computerized support of their operations => Business Intelligence

• Business Pressures–Responses–Support Model
  – Business pressures result of today's competitive business climate
  – Responses to counter the pressures
  – Support to better facilitate the process

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Business Pressures–Responses–Support Model


- **Decisions and Support**: Analyses, Predictions, Decisions, Integrated computerized decision support, Business intelligence

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The Business Environment

• The environment in which organizations operate today is becoming more and more complex, creating:
  – opportunities, and
  – problems
  – Example: globalization

• Business environment factors:
  – markets, consumer demands, technology, and societal...

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
# Business Environment Factors

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markets</td>
<td>Strong competition&lt;br&gt;Expanding global markets&lt;br&gt;Blooming electronic markets on the Internet&lt;br&gt;Innovative marketing methods&lt;br&gt;Opportunities for outsourcing with IT support&lt;br&gt;Need for real-time, on-demand transactions</td>
</tr>
<tr>
<td>Consumer demand</td>
<td>Desire for customization&lt;br&gt;Desire for quality, diversity of products, and speed of delivery&lt;br&gt;Customers getting powerful and less loyal</td>
</tr>
<tr>
<td>Technology</td>
<td>More innovations, new products, and new services&lt;br&gt;Increasing obsolescence rate&lt;br&gt;Increasing information overload&lt;br&gt;Social networking, Web 2.0 and beyond</td>
</tr>
<tr>
<td>Societal</td>
<td>Growing government regulations and deregulation&lt;br&gt;Workforce more diversified, older, and composed of more women&lt;br&gt;Prime concerns of homeland security and terrorist attacks&lt;br&gt;Necessity of Sarbanes-Oxley Act and other reporting-related legislation&lt;br&gt;Increasing social responsibility of companies&lt;br&gt;Greater emphasis on sustainability</td>
</tr>
</tbody>
</table>

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Organizational Responses

• Be Reactive, Anticipative, Adaptive, and Proactive

• Managers may take actions, such as
  – 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 …cont…>

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Managers actions, continued

– Improve customer service and relationships
– Move to electronic commerce (e-commerce)
– Move to make-to-order production and 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
– Improve decision making by employing analytics

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Closing the Strategy Gap

• One of the major objectives of computerized decision support is to facilitate closing the gap between the current performance of an organization and its desired performance, as expressed in its mission, objectives, and goals, and the strategy to achieve them.

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Managerial Decision Making

• Management is a process by which organizational goals are achieved by using resources
  – Inputs: resources
  – Output: attainment of goals
  – Measure of success: outputs / inputs

• Management \(\cong\) Decision Making

• Decision making: selecting the best solution from two or more alternatives

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Mintzberg's 10 Managerial Roles

Interpersonal
1. Figurehead
2. Leader
3. Liaison

Informational
4. Monitor
5. Disseminator
6. Spokesperson

Decisional
7. Entrepreneur
8. Disturbance handler
9. Resource allocator
10. Negotiator

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Decision Making Process

• Managers usually make decisions by following a four-step process (a.k.a. the scientific approach)

1. Define the problem (or opportunity)
2. Construct a model that describes the real-world problem
3. Identify possible solutions to the modeled problem and evaluate the solutions
4. Compare, choose, and recommend a potential solution to the problem

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Decision making is difficult, because

- Technology, information systems, advanced search engines, and globalization result in more and more alternatives from which to choose.
- Government regulations and the need for compliance, political instability and terrorism, competition, and changing consumer demands produce more uncertainty, making it more difficult to predict consequences and the future.
- Other factors are the need to make rapid decisions, the frequent and unpredictable changes that make trial-and-error learning difficult, and the potential costs of making mistakes.

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Why Use Computerized DSS

• Computerized DSS can facilitate decision via:
  – Speedy computations
  – Improved communication and collaboration
  – Increased productivity of group members
  – Improved data management
  – Overcoming cognitive limits
  – Quality support; agility support
  – Using Web; anywhere, anytime support

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
# A Decision Support Framework
(by Gory and Scott-Morten, 1971)

<table>
<thead>
<tr>
<th>Type of Decision</th>
<th>Operational Control</th>
<th>Managerial Control</th>
<th>Strategic Planning</th>
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</thead>
<tbody>
<tr>
<td>Structured</td>
<td>Accounts receivable</td>
<td>Budget analysis</td>
<td>Financial management</td>
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<tr>
<td></td>
<td>Accounts payable</td>
<td>Short-term forecasting</td>
<td>Investment portfolio</td>
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<td></td>
<td>Order entry</td>
<td>Personnel reports</td>
<td>Warehouse location</td>
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<tr>
<td></td>
<td></td>
<td>Make-or-buy</td>
<td>Distribution systems</td>
</tr>
<tr>
<td>Semistructured</td>
<td>Production scheduling</td>
<td>Credit evaluation</td>
<td>Building a new plant</td>
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<tr>
<td></td>
<td>Inventory control</td>
<td>Budget preparation</td>
<td>Mergers &amp; acquisitions</td>
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<td></td>
<td></td>
<td>Plant layout</td>
<td>New product planning</td>
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<td></td>
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<td>Project scheduling</td>
<td>Compensation planning</td>
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<tr>
<td></td>
<td></td>
<td>Reward system design</td>
<td>Quality assurance</td>
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<tr>
<td></td>
<td></td>
<td>Inventory categorization</td>
<td>HR policies</td>
</tr>
<tr>
<td>Unstructured</td>
<td>Buying software</td>
<td>Negotiating</td>
<td>R &amp; D planning</td>
</tr>
<tr>
<td></td>
<td>Approving loans</td>
<td>Recruiting an executive</td>
<td>New tech. development</td>
</tr>
<tr>
<td></td>
<td>Operating a help desk</td>
<td>Buying hardware</td>
<td>Social responsibility</td>
</tr>
<tr>
<td></td>
<td>Selecting a cover for a magazine</td>
<td>Lobbying</td>
<td>planning</td>
</tr>
</tbody>
</table>

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
A Decision Support Framework – cont.

• Degree of Structuredness (Simon, 1977)
  – Decision are classified as
    • Highly structured (a.k.a. programmed)
    • Semi-structured
    • Highly unstructured (i.e., non-programmed)

• Types of Control (Anthony, 1965)
  – Strategic planning (top-level, long-range)
  – Management control (tactical planning)
  – Operational control

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Simon’s Decision-Making Process

1. **Intelligence**
   - Environment scanning
   - Report & queries
   - Comparisons
   - Benchmarks

2. **Design**
   - Creativity
   - Finding alternatives
   - Analyzing solutions

3. **Choice**
   - Compare and select the best solution

4. **Implementation**
   - Deploy: put solution into action

5. **Problems or Opportunities**

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Computer Support for Structured Decisions

- Structured problems: encountered repeatedly, have a high level of structure
- It is possible to abstract, analyze, and classify them into specific categories
  - e.g., make-or-buy decisions, capital budgeting, resource allocation, distribution, procurement, and inventory control
- For each category a solution approach is developed => Management Science

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Management Science Approach

• Also referred to as Operation Research
• In solving problems, managers should follow the five-step MS approach
  1. Define the problem
  2. Classify the problem into a standard category (*)
  3. Construct a model that describes the real-world problem
  4. Identify possible solutions to the modeled problem and evaluate the solutions
  5. Compare, choose, and recommend a potential solution to the problem

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Automated Decision Making

• A relatively new approach to supporting decision making
• Applies to highly structures decisions
• Automated decision systems (ADS)
  (or decision automation systems)
• An ADS is a rule-based system that provides a solution to a repetitive managerial problem in a specific area
  – e.g., simple-loan approval system

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Automated Decision Making

• ADS initially appeared in the airline industry called revenue (or yield) management (or revenue optimization) systems
  – dynamically price tickets based on actual demand

• Today, many service industries use similar pricing models

• ADS are driven by business rules!

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Computer Support for Unstructured Decisions

- Unstructured problems can be only partially supported by standard computerized quantitative methods
- They often require customized solutions
- They benefit from data and information
- Intuition and judgment may play a role
- Computerized communication and collaboration technologies along with knowledge management is often used

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Computer Support for Semi-structured Problems

• Solving semi-structured problems may involve a combination of standard solution procedures and human judgment
• MS handles the structured parts while DSS deals with the unstructured parts
• With proper data and information, a range of alternative solutions, along with their potential impacts

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Automated Decision-Making Framework

Foundations and Sources

- Technology
- DSS Theories
- Artificial Intelligence
- Business processes

Business decision rules

Automated decision-making system

Types

- Customized
- Standard

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Concept of Decision Support Systems

Classical Definitions of DSS

• Interactive computer-based systems, which help decision makers utilize data and models to solve unstructured problems
  - Gorry and Scott-Morton, 1971

• Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semistructured problems
  - Keen and Scott-Morton, 1978

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
DSS as an Umbrella Term

• The term DSS can be used as an umbrella term to describe any computerized system that supports decision making in an organization
  – E.g., an organization wide knowledge management system; a decision support system specific to an organizational function (marketing, finance, accounting, manufacturing, planning, SCM, etc.)

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
DSS as a Specific Application

• In a narrow sense DSS refers to a process for building customized applications for unstructured or semi-structured problems

• Components of the DSS Architecture
  – Data, Model, Knowledge/Intelligence, User, Interface (API and/or user interface)
  – DSS often is created by putting together loosely coupled instances of these components

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
High-Level Architecture of a DSS

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Types of DSS

• Two major types:
  – Model-oriented DSS
  – Data-oriented DSS

• Evolution of DSS into Business Intelligence
  – Use of DSS moved from specialist to managers, and then whomever, whenever, wherever
  – Enabling tools like OLAP, data warehousing, data mining, intelligent systems, delivered via Web technology have collectively led to the term “business intelligence” (BI) and “business analytics”
Business Intelligence (BI)

• BI is an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies

• Like DSS, BI a content-free expression, so it means different things to different people

• BI's major objective is to enable easy access to data (and models) to provide business managers with the ability to conduct analysis

• BI helps *transform* data, to information (and knowledge), to decisions and finally to action

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
A Brief History of BI

• The term BI was coined by the Gartner Group in the mid-1990s

• However, the concept is much older
  – 1970s - MIS reporting - static/periodic reports
  – 1980s - Executive Information Systems (EIS)
  – 1990s - OLAP, dynamic, multidimensional, ad-hoc reporting -> coining of the term “BI”
  – 2005+ Inclusion of AI and Data/Text Mining capabilities; Web-based Portals/Dashboards
  – 2010s - yet to be seen

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The Evolution of BI Capabilities

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The 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
  – a user interface (e.g., dashboard)

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
A High-Level Architecture of BI

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Components in a BI Architecture

• The **data warehouse** is a large repository of well-organized historical data

• **Business analytics** are the tools that allow transformation of data into information and knowledge

• **Business performance management (BPM)** allows monitoring, measuring, and comparing key performance indicators

• **User interface** (e.g., dashboards) allows access and easy manipulation of other BI components

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Styles of BI

• MicroStrategy, Corp. distinguishes five styles of BI and offers tools for each
  1. report delivery and alerting
  2. enterprise reporting (using dashboards and scorecards)
  3. cube analysis (also known as slice-and-dice analysis)
  4. ad-hoc queries
  5. statistics and data mining

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The Benefits of BI

• The ability to provide accurate information when needed, including a real-time view of the corporate performance and its parts

• A survey by Thompson (2004)
  – Faster, more accurate reporting (81%)
  – Improved decision making (78%)
  – Improved customer service (56%)
  – Increased revenue (49%)

• A list of BI analytic applications, the business questions they answer and the business value they bring

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The DSS–BI Connection

• First, their architectures are very similar because BI evolved from DSS
• Second, DSS directly support specific decision making, while BI provides accurate and timely information, and indirectly support decision making
• Third, BI has an executive and strategy orientation, especially in its BPM and dashboard components, while DSS, in contrast, is oriented toward analysts

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The DSS–BI Connection – cont.

• Fourth, most BI systems are constructed with commercially available tools and components, while DSS is often built from scratch

• Fifth, DSS methodologies and even some tools were developed mostly in the academic world, while BI methodologies and tools were developed mostly by software companies

• Sixth, many of the tools that BI uses are also considered DSS tools (e.g., data mining and predictive analysis are core tools in both)

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
The DSS–BI Connection – cont.

• Although some people equate DSS with BI, these systems are not, at present, the same
  – some people believe that DSS is a part of BI—one of its analytical tools
  – others think that BI is a special case of DSS that deals mostly with reporting, communication, and collaboration (a form of data-oriented DSS)
  – BI is a result of a continuous revolution and, as such, DSS is one of BI's original elements
  – In this book, we separate DSS from BI

• MSS = BI and/or DSS

- drop the word “systems” from DSS
- focus on “decision support”
  “use of any plausible computerized or noncomputerized means for improving decision making in a particular repetitive or nonrepetitive business situation in a particular organization”

- **Work system**: a system in which human participants and/or machines perform a business process, using information, technology, and other resources, to produce products and/or services for internal or external customers

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Elements of a Work System

1. **Business process.** Variations in the process rationale, sequence of steps, or methods used for performing particular steps
2. **Participants.** Better training, better skills, higher levels of commitment, or better real-time or delayed feedback
3. **Information.** Better information quality, information availability, or information presentation
4. **Technology.** Better data storage and retrieval, models, algorithms, statistical or graphical capabilities, or computer interaction

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Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Elements of a Work System – cont.

5. **Product and services.** Better ways to evaluate potential decisions
6. **Customers.** Better ways to involve customers in the decision process and to obtain greater clarity about their needs
7. **Infrastructure.** More effective use of shared infrastructure, which might lead to improvements
8. **Environment.** Better methods for incorporating concerns from the surrounding environment
9. **Strategy.** A fundamentally different operational strategy for the work system

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
# Major Tool Categories for MSS

## TOOL CATEGORY

<table>
<thead>
<tr>
<th>TOOL CATEGORY</th>
<th>TOOLS AND THEIR ACRONYMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data management</td>
<td>Databases and database management system (DBMS)</td>
</tr>
<tr>
<td></td>
<td>Extraction, transformation, and load (ETL) systems</td>
</tr>
<tr>
<td></td>
<td>Data warehouses (DW), real-time DW, and data marts</td>
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<tr>
<td>Reporting status tracking</td>
<td>Online analytical processing (OLAP)</td>
</tr>
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<td></td>
<td>Executive information systems (EIS)</td>
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<tr>
<td>Visualization</td>
<td>Geographical information systems (GIS)</td>
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<td></td>
<td>Dashboards, Information portals</td>
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<td></td>
<td>Multidimensional presentations</td>
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<tr>
<td>Business analytics</td>
<td>Optimization, Web analytics</td>
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<tr>
<td></td>
<td>Data mining, Web mining, and text mining</td>
</tr>
<tr>
<td>Strategy and performance management</td>
<td>Business performance management (BPM)/</td>
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<td></td>
<td>Corporate performance management (CPM)</td>
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<td></td>
<td>Business activity management (BAM)</td>
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<td></td>
<td>Dashboards and Scorecards</td>
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<tr>
<td>Communication and collaboration</td>
<td>Group decision support systems (GDSS)</td>
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<tr>
<td></td>
<td>Group support systems (GSS)</td>
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<tr>
<td></td>
<td>Collaborative information portals and systems</td>
</tr>
<tr>
<td>Social networking</td>
<td>Web 2.0, Expert locating systems</td>
</tr>
<tr>
<td>Knowledge management</td>
<td>Knowledge management systems (KMS)</td>
</tr>
<tr>
<td>Intelligent systems</td>
<td>Expert systems (ES)</td>
</tr>
<tr>
<td></td>
<td>Artificial neural networks (ANN)</td>
</tr>
<tr>
<td></td>
<td>Fuzzy logic, Genetic algorithms, Intelligent agents</td>
</tr>
<tr>
<td>Enterprise systems</td>
<td>Enterprise resource planning (ERP),</td>
</tr>
<tr>
<td></td>
<td>Customer Relationship Management (CRM), and</td>
</tr>
<tr>
<td></td>
<td>Supply-Chain Management (SCM)</td>
</tr>
</tbody>
</table>

Source:  Turban et al. (2011), Decision Support and Business Intelligence Systems
Hybrid (Integrated) Support Systems

• The objective of computerized decision support, regardless of its name or nature, is to assist management in solving managerial or organizational problems (and assess opportunities and strategies) faster and better than possible without computers

• Every type of tool has certain capabilities and limitations. By integrating several tools, we can improve decision support because one tool can provide advantages where another is weak

• The trend is therefore towards developing hybrid (integrated) support system

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Hybrid (Integrated) Support Systems

• Type of integration
  – Use each tool independently to solve different aspects of the problem
  – Use several loosely integrated tools. This mainly involves transferring data from one tool to another for further processing
  – Use several tightly integrated tools. From the user's standpoint, the tool appears as a unified system

• In addition to performing different tasks in the problem-solving process, tools can support each other

Source: Turban et al. (2011), Decision Support and Business Intelligence Systems
Summary

• Business intelligence (BI) methodology and concepts and relate them to DSS

• The concept of work systems and its relationship to decision support
References