

Master Degree Programme in Computer Science

Enterprise Information Systems

23. Enhancing Decision Making



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Big Data and the Internet of Things

Drive Precision Agriculture (1 of 2)

- Problem
 - Explosive population growth
 - Opportunities from new technology
- Solutions
 - Identify technologies
 - Develop improvements for farmer processes
 - IoT wireless sensors
 - Supercomputer processing
 - Analytic software
 - Web links to farmers



Big Data and the Internet of Things

Drive Precision Agriculture (2 of 2)

- Precision Agriculture Systems
- Demonstrates IT's role in providing information and business intelligence that help small business like farmers improve efficiency
- Illustrates how information systems can improve an entire industry



What Are the Different Types of Decisions, and How Does the Decision-Making Process Work? (1 of 2)

- Business value of improved decision making
 - Improving hundreds of thousands of “small” decisions adds up to large annual value for the business
- Types of decisions
 - Unstructured: Decision maker must provide judgment, evaluation, and insight to solve problem
 - Structured: Repetitive and routine; involve definite procedure for handling so they do not have to be treated each time as new
 - Semistructured: Only part of problem has clear-cut answer provided by accepted procedure

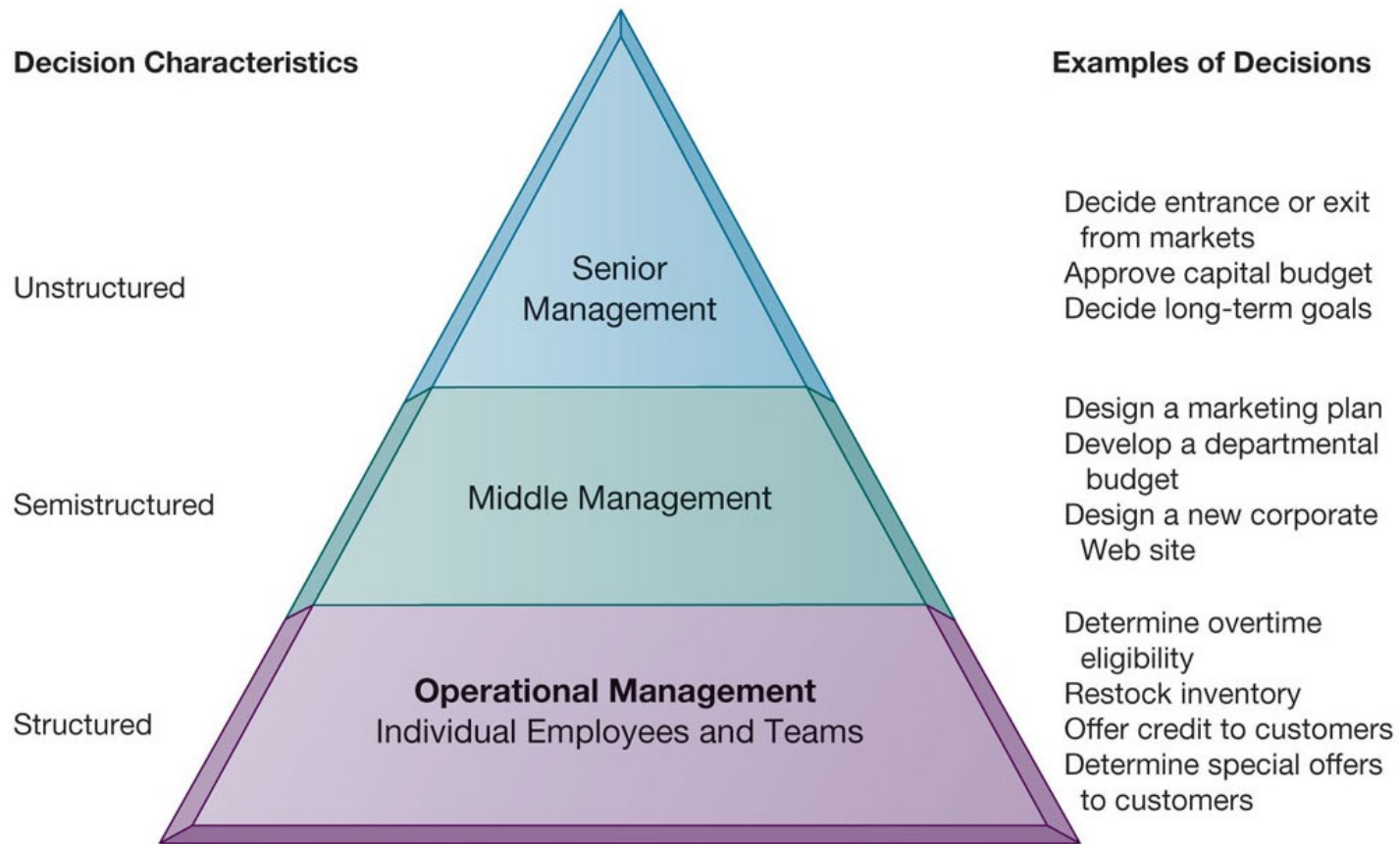


What Are the Different Types of Decisions, and How Does the Decision-Making Process Work? (2 of 2)

- Senior managers
 - Make many unstructured decisions
- Middle managers
 - Make more structured decisions but these may include unstructured components
- Operational managers and rank and file employees
 - Make more structured decisions



Information Requirements of Key Decision-Making Groups in a Firm

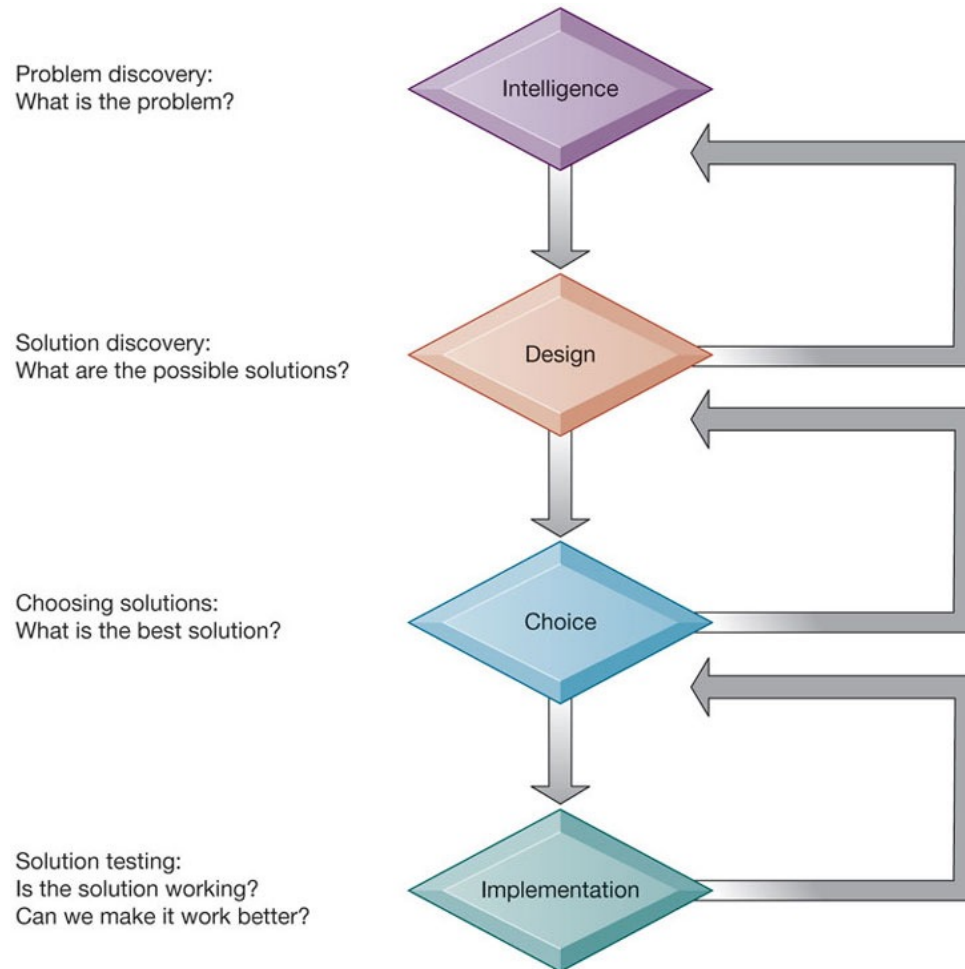


The Decision-Making Process

- Intelligence
 - Discovering, identifying, and understanding the problems occurring in the organization
- Design
 - Identifying and exploring solutions to the problem
- Choice
 - Choosing among solution alternatives
- Implementation
 - Making chosen alternative work and continuing to monitor how well solution is working



Stages in Decision Making



Managerial Roles

- Information systems can only assist in some of the roles played by managers
- Classical model of management: five functions
 - Planning, organizing, coordinating, deciding, and controlling
- More contemporary behavioural models
 - Actual behaviour of managers appears to be less systematic, more informal, less reflective, more reactive, and less well organized than in classical model



Mintzberg's 10 Managerial Roles (1 of 2)

- Interpersonal roles
 - Figurehead
 - Leader
 - Liaison
- Informational roles
 - Nerve center
 - Disseminator
 - Spokesperson



Mintzberg's 10 Managerial Roles (2 of 2)

- Decisional roles
 - Entrepreneur
 - Disturbance handler
 - Resource allocator
 - Negotiator



Real-World Decision Making

- Three main reasons why investments in I T do not always produce positive results
 - Information quality
 - High-quality decisions require high-quality information
 - Management filters
 - Managers have selective attention and have variety of biases that reject information that does not conform to prior conceptions
 - Organizational inertia and politics
 - Strong forces within organizations resist making decisions calling for major change



High-Velocity Automated Decision Making

- Made possible through computer algorithms precisely defining steps for a highly structured decision
 - Humans taken out of decision
- For example: High-speed computer trading programs
 - Trades executed in 30 milliseconds
- Require safeguards to ensure proper operation and regulation



What is Business Intelligence?

- Business intelligence
 - Infrastructure for collecting, storing, analysing data produced by business
 - Databases, data warehouses, data marts
- Business analytics
 - Tools and techniques for analysing data
 - OLAP, statistics, models, data mining
- Business intelligence vendors
 - Create business intelligence and analytics purchased by firms

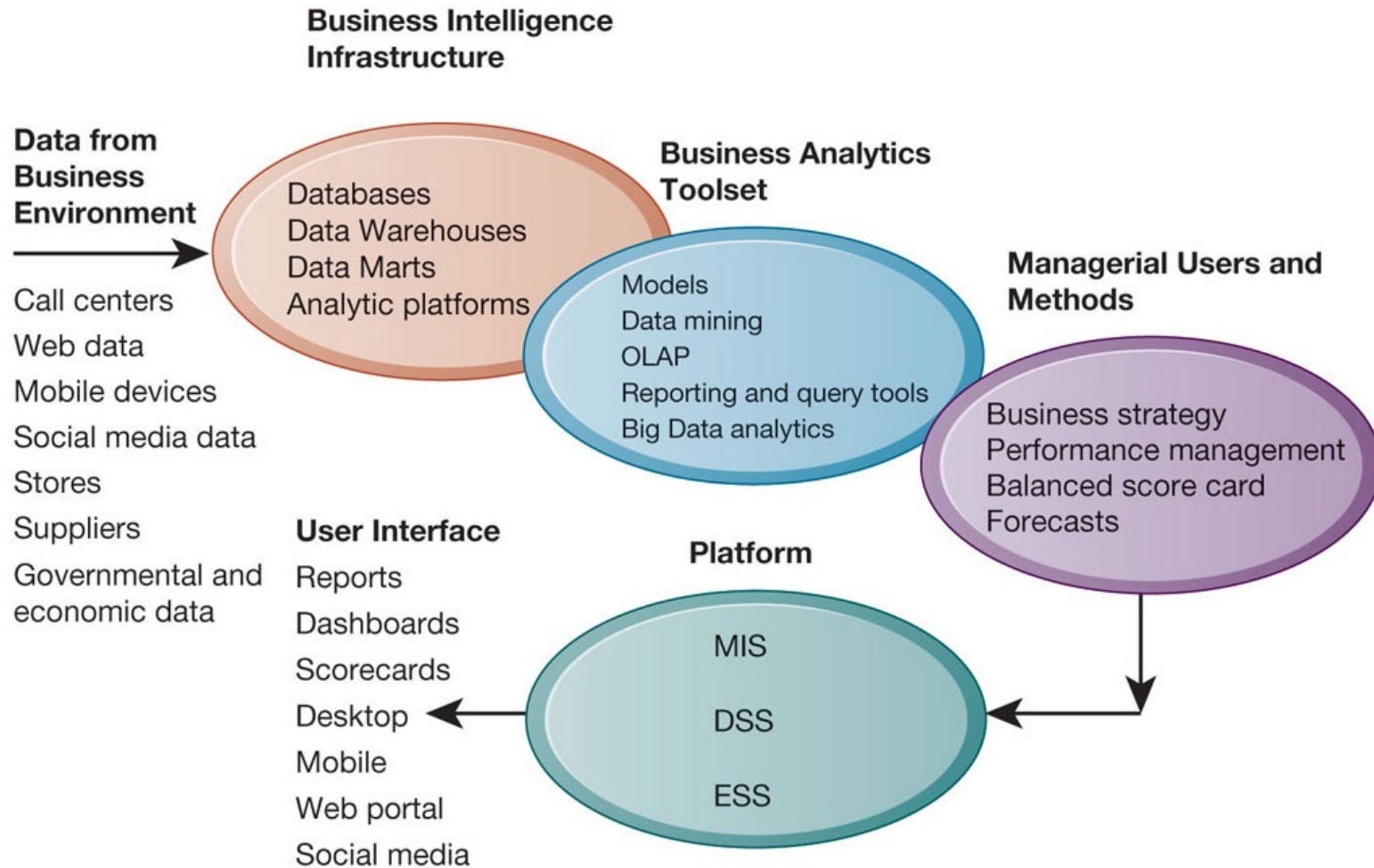


The Business Intelligence Environment

- Six elements in the business intelligence environment
 - Data from the business environment
 - Business intelligence infrastructure
 - Business analytics toolset
 - Managerial users and methods
 - Delivery platform—MIS, DSS, ESS
 - User interface
 - Data visualization tools



Business Intelligence and Analytics for Decision Support



Business Intelligence and Analytics Capabilities

- Goal is to deliver accurate real-time information to decision makers
- Main analytic functionalities of BI systems
 - Production reports
 - Parameterized reports
 - Dashboards/scorecards
 - Ad hoc query/search/report creation
 - Drill down
 - Forecasts, scenarios, models



Examples of Business Intelligence

Predefined Production Reports

| Business Functional Area | Production Reports |
|--------------------------|--|
| Sales | Forecast sales; sales team performance; cross-selling; sales cycle times |
| Service/call center | Customer satisfaction; service cost; resolution rates; churn rates |
| Marketing | Campaign effectiveness; loyalty and attrition; market basket analysis |
| Procurement and support | Direct and indirect spending; off-contract purchases; supplier performance |
| Supply chain | Backlog; fulfillment status; order cycle time; bill of materials analysis |
| Financials | General ledger; accounts receivable and payable; cash flow; profitability |
| Human resources | Employee productivity; compensation; workforce demographics; retention |

Predictive Analytics

- Uses variety of data, techniques to predict future trends and behaviour patterns
 - Statistical analysis
 - Data mining
 - Historical data
 - Assumptions
- Incorporated into numerous BI applications for sales, marketing, finance, fraud detection, health care
 - Credit scoring
 - Predicting responses to direct marketing campaigns



Big Data Analytics

- Big data: Massive datasets collected from social media, online and in-store customer data, and so on
- Help create real-time, personalized shopping experiences for major online retailers
- Smart cities
 - Public records
 - Sensors, location data from smartphones
 - Ability to evaluate effect of one service change on system



Operational Intelligence and Analytics

- Operational intelligence: Business activity monitoring
- Collection and use of data generated by sensors
- Internet of Things
 - Creating huge streams of data from web activities, sensors, and other monitoring devices
- Software for operational intelligence and analytics enable companies to analyse their big data



Location Analytics and Geographic Information Systems

- Location analytics
 - Ability to gain business insight from the location (geographic) component of data
 - Mobile phones
 - Sensors, scanning devices
 - Map data
- Geographic information systems (GIS)
 - Ties location-related data to maps
 - Example: For helping local governments calculate response times to disasters



Business Intelligence Users

**Power Users:
Producers
(20% of employees)**

Capabilities

**Casual Users:
Consumers
(80% of employees)**

IT developers

Production Reports

Customers/suppliers
Operational employees

Super users

Parameterized Reports

Senior managers

Business analysts

Dashboards/Scorecards

Managers/Staff

Analytical modelers

Ad hoc queries; Drill down
Search/OLAP

Business analysis

Forecasts; What if
Analysis; statistical models



Support for Semistructured Decisions

- Decision-support systems
 - Support for semi structured decisions
- Use mathematical or analytical models
- Allow varied types of analysis
 - “What-if” analysis
 - Sensitivity analysis
 - Backward sensitivity analysis
 - Multidimensional analysis / OLAP
 - For example: pivot tables



Sensitivity Analysis

| | |
|-------------------------------|--------------|
| Total fixed costs | 19000 |
| Variable cost per unit | 3 |
| Average sales price | 17 |
| Contribution margin | 14 |
| Break-even point | 1357 |

Variable Cost per Unit

| Sales Price | 1357 | 2 | 3 | 4 | 5 | 6 |
|--------------------|-------------|----------|----------|----------|----------|----------|
| 14 | | 1583 | 1727 | 1900 | 2111 | 2375 |
| 15 | | 1462 | 1583 | 1727 | 1900 | 2111 |
| 16 | | 1357 | 1462 | 1583 | 1727 | 1900 |
| 17 | | 1267 | 1357 | 1462 | 1583 | 1727 |
| 18 | | 1188 | 1267 | 1357 | 1462 | 1583 |



A Pivot Table That Examines Customer Regional Distribution and Advertising Source

The screenshot displays a Microsoft Excel spreadsheet with a PivotTable. The PivotTable is titled "Count of Cust id" and is located in the range J1:M3. The PivotTable fields are: Row Labels: Region, Column Labels: Source, and Values: Count of Cust id. The PivotTable data is as follows:

| Region | Email | Web | Grand Total |
|-------------|-------|-----|-------------|
| East | 24 | 77 | 101 |
| North | 28 | 64 | 92 |
| South | 33 | 73 | 106 |
| West | 57 | 154 | 211 |
| Grand Total | 142 | 368 | 510 |

The PivotTable Field List is open, showing the following fields:

- Cust id
- Region
- Payment
- Source
- Amount
- Product
- Time Of Day

The field list also shows the following configuration:

- Report Filter: Source
- Row Labels: Region
- Column Labels: Source
- Values: Count of Cust id

The background spreadsheet contains the following data:

| Cust id | Region | Payment | Source | Amount | Product | Time Of Day |
|---------|--------|---------|--------|--------|---------|-------------|
| 10001 | East | Paypal | Web | | | |
| 10002 | West | Credit | Web | | | |
| 10003 | North | Credit | Web | | | |
| 10004 | West | Paypal | Email | | | |
| 10005 | South | Credit | Web | | | |
| 10006 | West | Paypal | Email | | | |
| 10007 | East | Credit | Web | | | |
| 10008 | West | Credit | Web | | | |
| 10009 | West | Paypal | Web | | | |
| 10010 | South | Paypal | Web | | | |
| 10011 | South | Paypal | Email | | | |
| 10012 | East | Credit | Web | | | |
| 10013 | North | Paypal | Web | | | |
| 10014 | East | Credit | Web | | | |
| 10015 | West | Credit | Web | | | |
| 10016 | West | Paypal | Web | | | |

Decision Support for Senior Management (1 of 2)

- ESS: decision support for senior management
 - Help executives focus on important performance information
- Balanced scorecard method
 - Measures outcomes on four dimensions
 - Financial
 - Business process
 - Customer
 - Learning and growth
 - Key performance indicators (KPIs) measure each dimension



The Balanced Scorecard Framework



Decision Support for Senior Management (2 of 2)

- Business performance management (BPM)
 - Translates firm's strategies (e.g., differentiation, low-cost producer, scope of operation) into operational targets
 - KPIs developed to measure progress toward targets
- Data for ESS
 - Internal data from enterprise applications
 - External data such as financial market databases
 - Drill-down capabilities

