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Decision Support Systems
Multiple criteria decision making
Soft Modeling
Simulation
Data mining

IBM® On-Demand Innovation Center
Decision Support Systems

Grant: Dept of Defense (CORANET)

DSS for MRE design

• Developed database of costs, nutrients

• MRE designers looked for more variety to make more attractive to soldiers
DSS in Transportation

• Mechanism to take a general model
  – Apply to decision

• **Examples** (recent papers from IRIS)
  – Dealing with disturbances on public transportation system
  – Tunnel emergency management planning
  – Road investment in northern Sweden
  – Airport strategic capacity planning
  – Rail yard dispatching
  – Airline fleet composition
Systems/Conflicting Objectives

Profit

Government

Conservation
BUSINESS OBJECTIVES

- **PROFIT**
  - short run cash flow, after tax profit, long run

- **RISK**
  - diversify, hedge

- **MARKET DEVELOPMENT**
  - new products, wider market, quality

- **CAPITAL REPLENISHMENT**

- **LABOR RELATIONS**
METHODOLOGIES

- Multiple Criteria Analysis
- Soft Systems
- System Dynamics
- Data Mining
- Database
Transportation Applications

• Selection
• Optimization
  – Usually of transportation networks
• Process
  – Public hearings
  – Cross-impact analysis
  – Soft systems analysis
Multiple Criteria Selection

**Examples** (recent papers from IRIS)
- Allocation of transportation funds to guardrails
- Emergency response team siting
- Locating hazardous waste treatment sites
- Time-cost tradeoff in Highway Construction
- Bridge protection priority analysis against terrorism
- Oil pipeline maintenance
Multiple Objective Optimization (LP)

Examples (recent papers from IRIS)
- Transportation mode choice
- Airport location
- Hazardous waste treatment location & routing
- Urban multimodal transportation network design
- High-speed train scheduling
Multiple Attribute Process

• Soft Modeling
  • Checkland; Ormerod
  – Understanding the human element of systems
    • Hard OR doesn’t do well at that; soft systems might
    • Alternative to logical positivist view
  – Systems views to better understand unintended consequences
    • Perrow; Dörner; Tenner
Multiple Attribute Process

**Example** (recent paper from IRIS)
- Environmental planning of wildlife corridors in UK

Grant (UHD): Bulgarian transition economy system dynamics model
Vietnam: soft systems analysis of company

Soft systems modeling
  System Dynamics
Data Mining in Transportation

**Examples (recent papers from IRIS)**
- Why road accidents cluster
- Airline passenger screening (stopped)
- Forecast passengers (Saudi), tourists (Greece)
- Deaths due to living near transport facilities
- Driver recruitment and retention

**Technical**
- Damage indicators/fault detection on helicopters
- City database with agents