Optimizing Enterprise-Wide Capital Resource Allocation in Hospitals and Health Systems

Don N. Kleinmuntz
Executive Vice President
Strata Decision Technology LLC
• About Strata Decision Technology
• Capital budgeting in hospitals and healthcare systems
• Tools for supporting capital allocation
  – Multiobjective decision analysis
  – Optimization
• Implementation challenges, solutions, and outcomes
Strata Decision Technology LLC

- Founded 1996 by Catherine Kleinmuntz and Don Kleinmuntz
- Software for better strategic planning and financial decision making
- Market leader among not-for-profit hospital providers
  - Around 1,000 hospitals
  - More than 1,400 healthcare businesses of all types
• Champaign Office
  – Located in University of Illinois Research Park
  – ⅓ of staff
    • Corporate Administration
    • Marketing
    • Data Center
    • Software R&D
  – 7,500 sf
• Chicago Office
  – Aon Center 49th Floor
  – ⅔ of staff
    • Consulting & Technical Services
    • Software R&D
    • Training Center (soon)
    • Additional Data Center (soon)
  – 33,000 sf
Selected Healthcare Customers

- Health Systems [5 to 60 hospitals]
  - Ascension Health (MO)
  - Banner Health (AZ)
  - Bon Secours (MD)
  - Baptist Health (FL)
  - Baptist Memorial (TN)
  - Catholic Health System (NY)
  - Catholic Healthcare West (AZ/CA)
  - CHRISTUS Health (TX)
  - Continuum Health (NY)
  - Henry Ford Health System (MI)
  - Intermountain Health Care (UT)
  - Jefferson Health System (PA)
  - Orlando Regional Healthcare (FL)
  - Parkview Health (IN)
  - Providence Health & Services (WA)
  - Trinity Health (MI)
  - University Hospitals (OH)

- Healthcare Practices at Financial / Professional Service Firms
  - Navigant Consulting
  - Ponder & Co.
  - Ziegler Capital Markets
  - Various regional firms

- Major Medical Centers
  - Children’s Hospital of Philadelphia
  - Cleveland Clinic
  - Dartmouth-Hitchcock Alliance
  - Duke U Health System
  - Johns Hopkins Hospital & Health
  - Mt. Sinai School of Med (NY)
  - New York Presbyterian Healthcare System
  - New York U Medical Center
  - Northwestern Memorial (IL)
  - Rush U (IL)
  - SUNY Upstate Medical U
  - Temple U Health System
  - Tufts-New England Medical Center
  - U of Arizona
  - U of California Davis Health System
  - U of Illinois Medical Center
  - U of Iowa
  - U of Tennessee
  - U of Texas Medical Branch
  - U of Virginia
  - U of Wisconsin
  - Yale-New Haven Health
Products and Services

Software Product Line

- Capital budgeting & resource allocation
  - StrataCap® (first release: 1997)
- Capital project tracking
  - StrataTrak® (first release: 2000)
- Long-term forecasting and planning
  - StrataCast® (first release: 1999)
- Market demand forecasting & analysis
  - StrataPlan™ (first release: 2006)
- Budgeting, integrated planning, and collaboration
  - StrataJazz™ (first release: 2007)

Service Offerings

- Software implementation
  - Management consulting
  - Technical consulting
- Technical support
- Application hosting
- Data integration
  - ERP & financial systems
  - Third-party data sources
• What we tell our customers:
  – Our software uses state-of-the-art information technology and advanced analytics to support better planning and decision making

• What we don’t tell our customers:
  – Our software uses “OR”
Capital Allocation Challenges in Not-for-Profit Hospitals

- Diverse projects and requirements
  - Information technology, medical technology, facility and infrastructure, business development
- Highly constrained capital
  - Financial pressures (shrinking reimbursements, labor shortages, competitive threats, hostile regulators, etc.)
  - Limited access to funds (municipal debt markets)
- Current choices impact future opportunities
  - Bad decisions divert scarce funds now and drain more resources
What Did Administrators Say About Their Capital Budgeting Process?

• It is too difficult to plan for the long term…things are changing too quickly
• Planning takes too long and uses too much staff time
• Senior management lacks the information they need
• After the fact, no one understands how or why the decisions got made.
• No one feels good about the outcomes.
• All too often, the process is contentious.

(Apart from all that, it is fine…)
Capital Allocation in Hospitals

• Performing sound financial analysis is harder than it looks
  – Too many projects to analyze each in depth
  – Difficulties getting reliable information on project costs and impact on revenues and expenses

• Discounted cash flow analysis is only PART of the story…Impact on:
  – Quality?
  – Customer satisfaction?
  – Organizational capabilities (staffing, infrastructure)?
  – Strategic market position?
  – Critical mission-related strategies?
Multiobjective Analysis & Portfolio Selection

• Process focused on multiple objectives:
  – Financial value
  – Long-run drivers of financial value
  – Mission-related objectives

• Process is focused on selecting the best portfolio of projects in light of ALL objectives
Multi-Criteria Evaluation Process

• Score proposals for benefits on specific criteria
  – Financial criteria assessed by finance staff
  – Top-level management group scores proposals on individual criteria

• Assess importance weights for criteria
  – CEO only, Executive Committee, or others

• Compute weighted additive value scores
  – Combine weights and scaled project scores

\[ B_i = \sum_{i} w_i \cdot v_i(s_i) \]
# Capital Evaluation Attributes: “Standard” Definitions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Attribute</th>
<th>Definition</th>
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<tr>
<td>Financial</td>
<td>NPV</td>
<td>Net present value of projected future cash flows (dollars)</td>
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<tr>
<td>Quality</td>
<td>Clinical Impact</td>
<td>Improves clinical experience in terms of health outcomes, patient safety, waiting times, throughput times, and general comfort (rating from 0 to 100)</td>
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<tr>
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<td>Infrastructure</td>
<td>Improves or maintains quality of hospital, outside facilities, and equipment, including expenditures to comply with safety, code, and accreditation standards (rating from 0 to 100)</td>
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<td>Staff/Physician Relations</td>
<td>Improves ability of employees and medical staff to work effectively and productively (rating from 0 to 100)</td>
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<tr>
<td>Strategy</td>
<td>Market Share</td>
<td>Enhances market share by increasing the number of patients seen and/or increasing ability to attract new patients (rating from 0 to 100)</td>
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Project Portfolio Selection Methods

• Goal:
  Select projects that provide the highest cumulative benefit, subject to limited budget and other constraints

• Method 1 (fast, simple, easy to explain):
  – Compute Benefit / Cost ratio
  – Sort projects based on “bang for the buck”

• Method 2:
  – Optimization using integer linear programming
  – Easily formulated as a “knapsack” problem
Optimization

• Project portfolio optimization as a binary integer linear programming problem
  – Objective: Maximize total benefit
  – Constraints:
    • Budget (one or multiple years)
    • Financial performance targets
    • Project exclusivity / dependency
  – Solve using standard optimization tools
### StrataCap® Optimization Output

#### Analysis

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#### Financial Return

| Cost of Capital | 5.0% |
| Required Return | 12.5% |
| Actual Return | 13.19% |
| Total Funded NPV | $4,901,221 |

- Enforce Financial Constraint

#### Table

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<th>Appr</th>
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Sensitivity Analyses

- Impact of adding to budget constraint
- Analyze project alternatives
  - Variations in sizing, timing, financing options
- Reconsider project benefits and/or strategic priorities (weights)
- “Force” project in or out of budget
Implementation Timeline for Single Hospital

- **Advance preparation and communication** [1 week]
  - Define goals, objectives, capital request forms, review process
- **Training** [1 week]
  - How to write and review high-quality requests
- **Enter capital requests** [4 weeks]
  - Create business plans, justify needs
  - Analyze incremental financial impact on existing operations
- **Review and discussion** [4 weeks]
  - Senior managers and functional experts review
  - Return for clarification or more information
  - Sign-off prior to evaluation
- **Prioritize capital requests** [1 day]
  - Executive-level managers, including physician leadership
  - Focused discussion of proposals
  - Score proposals
  - Establish trade-off weights
  - Prioritize requests using optimization tool
  - Arrive at consensus on selected pool
Improving Implementation: IT to Support Efficient Process

Ten years later:
- Analytical framework still follows original design
- IT infrastructure has evolved considerably

- Improving proposal quality
  - External links to technology assessment databases
  - Internal review of proposals and projections
- Workflow and communication
  - Integration with Email
  - Integration to other systems (accounting, supply chain)
- More robust evaluation processes
  - Optimization to provide more robust analytical results
  - Budget constraints over multiple years
  - Required financial return targets
Implementation Challenges: Many Projects

- A typical hospital may have to evaluate and prioritize hundreds of proposed expenditures.
- A typical healthcare system must handle thousands of proposed expenditures.
- Required: Project management system
  - Database to handle thousands of proposals
  - Workflow management (review, tracking)
  - Collaboration and coordination
  - Budget implementation tracking
- Desirable: Data/system interfaces
  - Interface to accounting & ERP systems
  - Links to external technology assessment data
Implementation Issue: Many Projects with Negative NPV

- Projects with negative NPV are the norm
  - Designed to achieve other goals (mission)
- For any one project, this is fine
  - But if the aggregate portfolio has negative return… **NO MONEY = NO MISSION!**
- Putting more weight on NPV doesn’t help!
  - Violation of additivity and preference independence assumptions
- Solutions:
  - Nonlinear optimization (messy!)
  - Introduce minimum financial performance constraint
Implementation Insurance: Senior Management Involvement

- C-Level support is critical
- CFO, COO, CEO
- Focus on what they want:
  - Improve management discipline
  - Strengthen physician relations
  - Control operating costs
  - Create a strategic focus
  - Build consensus around the final plans
How Do We Know This Works?

• **Continued use:**
  Almost every organization that implements the process uses it for three or more years

• **Most common feedback:**
  Praise for open, collaborative nature of process
  Sense that everyone is “on a level playing field”
“Sitting on a hill, you can see everything clearly…”
Resources

• Recent book chapter:

• My contact information:
  – Email: dnk@strata-decision.com
  – Web: http://www.strata-decision.com
  – Phone: 217-531-2612