From Data to Decisions at Your Nonprofit

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Agenda

• Overview of data, analytics and decision-making: 45 minutes
• Break
• Break-out session – case studies: 60 minutes
• Break
• Report-out – what we’ve learned: 45 minutes
• Wrap-up
Michael’s bio

Education:
• B.S., Morehouse College, Atlanta, GA
• M.S., Georgia Institute of Technology, Atlanta, GA
• M.S., University of California, Berkeley
• PhD, Northwestern University, Evanston, IL

Teaching career:
• Carnegie Mellon University, 1997 – 2007
• University of Massachusetts Boston, 2007 – present

Research interests:
• Community data analytics: data collection, analysis and sharing for community and economic development
• Community-based operations research: participatory, values-driven decision modeling for social impact
• Planning support for vacant property management and neighborhood redevelopment
• Decision models and case studies in foreclosed housing redevelopment and community revitalization

Courses taught:
• Geographic information systems
• Research methods
• Urban housing policy
• Analytic methods for urban planning and community development

Community and professional service:
• Institute for Operations Research and the Management Sciences (Pro Bono Analytics, ad-hoc committee on diversity, equity and inclusion)
• Urban Research-Based Action Network, Boston node
• National Forum for Black Public Administrators, Boston chapter

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Analytics and decision-making

• Running organizations requires
  • Data
  • Expertise
  • Analytics

• Analytics can be understood in three ways:
  • Descriptive analytics
  • Predictive analytics
  • Prescriptive analytics

‘Decision science’, ‘decision modeling’ and ‘operations research’ have traditionally been seen as equivalent to prescriptive analytics. Here, we are interested in any aspects of analytics that can improve individual and organizational decision-making.
Levels of analytics

- **Skill Levels Required**
  - Descriptive Analytics
  - Diagnostic Analytics
  - Predictive Analytics
  - Prescriptive Analytics

- **Level of Business Impact**
  - What has Happened?
  - Why Did it Happen?
  - What Will Happen?
  - What To Do?

- **Impact**
  - Better Decisions
  - Insight

*Gartner Research - Modified*
What is special about public-sector decision-making?

• Private-sector decision-making usually assumes:
  • Impacts measured in dollars
  • Working markets for goods
  • Stakeholders consist of the corporation

• Public-sector OR is relevant when:
  • Benefits are not always measured in dollars
  • Goods and services are not always traded in markets
  • Beneficiaries lack influence to set policy priorities

• Characteristics of public-sector OR include:
  • Multiple stakeholders
  • Multiple objectives
  • Substantive engagement
  • Need for evidence of policy impact

• Some public-sector decision-making problems are quite similar to private-sector problems:
  • Minimize costs
  • Maximize client satisfaction
  • Maximize throughput but still require intimate knowledge of service context to ensure that solutions meet client needs
Some kinds of public problems require a special approach to decision modeling

• What measures of ‘resiliency’ are important to the well-being of vulnerable communities?
• How can low-income communities choose redevelopment strategies that balance opportunity and protection?
• What mix of energy development options are affordable to a wide range of populations?
• How can a school district design a lottery system for public schools that balances desires for local access and academic excellence?

Problems that are hard to define (see e.g. Rosenhead and Mingers 2001), that require a deep understanding of local needs, and whose solutions depend on active community participation can be addressed using methods referred to as community-engaged operations research.
What distinguishes community-engaged OR?

• Emphasis on ‘intervention’ as opposed to observational science or methodological innovations
• Local engagement and impact
• Focus on disadvantaged and underserved populations
• Interest in problem-solving processes as well as outcomes
• Critical approach and concern for ethics
• Use of qualitative and mixed-method analytics (e.g. ‘soft OR’)
• Aim for community empowerment and social change

‘Community operational research’ (Midgley and Ochoa-Arias 2004) places greater emphasis on understanding and empowerment; ‘community-based operations research’ (Johnson 2012) places greater emphasis on analytic methods for policy, planning and operations prescriptions
Problem context #1: Community concerns with local schools

A school district faces multiple challenges: low test scores, stagnant funding, parents choosing non-public school options, aging infrastructure. A community conversation has yielded many expressions of values and ideas for improvements. What can we do with these data?
A values analysis can help identify alternative courses of action and candidate performance metrics.

Specific courses of action can be linked to specific ‘means’ values.

Potential performance metrics:

- Level of safety
- Educational outcomes
  - Level of extracurricular activities
- Perceived quality
- Level of community engagement
  - Budget surplus
  - Building utilization

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Problem context #2: Multi-site service delivery

A community-based nonprofit provides family support services to clients at three sites. The organization has generated a dataset describing these services. What questions can these data help answer?

How far do clients travel?
How large are caseloads?
Do clients receive appropriate services?
How long do clients spend at office?

<table>
<thead>
<tr>
<th>Client ID</th>
<th>Client Address</th>
<th>Service Date</th>
<th>Office Visited</th>
<th>Counselor ID</th>
<th>Service Provided</th>
<th>Outcome Type</th>
<th>Visit Time Start</th>
<th>Visit Time End</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>143 Main St.</td>
<td>2/21</td>
<td>A</td>
<td>S_A02</td>
<td>Intake</td>
<td>In-system</td>
<td>9:15 AM</td>
<td>10:00 AM</td>
</tr>
<tr>
<td>C02</td>
<td>200 Center Ave.</td>
<td>2/21</td>
<td>A</td>
<td>S_A05</td>
<td>Follow-up</td>
<td>Referral</td>
<td>11:15 AM</td>
<td>12:00 PM</td>
</tr>
<tr>
<td>C03</td>
<td>53 Morris St.</td>
<td>1/16</td>
<td>C</td>
<td>S_C03</td>
<td>Intake</td>
<td>In-system</td>
<td>2:00 PM</td>
<td>3:30 PM</td>
</tr>
<tr>
<td>C04</td>
<td>450 Thomas St.</td>
<td>1/18</td>
<td>B</td>
<td>S_B01</td>
<td>Assessment</td>
<td>Status</td>
<td>8:30 AM</td>
<td>11:30 PM</td>
</tr>
<tr>
<td>C05</td>
<td>23 Ashmont St.</td>
<td>2/01</td>
<td>A</td>
<td>S_A02</td>
<td>Intake</td>
<td>Referral</td>
<td>10:30 AM</td>
<td>1:30 PM</td>
</tr>
<tr>
<td>C06</td>
<td>315 Fields Ave.</td>
<td>2/09</td>
<td>B</td>
<td>S_B02</td>
<td>Close-out</td>
<td>Success</td>
<td>2:20 PM</td>
<td>2:50 PM</td>
</tr>
<tr>
<td>C07</td>
<td>97 Willow Dr.</td>
<td>1/10</td>
<td>B</td>
<td>S_B03</td>
<td>Counseling</td>
<td>Follow-up</td>
<td>1:00 PM</td>
<td>3:00 PM</td>
</tr>
<tr>
<td>C08</td>
<td>51 Corner Ct.</td>
<td>1/30</td>
<td>C</td>
<td>S_C02</td>
<td>Close-out</td>
<td>Referral</td>
<td>4:30 PM</td>
<td>5:30 PM</td>
</tr>
<tr>
<td>C09</td>
<td>270 Harvard Ave.</td>
<td>2/5</td>
<td>C</td>
<td>S_C03</td>
<td>Counseling</td>
<td>Follow-up</td>
<td>6:00 PM</td>
<td>7:00 PM</td>
</tr>
</tbody>
</table>
Analytics can provide valuable insights about the offices and services provided to support a range of interventions

**Candidate decision opportunities**
- Re-design the client service process to minimize wait times
- Re-allocate counselor resources to enable improved encounter outcomes
- Develop an assignment scheme to encourage clients to visit the facility that is closest to them
- Re-assign clients across counselors to balance caseloads
- Modify the service area; expand, open or close facilities
Problem context #3: Community development interventions

An economic development organization works with multiple stakeholders to strengthen the local business district. It has identified a set of actions that its research has confirmed will benefit the district and reflects the values of the community. How can the organization develop an implementation plan?

<table>
<thead>
<tr>
<th>Economic Development Best Practices</th>
<th>Associated objectives/values from public discussions</th>
<th>Associated metric/attribute from public discussions</th>
<th>Constraints/limitations/concerns from analyst discussions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternatives</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Metric 1</td>
</tr>
<tr>
<td>1. Façade renovation</td>
<td>Attractive environment</td>
<td>Business management best practices</td>
<td>Increased patronage</td>
</tr>
<tr>
<td>2. Increased financial capacity</td>
<td>Business health and stability</td>
<td>Support immigrant entrepreneurs</td>
<td>Size of credit line</td>
</tr>
<tr>
<td>3. Community survey on shopping preferences</td>
<td>Diversity of shopping options</td>
<td>Cross-cultural understanding</td>
<td>Percentage of purchases done locally</td>
</tr>
<tr>
<td>4. Increase number of community events</td>
<td>Empowerment and viability</td>
<td>Connecting customers and businesses</td>
<td>Number and attendance of events</td>
</tr>
</tbody>
</table>
Developing an implementation plan

• Rank alternatives according to:
  • Measures of performance metrics
  • Preferences for metric categories
  • Perceived value (utility) of metrics

• Choose most-preferred sequence of options according to:
  • Decision points
  • Chance nodes, with probabilities of uncertain outcomes
  • Payoffs

• Schedule tasks to minimize one of multiple objectives based on:
  • Task due dates
  • Tasks that must come before or after other tasks
  • Resource constraints that limit number or type of tasks to be performed together
Community-Based Operations Research offers a path to decision solutions for nonprofits

Decision modeling process could end at any of these steps

- Place/neighborhood
- Community/social group
- Institutions/organizations

- Problem identification
- Problem formulation
- Problem solution
- Implementation

- Multiple research frameworks
- Multiple solution methods

- Multiple stakeholders
- Collaborative
- Evidence-based
- Social welfare/Equity emphasis

- Theory-building
- Organization/community impacts
- Social change

Iterative

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Common challenges in providing operations research and analytics to nonprofit organizations

1. Limited capacity of community partners to collect and analyze data, and to make productive use of analytically-advanced solutions

2. Skepticism among community partners that outside experts really understand their problems

3. Need for analysts to move from client-consultant relationship to peer-to-peer relationship to support collaborative problem-solving

4. Tension between a specific problem to be solved, and underlying community needs that may not align with funders’ immediate priorities

5. Acceptance by analysts trained in OR/analytics that qualitative as well as quantitative data and solution methods may be necessary
There are a variety of resources to help nonprofit organizations use analytics to improve operations and strategy design

- Volunteer-driven services of professional societies
- University community service projects
- College and university coursework and short courses
- Research engagements
- Paid consultants
Case studies

Community development
A community development corporation does housing development, community organizing and job training in a struggling small city. It has held an all-day focus group session to learn about values and ideas from its stakeholders. It hopes to use these data to identify objectives, program opportunities and metrics to guide its community revitalization efforts.

Homeless children services
The Sunshine Horizon Foundation, a charitable arm of a for-profit company, provides safe spaces in homeless shelters for children and their caretakers. These “Sunshine Spaces” require agencies to provide spaces within shelters, and programs to provide skilled staff. The Foundation also wants to decide if it should expand into other cities.

Credit union demand
The Northside Credit Union is popular in its North End neighborhood of Boston, and also draws customers from around the city. NCU has had trouble setting the correct staffing levels to match customer arrival patterns. The manager knows there is a problem but doesn’t have the training to find a better staffing solution. To start, he needs to develop accurate forecasts of daily customer arrivals.
Case study: Community Development

Excerpt from focus group summary:

The UMass PI leads the session. He starts by asking the group to throw out ideas about the overall mission and ultimate objectives of the work that is done in the organization.

Economic stability of the community – education, jobs, investment in the neighborhood (long term tenants and homeowners versus short-term tenants)

Neighborhood ownership – sense of community, trust, pride, desire to live in the neighborhood, acceptance of low-quality living conditions in exchange for affordability, willingness to improve property

Ability to afford housing (family economic well-being)

Ability to demand good quality housing.

Strength of housing market – ability to ask more for rent.

Improving tenant self-concept - feeling deserving of a good quality life – good housing, schools, safety, desire to learn and improve one’s skills/think outside the box, ability or willingness to go outside of one’s comfort zone and raise the bar, ability to overcome feeling “beat down”, classism, racism, feeling overwhelmed (even stakeholders) by the amount of work that needs to be done.

Sample focus group photos:

Questions:

1. How can we use these data to determine what values and objectives are most important to the organization?
2. How can we use these data to identify specific action alternatives, if any?
3. How can we use these data to identify performance metrics, if any?
Case study: Homeless children services

Similar data are available for agencies and cities.

Questions:
1. Where would we get actual data to populate the Decision Alternatives matrix?
2. Does it matter how important we think the various criteria are? How could we incorporate this notion into the decision problem?
3. How can we use the Decision Alternatives matrix data to choose which partners, if any, the Sunshine Horizon Foundation should work with?
Case study: Credit union demand

Questions:
1. Some of these data are numeric, others are text. How can we use these data with spreadsheet-type analysis tools?
2. What approach would you use to forecast customer data in the future?
3. What additional data do you think could improve the quality of your forecasts?
Guidelines for case study discussions

• Each table may designate a note-taker, but all members are welcome to share their ideas on the sheet provided.

• The sheet contains prompts to motivate discussion, but ideas need not be limited to these:
  • What is the real problem to be solved?
  • What do we know about the data available for this case?
  • What steps or procedures seem best-suited to solve this problem?
  • What insights can we provide, guidance or recommendations can we make?
  • What have we learned about data & community analytics from this problem?

• Every person should contribute one Post-It note idea to the portion of the wall devoted to their case study.

• In reflection, consider: what would I need to know that I don’t already know to solve problems like this case? How could I collaborate with partners to make best use of data, analytics and decision science?
Additional reading


