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Values, Objectives, and Decisions: Using Community-Based Operations Research for Neighborhood Redevelopment

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Values, Objectives, and Decisions: Using Community-Based Operations Research for Neighborhood Redevelopment

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Project background

- **Goals:**
  - Study decision processes of community development corporations (CDCs) acquiring and redeveloping foreclosed properties for neighborhood stabilization
  - Create partnerships with local CDCs to gain first-hand knowledge of their activities and develop practical applications to support their missions
  - Develop multi-disciplinary, multi-campus collaboration
- **Funding:**
  - National Science Foundation, “Collaborative Proposal: Decision Models for Foreclosed Housing Acquisition and Redevelopment”
  - Joseph P. Healey Grant Program, “Decision Modeling for Foreclosed Housing Acquisition in a Large Urban Area”
Why are we here?

- Foreclosure crisis has had significant impacts on communities across the country (Joint Center for Housing Studies 2011)
- CDCs have been on the front lines of efforts to stem negative effects of foreclosures and revitalize hard-hit neighborhoods (Mallach 2009)
- Policy actions to support CDC acquisition and redevelopment of foreclosed properties have increased attention and pressure on CDCs to make effective decisions
- Better understanding of those decisions and their outcomes can inform both policy and practitioner activities going forward
What is operations research?

- Operations research/management science (OR) helps individuals and organizations make better decisions (Albright, Winston and Zappe 2010):
  - How can we design a production supply chain to produce, store, transport products to fulfill demands at minimum cost?
  - Where should we locate facilities to provide services to spatially dispersed customers to balance coverage and cost?
  - How should we design service systems to serve customers who arrive at random time intervals to optimize various performance measures?

- OR encompasses multiple analytical approaches:
  - Descriptive models to represent real-world systems
  - Predictive models to anticipate evolution of systems over time
  - Stylized prescriptive models to design long-term strategies
  - Detailed prescriptive models for operational management
  - Multi-stage decision processes incorporating values and preferences
How is decision modeling useful for CDCs?

- OR has a long tradition of public-sector applications (Pollock, Rothkopf and Barnett 1994):
  - Emergency services, public safety and military
  - Natural resources management
  - Housing and community development
  - Humanitarian logistics
- OR can help resource-constrained CDCs do more with less.
- Community-based OR (Johnson 2011) is designed to address the multi-disciplinary, locally-focused, complex and multi-stakeholder nature of planning and service delivery
What is this research?

- Our project asks how CDCs make decisions about their acquisition and redevelopment (A&R) activities, and whether better decisions can be made with more systematic processes and models of potential decision outcomes.

- Using theories grounded in the field of operations research and decision science, we use multiple methods to uncover the what, why, and how of CDC foreclosure acquisitions:
  - Decision Analysis
  - Stochastic Modeling (Bayram, Solak and Johnson 2012)
  - Math Programming (Johnson, Drew, Keisler and Turcotte 2012)
  - Applied Economics (Johnson, Drew, Keisler and Solak 2012)
  - Housing Policy and Community Development (Turcotte, Johnson, Vidrine, Drew and Sullivan 2012)
Decision analysis

- Getting at the root of the problem to better explicate solutions

- Unlike other methods in OR, is often qualitative, time-intensive/iterative, and people-focused
  - Problem structuring methods (Rosenhead and Mingers 2001)
  - Multi-attribute utility theory (Keeney and Raiffa 1993)
  - Value focused thinking (Keeney 1992)
  - Multi-criteria decision analysis (Belton and Stewart 2002)

- Integrates well with the critical, empirical and people-focused nature of CBOR
  - Structuring a problem may be as important as solving it
  - ‘Decisions’ mean different things to different organizations
What is Value Focused Thinking (VFT)?

- Recognizes that the problem presented to you may not be the one whose solution is most central to your organization’s mission
- Visual representation of decision problem components helps distinguish:
  - Goals
  - Objectives
  - Attributes
  - Decisions
  - Constraints
- Incorporates qualitative and quantitative methods
- Requires substantive understanding of problem domain
How we used VFT

- Applied VFT to the foreclosure A&R decisions of a hypothetical CDC – a test run of a simplified model prior to engaging with our community partners
  - Met with ‘client’ to identify objectives of foreclosure A&R and links to particular development decisions
  - Created a values structure that diagrams decisions in terms of their means-ends and fundamental objectives
  - Review structure with ‘client’ to confirm accuracy and assign weights to decision-objective relationships
  - Developed model to assess how different decision strategies fare in achieving stated objectives
- Goal is to apply what we learn from simulation to real-life CDCs
Creating the values structure

Data collection can be time-intensive, iterative and messy
Creating the values structure

Means objectives are those that first occur to the client. They represent what the client believes is most important – but possibly without much understanding of how they relate to the organizations’ broader set of values, or to decisions over which they have control.

(Max) Quality of stock

(Max) Stability
Creating the values structure

Ends objectives help answer the question: why are these initial means objectives important? What more central objectives can be achieved if the initial means objectives are optimized?
Creating the values structure

Development decisions answer the question: by what means available to the CDC might we achieve the means objectives that motivated our initial analysis?
Creating the values structure

Fundamental objectives represent organizational values that cannot be influenced directly by specific acquisition decisions, but are influenced via achievement of ends objectives.
Creating the values structure

The overall fundamental objective is the best representation of the organization’s mission in the current decision context. This objective represents the organization’s satisfaction with a particular development strategy, given its understanding of values placed on relationships between different objectives.
Complete values structure

Fundamental objectives

(Max) Quality of Neighborhood

(Max) Quality of housing market

(Max) Neighborhood character

(Max) Resident outcomes

(Max) Tax base

(Max) Market efficiency

(Max) Amenities and services

(Max) Aesthetics

(Max) Safety

(Max) Social connections

(Max) Health

(Max) Economic well-being

(Max) Quality of stock

(Max) Stability

Development Decisions – Types of units developed

Vacancies - Good condition
- Poor condition
- Blighted

Market-Rate Rental Units

Affordable Rental Units

Resident Owned Units

Other (commercial, amenity)
We developed a spreadsheet to represent this values structure. In this case (but not always), the structure has separate levels, simplifying our analysis.
Values structure model: Weights

We assigned priorities to each link in the values structure, representing the importance the decision-maker places on a particular relationship.
Base case development strategy: Increase affordable rental housing

Inputs to the VFT model are desired final levels of different physical structures which arise from the CDC’s development decisions.

The base case development strategy assumes the CDC seeks to increase the stock of affordable rental housing by reducing vacancies and keeping market-rate rentals and resident ownership levels constant.
Alternative development strategy #1: Increase market-rate housing

An alternative development strategy assumes CDC wants to increase the stock of market-rate rental housing by reducing vacancies and converting some affordable rentals and resident-owned housing.
Alternative development strategy #2: Increase resident owned housing

Another alternative development strategy assumes the CDC wants to develop more owned housing than currently exists, by slightly reducing vacancies and converting market-rate rental housing to a mix of resident owned and affordable rental housing.
How do the different strategies compare?

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Achievement Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase affordable rentals</td>
<td>64.2%</td>
</tr>
<tr>
<td>Increase market-rate rentals</td>
<td>42.8%</td>
</tr>
<tr>
<td>Increase resident ownership</td>
<td>57.3%</td>
</tr>
</tbody>
</table>

- Strategy to increase affordable rentals suggests highest achievement of overall fundamental objective, followed by increasing resident ownership and market-rate rentals
  - Even small changes in types of developments pursued by CDC can have a notable impact on objective achievement
  - Note these results are specific to this CDC and its values structure, worst/best case bounds and weights
What have we learned?

- Even a ‘simple’ model can involve complex structures of decisions and objectives
  - Many assumptions, definitions, and specifications needed
  - Learning process for researchers and client
- Different inputs to model can have a significant impact on objective achievement
  - Effect of alternative structures
  - Effect of alternative strategies
  - Effect of alternative weights
Application to our partner CDCs

- VFT structures developed or in process for two partner CDCs
  - More complex models reflecting multiple objectives that real CDCs face in their housing and community development operations
  - Organizational idiosyncrasies also reflected in VFT sessions
- End product of VFT analysis with partner CDCs still to be determined
  - Spreadsheet model for routine use
  - General recommendations
- Longer-term goal: design a decision support application for case study of community-based decision model adoption and usage
  - VFT/DA model
  - Tactical bidding model
  - Neighborhood-level development model
Values structure: Partner #1

Fundamental values

- Quality of life in neighborhood
  - Beauty of neighborhood
  - Safety
  - Sense of belonging
  - Socio-economic diversity
  - Community economic well-being

Means-Ends Network

- Green space
  - Green space (active or passive)
- Displacement
- Blight
  - Subsidized rentals (including mixed income)
- Resident advocacy/control
- Afford-Ability
- Stability
- Asset building
  - Commercial developments

Development Decisions

- Occupied props in foreclosure
- Out of code rooming houses
- Run down and vacant props (incl. in foreclosure)
- Market rate Rentals
- Co-op properties
- Resident owned properties
Values structure: Partner #2 (draft)

Max Quality of Life in Neighborhood Over Time

Quality of Area
Proximate to Units
- Physical attractiveness of units
  - Community space
- Environmental quality
  - Blight
  - Exterior quality
  - Green space

Quality of Individual Units
- Basic improvements
  - Interior quality
- Unit safety
  - Foreclosures and distressed properties
- Safety living area
  - Accessible amenities
- Quality of amenities
- Accessibility of units to amenities

Sustainability of Quality
- Stability
  - Stability of Market
  - Stability of Community
- Neighborhood standards & expectations

Operational Decisions
- Purchases & repairs of existing units
- Changes to ownership
- Behavioral interventions
- Purchase & improvement of non-residential lots

Economic conditions
- Speculators

Homeownership rate
- Tenants
- Landlords/owners
- Turnover of tenants
- Turnover of owners
Conclusion

- This project exemplifies operations research for public policy, public management/administration and urban/community development:
  - Example of CBOR at work
  - Community-engaged research
  - Multi-method and multi-disciplinary

- There are many opportunities for extensions:
  - Decision tools and decision thinking for community-focused organizations
  - Dissertations on related topics
  - Book summarizing findings
Thanks for your attention!

Want to learn more?

PPOL-G 697 Special Topics: Community-Based Operations Research, Fall 2012

For more information, please visit:
http://umb.libguides.com/foreclosed_housing
References


