The Pittsburgh Housing eCounselor: Using Information Technology and Management Science to Help Housing Choice Voucher Program Participants Choose Better Homes and Communities

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Project Overview

Vision:
Design, implement and evaluate a Web-based decision support system for housing counseling assistance under the Housing Choice Voucher Program (“Section 8”)

Goal:
Develop a prototype SDSS in collaboration with the Housing Authority of the City of Pittsburgh, and solicit user reactions to application

Motivation:
– Conventional supply-side perspective regarding availability of affordable housing ignores capacity of low-income families to navigate the private rental housing market
– Limited capacity of public housing authorities to implement insights of Moving to Opportunity housing mobility experiment

Deliverables:
– Website with administrative, “how-to” data on housing search, ability to browse spatial and housing unit data
– PC-based decision support proof-of-concept
– PHA client and housing specialist interview results
– PHA Administrator and housing specialist reactions to prototype

Previous related work:
– Analysis of Impediments to Fair Housing, City of Pittsburgh (Martin, Johnson and Williams Foster 2000) and Allegheny County (Martin and Johnson 1999)
Observation: Available Section 8 Units are Disproportionately Concentrated in High Section 8-Incidence and Higher-Crime Neighborhoods of Pittsburgh, PA

To varying degrees, housing mobility experiments such as Gautreaux and MTO have emphasized supply-side strategies, and found that demand-side client capabilities evolve over time. But policy trends towards “choice” and “personal responsibility”, and limited PHA resources for intensive client support argue for a demand-side strategy complemented by a supply-side strategy.
Insights from Literature Reviews and Current Practices

- Gap between evaluation outcomes for housing mobility and methods for implementation
- Social science has not addressed housing search characteristics and needs of low-income families
- MS/OR has not developed models and applications for low-income housing search
- PHA needs consistent with housing search assistance, but resources, knowledge lacking
- Available applications for housing search focused on needs of private-market users with clear preferences

Opportunity for multi-disciplinary research that leverages best social science to design public-sector e-commerce solutions that integrate information technology, management science and practitioner experience
Housing Specialist Interview Results

- Do not provide intensive search assistance to families
- Saw themselves as case managers (650 cases/year on average)
- Majority of time spent on recertification forms, phone calls and mail
- Familiarity with basic PC tasks: data entry, Web, email, word processing
- Expressed desire to explain the benefits and opportunities of Section 8
- Only one out of five were familiar with HACP Web-based unit listings
- General endorsement of supply-side strategy

Spatial decision support system must address housing specialist productivity, landlord outreach, and must include extensive hands-on training.
Counselors must assist affirmative relocation decisions as well as monitor conformity to program rules
**Client Interview Results**

<table>
<thead>
<tr>
<th>Gender (N=28)</th>
<th>Educational attainment (N=19)</th>
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</thead>
<tbody>
<tr>
<td>- 20 (71%) Female</td>
<td>- 4 (21.05%) Some High School</td>
</tr>
<tr>
<td>- 8 (29%) Male</td>
<td>- 6 (31.58%) High School Graduate</td>
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<tr>
<td>- 9 (47.37%) Some College</td>
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<tr>
<th>Race/Ethnicity (N=28)</th>
<th>Employment Status (N=28)</th>
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<tbody>
<tr>
<td>- 25 (89%) African-American</td>
<td>- 7 (25%) Work Full-Time</td>
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<tr>
<td>- 3 (11%) White</td>
<td>- 2 (7.14%) Work Part-Time</td>
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<tr>
<td></td>
<td>- 6 (21.43%) Unemployed/Seeking Work</td>
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<tr>
<td></td>
<td>- 11 (39.29%) Not Employed/Other</td>
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<td></td>
<td>- 2 (7.14%) Retired</td>
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<tr>
<th>Household Composition (N=28)</th>
<th>Relocation status (N=28)</th>
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<tr>
<td>- 12 (43%) Families with Children</td>
<td>- 8 (28.57%) Have recently moved using Section 8</td>
</tr>
<tr>
<td>- 16 (57%) Families without Children</td>
<td>- 19 (67.85%) Looking to move to a new apartment using Section 8</td>
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<td>- 1 (3.6%) Unsuccessfully attempted to use Section 8</td>
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<tr>
<th>Respondents’ age distribution</th>
<th>Main reason for moving (N=27)</th>
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<tbody>
<tr>
<td>- 18-24 (1; 3.6%)</td>
<td>- 13 (48.15%) Dissatisfied with apartment quality</td>
</tr>
<tr>
<td>- 25-29 (2; 7.1%)</td>
<td>- 6 (21.43%) Dissatisfied with neighborhood quality</td>
</tr>
<tr>
<td>- 30-34 (1; 3.6%)</td>
<td>- 6 (21.43%) Both</td>
</tr>
<tr>
<td>- 35-44 (8; 28.6%)</td>
<td>- 2 (7.40%) None/Neither</td>
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<td>- 45-49 (4; 14.3%)</td>
<td></td>
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<tr>
<td>- 50-64 (10; 35.72%)</td>
<td></td>
</tr>
<tr>
<td>- 65 &amp; older (2; 7.1%)</td>
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</tbody>
</table>

- Difficulty finding good-quality housing in acceptable neighborhoods
- Dissatisfaction with the quality and quantity of housing search assistance provided by HACP
- Most have access to computers, open to possibility of using IT in housing search;
- Little difficulty with spatial or tabular data analysis; except those with limited literacy skills

Clients have motivation, cognitive skills and flexibility to use spatial decision support system productively

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Spatial Data

Spatial data enable users to:
  – Understand geographic context of housing search
  – Clarify search goals based on neighborhood characteristics
  – Select potential destinations based on aggregate data or local amenities

Requires client and housing specialist to work together:
  – What are the goals of the housing search?
  – What neighborhood attributes are important to meeting these goals?
  – How do neighborhoods vary across these attributes?
  – What “cutoff values” distinguish “acceptable” from “unacceptable” neighborhoods?

Data types:

Inter-neighborhood analysis:
  • Zip codes
  • Census tracts
  • Pittsburgh neighborhoods/suburban municipalities
  • Pittsburgh neighborhoods/suburban school districts
  • Mass transit accessibility regions

Intra-neighborhood analysis:
  • Points (amenities)
  • Streets and transit routes
  • Property parcels
Decision Support for Housing Search

- **Problem Structuring**
  - Value-focused thinking
    - Ends goals: what life goals are most important to the family
    - Means goals: neighborhood/housing unit attributes that are associated with ends goals

- **Problem Definition**
  - Spatial and relational data analysis
    - Use spatial data to identify important *neighborhood attributes*, e.g. Crime rate, education quality, housing complaints, ...
    - Use relational data to identify important *housing unit attributes*, e.g. Inspection status, contract rent, # bedrooms, ...
  - Spatial and relational data selection
    - User-defined thresholds for attributes generate a subset of alternatives
      - Desirable neighborhoods, via spatial overlay
      - Desirable housing units, via SQL Select

- **Problem Solution**
  - Rank alternatives using multi-criteria decision models:
    - “Basic” (Elimination by Aspects (SQL Order By); Holsapple and Whinston [1996])
    - “Advanced” (PROMETHEE; Brans and Vincke [1985])
  - Refine sorted list of alternatives:
    - Users may generate an ordered list of “desirable” landlord-provided housing units in “acceptable” neighborhoods
Application Architecture

Destination selection/ranking functionality currently in separate desktop application; goal is to integrate it into website
Client Component: How to Choose a Neighborhood/Housing Unit

Application tools: HTML, JavaScript
Client Component: Search Neighborhoods

Application tools: ESRI ArcIMS 4.0, HTML version, no customization
Client Component: Search Housing Units

Application tools: Active Server Pages with JavaScript, Microsoft Access
Landlord/Property Owner Component: Listings Maintenance
Client Component: Select and Rank Neighborhoods

Application tools:
ESRI ArcView/Avenue 3.2 (selection);
Java/HTML (ranking)
Evaluation and Development Path

User Reactions:

- **HCVP administrators**
  - See application as consistent with PHA goals:
    - Maximize lease-up rate
    - Maximize landlord satisfaction
    - Minimize neighborhood opposition
    - Maximize beneficial client outcomes
  - View application as competitive advantage for PHA

- **HCVP housing counselors**
  - Concerned that application will encourage clients to choose suburbs over central city
  - Maximize likelihood of success by incorporating measures of housing availability
  - Require means to visualize tradeoffs between attributes

Next Steps:

**Short-term:**
- More sophisticated analysis of client interview results
- Trial use of prototype by clients and housing specialists
- Development standards for professional-quality, fully Web-enabled SDSS

**Medium-term:**
- Evaluate alternative MCDMs and decision strategies using actual housing clients
- Redesign application to fully-integrate GIS, MCDM and caseload management

**Long-term:**
- Install beta version of application in HACP’s Section 8 Department for evaluation
- Application evaluation: user satisfaction, workflow impacts, family outcomes
- Cost-benefit analysis, policy recommendations