

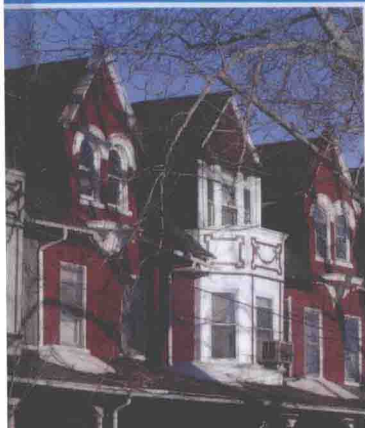
**Wiley Series in Operations Research
and Management Science**

DECISION SCIENCE FOR HOUSING AND COMMUNITY DEVELOPMENT

**Localized and Evidence-Based Responses to
Distressed Housing and Blighted Communities**

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PREFACE

This book represents the culmination of an effort to expand the horizons of public sector operations research and management science to address critical problems in urban housing and community development. It is based on a belief that research that is empirical, problem driven, interdisciplinary, and mixed methods in nature can enable mission-driven, not-for-profit community-based organizations (CBOs) improve upon what they do best—solving problems to improve the quality of life in neighborhoods facing challenges of socioeconomic distress and limited technical and financial resources.

Our work on this book originated with, synthesizes and expands upon a multi-year, multi-phase research project to address neighborhood-level effects of the U.S. foreclosed housing crisis. At the time of the project's origin in 2008, when the worldwide Great Financial Crash and the housing market meltdown that was a proximate cause of the crash was peaking in intensity, it seemed that there was an opportunity to design decision models that could speak directly to the needs, capacities, and challenges of CBOs, but through a conceptual framework—community-based operations research (CBOR)—that would allow for flexibility in methodological orientation and analytic methods. In addition, this project offered the possibility of a scholarly response to the reality of community development that did not rely solely on the use of traditional methods in operations research and management science that have had demonstrated success in other aspects of public affairs such as transportation, public safety and emergency response,

logistics, and health services delivery. Analytic methods used to address these important problems have tended to emphasize model complexity and analytic sophistication beyond the resources of CBOs. We believe that the problems in housing and economic development and infrastructure design that CBOs routinely address are particularly challenging: they embody multiple competing objectives, multiple stakeholders, and multiple limitations on process activities and resource availability. These problems must be solved in a context of financial and political uncertainty and must accommodate planning horizons that vary from the very short (addressing immediate responses to community concerns) to the very long (designing strategy and initiatives to ensure the social and economic sustainability of neighborhoods in uncertain environments).

By applying principles from CBOR (Johnson, 2012; Johnson and Smilowitz, 2007) and its UK-based antecedent, community operational research (Midgley and Ochoa-Arias, 2004), as well as modeling and analytic methods from diverse sources such as urban operations research (Larson and Odoni, 2007), problem structuring methods (Rosenhead and Mingers, 2001), and public sector operations research broadly considered (Pollock, Rothkopf, and Barnett, 1994), we hope to contribute to the field of OR/MS a suite of successful decision modeling applications for local impact. This effort could in turn inspire researchers and practitioners who seek to address other difficult problems in the urban context in which the needs of socioeconomically diverse communities might have a direct influence on the chosen analytic approach.

Since we began to address local aspects of the foreclosure crisis and housing and community development more generally, our team has expanded from three (Johnson, Turcotte, and then-University of Massachusetts Boston doctoral student Felicia Sullivan) to a team of seven (the six authors of this book plus then-University of Massachusetts Lowell master's student Emily Chaves), augmented by University of Massachusetts Boston doctoral student research assistants Sandeep Jani, Merritt Hughes, Alvine Sangang, and Omobukola (Buki) Usidame, and University of Massachusetts Boston doctoral candidate and editorial assistant Alma Biba. All of the participants in this research enterprise share a commitment to using decision analytics to improve operations of urban CBOs and outcomes for the residents served by these organizations. In particular, we wish to learn how CBOs can address the critical problem of foreclosed housing acquisition and redevelopment for community stabilization and revitalization.

Our work in this area has evolved to address issues of housing policy, community development, policy analysis, and multiple fields within OR/MS. We have produced models, methods, applications, and findings that offer CBOs a

rich menu of resources to help them better achieve their objectives. We have found that even small, resource-constrained and mission-driven organizations routinely solve decision problems that are rich and complex. Moreover we have learned that these solutions offer marginalized and economically disadvantaged communities to opportunity to define their own futures and to make progress toward meeting basic needs for good housing, education, employment opportunities, social and physical environments, and human and family services. We have also found, however, that decision analytics and related disciplines offer substantial but largely heretofore untapped opportunities to assist individuals and the local organizations that represent and serve them to achieve even better outcomes.

Though the community development corporations (CDCs) with whom we have collaborated may have different levels of capacity to incorporate decision models into their daily practice, we have learned that the entire OR/MS toolkit has illuminated different aspects of the foreclosed housing acquisition and redevelopment decision problem in different ways, generating a whole suite of insights. We believe that our book's findings represent for our community partners and for the readers of this book a sense that the whole of the array of insights is greater than the sum of their parts. Our decision modeling efforts provide decision makers with a rich set of lenses, each with different frames. Is acquiring a property like a card play in an uncertain game of blackjack, or finding the missing piece of a puzzle? Is it like choosing a dishwasher for a kitchen, or prescribing a treatment for a patient or, simply laying the next brick in a pathway? It is all of the above, and the skilled decision maker can think of using these different frames to connect the formal model-based results with the real-world problems of implementation, community building, and community development.

The structure and form of this book bear some explanation, especially since we have written it with multiple audiences in mind: operations research/management science (which draws researchers and practitioners mostly from business, management, and engineering-related fields), as well as urban and regional planning, community development, public policy, and public administration (and social science disciplines such as economics and sociology that form the basis for these professional domains). We have divided the core of the book into three sections. The first, "Policy and Practice in Foreclosed Housing and Community Development," puts our research into the context of housing, especially the recent foreclosure crisis, the organizational characteristics and foreclosure response practices of our community partners, and finally multiple traditions in data and decision analytics that are relevant to the models and methods we use in the book. The second, "Values, Metrics and Impacts for Decision Modeling," uses

principles of decision modeling, primarily decision theory and data analytics, to describe ways in which we have identified and quantified values and objectives, the basis of decision models that are relevant to our project. The third, “Prescriptive Analysis and Findings,” contains three contrasting prescriptive decision modeling applications for foreclosure response. Readers trained in OR/MS may wonder why a whole section is needed to set up our problem; readers trained in planning and policy may wonder if the mathematics-oriented material in the last section is really relevant to them.

We believe that this rich detail is essential to engaging fully with a new application in public sector operations research and management science, particularly within a domain we call community-based operations research. The book presents our fullest understanding of practices and methods necessary to meet community-based partner organizations where they are. It also provides us with the opportunity to explore certain problems with which CBOs are quite familiar—but which offer opportunities for improved responses—and which differ in important ways from most applications in the OR/MS literature. Therefore, the book represents an effort to dive deeply into problems and practices within the world of CBOs in order to develop findings and insights that may enable them to better fulfill their missions and, simultaneously, enrich multiple academic disciplines and professional domains.

This book represents one of the very first attempts to apply a fully multimethod, mixed-methods, and multidisciplinary approach, rooted in operations research and management science, to the problems of CBOs, especially CDCs. Our work demonstrates that the entire OR/MS approach fits within our conception of CBOR. Through this book, we hope that practitioners, researchers, and students will be persuaded that our findings, and others like it to follow, hold great promise for nonprofit and government actors to judiciously apply decision and data analytics to better achieve fundamental goals of economic opportunity, resilient communities and social change.

FOREWORD

With all the recent fuss about big data and smart cities, it is not surprising to see a new book about decision sciences applied to housing and community development. The book does indeed use new data and analytics to examine urban planning and revitalization strategies. However, much to my delight, the book is long on problem framing and articulating suitable objectives and indicators, without resorting to unnecessarily complex mathematical formulations. Yes, there are some equations and the book does take advantage of newly available and spatially disaggregated data about land use, property values, and financially troubled properties. Likewise, the book includes constrained optimization formulations of property acquisition and development strategies for community development corporations (CDCs) across their service areas, and dynamic programming formulations of bidding strategies that indicate when a bird in the hand is likely to be better than what is left in the bush. But the focus of the book is less on complex models and “optimal” strategies *per se* and more on problem formulations that facilitate clear thinking and meaningful comparisons of planning and policy alternatives. This work takes seriously the multidimensional nature of community development impacts; the diverse goals and skill sets of local nonprofits; and the inherent uncertainties about funding availability, political support, and development outcomes.

It may be worth reflecting for a moment on why the use of decision sciences is so much more developed in private-sector business settings than in public-sector domains such as urban planning and community

development. During the past few decades, airline scheduling, network routing, online shopping and delivery, taxi hailing services, and many other supply chain and logistics operations have greatly increased the sophistication of the data and algorithms they use to optimize their operations. One obvious, and often cited, reason for the difference is the bottom-line profitability focus of private business. Such use of decision sciences requires significant investment in analysts, data, and information infrastructure. Where the return on investment is clear, and accrues to the same entities that commit the investments, then it is easier to raise the funds and hold the innovators accountable for the performance of the new systems.

Certainly, in some areas of urban service delivery, financing and accountability are fairly well identified and some “smart city” efforts have indeed tapped new data streams and technologies to improve urban logistics. Traffic signaling, snowplow routing, and various online fees and payment systems are notable examples. In community redevelopment and many aspects of urban planning, however, the opportunity to capitalize on “big data” is much less clear. These domains tend to involve “wicked problems¹” that are often open ended, multifaceted, and politically controversial. Such problems have complex social choice dimensions for which there is little agreement about values, beliefs, and desirable trade-offs. How much public funding should be invested in revitalizing a neighborhood with high poverty rates? Can such a program be successful for a particular geography and population without addressing broader social policy issues such as unemployment, job training, family responsibility? Suppose, moreover, that a community-based program is “successful” in increasing economic activity and reducing blight and poverty rates. If residents are displaced and the neighborhood is gentrified, can the program still be considered a success? As Schon and Rein (1994) argued in their book, “Frame Reflection: Towards the Resolution of Intractable Policy Controversies,” policy and plan development in such settings is often shaped by “naming and framing” strategies that use diagnostic metaphors to build consensus about problem framing in a way that suggests a particular policy and programmatic choice. Solving problems in housing and community development requires serious assessment of the social impacts of new programs in ways that private-sector program design that may benefit from decision sciences usually do not consider in their business plans. An example of this is the so-called “sharing economy”.

In *Decision Science for Housing and Community Development*, Johnson and his co-authors do not “solve” community development problems as much

¹ A term originally used by Churchman (1967) and Rittel and Webber (1973) when debating the applicability of management science methods to urban planning problems that typically involve complex social choices.

as they help professional planners and community-based organizations to frame practical problems about development options and resource allocation in ways that can benefit from new data and decision science tools. It is appropriate, albeit somewhat ironic, that the book focuses on examples where CDCs seek to mitigate the adverse effects of the recent housing foreclosure crisis. In many respects, the scope of the foreclosure crisis was exacerbated by the use of complex private-sector financial instruments that greatly expanded housing loans and optimized bank profits, but also opened the door to fraudulent loans and greatly underestimated the resulting systemic risk. The public was not well served by these private-sector applications of decision sciences, so it would be fitting if decision science can offer some help to the local governments and community organizations who are stuck with cleaning up the mess. Of course, the authors recognize that real, sustainable solutions to problems such as stabilization and revitalization of local housing markets ultimately require action at a higher level in the political economy than the CDCs, which are their focus in this book.

What I particularly like about the book is the extent to which the problem framing portions of the decision science modeling are developed through detailed descriptions of the case study settings and careful articulation of the steps involved in defining multiple objectives and constructing practical measures of effectiveness. An entire chapter (Chapter 5) explains Ralph Keeney's "value-focused thinking" approach to defining objectives and walks the reader through two "real-world" examples in which the authors work with two CDCs to help them articulate their thinking about foreclosure problems and mitigation strategies. Two subsequent chapters (Chapters 6 and 7) examine two particular objectives of property acquisition strategies in detail. Chapter 6 focuses on "strategic value" in order to understand both how a foreclosure acquisition fits into a CDC's broader mission and also the extent to which some properties might have disproportionate impact on a neighborhood depending upon their location and relationship to other properties. Chapter 7 focuses on the "property value" effects of foreclosure and the extent to which any particular foreclosure acquisition might reduce or eliminate any negative effects of a distressed property on property values across the neighborhood. Since these effects can depend on the length and specific stages of a foreclosure process, a Markov chain model is developed both to address the uncertainty of the effects over time and to relate the estimated property value impact of a potential acquisition to the specific status of the property when it is acquired by a CDC. In both chapters, as is customary throughout the book, specific cases are examined in detail so that the reader can see how the models value actual properties and allow one to be explicit about various trade-offs and sensitivities, as well as aspects of the valuation that might be ignored or undervalued.

In Chapter 8, the authors formulate and solve a simple bi-objective decision model that integrates the findings of the previous two chapters in order to provide tangible representations of strategy alternatives that trade off impacts associated with property value and strategic value.

By the time the more complex models of foreclosure acquisition strategies are developed in Chapters 9 and 10, the reader has a rich understanding of the context in which CDCs might bid for foreclosed properties as part of their efforts to revitalize neighborhoods by investing in distressed properties. At this point, the mathematical model is less of a black box and more of a shorthand way to capture the relationships among key measures under the (many) assumptions made by the authors as part of the modeling process. In this way, the model solutions are more readily seen as “optimal” for a somewhat simplified problem and best utilized as quantitative measures of key relationships, guidelines, and trade-offs that are too complex to sort out without careful articulation of objectives, values, and real-world interdependencies. Finally, Chapter 11 takes advantage of this careful, case-rich development of concepts, measures, and models to outline useful findings and opportunities regarding the decision science approaches to foreclosure response and community development. The authors use the term “community-based operations research” (CBOR) to represent the analytic approach used throughout this book for neighborhood revitalization, including the problem formulation process and value-focused thinking.

In this age of big data and smart cities, we are still a long way from solving “wicked problems” such as community development and neighborhood revitalization as if they were more straightforward logistics problems associated with urban service delivery. Nevertheless, there are many opportunities to crank up the level of sophistication with which cities and community-based organizations articulate and explore their urban planning options and revitalization strategies. The spatial encoding and standardization of parcel-level databases of land use, ownership, real estate value, and the natural and built environment are greatly improved during the past few decades. Geographic information system technologies and methods have greatly enhanced the value of urban analytics because visualization of trends and urban performance measures at block and building scales help fit modeling and model results into a broader, multiparty discussion about options, trade-offs, impacts, and the like.

As we begin to view the emerging urban information infrastructure as a key to accumulating and maintaining “city knowledge”² as a public resource,

²See, for example, Carrera and Ferreira (2007) for an expanded discussion of accumulating city knowledge.

it will become easier for planning agencies and community organizations to implement the form of CBOR that is so extensively illustrated in this book. In the meantime, the book is a must-read not only for professionals concerned with foreclosures and distressed property strategies but also for urban planning students with interests in housing and community economic development. Even for those planning students without sufficient math background to follow all the models, the detailed explanations of value-focused thinking and model formulation, using the detailed case studies of CDC foreclosure acquisition processes, are a great introduction to how urban planners can use decision science methods effectively.

JOSEPH FERREIRA, Jr.³
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REFERENCES

- Carrera, F., and Ferreira, J. 2007. The Future of Spatial Data Infrastructures: Capacity-Building for the Emergence of Municipal SDIs. *International Journal of Spatial Data Infrastructures Research*, **2**: 54–73.
- Churchman, C.W. 1967. “Wicked Problems,” Guest Editorial. *Management Science*, **14**(4): B-141–B-146. Web: 10.1287/mnsc.14.4.B141.
- Rittel, H. and Webber, M. 1973. Dilemmas in a General Theory of Planning. *Policy Sciences*, **4**: 155–169. doi: 10.1007/bf01405730.
- Schon, D. and Rein, M. 1994. *Frame Reflection: Towards the Resolution of Intractable Policy Controversies*. New York: Basic Books.

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Dr. Bayram's honors and awards include several Best Paper Awards, including a Finalist Award in the 2013 INFORMS Doing Good with Good OR Paper Competition and an Honorable Mention in 2013 INFORMS Section on Public Programs, Services and Needs Best Paper Award.

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Dr. Johnson’s research interests lie in data analytics and management science for housing, community development, and nonprofit service delivery. His methods enable nonprofit and public organizations, especially those serving disadvantaged and vulnerable populations, to develop programs and policies that jointly optimize economic efficiency, public welfare, and social equity. Current research projects include acquisition and redevelopment of distressed properties, resource allocation and urban planning for municipal shrinkage and infrastructure redesign, and analytics and data needs assessment for community-based organizations.

Dr. Johnson’s work has appeared in a variety of journals, edited volumes, and conference proceedings. He is the editor of *Community-Based Operations Research: Decision Modeling for Local Impact and Diverse Populations* (Springer, 2012).

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