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High Technology and Low-Income Communities:
Prospects for the Positive Use of
Advanced Information Technology

7

Information Technologies That Change Relationships between Low-Income Communities and the Public and NonProfit Agencies That Serve Them

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What are the prospective benefits for service providers and service recipients of decentralized access to information about populations and their needs, service systems, and operations? Will growing access to such information be, on the whole, enfranchising for community members, or will it subject them to increased centralized control? This chapter examines particular ways in which information technologies (IT) can make land-use planning (and other aspects of metropolitan evolution) more transparent and understandable to individuals and communities. The point is not that such a use of IT is possible; rather, it is to better understand how it might empower or disenfranchise low-income communities, promote efficiency through improved self-governance, or further centralize authority in the hands of government and other large-scale data providers.

I begin by focusing on a simple, seemingly straightforward example of the use of IT: to computerize inquiries about land use and ownership of land and property in the city. This "simple" example of decentralized data access becomes complicated, however, as soon as the issues of maintenance and updating are addressed. Moreover, various IT strategies for addressing these issues have significantly different impacts on whether or not data access promotes effective decentralization and citizen empowerment. A careful examination of some of the issues and options involved in simple example improves our ability to draw inferences about how access to information can and should foster improved metropolitan governance and broader public participation in urban and regional planning. The real potential for capitalizing on IT to improve governance is not simply a matter of automating government services, nor is it a question of whether or not to introduce IT. Shaping planning processes, to capitalize on IT, are crucial in improving local governance through reduced bureaucracy and devolution of authority. My reasoning is consistent with recent observations in the management literature by Shoshana Zuboff, Tom Peters, and others about IT-driven restructuring of work in U.S. corporations (Peters 1992; Zuboff 1988).

Supporting urban revitalization with data and information systems

The role and relevance of information in urban planning is a broad, complex, and much-debated issue (Harris 1989; Innes 1995, Schön 1995). Here I focus on a few practices (of data gathering and analysis) that are common in urban revitalization, concentrating on how the design and implementation of a metropolitan area's information infrastructure can affect the usefulness of such practices to constituencies typically involved in urban revitalization.

Urban planning can be about the public investment, authorization, and support for improved infrastructure (roads, transit, water and sewer, etc.), and for other public works and services (parks, buildings, public housing, garbage collection, job training, public safety, health care, etc.). It can also be about the regulatory processes that set, monitor, and enforce land-use and zoning regulations, environmental controls, economic development incentives, design guidelines, and the like. Land-use functions-the focus of this chapter-are typically undertaken by institutions that exist in different sectors (public, private, and nonprofit) and at different levels of government (federal, state, metropolitan, city, and neighborhood). In Boston, for example, the Boston Redevelopment Authority (BRA) plays a key role in land-use planning. It is usually responsible for planning studies of major real estate investment projects such as Government Center, the Prudential Center complex, and more recently, the controversial "megaplex" proposals to develop a convention center and related commercial and sports facilities in South Boston. But, the Boston Housing Authority (BHA), which owns and manages housing for more than 10 percent of the city's residents, is the lead agency for two Housing and Urban Development (HUD)-financed urban revitalization demonstration programs costing more than $80 million over a five-year period. Neither authority is completely under the mayor's control, nor are they the only citywide agencies with significant authority in land-use planning. Boston's Public Facilities Department (PFD) is responsible for land and facilities owned by the city (including, for example, abandoned property); it is also heavily involved in Boston's "Empowerment Zone" planning.[1]

Other federal-, state-, and metropolitan-level agencies and authorities are also significant players in urban redevelopment. HUD and the Massachusetts Housing Finance Agency (MHFA) are major underwriters of subsidized housing in the region; the Massachusetts Water Resource Authority (MWRA) is in the midst of multi-billion dollar projects to upgrade the region's water and sewer system; and the Central Artery Project is managing the $7 billion decade-long transportation improvement project to sink Boston's Central Artery and build a third harbor tunnel. Also, the Massachusetts Bay Transit Authority (MBTA) and related transit and transportation planning agencies have a considerable impact (through their control of transit routes and transportation investment) on the accessibility of inner-city residents to jobs and services; and federal and state environmental protection agencies regulate the reuse of the many "brownfields"[2] in inner- city areas that have questionable land-use history.

Private agencies are also important in land-use planning. The Metropolitan Boston Housing Partnership (MBHP), a regional nonprofit organization, manages the pass-through of state and federal housing subsidies for more than five thousand households. Along with large landlords, community development corporations, neighborhood and church associations, private developers, and the like, such groups represent significant interests and planning/management capabilities that are vocal, more or less organized to represent their interests, and likely to grow in size and/or number as federal efforts continue to decentralize control of programs for housing, economic development, and social services.

To develop new land-use plans and proposals (or to form opinions as new opportunities and proposals surface), all of these agencies typically spend considerable energy researching and analyzing land use and ownership in the neighborhoods surrounding the sites that are targeted in the plans. This work (along with other related studies) is then used to develop tables, charts, and maps that summarize patterns of land-use and ownership and that estimate the size and nature of changes in both the physical and socioeconomic environment that are likely to result from one or another of the proposed changes in land use.[3] For large proposals with relatively formal review and approval processes, the results of this work are typically included in an environmental impact assessment (EIA) report and/or in various related planning reports and documents that critique, amend, or expand upon the EIA. In the case of large and controversial projects, the public review process can be long and complex; and public (or mandated private) funds are often used for separate studies and technical reports, so different interest groups can be more evenly balanced as they debate relevant issues and expectations.

The land-use and ownership studies are only one part of a complex land-use planning process, and their effects on urban revitalization are indirect. Nevertheless, they help us explore the planning uses of emerging computing technologies, because they show how unexpected difficulties can arise in a seemingly simple data-processing setting. And, these difficulties highlight a generic issue. Much urban planning focuses on understanding places and spatial relationships. Computing technologies have only recently had the horsepower and computer graphics tools to track, digest, and visualize complex urban settings. But to understand the plans and build consensus on action, we need to integrate and reinterpret many data sources now dispersed among agencies and groups that are administratively isolated and focused on different issues and goals. Moreover, they often use different accounting systems to name, measure, and value urban activity.

Although I am optimistic about our learning to deal with these difficulties, the devil is in the details. In forecasting the impacts of computing technologies, it is often easy to take for granted elementary operations that bog down when they assume the scale and complexity needed to address real-world settings. This is especially true if, as I believe, the important benefits of data-processing systems for urban planning are not so much in gaining *access* to detailed urban data, but in having *decentralized* access in a way that allows *meaningful dialogue* as part of an ongoing planning process of design, discussion, and consensus building across many diverse and relatively autonomous groups. With this in mind, I examine how Boston's parcel database is used to identify and categorize land-use and ownership patterns. I then discuss how emerging information technologies might assist us in the development of improved planning for urban revitalization.

Researching land-use and ownership patterns

As suggested earlier, many neighborhood planning activities-from economic development studies and urban revitalization projects to community organizing, community development corporations (CDC) development, and site planning-begin with a study of patterns of land use and ownership. In the old days this meant spending considerable time in the Assessor's Office and at the Registry of Deeds. Today, most parcel ownership and land-use records are computerized, so that information can be obtained by searching digital databases for a parcel's address, owner name, and the like. A sample of such parcel data for one-to-three family residential housing in East Boston is shown in table 7.1.[4] The addresses and owner names are shown for several dozen residential parcels, along with their lot sizes and the February 1, 1996, assessed values for the land and buildings. In many U.S. cities and counties electronic access to such parcel data is provided from terminals in a limited number of

government offices through the use of database applications. These allow the user to select from a limited set of text-based inquiry "screens" in order to find and display information about a single parcel. Providing citizens with direct access to these terminals in government offices became relatively common during the 1980s. More recently, some cities and counties in the United States have begun to provide more flexible and widespread access to parcel data through use of the Internet or CD-ROM distribution and, in recent months, through map-based interfaces that make it easy to identify relevant properties and compare the characteristics of neighboring properties.[5]

Table 7.1. Sample Parcel Data for Residential Housing in East Boston.

PARCEL_ID	OWNER	NO	STREET	USE	LANDVAL (dollars)	BUILDVA (dollars)	LOTSIZE (sq. ft.)
0100001000	PASCUCCI CARLO	105A	PUTNAM ST	R3	39400	55500	1,150
0100002000	MASTRORILLO ANGELO P	197	LEXINGTON ST	R3	39400	59600	1,150
0100003000	HASELTON PETER	199	LEXINGTON ST	R3	39400	48400	1,150
0100004000	DILLON KELLEY A	201	LEXINGTON ST	R3	39400	73400	1,150
0100005000	DIGIROLAMO JOHN F	203	LEXINGTON ST	R2	40900	73700	2,010
0100006000	BOTTE FRANK A	205	LEXINGTON ST	R3	41600	65100	2,500
0100007000	PORCELLA RACHELA	209	LEXINGTON ST	R3	41600	79700	2,500
0100021000	CIOTO ROBERT	245H	LEXINGTON ST	R1	39200	37900	1,238
0100022000	CAHILL STEPHEN F	245	LEXINGTON ST	R3	41200	72300	2,250
0100023000	MIANO MARIA ETAL	247	LEXINGTON ST	R3	39800	54300	1,838
0100024000	SHEA RAFFAELA	249	LEXINGTON ST	R3	40100	67800	1,835
0100026000	CARUSO SYLVIA HELEN	31	PRESCOTT ST	R1	39300	42700	1,263
0100027000	PATTI RALPH ETAL	33	PRESCOTT ST	R1	39700	70000	1,650
0100028000	MELE ANTHONY	35	PRESCOTT ST	R2	39700	68400	1,650
0100029000	STEWART ROBERT	37	PRESCOTT ST	R3	39600	87900	1,700
0100030000	SLOWEY JAMES J	252	PRINCETON ST	R3	41600	95300	2,500
0100031000	BOSSI MICHAEL ETAL	250	PRINCETON ST	R3	41600	99200	2,500
0100032000	TONTODONATO SANDRA M	248	PRINCETON ST	R1	41600	61900	2,500
0100033000	MARSIGLIA MARILYN G	246	PRINCETON ST	R1	41600	43100	2,500
0100034000	CAPO JOHN A & MARY B	244	PRINCETON ST	R2	41600	61200	2,500

Source: Boston Assessing Office data from February 1, 1996.
Parcel Records for Boston, Massachusetts.

Compared with poring over printed records of parcel information, electronic access speeds up research into land use and ownership. This is especially true now that Internet or CD-ROM access can run queries from a desktop computer (rather than a customized dial-up terminal) so that the results can be "cut-and-pasted" into the neighborhood planner's spreadsheet or report. The latest database technologies and mapping software enable users to construct spatial and textual queries; find, map, and aggregate significant amounts of digested parcel data; and download these data to the desktop in user-determined formats that become local tables, maps, and spreadsheets.

Using IT to accelerate the process of researching land use and ownership is a typical example of enhanced efficiency through IT *automation*. But, this "speed-up" effect is only the most obvious of the possible impacts we might imagine; and, as it turns out, it may not make much of a dent in the considerable amount of time that our prototypical neighborhood planner must spend studying land use and ownership.[6] We shall see why in the following two sections. In subsequent sections, I shall suggest how computerizing parcel records might result in a deeper restructuring of neighborhood planning activities.

Exploring Land Ownership Patterns

A typical land- use and ownership study might examine in detail the records for a few hundred to perhaps a thousand parcels. Boston has approximately 138,000 parcels distributed among 16 primary neighborhoods, 22 political wards, 64 sub-neighborhoods, and about 4,500 city blocks.[7] Hence, a typical land-use and ownership study might focus on an area smaller than a BRA sub-neighborhood, one that ranges from a few dozen to a hundred blocks. To explore the characteristics of computerized parcel records, however, we need not limit ourselves to a sub-neighborhood. Since we have access to a "snapshot" of 1996 Boston parcel records stored on a fast network server with relational database management tools, we can explore land ownership patterns by sorting, aggregating, and summarizing the parcel data for all of Boston.[8] By doing so, it will be easier to spot data ambiguities and problems that might have an impact on the accuracy and generality of a small area study.

For example, table 7.2 lists the owners of the largest amounts of residential property throughout Boston. The listing is the output of a query written in Structured Query Language (SQL), which has become the *lingua franca* of database interoperability.[9] For each unique owner name in the official records, the query counts the number of parcels owned and sums the total lot size and the total assessed value.[10] Since we have been discussing *neighborhood* planning, we focus only on those 80,842 parcels zoned for residential use (that is, those with a land-use classification code beginning with "R").[11] Of these 80,842 residential parcels, 3,213 were owned by the top-20 owners shown in table 7.2.

Table 7.2. Residential Holdings of the Largest Boston Property Owners (using "official" owner names as of February 1, 1996).

OWNER	PARCELS	TOTVAL_K ($ x 1000)	ACRES
CITY OF BOSTON	1,589	506	271.9
CITY OF BOSTON BY FCL	944	168	81.2
	102	7,664	8.3
BOSTON REDEVELOPMENTAUTH	83	0	11.9
CITY OF BOSTON FCL	71	0	4.5
WEST ROX CRUSHED STONE CO	46	883	8.6
BOSTON HOUSING AUTHORITY	37	0	4.5
CITY OF BOSTON MUNICIPAL CP	35	0	3.3
UNITED STATES OF AMERICA	35	95	12.1
SAMIA LEONARD J	34	7,135	3.3
MERCURI ANTHONY C	30	547	5.3
ABBEY ST GERMAIN LP	28	9,554	0.8
W ROX CRUSHED STONE CO	27	1,500	41.7
OBRIEN PATRICK	24	4,012	4.1
HYDE SQUARE CO OP	22	1,929	1.6
RAND MORRIS TRST	22	91	0.5
FEDERAL HOME LOAN MGT CP	21	2,398	2.2
JONES JOHN C	21	1,189	1.7
SECRETARY OF HOUSING	21	1,651	2.5
TODESCA CHARLES ETAL	21	456	2.5

A look at the owners' names in table 7.2 suggests that a problem must be solved in order to make good use of this computerized listing of the official parcel records. It is not surprising to find that the city of Boston owns most of the parcels. But the city is also second, fourth, fifth, seventh, and eighth in this top-20 listing. The BY FCL in CITY OF BOSTON BY FCL stands for "by foreclosure" and represents

foreclosures for nonpayment of taxes. Seven hundred forty-four such parcels are listed, but another seventy-one parcels list "CITY OF BOSTON BY FCL" as the owner and are presumably more of the same. The BRA, the BHA, and the CITY OF BOSTON MUNICIPAL CP are also among the top-20 residential landowners and should probably be treated as municipal ownership in any land ownership study. Note also that one hundred and two residential parcels have the owner name missing and that the UNITED STATES OF AMERICA, the FEDERAL HOME LOAN MGT CP, and the SECRETARY OF HOUSING make the top-20 owner list. Almost all of the U.S.-owned parcels are on the Stony Brook Reservation in Hyde Park, whereas the Federal Home Loan and Secretary of Housing parcels are spread around town and probably represent foreclosed residential property owned (as of February 1996) by the Federal Home Loan Mortgage Corporation and HUD. In all likelihood, these properties should also be treated as "municipal ownership" in a land ownership study aimed, say, at understanding property ownership for the purpose of designing a program of urban revitalization.

Difficulties in Categorizing Owner Names

If the parcel data recorded ownership in a way that matched the needs of such a study, then access to the computerized records through powerful data query tools such as SQL would be especially useful. But variations in spelling and the need to group official names into broader categories of ownership complicate our efforts to capitalize on the speed and cross-referencing capabilities of tools for processing digital parcel records. Of course, spelling errors could be corrected, and we could take steps to categorize ownership. But there are several ways of making such corrections and categories, and the choice can make more difference for planning and policy analysis purposes than we might at first think.

If the only issue were an occasional spelling error in owner names, then almost any solution would be effective. Occasional errors would not have a big impact on our totals and summary statistics, and we could still save a lot of the legwork involved in chasing down owner names for the bulk of the parcels recorded correctly in the database. But a closer look at the 1996 parcel database reveals more than an occasional spelling error or omitted name. The West Roxbury Crushed Stone Company shows up twice in the top-20 list with a total of seventy-three parcels of (mostly unusable) residential land. The owner name, WEST ROX CRUSHED STONE CO, is associated with forty-six of the parcels, and the other twenty-seven parcels are recorded under the owner name W ROX CRUSHED STONE CO. The two spellings might result from different choices about how to abbreviate the long name in order to fit it within the thirty characters allowed in the parcel database. The database comes from official "owner of record" information generated when the deed of ownership is recorded. Hence, standardizing the owner names used to record land ownership would not be an easy task-especially since the "owner" might include multiple individuals, corporations, trusts, and the like.

Table 7.3. Residential Holdings of Boston Property Owners with "CITY" Included in the Official Owner Name (as of February 1, 1996).

OWNER	PARCELS	TOTVAL_K	ACRES
CITY OF BOSTON	1,589	506	271.9
CITY OF BOSTON BY FCL	944	168	81.2
CITY OF BOSTON FCL	71	0	4.5
CITY OF BOSTON MUNICIPAL CP	35	0	3.3
BOSTON CITYWIDE LAND TR INC	7	4,330	0.3
CITY OF BOSTON FCL.	7	0	0.3
CITY OF BOSTON PWD	6	0	0.9
CITY OF BOSTON BY F CL	3	0	0.1
CITY OF BOSTON BY FCL	2	0	0.1
CITY SUITES BOSTON INC	2	873	0.0
BOSTON CITYWIDE LAND	1	186	0.0
CITY OF BOSTON PUBLIC FACLTS	1	0	0.1
CITY OF BOSTON-MUNICIPAL CP	1	0	0.1
CITY OF BSOTON BY FCL	1	0	0.1
CITY OF BOSTON BY FCL.	1	0	0.1
CITY OF BOSTON MUNICIPAL	1	0	3.3

Examining a few more ways of trying to account for parcels owned by the city of Boston will help clarify the nature and extent of the difficulties involved in interpreting the "official" names of the parcel owners. Table 7.3 lists all owners of record for residential parcels containing the word "city" in the owner name. Thirteen of the sixteen names do appear to indicate city ownership, and the vast majority of city-owned parcels are associated with the first two spellings. But the other three listings-BOSTON CITYWIDE LAND TR INC, CITY SUITES BOSTON INC, and BOSTON CITYWIDE LAND,-appear to be nongovernmental entities. Note also that the BOSTON CITYWIDE LAND name might seem to indicate city ownership except that BOSTON CITYWIDE LAND TR INC also appears on this list, which suggests that the entity is a private trust and not the City.[12]

Furthermore, this list does not include many other public entities that are directly or indirectly controlled by the city. Both the BRA and the BHA own hundreds of Boston parcels and should probably be counted as city-controlled agencies even though the word "city" does not appear in their name. Table 7.4 indicates that at least seventeen different spellings of the Boston Redevelopment Authority are involved in accounting for some 605 parcels that they own. Additional parcels with other abbreviations or misspellings might also be owned by the BRA.[13] Note that no one way of spelling BRA accounts for even 40 percent of these parcels, and a considerable amount of investigation might be needed to find all the parcels that the BRA owns. Likewise, the Public Facilities Department is directly under the mayor's control and owns a number of residential and nonresidentially zoned parcels under an owner name that contains neither "city" nor "Boston".[14] Sorting through various spellings of corporate, nonprofit, and individual ownership cases can be even more problematic; for example, we found twenty-seven different spellings indicating Boston University ownership.

Table 7.4. Boston Redevelopment Authority Parcels Listed under Seventeen Different Owner Name Spellings (February 1, 1996).

OWNER	PARCELS	TOTVAL_K	ACRES
BOSTON REDEVELOMENT AUTH	1	327	0.2
BOSTON REDEVELOPMENT	5	157	0.5
BOSTON REDEVELOPMENT AUTH	231	106,863	123.9
BOSTON REDEVELOPMENT AUTHRTY	3	61	0.1
BOSTON REDEVELOPMENTAUTH	83	0	11.9
BOSTON REDEVELOPMENTAUTHRTY	1	0	0.1
BOSTON REDEVELOPMNT AUTH	82	32,975	23.3
BOSTON REDEVELPMENT AUTH	41	1,418	3.0
BOSTON REDEVELPMNT AUTH	22	5,073	2.4
BOSTON REDEVELPOMENT AUTH	1	33	0.2
BOSTON REDEVLPMNT AUTH	28	7,488	3.2
BOSTON REDEVLPMNT AUTHOR	29	2,955	3.3
BOSTON REDEVLPMNT AV	1	0	0.0
BOSTON REDVLPMNT AUTH	60	2,472	7.8
BOSTON REDVLPMNT AUTHOR	15	3,416	1.8
BOSTON REDVLPMNT AUTHORITY	1	1,095	0.5
BOSTON REDVLPMNT CORP	1	662	0.1

Strategies for Standardizing Owner Names

The point of these examples is to illustrate why it is unrealistic to expect that computerizing parcel records will, by itself, turn land-use and ownership studies into trivial, push-button tasks. The land-use planning studies try to identify and interpret various spatial patterns of common land use, ownership, and control; but the parcel records merely indicate the "owners of record" as each property changes hands. Variations in spelling, and other ambiguities in interpreting the official owner names, hamper the planner's ability to digest the detailed parcel data quickly. One can imagine several ways of addressing the problem of the lack of standardized owner names. I focus on three strategies-bottom-up, top-down, and middle-out-which have very different implications for both the efficiency and the degree of decentralization of the kinds of prototypical neighborhood planning studies we have been contemplating.

Bottom-Up Strategy

In this case, one accepts spelling variations and simply tries to find a workaround without changing the parcel information system. One might say, for example, "I'm studying only 250 parcels. Just give me a copy of the parcel records. I'll correct the spelling errors as I find them and get on with task at hand." Computerizing the parcel records automates the copying process and allows the planner to enter the copied records into a desktop database or spreadsheet that can be readily updated as spelling errors are found and corrected. But the process is still time consuming because, as I have shown, there are many spelling variations for key owners, as well as many cases in which it is not obvious how to determine who has controlling interest in the property from the name of the owner-of-record, even if that name is correctly spelled.

If a study of parcel data focuses on a relatively small neighborhood, this strategy may work; but the time and effort required to research land use and ownership in one such case is not easily transferable

to others. All the effort goes into correcting the planner's *copy* of the parcel records; the original data lie beyond the planner's control. Moreover, the parcel records are constantly changing. When next year's parcel data arrives, the planner will have to spend additional time transferring all the corrections and adjustments already made in the old parcel records so they are not overwritten by the new year's parcel data; hence, our planner's corrected parcel records will not be very easily maintained. Indeed, most such land-use and ownership studies are one-shot efforts that provide no lasting body of knowledge that can either accelerate or improve the quality of subsequent land-use and ownership studies.

Top-Down Strategy

This traditional approach, especially familiar in data-processing circles within management information system departments, involves standardizing the spelling of owner names and redesigning the parcel records system to ensure consistency and avoid spelling errors and other ambiguities. Modern relational database management systems provide a rich array of data-entry tools and multiuser, distributed access capabilities. Parcel record updates can be made using "forms" packages that run as "clients" on local desktop machines and can run edit checks of owner names against shared master files located and maintained on a central machine. Standardizing names through the use of such technology would eliminate the seventeen different spellings of the Boston Redevelopment Authority and the twenty-seven different variations of Boston University. As part of the redesign, one could also add a few additional fields for use in categorizing ownership-for example, a category that distinguished among levels of public, private, corporate, and individual ownership.

Such a redesign would go a long way toward eliminating the difficulties of researching land ownership; but this strategy also has its drawbacks. As with many top-down central planning efforts, such a system takes months or years to design and implement, is hard to implement incrementally, and tends to be rigid and not easily adapted to changing circumstances and needs. Handling the multiple spellings of Boston Redevelopment Authority and Boston University is one thing, but standardizing the names of not-yet-formed corporations, partnerships, joint owners, and the like is more difficult. Do we want a data-entry clerk to have the authority to alter the names of the owners of record as recorded on the deed in order to conform to standardized spellings? Can we go far enough in standardizing names like "John A. and Jane B. Smith et al."? Moreover, the official owner name is unlikely to be the desired grouping in any case. Perhaps John A. Smith owns many properties with different partners, or through various corporations. Matching the official owner name would not be sufficient to track the common thread of ownership. Likewise, the categorizations of ownership-for example, public/private, state/local, corporate/individual-are useful but limited in that no one set of categories suits all purposes; in addition, the categorization is likely to involve enough subtleties and ambiguities that self-reported categories would have to be double-checked by professionals.

Middle-Out Strategy

This strategy tries to combine the best of both worlds so that the end-user flexibility of the bottom-up approach is not lost in the effort to ensure consistent recording of owner names. The basic idea is to leave the official parcel data untouched and build local "lookup" tables that accumulate owner name corrections and interpretations. These tables can then be cross-referenced as needed with official parcel

data so as to aggregate and map patterns of land use and ownership. While the idea is simple, its implementation in decentralized settings challenges modern database technology and requires more understanding of end-users' data management than the typical "turnkey" database application. But it can also lead to a very different view of how to share data in ways that allow one to decentralize *interpretations* of data. Such an approach could support a form of "grassroots" self-help planning while maintaining an acceptable level of coordination and standardization. Through shared data and data analysis tools, it could reduce the inefficiency, fragmentation, and delay that tends to plague decentralized, inclusive approaches to planning. In the following sections, I consider a specific example of the middle-out strategy.

Using Lookup Tables to Correct Spelling Errors

Instead of correcting spelling errors in our copy of the official parcel data, we can create a new lookup table that lists each of our corrections next to its original name. Relational database management tools make this easy. First, we use SQL to pull all unique owner names that appear in the original parcel records and store them in a new table called "own_lookup". We also add two new columns to this table-one for storing our spelling corrections and the other to hold categories of ownership (e.g., public, private, local, institutional, etc.) that we might want to assign to various owners later on. Table 7.5 shows a portion of this table for some of the entries that contain "Boston" in the official owner name.15 Since we have not yet corrected spellings or categorized ownership, the second and third columns retain the "xxx" and "yyy" code we have used to indicate missing values.

Table 7.5. Creating a Lookup Table for Correcting Boston Owner Names.

```
CREATE TABLE own_lookup AS
SELECT DISTINCT owner oldowner,
                'xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx' fixowner,
                'yyyyyyyyyy' owngrp
  FROM parcel96;

SELECT oldowner, fixowner, owngrp
  FROM own_lookup
 WHERE oldowner LIKE '%BOSTON%' AND oldowner LIKE '%CITY%';

OLDOWNER                      FIXOWNER                       OWNGRP
----------------------------- ------------------------------ ----------
BOSTON CITY LIGHTS FOUNDATON  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
BOSTON CITYWIDE LAND          xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
BOSTON CITYWIDE LAND TR INC   xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
BOSTON CITYWIDE LAND TRUST    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
BOSTON CITYWIDE LAND TRUST I  xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON                xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON                xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON MUNICIPAL      xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON BY FCL         xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON BY F CL        xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON BY FCL         xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON BY FCL.        xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
CITY OF BOSTON BY FL          xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx yyyyyyyyyy
...
```

Next, we write a series of SQL statements to update the own_lookup table as we identify various spelling corrections and assign ownership categories. If the lookup table had fewer rows, we could update by hand; however, it is useful to take the time to write update statements that make the changes, so as to avoid hard-to-find typographical errors that result from handwritten corrections, and to archive precise update statements that can be reused as needed. Table 7.6 lists a selection of such update statements. The first one simply sets all names in the "fixowner" column to be the same as the original "oldowner" names; we use this as our starting point. The next two update statements standardize several of the variations of "City of Boston" found in table 7.5. The last update illustrates a more complicated statement that does what the previous two updates did and then some. It corrects owner names and categorizes the "owngrp" as PUBLIC for those parcels that have both CITY and BOSTON (or BSOTON) in their owner name-as long as the name does not also have CITYWIDE or SUITES in it.[16] As a planner digs into the official land use and ownership data, she will discover a number of such spelling corrections and name interpretations that can be accumulated and stored in such update statements. Table 7.7 shows the results of applying the table 7.6 updates to the same rows of the "own_lookup" table that were shown above in table 7.5.

Table 7.6. Updating the Lookup Table to Correct Spelling Errors.

```
UPDATE own_lookup SET fixowner = oldowner;

UPDATE own_lookup
   SET fixowner = 'CITY OF BOSTON'
 WHERE oldowner = 'CITY OF BOSTON';
UPDATE own_lookup
   SET fixowner = 'CITY OF BOSTON'
 WHERE oldowner = 'CITY OF BOSTON BY FCL';
UPDATE own_lookup
   SET fixowner = 'CITY OF BOSTON', owngrp = 'PUBLIC'
 WHERE oldowner LIKE '%CITY %' AND ((oldowner LIKE '%BOSTON%' and
       oldowner NOT LIKE '%CITYWIDE%' AND
       oldowner NOT LIKE '%SUITES%')
    OR (oldowner LIKE '%BSOTON%' ));
```

Table 7.7. Viewing the Updated Lookup Table.

```
 SELECT oldowner, fixowner, owngrp
 from own_lookup
 where owner like "%BOSTON%";
```

OLDOWNER	FIXOWNER	OWNGRP
BOSTON CITYWIDE LAND TRUST I	BOSTON CITYWIDE LAND TRUST I	yyyyyyyyy
CITY OF BOSTON	CITY OF BOSTON	PUBLIC
CITY OF BOSTON	CITY OF BOSTON	PUBLIC
CITY OF BOSTON MUNICIPAL	CITY OF BOSTON	PUBLIC
CITY OF BOSTON BY FCL	CITY OF BOSTON BY FCL	PUBLIC
CITY OF BOSTON BY F CL	CITY OF BOSTON BY FCL	PUBLIC
BOSTON HOSPITAL FOR WOMEN	BOSTON HOSPITAL FOR WOMEN	yyyyyyyyy
BOSTON HOTEL LP	BOSTON HOTEL LP	yyyyyyyyy
BOSTON HOUSING AUTH	BOSTON HOUSING AUTHORITY	PUBLIC
BOSTON HOUSING AUTHORITY	BOSTON HOUSING AUTHORITY	PUBLIC
BOSTON HOUSING AUTHOURTY	BOSTON HOUSING AUTHORITY	PUBLIC

After making our spelling corrections and owner groupings in this manner, we can use the lookup table to interpret the official parcel table along the lines suggested earlier in tables 7.2 and 7.3. Suppose we

want to look again at the residential holdings of the largest Boston property owners. We can run the same query we ran earlier for table 7.2, but now, instead of grouping owners by their *official* owner name, we link the parcel table to the own_lookup table (using the official owner name) and then use the "fixowner" column in the lookup table to lump together parcels that have the same *fixed* owner name. Table 7.8 illustrates how the relational algebra of SQL links rows in the parcel table with rows in the lookup table.17 Several parcels in the parcel table may have the same spelling for their owner name, in which case they will match up to the same entry in the lookup table. In addition, the lookup table will match many different original spellings of, say, CITY OF BOSTON BY FCL with the same "fixowner" spelling (viz. CITY OF BOSTON). Once the tables are linked in this fashion, the SQL query language enables us to count parcels, sum acres, and the like by grouping parcels according to the values of any field in *either* of the linked tables. We can link the tables using the original owner names, but then count parcels, value, and acreage by lumping together all parcels with the same "fixowner" name. Table 7.9 uses this technique to recompute the residential holdings of Boston's largest property owners (cf., table 7.2) after making only those owner name corrections listed in table 7.7.[18]

We see in table 7.9 that Boston's land ownership now includes 2,662 residential parcels. This includes the 2,639 parcels for the four entries in table 7.2 that have both "city" and "Boston" in the (old) owner name plus another 23 residential parcels that did not show up on the table 7.2 list of landowners with 20-plus parcels but were identified as having city of Boston ownership in our table 7.7 updates. Evidently, there were nine different spellings of Boston for these cases since the total number of spellings collapsed into the CITY OF BOSTON row is 13. Note that, thus far, we have only standardized those names containing both "city" and "Boston."[19] The results in table 7.9 do not lump together any other spellings indicating Boston ownership, such as the two Boston Housing Authority and Boston Redevelopment Authority entries, which remain as they were in table 7.2.

Table 7.8. Using the Lookup Table.

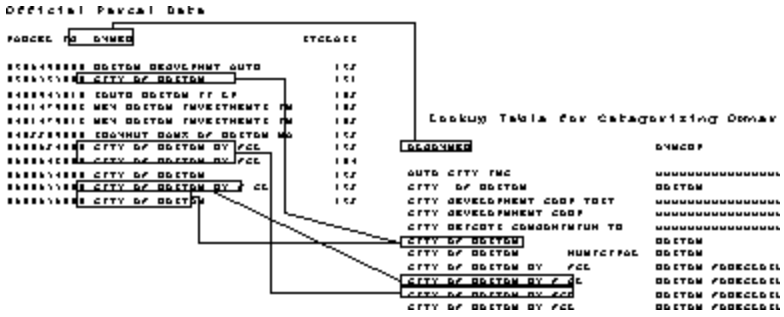

Table 7.9. Residential Holdings of the Largest Boston Property Owners (reworked table 7.2 results after standardizing "city of Boston").

FIXOWNER	SPELLINGS	PARCELS	TOTVAL_K	ACRES
CITY OF BOSTON	13	2,662	673	366.0
BOSTON REDEVELOPMENTAUTH	1	83	0	11.9
WEST ROX CRUSHED STONE CO	1	46	883	8.6
BOSTON HOUSING AUTHORITY	1	37	0	4.5
UNITED STATES OF AMERICA	1	35	95	12.1
SAMIA LEONARD J	1	34	7,135	3.3
MERCURI ANTHONY C	1	30	547	5.3
ABBEY ST GERMAIN LP	1	28	9,554	0.8
W ROX CRUSHED STONE CO	1	27	1,500	41.7
OBRIEN PATRICK	1	24	4,012	4.1
HYDE SQUARE CO OP	1	22	1,929	1.6
RAND MORRIS TRST	1	22	91	0.5
FEDERAL HOME LOAN MGT CP	1	21	2,398	2.2
JONES JOHN C	1	21	1,189	1.7
SECRETARY OF HOUSING	1	21	1,651	2.5
TODESCA CHARLES ETAL	1	21	456	2.5

We could easily construct another set of updates to handle the various spellings of BHA and BRA. In fact, we can accumulate any number of corrections and categorizations of owner names in our lookup table. Then, whenever we want to probe a question of multiple parcel ownership or perform some other land ownership analysis, we can use the *same* query used earlier to produce table 7.9, in order to generate a revised table or map that reflects the impact of the latest corrections and categorizations in our lookup table.

Accumulating knowledge about land ownership

This last point suggests how a middle-out approach that makes use of SQL and relational tools could support distributed, decentralized planning more effectively than top-down or bottom-up approaches. Rather than seeing the middle-out approach as an elaborate way of handling spelling errors, we can see it as a robust strategy for decentralizing city data in ways that empower end-users to analyze data through the lens of their own interpretations and accumulated knowledge. Conventional "citizen inquiry systems"[20] restrict users to a limited set of narrow, predefined questions; they do not help users to adjust or aggregate data to suit their own conceptions of reality. Conventional systems may suffice for predictable day-to-day queries, such as "What's my assessed value?" or "Did you get my tax payment?" But they do not support the creation of an inclusive, decentralized planning process that would enable individuals at the neighborhood level to query city data efficiently in the light of questions they invent in the service of their own interests.

Interpretations of official owner names can take time to research and compile, and findings may vary from organization to organization, or change from time to time. It is better to isolate such volatile local information from a central list of official owner names and records that serves a variety of purposes for different agencies and may be needed, unchanged, as a basis for cross reference to other official records. In addition, I should note that official parcel records are reasonably well maintained in a central city department such as "Assessing" or "Management Information Systems"; but lookup tables can be generated and maintained by any number of independent planners and researchers, and spread among departments and neighborhood groups throughout the city, so long as local planners have the network access, data-processing tools, and the know-how to tap into the city's databases.

Distributed, networked databases coupled with end-users who are skilled at cross-referencing data may look like exotic technology today. Nevertheless, the core elements of this technology are progressing rapidly. They include the Internet, multitasking desktop machines, inexpensive large-volume storage devices, and powerful user interfaces that support mapping and visualization. Standards for encoding and processing digital spatial data are also improving rapidly. It is already possible, through open database connection (ODBC) tools and object linking and embedding (OLE) tools, to construct lookup tables locally. The tables can be contained in a spreadsheet or desktop database package and cross-referenced, with the click of a few buttons, with remotely stored databases such as the parcel database. These databases exist on database servers accessible through the Internet, and employ a variety of software packages for database management. In classes for planning students at MIT-not necessarily computing majors-we are doing this already. Moreover, we are able to link the work of data analysis with map and image servers that provide visual assistance in locating and interpreting data, without bogging down in the complex manipulation of sophisticated geographic information systems.

Individual citizens may not need such technology. But a growing number of local organizations involved in bottom-up planning for urban revitalization already have some capacity to access and use computing technologies, and could make good use of the technologies described above.

Conclusion

The middle-out approach to data access and analysis has many applications beyond land ownership accounting. For example, neighborhood groups, concerned about conditions that provide economic incentives for arson, sometimes form arson-prevention teams. Such teams try to keep track of landlords who are delinquent in their tax payments, often appear in housing court over disputes with tenants, disinvest in their property, or even amass land with run-down or abandoned buildings in the hope of clearing it for other uses via arson. It takes considerable time and energy to investigate such landlords, since they tend to use "shells" to hide their identity. The middle-out approach enables local agents to accumulate knowledge in a lookup table (noting, for example, that "John Smith controls the XYZ Corporation"). The lookup table can be used from time to time to reinterpret official data about land ownership contained in central parcel databases that lie outside the control of local actors. When such results are linked to parcel maps of a neighborhood, they allow for quick, visual inspection of ownership patterns. Indeed, as software evolves and "intelligent agents" become more practical, one can imagine programming an "agent" to help plan such detective work. "Take a look at this block," the agent might suggest. "I've looked around, and I suspect that if you examine what's happening with its twenty "uncategorized-ownership" parcels, you'll find cause for concern!"

There are many other questions of interest to neighborhood planners that lend themselves to a middle-out approach. Which housing near a BHA site should be first targeted for acquisition? What is a good location for a new day-care or job-training center? Which landlords are overdue on taxes and likely to abandon their property, or milk it dry, before converting to high-rise buildings or condos? Who else is heavily involved in housing in the neighborhood? Does the neighborhood have the local buying power to sustain a bigger grocery store?

The middle-out approach to data processing is important because both top-down and bottom-up approaches prevent neighborhood groups, or neighborhood departments of city agencies, from interactively engaging and keeping pace with the city planning process. Access to official databases, spelling errors and all, will not suffice to enable neighborhood groups, or smaller agencies and nonprofit organizations, to digest the relevant data in time to engage urgent planning issues and

decisions-not so long as they have to construct their own data analyses for themselves, from scratch, for each new project. Moreover, neighborhood groups and organizations have local knowledge that the city lacks-for example, knowledge about the actual uses of land and space-but no efficient way to share that knowledge with the city, or with other organizations. If we could count on the availability of data in the flexible and decentralized manner supported by the middle-out approach to data processing, then the stage would be set for a truly interactive, timely planning dialogue between neighborhood planners and city agencies-as well as for a mode of interagency coordination that might allow agencies to keep pace with one another.

Notes

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[1] In 1993, the U.S. Federal Government began an "Empowerment Zones/Enterprise Communities Program" aimed at revitalizing inner city neighborhoods through tax incentives and other Federally funded assistance intended to stimulate economic development within impoverished urban communities.

[2] "Brownfields" refer to parcels of land whose land use history makes them suspect as the location of hazardous waste such as contaminated soil or undocumented and leaky underground oil tanks. The uncertainty regarding their history and the (limited) prospect of collecting on their prior owners' liability, clouds efforts to promote their reuse and adds financial risk and delay to land use planning efforts in their vicinity.

[3] For example, such studies might employ the land-use and ownership data to develop a series of (before and after) parcel- or block-level maps of the neighborhood showing land-use (residential, retail, commercial, etc.) demographics, population, density, job locations, transit stops, rent levels, vacancy rates and the like. These maps are then used to characterize the proposed plans as having small (or large) impacts, being similar to (or different from) current patterns, and so on. Neighborhood and community groups familiar with the neighborhood still spend considerable time amassing such data to provide systematic and credible justification for their proposals and opinions and to reduce to common terms their anecdotal impressions and recollections of land-use and ownership.

[4] Of course, the "official" records are more complex than the single-table "flat file" extract shown in table 7.1. Not only are there many more variances associated with each parcel (e.g., building characteristics, square footage, owner's mailing address, etc.), but there are "one-to-many" relationships (e.g., multiple owners of a parcel, multiple buildings on a parcel, condominium ownership, etc.), and complex changes in the data as various transactions occur (e.g., the sale of buildings and parcels, subdivisions of land, construction and renovation, etc.). Nevertheless, most of today's land records can distill form the more complex databases a "snapshot" of current information such as shown in table 7.1.

[5] For example, the Oakland, California, Community and Economic Development Agency has recently begun providing an online "map room" on the Internet that allows the public to zoom in on a neighborhood or parcel and obtain parcel-specific ownership and land-use information. See the "Map Room" and "Permit Counter" on the City of Oakland Virtual Permit Center and web page at http://ceda.ci.oakland.ca.us.

[6] Note that computerizing parcel ownership and tax records has a significant impact on the day-to-day operations of Assessor's Office and Registry of Deeds in that it enables many individual inquiries about property characteristics and ownership to be handled much more quickly and reliably and from decentralized locations. But our focus is whether and how IT innovations influence land-use planning and policymaking activities rather than on the use of automation to improve the efficiency of specific operations involved in delivering urban services.

[7] These 64 sub-neighborhoods were defined by the Boston Redevelopment Authority and Boston's Public Facility Department as neighborhood statistical areas for the purpose of aggregating 1980 U.S. Census data.

[8] The parcel data are stored (along with other Boston data, maps, and GIS tools) in an Oracle relational database on a SPARCServer 1000E with half its 128 megabytes of RAM dedicated to relational data processing.

[9] The SQL used by Oracle Release 7.1 conforms to the SQL-2 standard, In this case, the query is:

```
SELECT owner, count(*) parcels, sum (totalval) /1000 totalval_k,
       sum (lot size) /43560 acres
```

```
  FROM parcel 96
 WHERE land-use LIKE 'R%'
 GROUP BY owner HAVING count (*) > 20
 ORDER BY count (*) DESC;
```

[10] The total assessed value of zero shown is not a coding error. For most tax-exempt property, the assessor's office does not try to determine and record the market value of the land and buildings.

[11] A three-digit land-use code is also available for each parcel and provides a more precise definition of property use. For this example, however, we used a simpler (albeit less precise measure)-whether city land-use code begins with "R." This convenient approximation is sufficient for the purposes of discussing encoding and interpretation issues that are of interest in this chapter.

[12] If we had not restricted the research to residential parcels, the presence of the word "CITY" in the owner name would have been more ambiguous as an indicator of municipal ownership. Among all parcels, 4,356 were owned by 41 different owner names containing the word "city," and these owner names included BOSTON CITYWIDE LAND, CITY OF BOSTON MUNICIPAL CP, CITY OF BOSTON TRST, and CITY DEVELOPMENT CORP TRST.

[13] The query n Table 7.4 was not restricted to residential parcels:

```
SELECT owner, count (*) parcels, sum(totalval) /1000 totalval_k,
   sum (lotsize)/43560 acres
  FROM parcel96
 WHERE owner LIKE '%BOSTON%' AND
      (owner LIKE '%REDEV%' or owner LIKE '%REDEV%'
 GROUP BY owner;
```

There are 154 residential parcels among the 605 BRA parcels summarized in Table 7.4 and these 154 residential parcels utilized 11 different spellings of the Boston Redevelopment Authority.

[14] The CITY OF BOSTON PUBLIC FACLTS name in Table 7.3, probably refers to the Public Facilities Department. But in other cases, the owner is listed as PUBLIC FACILITIES.

[15] There are 103,281 unique owner names in Boston's parcel database.

[16] Examination of owner names using other SQL statements indicated that the only nonpublic owner names having both "Boston" and "city" in them were names containing "citywide" or "suites".

[17] Table 7.8 is not wide enough to fit all columns of the lookup table. The "fixowner" column is omitted and the "oldowner" column is displayed along with the "owngrp" column which updates not discussed in the chapter have been used to group city-owned properties into various Boston-xxx categories.

[18] The SQL query used to produce Table 7.9 is:

```
SELECT fixowner, count(distinct oldowner) spellings, count(p.parcel_id) parcels,
       sum(totalval)/1000 totalval_k, sum(p.lotsize)/43560 acres
  FROM own_lookup g,parcel96 p
 WHERE p.owner=g.oldowner and landuse like 'R%'
 GROUP BY fixowner HAVING count(p.parcel_id) > 20
```

```
ORDER BY count(p.parcel_id) DESC;
```

[19] Note also that the 102 parcels from table 7.2 with a missing owner name drop out of the table 7.9 since they do not match up with any name on the lookup table.

[20] For example, most Assessor's Offices allow citizens to have access to their records by coming to the office and thumbing through voluminous printouts of owner names, addresses, and assessed values that are sorted alphabetically by owner name and street address. Within the past two decades, many such offices have switched from printouts to terminal screens -- i.e., computer monitors that are 'dumb' terminals directly wired to minicomputers and mainframes. However, these terminals do not provide the open-ended inquiry and cross-referencing discussed in this paper. Rather, they automate the answering of a few specific questions such as, "Who owns the property at 45 Main St." The result is a screenful of information for the one property that is found and, while the citizen might be able to obtain a printout of the screen, they cannot take away an electronic record of the information that can be readily merged and cross-referenced with other information.