

Retrofit, Rehab, and Maintenance

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Abstract

Rehabilitation investment, estimated between \$100 billion and \$200 billion annually, approaches, or even exceeds investment in new housing construction, and constitutes about 2 percent of the nation's economic activity. Despite its scale and significance, there is much less literature and research concerning housing rehab than there is on new construction. This paper overviews the state of the art and future research directions concerning three aspects of housing rehab: data, technology, and regulation.

Keywords: Housing rehabilitation, Housing retrofit, Housing maintenance

Introduction

About \$100 billion to \$200 billion² in improvements to the existing housing stock—retrofit, rehab, and maintenance—(hereinafter rehab or renovation) is carried out each year in the United States. Rehab activity thus approaches or even exceeds investment in new housing construction and constitutes about 2 percent of the nation's economic activity.³

Rehab is essential for sustaining the useful life of America's housing stock—which, like its population, is aging. In 2000, the median housing unit in the United States was “thirty-something,” and in central cities, it was “forty-something.” In a decade or two, much of America's housing stock will be in advanced middle age, and central-city housing will be geriatric. Rehab is a matter of life or death to these aging housing units.

While rehab takes place throughout metropolitan areas, it is especially prevalent in central cities. In the 1990's, rehab constituted almost 80 percent of the total dollar amount of central-city residential construction in St. Louis and 50 percent to 60 percent in Baltimore, Cleveland, Detroit, Philadelphia, San Francisco, and Washington, D.C. Rehab is thus critical for central cities. If these places and other older centers are to be invigorated—as is contemplated under smart growth—then a vital rehab industry is essential.

Given the above, it is important for the private and public sectors involved in housing to better understand rehab. Unfortunately, rehab—especially in comparison to new construction—has received relatively little attention in housing research and the housing literature. In addition, the data on rehab are far less extensive than are data on new construction. The scarcity of rehab data perpetuates the insufficient attention being paid to this important housing and economic sector.

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²The wide range is due to variations in how rehab is defined (e.g., whether it includes or excludes repairs and whether conversions from nonresidential use, such as loft conversions, are included).

³These data are from the Joint Center for Housing Studies and the National Association of Home Builders (2000).

This paper overviews the state of the art and future potential research directions of three aspects of rehab: data, technology, and regulation.

HOLISTIC HOUSING REHAB DATA NEEDS

It is instructive to holistically consider a broad array of rehab data needs and sources. Exhibit 1 presents a few of the broader topics (there could be numerous others). Ideally, one would start by analyzing the need for residential rehab based on housing and demographic forces. Only a portion of the gross rehab need materializes. Many poor families live in deteriorated housing units that need upgrading; however, the necessary work is not done because these families have limited financial resources. It would be useful to determine what data would facilitate study of rehab affordability. Demographics also have an impact on what rehab is effected. For instance, seniors and long-term homeowners may defer renovation despite having the financial means necessary for the upgrading. Thus, study of the demographic and housing life-cycle influences on rehab is critical and has its own data requirements.

The net remaining from the gross rehab needs less affordability and the effect of demographics (and other factors) is the actual rehab activity. A portion of the rehab activity that occurs is financed, and government entities are involved in a share of the rehab financing and the broader rehab intervention. Thus, there are a broad stream of interlinked rehab subjects. This sense of the whole suggests the premier data sources for accessing and improving our knowledge of rehab.

Rehab Data Current State of the Art

The upper portion of exhibit 1 indicates primary data sources for informing the above described different aspects of rehab. For instance, information on rehab activity is available from the Annual Housing Survey (AHS) and census materials (e.g., C-30 and C-50 reports), as well as from industry (e.g., NAHB's Consumer Practices Survey).

The existing rehab data are limited, however. For example, while the AHS contains many fields of information related to housing unit quality (e.g., presence of water leaks, and falling plaster), these data do inform us as to whether the housing unit requires different levels of rehab intervention, such as "minor," "moderate," or "extensive," renovation. Also, lacking from the AHS is the cost of the varying levels of renovation and how renovation would be financed.

Future Rehab Data Research

The lower portions of exhibit 1 gives some example of how the rehab data could be enhanced or in other ways improved. For example, from the multiple individual descriptions of housing inadequacy listed by the AHS, researchers could predict likely appropriate rehab interventions (i.e., minor, moderate, or extensive renovations). The AHS has information on rehab effected as well as questions on financing, but it does not link the two by querying how the rehab was financed (e.g., refinanced first mortgage, second or third mortgages, or home equity credit line [HEL]). The Survey of Consumer Finance (SCF) provides good information on home finance, but only sketchy data on rehab (e.g., the rehab indicated could have been done in the past year or the last 25 years), so a complete picture on rehab financing is not forthcoming.

What can be done to improve the rehab finance data? Some examples are indicated in the lower portion of exhibit 1. The AHS could specifically ask how rehab was financed (e.g., first mortgage refinancing, second or third mortgage, and/or HEL). The AHS's rehab financing query could also serve to ascertain if any government subsidy or other assistance was secured (e.g., government mortgage insurance, grant, or property tax abatement). Improving AHS's ability to track rehab financing would be especially beneficial because the survey already provides data across an array of rehab topics (exhibit 1).

Other data sources could be enhanced. For example, the SCF could be improved upon by tightening the link between its financing questions and specific rehab outlays. The Home Mortgage Disclosure Act (HMDA) could also be enhanced as a rehab finance data source, for example by differentiating in the HMDA loan application register (LAR) between refinancings earmarked for home purchase and refinancing intended for home improvement.

The remodeling industry can play a role in raising the level of available data on rehab finance. The NAHB's Consumer Practices Survey (CPS) already elicits detailed information on repair and remodeling purchases. The CPS contains such questions as "What were the total expenditures by category of repair or improvement?" "Who made the purchase?" "Who installed it?" and "Where was the material purchased?" (Joint Center for Housing Studies and NAHB 2000, 34). Perhaps the CPS could add questions pertaining to how the repair or improvement was financed, including whether any government assistance was tapped. The CPS could then be a source of information on both rehab activity and financing.

Remodelers themselves can offer insight into how rehab is financed. The larger remodelers sometimes have their own financing subsidiary; at the least, they work closely with a financing entity. Perhaps some questions related to consumer rehab financing could be added to the Home Improvement Research Institute's (HIRI) Remodeler Study. While this likely will be less useful than adding financing questions to the NAHB's CPS would be, it is worth exploring how the remodeling industry, through HIRI or some other entity, can add to our rehab financing knowledge.

Better information of government aid for rehab would also be useful. To illustrate, we will consider tax credit support for rehab.

The low-income housing tax credit (LIHTC) is the premier affordable housing program in the United States. In 1996, HUD commissioned Abt Associates (1996) to prepare a data file on LIHTC activity. The Abt database contained many fields of general project data, such as project location, project size, and project construction type (new or rehab). Limited LIHTC financial information (e.g., tax credit rate, use of tax exempt bonds and Section 515 loans) was also assembled. Abt updated this database in 2000, again under HUD sponsorship.

The Abt-HUD database is very helpful in creating a profile of LIHTC projects. More detailed financial information would enhance the usefulness of this source. Cummings and DiPasquale (1998, 1999) of City Research secured data from major syndicators on LIHTC activity. Like Abt-HUD, City Research collected information on general project characteristics. Unlike Abt-

HUD, however, City Research assembled a variety of detailed LIHTC characteristics, such as project total development cost (TDC), sources of financing for the TDC, project operating income and expenses, and return to equity and debt investors. The City Research database is proprietary, however, with only limited public release of information. An example is a breakout of the TDC into first mortgage, equity, and gap financing components by location and construction type. Making such information more widely available, as well as adding more financial fields to the Abt-HUD database (both admittedly hard to do given the sensitive nature of these data items), would improve our knowledge of the LIHTC.

Another important tax aid is the historic rehabilitation tax credit (HRTC). From data maintained by the National Park Service (NPS), it can be determined that about half of all HRTC activity has targeted housing and another 20 percent to 25 percent has consisted of mixed uses, typically housing and another use. The HRTC is often used in conjunction with other subsidies, such as the LIHTC, state historic tax credits, property tax abatement, and so on.

The HRTC is an underappreciated support for rehab. Knowledge about the HRTC could be enhanced as follows:

1. Make the NPS's HRTC database more readily available to the public (as is the Abt-HUD LIHTC information).
2. Formulate common fields of information for both the LIHTC and HRTC databases. For instance, our knowledge of the LIHTC would be furthered if the Abt-HUD data had the "other incentives used" field of information that is collected for the HRTC.
3. Add to the HRTC database detailed financial information comparable to that collected by City Research in its LIHTC proprietary studies—an admittedly difficult task.

REHAB TECHNOLOGY

Housing rehab has traditionally been characterized as "low tech(nology)" with respect to material and applications. A 1995 study (NAHB Research Center, Inc.) however, identified numerous "innovative rehabilitation technologies" with respect to rehab-applicable materials, products, methods used during design and construction, and new and improved equipment used in diagnostics and construction activities.

Rehab Technologies Current State of the Art

Examples of extant "innovative rehab technologies" are shown in exhibit 2 with respect to the building site, building foundation, building envelope, electrical, plumbing and HVAC, and other building components. For example, reinforced hollow brick masonry is not new to construction, but development of a size (5-inch module) specifically for housing is new for residential construction (NAHB Research Center 1995, 5). Hollow bricks receive reinforcing and grout to produce brick walls that are exterior finish and structure. Joist hangers and bolts and ledges are built in to receive floor framing, and plastic furring strips attached to the inside face of the brick to receive interior finishes. Use of reinforced hollow brick masonry represents time savings in brick exterior wall construction.

Future Rehab Technology Research

The line of research described above should be continued and expanded. There needs to be further identification of “innovative research technologies.” Furthermore, research should be undertaken to examine:

1. the *actual use* of the potential innovations;
2. *barriers to the adoption* of the innovations; and
3. the potential *cost savings* from current or future application of the innovations.

One hurdle to the adoption of innovative rehab technology may result from regulatory barriers, such as building code regulations.

REHAB REGULATION: THE BUILDING CODE

The building code is a significant regulation affecting rehab. A building code prescribes the standards for construction, including permissible types of construction; quality of building materials; minimum floor and roof loads; permissible electrical and mechanical equipment; and health and safety requirements pertaining to water pressure, fire ratings, and other considerations (Schultz and Kasen, 1984, 43). Depending on statute or custom, a local government adopts a building code or has one prescribed by the state. States and municipalities often adhere to model codes.

The Building Code and Rehab: Current State of the Art

Although building codes regulate both new construction and rehabilitation, they are largely oriented to new construction, and that emphasis creates problems for renovation. The building code, in practice, sometimes mandates a new-construction standard for rehab, but retrofitting an existing building to the new-building standard is technically problematical and expensive.

Two building code provisions in particular, the “25–50 percent rule” and the “change-of-occupancy rule,” have often proved most problematical for rehab. There are variations of the “25–50 percent rule.” All versions seem to indicate that a complete code-complying building (e.g., existing portions, renovated areas, new additions) must be the net result if the total cost of the proposed work (over some stated period of time) exceeds 50 percent of the estimated cost to replace the existing building. If the total cost of the proposed work is between 25 percent and 50 percent of the estimated cost to replace the existing building, then less-stringent requirements are demanded, with a further lowering of requirements if the cost falls below 25 percent.

Building codes also address a change of use or occupancy in existing buildings because such a change may introduce new or greater hazards. A building code may require that the entire building comply with the new-construction requirements for the new occupancy. For instance, if industrial space is adapted for housing, then the new-construction standard for housing would have to be satisfied.

Until about two decades ago, the model building codes typically required a strict adherence to the “25–50 percent rule” and the “change-of-occupancy rule” as described above. That created

severe compliance problems. A rehab job valued at more than half of the value of the building being worked on, a not uncommon occurrence, would trigger the mandate that the entire building, not just that portion or the components being worked on, would have to satisfy standards for new construction. A similar new-building mandate was prescribed with every change of occupancy, even if the new occupancy was less hazardous than the prior one.

These problems caught the attention of HUD and the building code community in the 1970s. HUD sponsored a series of documents, titled *Rehabilitation Guidelines*, that recommended changes with respect to the “25–50 percent rule” and the “change-of-occupancy rule.” The model codes responded to those recommendations (see chapter 5 for a summary).

Over time, the model codes also included significant documents specially oriented to rehab. For example, in 1985, the International Conference of Building Officials (ICBO) published the *Uniform Code for Building Conservation* to encourage rehab. In 1987, Article 32 was added to the National Building Code (NBC) as an alternative to compliance with new construction when there is work involving repairs, alterations, additions, or changes of use.

More recent is the adoption of “smart codes.” “Smart codes” is the term used to describe building and construction codes that encourage the alteration and reuse of existing buildings (Building Technology, Inc. 2001, 3). For example, such codes eliminate the “25-50 percent rule” and arbitrary change of use regulations.

One Example of a smart code is the National Applicable Recommended Rehabilitation Provisions (NARRP) developed under HUD sponsorship. The starting point for the development of the NARRP was New Jersey’s Code for the Rehabilitation of Existing Buildings. The NARRP and the New Jersey rehab code have inspired adoption of similar smart codes in the states of Maryland, Minnesota, and Rhode Island, and in various local jurisdictions (e.g., Wilmington Delaware).

Future Rehab Building Code Research

It is opportune to do the following:

1. Compare the technical features of the NARRP, New Jersey rehab code, and other smart codes to one another and how they contrast to prior, more restrictive regulations (some work has been done in this area).
2. Detail the cost saving potential of the new generation of smart codes (some work has started in this area).
3. Examine empirically the influence of smart codes. The University of North Carolina has begun research on whether New Jersey’s smart code has enhanced rehab investment in that state.
4. Examine administrative and other challenges to the effective implementation of smart codes.

Exhibit 1
Holistic Perspective of Rehab Data Needs and Sources

| Rehab Component | Rehabilitation “Need” and Affordability | | Actual Rehabilitation Activity, Financing, and Government Participation | | |
|---|---|---|--|--|--|
| | (1) Rehab Need | (2) Rehab Affordability | (3) Rehab Activity | (4) Rehab Financing | (5) Government Programs and Government Participation in Financing |
| Current Data Sources (National-Regional) | ?? AHS (various housing quality measures) | | ?? AHS ?? C-50 ?? C-30 ?? CPS | ?? AHS ?? SCF ?? RFS ?? HMDA | ?? Abt-HUD LIHTC data base ?? NPS HRTC data base ?? HUD CDBG-HOME data; other sources |
| Local Data | ?? Local surveys | ?? Local surveys | ?? Local building permits | ?? Local data | ?? Local data |
| “Enhanced” National Data Sources and Procedures | ?? “Connect” AHS housing quality measures to levels of rehab need (e.g., “minor,” “moderate,” and “extensive” ?? “Restart” annual housing goal rehab need projections by HUD—others? | ?? “Cost out” rehab levels based on AHS “connections” and relate costs to affordability | ?? Reinstitute C-40 Building Permit Survey for rehab ?? Improve C-50 reporting (e.g., better geographic detail) | ?? “Enhance” AHS (e.g., link financing questions to <i>specific</i> home improvements) ?? “Enhance” other data sources (e.g., in SCF—improve linkage between finance question [QD37] and <i>specific</i> home improvement and differentiate in HMDA whether refinancing was used for home improvement) ?? Expand CPS to include financing component ?? Expand HIRI Remodeler Survey to include consumer financing component | ?? “Expand” current data sources (e.g., add more financial detail in LIHTC-HRTC data) ?? “Enhance” access to available data (e.g., NPS HRTC data base) ?? Add parallel financing fields to available data (e.g., LIHTC and HRTC should incorporate common subsidy identifications) ?? Improve rehab “identification” in existing programs (e.g., CDBG) ?? “Enhance” other data sources to include government participation in financing rehab (e.g., in AHS) |

Key:
AHS = American Housing Survey
CPS = Consumer Practices Survey of the National Association of Home Builders
HMDA = Home Mortgage Disclosure Act
HIRI = Home Improvement Research Institute
HRTC = Historic rehab tax credit
LIHTC = Low income housing tax credit
NPS = National Park Service
RFS = Residential Finance Survey
SCF = Survey of Consumer Finance

Exhibit 2
Examples of Innovative Rehabilitation Technologies

| | |
|--------------------------|---|
| SITE | Conductive Concrete Hill-Climber Lift |
| FOUNDATIONS | Footing/Forms/Radon Vents |
| BUILDING ENVELOPE | Reinforced Hollow Brick Masonry Fireplace Construction Template Brick Veneer with Steel Stud Improved On-Site Brick Handling Lighter Concrete Masonry Units Marble and Stone Slabs as thin as ½” Lightweight Concrete Forms Sprayed Polyurethane Foam Insulation MIRAFLEX® Encapsulated Glass Fiber Insulation Housewrap Fiber Cement Shakes Improved Cedar Shakes and Shingles Improved Vinyl Siding Exterior Insulation and Finish Systems Improved Glazing Retrofit Heat Control Film Wood Composites for Window Frames Pultruded Fiberglass Window Frames Improved Steel Doors Polymer Doors and Frames Improved Door Hardware New Door Control Units Improved Elastomeric Caulk Building Cleaning System – Dry Procedure Building Cleaning System – Wet Procedure |
| ELECTRICAL | Halogen lamps Lighting Controls Baseboard Raceway |
| PLUMBING AND HVAC | Alternative to HCFC 22 Natural gas Refrigeration systems Better Controls Ductless Air Conditioners Corrugated Stainless Steel Gas Piping Plug-In Gas Outlets Through-the-Wall Vents Unvented gas Heaters Improved gas Fireplaces Gas-Fired Space Heaters Air Admittance Valve for Drainage Systems Corrosion-Proof Piping Flue Reclining Systems |

NAHB Research Center 1995, III-IV

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