WHAT IS THE U.S. HOUSING INDUSTRY?

The housing industry comprises hundreds of thousands of firms designing, building, and maintaining the nation’s homes. It is also made up of millions of individuals working in roughly 80 capacities ranging from surveyors to bankers, Realtors, product manufacturers, code inspectors, homebuilders, contractors, insurance agents, homebuyers, and many others.¹ Harvard University’s Joint Center for Housing Studies has estimated that the housing sector, in total, represents roughly 20 percent of gross domestic product (GDP) once all housing-related costs have been included.² If one only looks at residential construction, it alone has averaged four percent of GDP over the last 20 years.³ Finally, the housing industry produces the most valuable asset a family owns as well as the largest component of the nation’s physical wealth.⁴

¹O’Brien et al. (2000).
²Joint Center for Housing Studies of Harvard University (2002, p. 6).
³For the period 1981 to 2000, residential housing investments expressed as a percentage of GDP have an annual average of 4.1 percent. U.S. Department of Commerce (2002).
⁴In 2000, residential structures represented 36 percent of the value of the nation’s fixed assets. Of privately held assets, residential structures represented 49.5 percent. U.S. Department of Commerce (2002).
The size, complexity, and many facets of the housing industry make a complete yet simple description of the industry nearly impossible. To overcome this, we use the general chronology involved in building a single-family home to structure our discussion of the housing industry. We use this systematic approach even for industry participants far removed from the construction site, by introducing them in the phase where they have their most significant effect on the home-building process.

We also simplify this introduction by focusing it on single-family homes—the largest portion of the market. Although this limits the explicit discussion of other forms of residential construction (e.g., high-rises, manufactured homes), this report’s analysis and conclusions can provide insights into other forms of housing as well. Before describing the housing industry through the process of building a single-family home, we briefly review the nation’s housing stock and current construction trends to show the historical and continuing importance of single-family homes.

HOUSING STOCK, NEW CONSTRUCTION, AND REMODELING

In 1999, there were roughly 115 million units of housing in the United States. Of these, 68 percent were single-family homes, 25 percent were multifamily, and 7 percent were HUD-Code homes. In that same year, 1.6 million new site-built homes were con-

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6A HUD-Code home is a housing unit designed to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory. They are produced in factories and transported virtually completed to site. They are known as HUD-Code homes because, as products of interstate commerce, they are regulated by a national—rather than local—building code that is maintained by the U.S. Department of Housing and Urban Development. HUD-Code homes do not include travel trailers, motor homes, or modular housing though they are often confused with those types of housing.

7A site-built home is largely built on-site from basic materials (e.g., plywood, lumber, concrete block) and building components (e.g., roof trusses, wall sections, kitchen cabinets). Site-built homes can also be built from housing modules.
The U.S. Housing Industry as the Context for Innovation 27

structured with 80 percent being single-family and 20 percent being multifamily. In addition to site-built homes, 338,300 HUD-Code homes were placed throughout the United States.

In addition to new construction, remodeling, maintenance, and repairs are also an important part of the housing industry. For example, in 1999 the U.S. Census Bureau estimates that $143 billion—35 percent of all investments in fixed residential property—were spent for these purposes. During the 1990s, roughly 70 percent of these expenditures were for improvements (e.g., additions, alterations, and major replacements) with the remainder being maintenance and repair (see Figure 3.1).

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**Figures 3.1—Housing Stock and Housing Completions, 1999**

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9 U.S. Census Bureau (2002b).

10 U.S. Census Bureau (2001b).

11 U.S. Census Bureau (2001b).
OVERVIEW OF THE HOMEBUILDING PROCESS

The housing construction process can be divided into five stages, beginning with land development and then moving to design, pre-construction, construction, and post-construction (see Figure 3.2).¹²

This model of the extended homebuilding process is sufficient for our purposes, but it does not include every participant, every activity, and every case of feedback and interaction. This is partly because not all participants or activities in a given phase are relevant to every home, but also this simplification is intended to keep the explanation clear and useful.¹³ This means that the roles of homeowners or homebuilders who are active in many and potentially all steps are typically described only in the stage where they are most involved.

![Figure 3.2—The Homebuilding Process](RANDMR1658-3.2)

LAND DEVELOPMENT

Land development is usually the first step in the homebuilding process because whether the home is built on an empty lot in an existing neighborhood or on undeveloped land, a number of steps must be completed before construction of the home (see Figure 3.3).

¹² These five stages as well as the “exploded” diagrams and the discussion on the following pages are adapted from the following sources, except where indicated: NAHB Research Center (2001b); and Hassell et al. (2000).

¹³ For example, the precise ordering of some activities will depend on when the homebuyer becomes involved in the homebuilding process (i.e., during land development, design, or post-construction).
In a new community, a land developer may purchase a large parcel of land on which to build a number of homes or may subdivide the land and sell individual lots to homebuilders or homebuyers. After acquisition, the land developer must obtain regulatory approvals for the land’s intended use, portions of the land must be graded (i.e., leveled or contoured), and basic infrastructure installed (e.g., water, sewer, electricity, roads).

In the case of a lot purchased in an existing neighborhood, some or all of these steps may have been completed. Even rehabilitating or renovating existing homes may require land development activities if the use of the property or the existing structure is to be changed significantly.

Among the participants in the land development stage are developers, municipal planning and zoning departments, elected officials, and community interest and advocacy groups.
• *Developers* buy land to develop into residential property. The land purchased might be undeveloped property or lots with existing structures. In some cases, developers are directly involved in homebuilding, taking loans from financial institutions to build new homes or to rehabilitate existing structures. In other cases, developers obtain needed permits, install basic infrastructure (e.g., water, sewer, electricity, roads), and then sell individual lots.

In the case of new communities, developers also often have the opportunity to establish architectural and neighborhood covenants that add additional requirements beyond those of the municipality. These covenants are typically used to impose standards for home appearances and lot use.\(^{14}\)

• *Planning and zoning departments and elected officials* together develop, enforce, and modify land-use and zoning policies for their jurisdictions. The role of planning and zoning departments is to enforce existing land-use regulations and to provide elected officials with plans, advice, and assistance in developing, enforcing, and modifying those regulations. As a result of the largely advisory role of planning and zoning departments, it is the elected officials who ultimately accept, reject, or modify their suggestions and rule on major land development issues.

• *Community interest groups* often seek to influence land-use and development decisions through public comment, advocacy, and technical support. These groups are generally locally based and they represent various causes ranging from affordable housing to environmental protection, historical preservation, and architectural features and appearances among others. Although usually not directly involved in individual homes, they may influence the decisions and actions of developers and municipal agencies. In addition, affordable housing interest groups may provide labor or economic incentives for land development, construction, and homeownership.

\(^{14}\)In some cases, covenants can directly affect whether innovations such as solar arrays are permitted or whether a homeowner is entitled to solar access.
DESIGN

Designing a home can vary from using an “off-the-shelf” plan to custom designing an entire home from scratch. In the case of off-the-shelf plans, licensed architects and engineers may only need to review and approve plan revisions made by draftsmen. However, licensed architects and engineers may be intimately involved in designing a custom home. Beyond the architectural and engineering plans, the design process also includes specifying basic materials, products, and systems, as well as rough cost estimates. The above-described design stage for building a new home is also the first step when a home is remodeled (or more generally rehabilitated).

In addition, for the purposes of this study, the design phase of the homebuilding process also includes the many “upstream” efforts that directly influence how homes are designed and which products and materials architects and engineers can use. This upstream work, done by companies, universities, governments, and nonprofit organizations, includes product and process research, consumer and market research, design, testing, and evaluation (see Figure 3.4).

Figure 3.4—The Design Stage
The participants directly involved in the design phase include the following:

- **Architects and Engineers.** Architects focus mainly on the overall appearance and design of a home, whereas engineers typically prepare general designs for the structural, mechanical (i.e., plumbing, heating, and air conditioning), and electrical systems. Since many homes have simple designs and may be modifications of pre-existing designs, the architect and engineer involvement may be limited to approving plans prepared by others (e.g., draftsmen). In contrast, for new and complex home designs, architects and engineers may be involved in nearly every aspect of the design.

- **Homebuyers.** In situations where homebuyers purchase an empty lot and initiate the construction of a new home, they will become involved in the design stage. Their level of involvement will vary depending on the level of customization as well as on how much they defer to the judgment of the designers. In addition, depending on the particular owner, they might stay involved in all of the subsequent phases of the homebuilding process.

- **Researchers.** The housing-related research community is very diverse and consists of scientists, engineers, and others from industry, government, and academia. They research new building materials and products ranging from roof shingles to prefabricated wall sections and washing machines among others. They also study the homebuilding process itself and recommend new design and construction techniques for using both old and new products to lower costs and improve quality.

- **Testing and Certification Organizations.** These organizations test and certify products and materials according to procedures and criteria that standard-setting bodies have determined will protect public safety and ensure minimum performance. It is their role to independently and objectively test products and materials

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15Homebuyers have the most variable role of all participants. They can enter the homebuilding process at any stage. For this reason, they may not be involved in design at all, or they may be very involved. In this report, the homebuyer is primarily discussed within the design stage.
according to these standards and to present their findings in official reports.\textsuperscript{16}

- **Evaluation Groups.** These groups review new products and materials to determine under what conditions they comply with the nation’s “model” building codes found in the United States.\textsuperscript{17} To make this decision, evaluation groups review the innovation itself as well as the reports produced by testing and certification organizations. They then document and publish their findings. The resulting evaluation report provides an independent, advisory, and professional opinion on whether a new technology, perhaps under specific conditions, satisfies the requirements of the model codes. In practice, these reports are widely used by code officials, designers, and all others interested in the new technology.\textsuperscript{18}

### PRE-CONSTRUCTION

Planning for construction begins with choosing the homebuilder (also known as a general contractor) who in turn selects trade contractors (also known as subcontractors) and plans the related tasks including obtaining plan approvals and permits, contracting and scheduling work crews, and ordering and procuring materials.

Concurrent with these efforts, the design plans are reviewed by local building departments and other agencies such as fire and public works. These reviews ensure that the plans meet the codes adopted by state and local authorities. However, since these codes are themselves based on the “model codes,” model code groups are also considered part of the pre-construction stage (see Figure 3.5).

\textsuperscript{16}The standards used in these tests are typically directly referenced in the nation’s building codes.

\textsuperscript{17}Building codes and the “model codes” will be introduced in the next section of this chapter.

\textsuperscript{18}Traditionally, each model code has its own evaluation service. However, on April 18, 2002, the International Code Council (ICC) announced that all existing evaluation services would be consolidated into a single evaluation service that will reside within the ICC. See www.nateval.org
Finally, for the purposes of this study, this stage also includes the production and delivery to the construction site of the building materials and products used to construct the home itself. As a result, raw material producers, processors, and manufacturers are part of the pre-construction stage as are the retail and wholesale suppliers who provide the distribution system needed to deliver these goods to builders and trade contractors.

The primary participants in the pre-construction stage include homebuilders, model code organizations, municipal regulatory agencies, and the producers and suppliers of building materials and products. These are all discussed in more detail below, except for homebuilders, who will primarily be discussed in the next section.

- **Model Code Organizations.** Although state and local regulatory agencies are usually responsible for updating and enforcing building codes, these agencies rely on model code organizations\(^{19}\) to produce complete, integrated, and up-to-date re-

\(^{19}\)There are model code groups focused on building codes, electrical codes, fire codes, etc. Historically the United States had three major model building code organizations, each focused on a particular geographic region. These groups are the Building Officials and Code Administrators International, the International Conference of Building
requirements known as “model codes.” Developed using theory, practice, and carefully designed voting procedures, states and localities use the model codes to guide the development of their own.

- **Regulatory Agencies.** Regulatory agencies have two major responsibilities: adopting codes and enforcing them. Depending on the law in a particular state, the responsibility for adopting and enforcing codes may rest with state or local agencies or may be shared by both. Many agencies adopt the model codes “as is,” but others customize them to their own particular needs. Officials from regulatory agencies (e.g., building and fire departments) are responsible for enforcing these codes and determining whether plans and specified technologies comply.\(^{20}\)

- **Material Producers, Product Manufacturers, and Pre-Fabricators.** Material producers obtain and produce the raw materials such as gypsum, asphalt, and wood that are then used to produce common building materials such as drywall, roof shingles, and doors. Material producers also provide many of the inputs such as steel, brass, and plastic that are used by product manufacturers to make items from water faucets to kitchen refrigerators. Finally, pre-fabricators process materials and intermediate products into larger subcomponents such as roof trusses and wall sections that can be more easily assembled on construction sites. Beyond producing these goods, producers also submit their products to testing, certifying, and evaluation organizations to document that they meet code in the hope that designers will specify them, builders will use them, and code officials will approve them.

- **Suppliers.** Finally, retail and wholesale suppliers are the primary channel through which homebuilders, trade contractors, and in some cases homeowners, learn about and order building mate-

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\(^{20}\)Regulatory agencies enforce the codes through several mechanisms including reviewing construction documents and evaluation reports, issuing construction permits, inspecting construction sites, issuing occupancy certificates, and verifying that buildings are maintained in a safe manner. For an overview of the building codes and how they affect new technology, see National Evaluation Service (forthcoming).
rials and products. In many cases, suppliers specialize by trade or product and they generally order directly from the manufacturer.

CONSTRUCTION

Construction of the home consists of managing labor and materials, preparing the land and foundation, erecting and enclosing the walls and roof, installing the mechanical and electrical systems, installing appliances, and applying the interior and exterior finishes and trim.21 During these steps, the builder and trade contractors obtain additional permits from municipal regulatory departments. In addition, field inspectors from these departments conduct site inspections to ensure that the construction is in compliance with the local codes and requirements. The home construction stage typically ends with the issuance of the certificate of use and occupancy, which is awarded after a home successfully passes the final inspections by municipal authorities (see Figure 3.6).

21 Portions of this section are based on NAHB Research Center (1993). Readers interested in further discussion of the subprocesses, sequencing, and different approaches to managing work flows should refer to this reference.
The primary participants in this phase are the homebuilder, trade contractors, and municipal field inspectors.

- **Homebuilders.** As the central participants in the construction stage, homebuilders are responsible for all aspects of the physical construction of the home, from the foundation to the roof, including all wiring, plumbing, and detailing. Homebuilders may do all of these tasks themselves or subcontract them to trade contractors.

- **Trade Contractors,** also known as subcontractors, typically specialize in a specific trade. Examples include framers, electricians, roofers, and plumbers. These groups generally own their own tools and equipment and manage their own work crews when doing work for a homebuilder. Small and middle-size homebuilders, in particular, depend heavily on trade contractors.

- **Municipal Field Inspectors.** Building departments and other municipal agencies typically have field inspectors who make scheduled and unscheduled visits to construction sites to ensure that construction complies with local codes. Failure to comply typically requires replacing and reinspecting unsatisfactory work, thereby adding costs and delays.

**POST-CONSTRUCTION**

The post-construction stage consists of a variety of events, including marketing, checking legal requirements, and adding the finishing touches required to put homeowners or renters in their homes. First, if a home has not yet been sold, it must be marketed. Most buyers finance their purchase with a mortgage and buy an insurance policy. Smaller purchases that help finish the home are often added into the mortgage, including kitchen or laundry appliances and light fixtures. Also, before a home is occupied, minor repairs and corrections are frequently made as well as changes to meet the buyer or resident’s needs and preferences. These purchases, repairs, and changes may require additional financing or coverage through warranty claims.

Finally, owners begin to incur a variety of operation and maintenance costs including monthly utilities (e.g., water, telephone, gas, and electricity) as well as larger but less frequent expenses such as
reroofing, reflooring, and landscaping. The post-construction stage is also where remodeling efforts initiate, although in many cases, such efforts may lead back to the land development or design stages (see Figure 3.7).

Although roles and the degree of involvement vary considerably depending on the circumstances, some or all of the following participants may be involved in the post-construction stage:

- *Real estate agents and salespersons* market new or renovated homes to potential buyers. Independent Realtors as well as the sales agents of homebuilding firms are often the main contact for homebuyers. As such, they can be the most important source of information about a home and its surroundings for the homebuyer. Usually, these professionals are not involved in earlier stages of the home construction process and might know little about the technical details of materials, components, or the processes used in building a home (unless the salesperson is the homebuilder).

- *Mortgage brokers* evaluate whether a potential homebuyer can afford a given home. If so, they find appropriate financing options and loan sources at a primary lender. Mortgage brokers charge homebuyers fees for their services, and how much they

![Figure 3.7—The Post-Construction Stage](image-url)
charge can be affected by the costs involved in determining the value of a home and the creditworthiness of a loan applicant.

- **Appraisers** assess the value of a home to ensure that its value is at least as great as the requested loan. Appraisers estimate the value of a home by judging its structural integrity, material composition, size, location, and the value of adjacent and comparable homes among other factors. Appraisals based on these factors alone are referred to as “standard appraisals.” A “custom appraisal” can be used to better recognize the value of homes with unique features that may be undervalued by a traditional appraisal. Since custom appraisals require special training and are more detailed, they typically take longer and are more expensive, increasing the cost to the homebuyer.

- **Primary lenders** evaluate the loan application and appraisal reports submitted by the mortgage brokers. If the application is approved, the primary lender makes the initial mortgage loan directly to the homebuyer. Primary lenders include savings and loans, commercial banks, mortgage companies, and state and local housing finance agencies. In some cases, primary lenders may then sell these mortgages to secondary lenders.

- **Secondary lenders** buy mortgages from primary lenders and package them together in bundles as low-risk investments that are then sold to insurance companies, securities dealers, and other financial institutions. The two largest secondary lenders are Fannie Mae and Freddie Mac.  

- **Insurers** provide homeowners with insurance coverage against the risk of fire or other damage to the home. Aside from the protection this offers to the buyer, mortgage lenders typically require that a homebuyer have insurance to ensure that the lender can recover the remaining portion of the loan in the event of loss.

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22 Secondary lenders play a large role in keeping housing affordable because they increase the supply of funds available for low-interest loans beyond what would otherwise be available. In addition, by purchasing mortgages from primary lenders, secondary lenders make it easier for primary lenders to finance other stages of the home-building process including land development and builder-initiated homes.
THE HOMEBUILDING PROCESS AND ITS IMPLICATIONS FOR INNOVATION

This brief description of the homebuilding process reveals that it is complex and requires careful coordination and sequencing of many tasks and specialized participants. Only when all of these parties are brought together in the correct order do their unique skills, materials, and services result in a quality home successfully purchased by a homebuyer.

Although this description of the homebuilding process and its participants may seem to fully explain how a home is built, this process is independent of the characteristics that shape the housing industry and how the homebuilding process is carried out. This process description also leaves out the motivations that guide the decisionmaking of the process’s participants. Each of these is discussed in the next chapter.