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Procurement Strategies in the Homebuilding Industry: An Exploratory Study on the Largest Builders in the United States

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ABSTRACT

In a context of market orientation, the softwood lumber and composite panel industries have little choice but to consider the needs of homebuilders. In view of the consolidation of the homebuilding industry and of their position as leaders, large homebuilders are considered to be gaining particular purchasing power, as well as influence over building techniques and preferred business relationships with suppliers. Increasingly, large builders are looking for easy-to-install products, engineered wood products, and more off-site construction solutions. However, their strategies regarding business relationships with their suppliers are not yet well understood. This exploratory study investigates the large U.S. homebuilders with respect to changes in procurement sources and arrangements, collaborative practices, and information technology use. A survey instrument was implemented within the population of the top 100 builders in the U.S. residential market. Twenty-four of the top 100 builders completed the questionnaire. Observations suggest that purchasing agreements are currently short-term based and that pro-dealers are the preferred procurement sources. Nevertheless, more direct, cooperative, and long-term oriented relationships with suppliers supported by information technologies are expected to develop over the next five years. This study underlines a need for further research to focus on interfirm relationships and the possible emergence of value-creating networks for structural wood products.

Keywords: residential construction, wood products industry, homebuilding industry, value-added wood products, interfirm relationships, cooperation, electronic business, procurement, building techniques

Introduction and Purpose

Overwhelming changes are currently reshaping the business environment of both the wood products industry and its primary market, residential construction. Indeed, the U.S. residential

construction market segment is expanding. This, coupled with its undisputed position as a first-rate market for wood products, means that changes occurring in the business environment are worthy of careful consideration. According to the literature, the U.S. homebuilding sector is experiencing fast rates of industrialization and consolidation as builders seek to continuously improve performance through costs savings and reduced delivery cycles. There is a desire among builders to respond better and more quickly to marketplace needs in the residential sector. Not surprisingly, they are increasingly looking to solutions such as value-added wood products and prefabrication/preassembly to achieve these objectives. Concurrently, the emergence of a group of large homebuilders in the United States has recently been documented, as has the rise of new business practices such as interfirm cooperation, electronic business, and supply chain management as means of value creation. Traditionally, the wood products industry has been slow to adopt innovative business practices, so it remains to be seen how it will respond to a quickly evolving market landscape.

The goal of this study was to collect empirical data that begins to answer the fundamental question of how the wood products industry will respond to this quickly evolving market landscape. Given that gaps in knowledge are evident with respect to large U.S. homebuilders, their building techniques and products, their procurement channels, and their preferred business practices with suppliers, this seemed to be a logical starting point. The key objectives of this study were to:

- document the actual and prospective building techniques used by the largest U.S. homebuilders;
- understand the procurement channels and purchasing agreements for structural wood products; and
- describe the relationships between large U.S. homebuilders and their suppliers with respect to interfirm cooperation and the use of information technology (IT).

It is hoped that results from this study will inform structural wood products suppliers on a means of capitalizing on the rapidly changing U.S. homebuilding sector through the use of innovative business practices.

Theoretical Background

Information in this section is provided on the major changes occurring in the U.S. construction sector, including expansion, industrialization, consolidation, and product substitution. This sets up a business environment in which wood products suppliers tend also to adapt by consolidating, developing stronger market orientations, producing value-added products, and engaging in new business practices such as interfirm cooperation, electronic business, and supply chain management.

Overview of the U.S. Housing Sector

The U.S. housing sector is currently expanding (NAHB Research Center 2004). The number of housing starts in the United States reached more than 1.9 million units in 2004 (Builderonline 2006), and the construction industry employed almost 7 million individuals in 2002 (U.S. Census Bureau 2005b). Spending on private new housing units totaled U.S. $300 billion in 2002, up 120 percent over the past decade (JCHS 2004). Despite high fluctuations, which are tied to the nation's economic wealth

and demographic trends (NAHB Research Center 2004), growth in the U.S. residential construction segment has manifested itself in increasing numbers of manufacturing establishments and employees, as well as increased revenues (U.S. Census Bureau 2002).

Given the intensive use of lumber and wood-based panels in homebuilding, the U.S. residential construction sector represents one of the world's premier markets for manufacturers of structural wood products. In the average single-family home (2,272 sq.ft.) or multi-family home (1,268 sq.ft.), 90 percent of the beams used are wood-based (lumber, laminated veneer lumber, glulam, I-joist, etc.), 80 percent of the materials used for exterior wall framing is wood, 75 percent of decking materials are wood, and 80 percent of floor, wall, and room sheathing are wood-based (plywood, oriented strandboard, etc.) (NAHB Research Center 2004). In terms of end-use consumption, almost 60 percent of all lumber purchased in 2003 was directed toward residential construction (31% in new housing and 27% in residential upkeep and improvements) (U.S. Census Bureau 2005b). Similarly, approximately two-thirds of the structural panels consumed in the United States are used in the building construction sector (APA 2002).

The Evolving U.S. Housing Sector

For more than a decade, challenges in the U.S. housing sector (such as an increasingly scarce and costly site labor workforce, construction waste, and schedule overruns) have forced homebuilders to seek new ways of saving time and money in order to remain profitable (Schuler and Adair 2003, Love et al. 2004a, Robichaud et al. 2004). Consequently, builders are looking for means to facilitate installation, maintain products, and reduce building cycle times (Robichaud and Fell 2002). This has led to three key trends in the U.S. housing sector: increased industrialization, product substitution, and consolidation.

The concept of industrialization in homebuilding – targeting the design and construction of houses – extends back more than a century, but the sector has been slow to adopt these processes (PATH 2000). Currently, traditional "stick-built" or on-site construction remains dominant in the U.S. housing sector, but the use of "factory-built" construction has grown significantly in the past decade. Throughout the 1970s and 1980s, factory-built housing represented approximately 20 percent of all building methods used for housing construction, but this has since grown to 25 to 30 percent of total U.S. new single-family housing starts (PATH 2000, Schuler and Adair 2003). Even so, the United States lags behind other countries such as Japan and Sweden, where factory-built houses account for approximately 75 to 80 percent of current construction (Woodbridge and Associates 2003).

Factory-built housing allows manufacturers to carefully plan how they use materials, making the most out of every piece of lumber and panel. As such, time, cost, quality, and productivity benefits are derived through the minimization of time spent on site operations and duration (Gibb and Isack 2003, NAHB Research Center 2004). For these reasons, it is expected that factory-built housing will continue to capture market share of new housing in the United States over the next two decades, according to several indicators, not the least of which is the current trend among traditional site-builders to integrate more factory-built systems (Woodbridge and Associates 2003). These trends should be of special interest to wood products manufacturers in as much as wood is a dominant building material in factory-built homes.

However, with the emergence of industrialization benefits comes product substitution, a trend that has been well documented in the housing sector (e.g., Eastin et al. 2001, Schuler and Adair 2003, IWMR 2004, NAHB Research Center 2004, Robichaud et al. 2004). For wood producers, this trend toward substitution represents a proverbial double-edged sword: on the one hand, steel, concrete, or composites threaten wood products' market share in residential construction, but on the other hand, there are increasing opportunities for producers of engineered wood products.

The quest for superior performance in the U.S. housing sector is also one of the main drivers of consolidation in the homebuilding industry. Through mergers and acquisitions, companies are increasingly uniting and becoming more influential in the marketplace as a result of economic efficiencies achieved through cost savings and rationalization of business functions such as transportation and purchasing. The reasons for this trend are varied. Some companies are motivated by a defensive strategy of acquiring rather than being acquired, while others are driven by strategic growth in the form of vertical integration, geographic expansion, product diversification, or increased market presence (Diamond et al. 1999, Schuler and Adair 2003). While this trend toward mergers and acquisitions has not been well studied in the context of residential construction (Choi and Russell 2004), it is a widely believed that consolidation will continue to gain momentum in the sector, leading to the emergence of ever larger builders.

Indeed, the rise of a group of "superbuilders" in the United States residential sector has been observed for over a decade, and a number of research and business reports have set out to assess their impact and increasing market power (Alexander 2000, Schuler and Adair 2003, Rice 2004). In the near future, the top U.S. builders are expected to continue to erode mid-sized builders' market share, while small builders are expected to flourish in niche markets (Alexander 2000, Rice 2002). As a rule, large builders are looking for easy-to-install and easy-to-maintain building solutions (i.e., more engineered wood products and less on-site construction) and a higher degree of vertical integration of activities as they already tend to produce their own components, such as wall panels, structural insulated panels (SIPs), and so on (Robichaud et al. 2004). Furthermore, large builders, especially those using fewer subcontractors and involved in larger building projects, are more likely to adopt new technologies or processes (Fleishman et al. 2000). For instance, Fell and Robichaud (2002) showed that larger U.S. builders used prefabricated walls in 24 percent of their housing starts in 2001, while smaller ones used them only 14 percent of the time. The authors also showed that large builders were more concerned with energy issues, moisture failure, lumber availability, availability of trades, material costs, speed of assembly, and on-site waste, than were small builders (Fell and Robichaud 2002).

Suppliers Attempt to Adapt in Procuring Wood Products

Although the marketing concept and the related construct of market orientation have been fundamental components of business practice for several decades, the forest products industry has been late in adopting a marketing philosophy (Cohen and Kozak 2002). The marketing concept reflects a philosophy of doing business that is central to firm performance (e.g., Lusch and Laczniak 1987, Narver and Slater 1990, Jaworski and Kohli 1996). Its basic foundation relies not only on an emphasis on customer needs, but also on the importance of shared knowledge (information), the necessity of coordination of marketing activities and relationships between business units, and responsiveness to market demand (Lafferty and Hult 2001). During the 1990s, a combination of pressures (not the least of which are increased environmental concerns and competitive threats as a result of globalization) has

led to a general shift from a production orientation to a marketing (customer-based) orientation (Beauregard and Bouthillier 1993, Cohen and Kozak 2002, Juslin and Hansen 2002, PWC 2002, Vincent 2002).

In the wood industry, this paradigmatic shift "from volume to value" has occurred through the adoption of marketing-based solutions that add value to processes and/or for customers (Forintek 2001, Juslin and Hansen 2002). The increasing interest in secondary processing and new business practices observed in academia can be considered a response to this market-orientation shift, and literature on value-added processing, environmental certification, and supply chain management are now commonplace (e.g., Kozak and Maness 2001, Vlosky et al. 2003, Haartveit et al. 2004).

With regards to consolidation, recent trends in the forest products industry are fairly well documented in the literature (Sinclair 1992, Juslin and Hansen 2002, PWC 2002). In addition to the rationales mentioned for the construction industry, this trend also appears to have emerged as a result of fragmentation in the industry and consequent structural problems such as price volatility and production over-capacity. Globalization and increased international competition, combined with buyer demand for worldwide delivery, have contributed to forcing wood products suppliers to increase in size (Juslin and Hansen 2002, Schuler 2004). Building products dealers have also moved toward consolidation (JCHS 2004). However, the literature tends to describe the process of consolidation without providing any in-depth analysis of consequent changes in their power structure. Finally, the wood products industry is renowned for lagging behind in terms of market orientation (Juslin and Hansen 2002). However, it is investing a great deal of effort to adapt the industrialization process under way in the construction sector by considering value-added wood products and new business practices.

New Business Practices in the Forest Products and Construction Sectors

The ongoing search for improved performance in the homebuilding industry has sped up changes in building techniques and materials and, by association, in the wood products industry. In addition, more general trends in business practices have significantly impacted the ways in which business is traditionally conducted. Specifically, interfirm cooperation, electronic business, and supply-chain management are three areas that are perceived by both the wood products and homebuilding industries to be new paths leading to increased performance.

While the terminology is relatively recent, interfirm cooperation has been gaining ground in many sectors for several decades, normally in the form of joint ventures, strategic partnerships, and alliances. Interfirm cooperation can be defined as a joint coordination, sharing and planning of activities, resources and competencies among trade partners (Brousseau 1993). Usually measured by a level of joint action and the propensity to harmonize conflicts, interfirm cooperation is positively correlated to levels of commitment, communication, and trust in the buyer-seller relationships (Dwyer et al. 1987, Anderson and Narus 1990, Vlosky et al. 1998). The forest products industry is certainly not immune to this business trend and several studies exploring the benefits of and key success factors for interfirm cooperation have been undertaken in this context (e.g., Kozak and Cohen 1997, Simpson and Wren 1997, Vlosky et al. 1998). Typically, cooperation in the forest products sector is considered within the contexts of market orientation drivers (Schuler and Adair 2003), sources for product innovation (Fell

et al. 2002), market penetration, competitiveness, and/or cost reduction (Juslin and Hansen 2002, Reeves et al. 2002). The literature on interfirm cooperation in the construction industry is not as well developed, with the exception of some work on the United Kingdom sector. Recent studies there have approached interfirm partnerships from an organizational learning perspective or have considered the opportunities for and impediments to building collaborative partnerships (e.g., Barlow and Jashapara 1998, Burnes and Coram 1999, Bresnen and Marshall 2000).

Electronic business is often presented as a revolutionary means of doing business in the "new economy". In the forest products literature, it is generally defined as the use of Internet-based technologies in support of business activities (Cohen and Kozak 2002, Shook et al. 2002, Vlosky and Westbrook 2002), and most research in this area concentrates on the use of information technology (IT), expected benefits, general acceptance, and adoption levels (e.g., Vlosky and Pitis 2001, Cohen and Kozak 2002, Shook et al. 2002). Electronic business is generally seen as providing cost reductions in and improvements to marketing and logistics, basically by allowing companies to improve customer relations, better understand the marketplace and, thus, offer products and services that are highly valued (Cohen and Kozak 2002, Shook et al. 2002). Specific IT tools can be used as a means of increasing market coverage, reducing costs linked to information management, improving access to procurement sources, and reducing procurement costs (Cohen and Kozak 2002, Vlosky and Westbrook 2002). In addition to offering visibility, web sites, extranets, and electronic marketplaces can improve customer service and inventory management by reducing delivery cycles and errors and by facilitating information exchange on prices, products, and credit terms (Roadcap et al. 2002). In the construction industry, electronic business approaches are not yet common (Abraham et al. 2004), and the few studies available deal only with general uses of IT (e.g., Barthorpe et al. 2003, Abraham et al. 2004). However, there appears to be rising interest in the development of specific electronic business models aimed at supporting supply chain activities and electronic negotiations (e.g., Cheng et al. 2001, Schoop et al. 2003). To this end, the Partnership for Advancing Technology in Housing (PATH) has recently advocated the adoption of electronic tools, such as Enterprise Resource Planning (ERP) systems, object -oriented Computer-Aided Design (CAD), just-in-time supply activities, and Design for Manufacture and Assembly (DFMA), to hasten the pace of industrialization in the United States (PATH 2000, 2005).

Another emerging business practice in the homebuilding sector is supply-chain management (SCM), defined by Haartveit et al. (2004) as the: "planning, development, coordination, organization, steering and control of intra- and inter-organizational processes from a holistic perspective and accounting for exchanges of materials, information, cash, product development activities and marketing activities in supply-chain". Although SCM is only beginning to be integrated into the forest products industry and is in need of further adaptation and mapping methods (Haartveit et al. 2004), the number of studies are increasing in this burgeoning field. The promise of SCM lies in increased company performance in terms of efficiencies, profitability, and competitiveness. Specific advantages of SCM include the integration and optimization of supply chains (e.g., Bredström et al. 2004, Carlsson and Rönnqvist 2005), improved efficiencies in the procurement of raw material supplies (e.g., Myers and Richards 2003, Ulmer et al. 2004), and/or reductions in order variability (known as the "bullwhip effect") along the supply chain (Moyaux et al. 2004). However, studies on SCM in the forest products industry tend to focus on an upstream (forest to production) orientation and, to date, have not examined SCM in the context of residential construction. The few academic studies that look

specifically at the construction sector tend to approach SCM in a fragmented manner, but they also reveal growing interest for such practices and tools. Research is mainly oriented toward cost reduction and improved efficiencies by means of integrated supply chain systems (e.g., Childerhouse et al. 2003, Palaneeswaran et al. 2003, Love et al. 2004b) and reductions in rework (e.g., Love et al. 2004a), or through the development of supplier/subcontractor selection models (e.g., Tserng and Lin 2002).

Furthermore, studies in the forest products industry have not addressed an increasing concern which has been expressed in recent years over the limitations of the supply chain concept in embracing the post-delivery, post-evaluation, and overall relationship building aspects of complex supply processes (Al-Mudimigh et al. 2004). Indeed, critics have pointed out that the supply chain concept does not extend far enough to capture the customer's (end user) future needs, which arguably are the most critical in a market-focused economy. In different research fields (strategic management, marketing, logistics, operations management, etc.), a need to better define this "extended supply chain" has led to a proliferation of new terms such as "hyper-chain", "supply-network", "supply-chain network", "interfirm logistics network", "value creation systems", and so on. Of these, the concept of value-creating networks appears to be gaining momentum. A value-creating network is defined as "an entity aiming at producing superior value for end customers" (Kothandaraman and Wilson 2001), with an emphasis being put on interfirm relationships as a key element (Helander 2004).

In summary, the literature has reported on various trends such as consolidation, factory-built methods, and value-added wood products, strategic partnerships, electronic business, and supply-chain management. Through an investigation of the largest homebuilders' procurement strategies in the United States, this study intends to provide empirical information on these trends and the evolving linkages between the wood products and homebuilding industries.

Methods

Primary data collection on the largest homebuilders in the U.S. residential market was carried out in an exploratory manner by surveying a small, quota sample of large builders from the U.S. Top 100 (Builderonline 2004). This study did not aim to provide a statistically valid representation of the population of large U.S. homebuilders, but rather is a collection of observations that can provide insight into the influence that larger builders may have on the lumber and composite panel industries.

Targeted Population

The reason for selecting participants from the largest U.S. homebuilders is because of their emergence as a powerful group of "superbuyers" whose needs and expectations require further understanding. Annual reports of builders in this group show that they are actively seeking consolidation solutions, have strong marketing orientations, and tend to emphasize purchasing power as one of their competitive strengths. In addition, rapid changes in the building products distribution channels have been observed with the customer base shifting from pro-dealers toward large volume homebuilders (JCHS 2004).

The annual survey by Builder Magazine which ranks the Top 100 U.S. homebuilders states that, as a group, they were responsible for nearly 25 percent of the total 1,678,700 units completed in 2003 (Builderonline 2004, U.S. Census Bureau 2005a), up 14 percent from the previous year (Builderonline

2004). Of the total 393,178 units built by these Top 100 builders, the Top 10 claimed a share of 56.2 percent in 2003, i.e., 20 percent more than seven years earlier. In other words, it seems clear that the Top 100 U.S. homebuilders represent both an adequate and interesting population to study.

Data Collection Method and Analysis

Primary data were collected by means of a semi-structured telephone survey administered to some of the Top 100 builders in the U.S. residential market. A professional market research firm was hired to conduct telephone interviews, with a target of 15 to 30 homebuilders, randomly selected from the sample frame of the Top 100 builders. In the end, 24 purchasing managers and vice presidents from the Top 100 U.S. homebuilders took part in the study between March 2004 and January 2005. In addition, field visits were conducted in May 2004 and involved site visits of two of the largest U.S. homebuilders, meetings with important pro-dealers and key specifiers in building material procurement, as well as structural components and prefabricated homes plant visits.

The questionnaire itself was designed in accordance with Dillman's Tailored Design Method (Dillman 2000) and was based on previous work conducted in the areas of collaboration, supply chain management, and electronic business in the forest products sector (e.g., Vlosky et al. 1998, Vlosky 1999, Robichaud and Fell 2002, Frayret et al. 2003, Robichaud et al. 2004). The semi-structured telephone questionnaire was pre-tested with four builders from the bottom half of the Top 100 rankings, some of whom experienced difficulties in completing the questionnaire in a timely manner. For this reason, a shorter version of the questionnaire was designed (in collaboration with wood products researchers and consultants) and implemented. This revised questionnaire essentially contained three types of questions: 1) categorical scales for collecting descriptive/company information; 2) five-point interval scales (including Likert scales) questions for collecting attitudinal information (derived from Frayret et al. 2003); and 3) open-ended questions to gain additional insight and qualitative information. The questionnaire was divided into five distinct sections:

- building systems and techniques used;
- supplier relationships;
- use of information and communication tools;
- supply sources and purchasing agreements; and
- background (company) information.

Responses were collated upon completion of the interviews. While the questionnaire was semi-structured, this study is considered to be qualitative in so much as it does not purport to be inferential. The results here provide insight into the Top 100 builders in the United States, and extrapolation beyond this population is inappropriate. That said, means were used in the analysis to provide benchmarking information on attitudinal variables. In all other instances, analyses were more qualitative in nature, with extensive use of counts, proportions, and anecdotal reporting.

Results

Respondents Profile

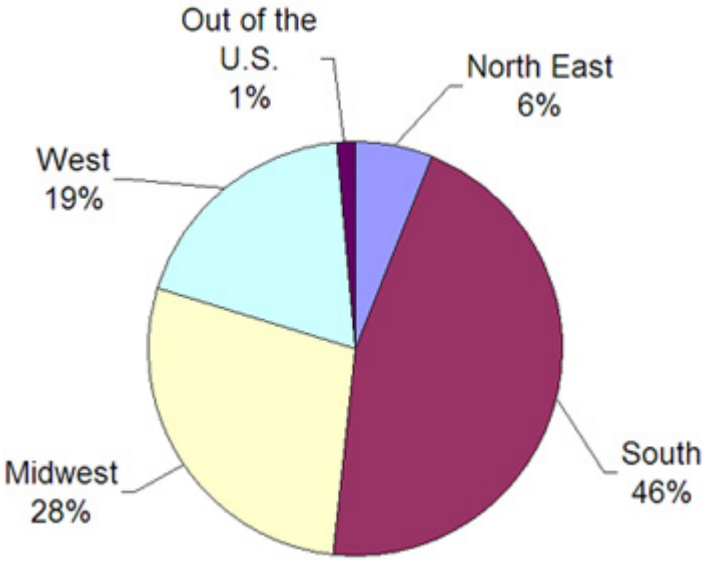
Questionnaires were answered by purchasing managers or vice presidents of homebuilding firms. The responding companies have been in business for an average of 29 years (ranging from 5 to 54 years). **Table 1** presents information on their sizes for the year 2004 and shows how important half of the firms participating in this survey were in terms of closings and gross revenues.

Table 1. Respondents' range of closings and revenues for 2004.[a]

Number of respondents	Ranking	Closings	Gross revenue ($US billion)
3	Top 5	25,000 to 38,000	4 to 12
2	Top 6 to 10	9,000 to 25,000	3.5 to 4
6	Top 11 to 25	3,800 to 9,000	0.5 to 3.5
13	Top 26 to 100	1,000 to 3,800	0.2 to 0.5
Total: 24			
[a] Data from Builder Magazine, Builder 100 Listing, www.builderonline.com			

Not surprisingly, as companies grow, they tend to operate with more divisions across the United States. Most of the Top 10 players operate nationwide. Seven of the responding firms had between 20 and 45 divisions, while 11 operated with five or fewer regional offices. The geographic market reach of responding firms is seen in **Figure 1**.

Figure 1. Respondents' geographic markets in the United States.



Respondents were asked if they expected any changes with respect to their sales' locations over the next five years; seven answered no to this question. The majority (15 out of 24 respondents) are considering geographical expansion, mostly by means of acquisitions. Annual reports and site visits also confirm that large U.S. homebuilders are expecting growth over the next five years.

The less optimistic respondents expected a 5 to 10 percent growth per year in terms of revenues and closing sales on new homes. However, nine respondents expected growth rates in the 10 to 20 percent range. Builders generally stated that they would focus on customer satisfaction, and they forecasted that the size of units would rise in line with customer demand. Home sizes ranged in average from 1,650 to 3,500 ft^2.

Overall, the respondents' production included 51 percent starter homes, 29 percent move-up homes, 10 percent high-end/luxury homes, 8 percent pre-retirement/retirement homes, and 2 percent vacation homes. Although the entry-level and move-up segments were the builders' main targets, the housing product mix reflected different marketing strategies, with 10 companies focusing exclusively on starter and move-up homes; two being diversified and addressing all five market segments; four offering four home types; and another four targeting three segments. Very few respondents focused on only one type of housing unit. As a rule, no substantial changes in unit types were planned over the next five years. Only five companies mentioned the possibility of changes, which is reflective of their strategic diversity; one tended toward pre-retirement/retirement homes, one toward starter homes, and three toward move-up and/or high-end/luxury units.

Sector Overview

Building Techniques and Materials

Respondents had difficulty estimating their overall consumption of building materials. They either did not track building material volumes or found that regional purchasing patterns made them impossible to estimate. Only a few respondents readily knew their consumption figures.

That said, **Table 2** presents the consumption of the Top 100 builders for various building materials in single-family residential construction. These estimates rely on average homebuilding consumption data and are not specific to large builders. Nevertheless, the data clearly shows how important this market segment is.

Table 2. Estimated consumption by U.S. Top 100 homebuilders.

Consumption per new housing start	Consumption by the Top 100
Lumber (14,000 BF[a])	5.5 billion BF
Engineered wood products (1,300 BF)	511 million BF
Oriented strandboard (OSB) (7,500 ft^2)	3 billion ft^2
Medium density fiberboard (MDF) and particleboard (2,500 ft^2)	1 billion ft^2

[a] BF = board feet.
Source: (Robichaud and Lefaix-Durand 2004).

Respondents were asked to describe their current structural framing techniques for roof, floor, and wall systems. Trusses were widely used in roof framing; 18 out of 24 respondents used them in more than 90 percent of their units. While four companies used a more balanced mix of roof trusses and stick-built roofs, only two respondents used stick-built roofs, which they attributed to the particularly low cost of labor in some southern states.

In floor systems, the use of preassembly was much lower, but prefabricated floor sections were reported as an emerging technique. Only five respondents reported using mostly trusses. Traditional engineered products, such as I-joists and open web joists, were reported as being widely used. The use of these floor decks were observed during site visits, especially in multi-family construction. Site visits also showed a mix of I-joists and open web joists being used, the latter being more common in multi-family construction. Two of the 24 respondents fully relied on steel or concrete (or both) for their flooring systems.

Approximately half of the homes built by the respondents in 2003 involved the use of prefabricated walls. Apart from the two companies using concrete for their walls, 11 respondents indicated that they use panelized walls in 30 to 100 percent of their units, while 11 other respondents reported building all of their walls on site. Larger-firms tended to use more prefabricated wall panels, which is in line with previous findings.

Finally, the respondents were also asked whether they were currently using modular building systems and if they would use more such systems in the future. Notably, none of them currently made any use of modular construction, and 70 percent said that they did not expect to over the next five years. Only three respondents were considering this possibility, and four chose not to answer this question.

Procurement Sources and Trade Agreements

Respondents were asked to identify their procurement sources for products purchased and the types of trade agreements favored currently and over the next five years. Difficulties were encountered in structuring the findings as respondents: 1) often purchased similar products from several different suppliers; and 2) purchased products in varying volumes depending on product and supplier types. **Table 3** shows, however, that most respondents bought their dimension lumber and structural panels from pro-dealers, whereas only a few purchased them directly from sawmillers. In three cases, framers were found to fulfill the majority of the respondents' needs for dimension lumber and wood-based panels. Only one respondent reported using the services of brokers, but this represented a minor proportion of that particular company's supplies. Pro-dealers were also the preferred suppliers for engineered wood products in most cases. However, two large builders preferred dealing mainly with component manufacturers, and two others with framers. Procurement strategies were much more diverse with respect to roof trusses, which were most commonly used by 21 out of 24 respondents: nine respondents relied only on component manufacturers; four respondents on pro-dealers only; four respondents on framers only; one respondent bought half of its trusses from component manufacturers and half from pro-dealers; one builder purchased them from its own truss plant for 80 percent of its needs and from pro-dealers for the rest; and finally, another builder produced one-third of its roof trusses, and bought one-third from pro-dealers, and one-third from component manufacturers. The procurement channels for floor systems and panelized walls were less numerous, but these products were also less commonly used. Only 12 and nine respondents, respectively, purchased floor systems and panelized walls. For floor systems, two of the respondents purchased them from component manufacturers only; three from framers; and five from pro-dealers. For panelized walls, three of the respondents purchased them from component manufacturers; two from framers; and two from pro-dealers. One builder purchased half of its floor systems and panelized walls from pro-dealers, and the

other half from framers, while another procured all of its floor systems and panelized walls from its own plant.

Table 3. Procurement sources for large U.S. homebuilders surveyed (percentages represent proportions procured from each source).

Procurement sources	Sawmiller	Broker	Component manufacturer	Pro-dealer	Framer	Homebuilder's own plant
Dimension lumber and structural panels *(23 respondents, 1 did not answer)*						
2 respondents	100%					
1 respondent	80%	20%				
1 respondent	30%			70%		
15 respondents				100%		
1 respondent				70%	30%	
3 respondents					100%	
Engineered wood products *(20 respondents, 2 did not answer, 2 non-users)*						
1 respondent			100%			
1 respondent			80%	20%		
15 respondents				100%		
1 respondent				70%	30%	
2 respondents					100%	
Roof trusses *(21 respondents, 2 did not answer, 1 non-user)*						
9 respondents			100%			
1 respondent			50%	50%		
4 respondents				100%		
1 respondent				70%	30%	
4 respondents					100%	
1 respondent				20%		80%
1 respondent			33%	33%		33%
Floor systems *(12 respondents, 2 did not answer, 10 non-users)*						
2 respondents			100%			
5 respondents				100%		
1 respondent				50%	50%	
3 respondents					100%	
1 respondent						100%
Panelized walls *(9 respondents, 1 did not answer, 14 non-users)*						
3 respondents			100%			
2 respondents				100%		
1 respondent				50%	50%	
2 respondents					100%	
1 respondent						100%

For most p