

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

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Abstract (205 words)

In a context of market orientation, the softwood lumber and composite panel industries have no choice but to consider homebuilding needs. 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. However, their strategies regarding business relationships with their suppliers are not yet well understood. This study explores the large U.S. homebuilding sector 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. Findings indicate 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. The results of this study suggest a need for further research to focus on interfirm relationships and the possible emergence of value-creating networks for structural wood products.

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Introduction

Overwhelming changes are currently reshaping the business environment of both the wood products industry and its first-rate market, residential construction. Recently, the literature has been reporting on various trends such as consolidation, factory-built methods and value-added wood products, strategic partnerships, electronic business, and supply-chain management. However, no integrative approach has been offered to analyze the impact of these changes on the commercialization of structural wood products. Through an investigation of the largest homebuilders' procurement strategies in the United States (U.S.), this study intends to offer this integrative approach in providing information on the trends observed and the linkages expected to be evolving between the wood products and homebuilding industries.

1 Background and Objectives

1.1 Overview of the U.S. housing sector

The U.S. housing sector is currently expanding (NAHB 2004). The number of housing starts in the U.S. reached nearly 1.8 million units in 2003 and the construction industry employed almost 7 million individuals in 2002 (U.S.-Census-Bureau 2005). Spending on private new housing units totaled U.S. \$300 billion in 2002, up 120% over the past decade (JCHS 2004). Despite high fluctuations which are tied to the nation's economic wealth and demographic trends (NAHB 2004), growth in the U.S. residential construction segment involves increasing numbers of manufacturing establishments and employees, as well as increased revenues (U.S.-Economic-Census 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 multifamily home (1,268 sq.ft.), 90% of the beams used are wood-based (lumber, LVL, glulam, I-Joist, etc.), 80% of the materials used for exterior wall framing is wood, 75% of decking materials are wooden, and 80% of floor, wall and room sheathing are wood-based (plywood, oriented strand board, etc.) (NAHB 2004). In terms of end-use consumption, almost 60% of all lumber purchased in 2003 was directed towards residential construction (31% in new housing and 27% in residential upkeep and improvements)

(U.S.-Census-Bureau 2005). Similarly, approximately two-thirds of the structural panels consumed in the U.S. are used in the building construction sector (APA, 2002, as cited by Schuler and Adair, 2003a).

1.2 The evolving U.S. housing sector

For more than a decade, challenges in the U.S. housing sector (such as, for instance, an increasingly scarce and costly site labor workforce, and construction waste and schedule overruns) have forced homebuilders to seek out 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 largely 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% of all building methods used for housing construction, but this has since grown to 25%-30% of total U.S. new single-family housing starts (PATH 2000, Schuler and Adair 2003). Still, the U.S. lags behind other countries such as Japan and Sweden, where factory-built houses account for approximately 75%-80% of current building methods for construction (Woodbridge and Associates 2003).

The benefits of factory-built housing are mainly in allowing 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 on-site operations and duration (Gibb and Isack 2003, NAHB 2004). For these reasons, it is expected that factory-built housing will go on capturing share of new housing in the U.S. 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 2004, Robichaud et al. 2004). For wood producers, this trend towards substitution represents a proverbial two-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 to 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 U.S. 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, 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 (2001) showed that larger U.S.

builders used prefabricated walls in 24% of their housing starts in 2001, while smaller ones used them only 14% of the time. The authors also showed that large builders were more concerned with energy issues, moisture failures, lumber availability, availability of trades, material costs, speed of assembly, and on-site waste, than small builders are (Fell and Robichaud, 2001).

1.3 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, sustainable forest management, and environmental certification are now commonplace (e.g., Kozak and Maness 2001, Vlosky et al. 2003, Haartveit et al. 2004).

As regards consolidation, the trend is fairly well documented in the literature dealing with the forest products industry (Sinclair 1992, Juslin and Hansen 2002, PWC 2002). In addition to the rationales mentioned for the construction industry, this trend also appears to address the issue of fragmentation in the industry and consequent structural problems such as price volatility and over-capacity in production. Globalization and increased international competition, combined with buyer demand for

worldwide delivery contribute to forcing wood products suppliers to increase in size (Juslin and Hansen 2002, Schuler 2004). Building products dealers are also submitted to this trend towards consolidation (JCHS 2004). However, the literature tends to describe the process of consolidation without providing any in-depth analysis of consequent changes in the power structure within the industries concerned.

Finally, the wood products industry is renowned for lagging behind in terms of market orientation. 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.

1.4 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 articulation and sharing of activities, resources, and competencies among trade partners (Brousseau 1993). The forest products industry is certainly not immune to this business trend and several studies exploring the benefits of and the 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 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 literature on forest products, 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 market places 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 does appear 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 U.S. (PATH 2000, PATH-Toolbase 2005).

Another emerging business practice in the homebuilding sector is supply-chain management (SCM), defined by Mattsson (1999) 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" (Haartveit et al. 2004). 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), studies are filling out 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), 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 do 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 towards 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).

1.5 Research objectives

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 faster industrialization and consolidation, as builders seek to continuously improve performance through costs savings and reduced delivery cycles. There is a desire amongst 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 U.S. 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.

This study aimed to collect empirical data that begins to answer this fundamental question. 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, they 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. builders
- understand the procurement channels and purchasing agreements for structural wood products
- describe the relationships between large U.S. homebuilders and their suppliers with respect to interfirm cooperation and the use of IT.

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

2 Methods

Primary data collection on the largest builders in the U.S. residential market was carried out in an exploratory manner by means of surveys with a small, quota sample of large builders among 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 help explore and provide insight on the influence that larger builders may have on the softwood lumber and composite panels industries.

2.1 Targeted population

The reason for selecting participants from the largest U.S. homebuilders lays in their emergence as a powerful group of "superbuyers" whose needs and expectations require further understanding. Annual reports of this group of builders 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 towards large volume homebuilders (JCHS 2004).

The Builder Magazine annual survey that ranks the Top 100 U.S. homebuilders states that, as a group, they were responsible for nearly 25% of the total 1,678,700 units completed in 2003 (Builderonline 2004, US-Census-Bureau 2005), up 14% 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% in 2003, i.e., 20% 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.

2.2 Data collection method and analysis

Primary data were collected by means of a structured telephone survey of 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. In the end, 24 purchasing managers of the Top 100 U.S. homebuilders took part in the study between March 2004 and January 2005.

The survey 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 structured telephone survey was pre-tested with four builders from the bottom half of the Top 100 rankings, many of whom experienced difficulties in completing the survey in a timely manner. For this reason, a shorter version of the survey was designed (in collaboration with wood products researchers and consultants) and implemented. This revised survey essentially contained three types of questions: 1) categorical scales for collecting descriptive/company information; 2) five-point interval scale (including Likert scale) questions for collecting attitudinal information; and 3) open-ended questions to gain additional insight and qualitative information. The survey was divided into five distinct sections as follows:

- building systems and techniques used
- supplier relationships
- use of information and communication tools

- supply sources and purchasing agreements
- background (company) information.

Responses were collated upon completion of the interviews. While this study did not purport to be inferential, 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.

3 Results

3.1 Respondents profile

The surveys were filled out by purchasing managers or vice presidents. The respondent companies have been in business for an average of 29 years. Table 1 presents information on their size for the year 2003 and shows how extremely important half of the firms participating in this survey were.

Table 1 - Respondents' range of closings and revenues for 2004

Number of respondents	Ranking (2004)	Closings (2004)	Gross revenue – \$US billion (2004)
3	Top 5	25,000 – 38,000	4 – 12
2	Top 6-10	9,000 – 25,000	3.5 – 4
6	Top 11-25	3,800 – 9,000	0.5 – 3.5
13	Top 26-100	1000 – 3,800	0.2 – 0.5

Total: 24

Data from: Builder Magazine, Builder 100 Listing, <http://www.builderonline.com>

Not surprisingly, as companies grow bigger, they tend to operate more divisions across the U.S. Most of the Top 10 players operate nationwide. Seven of the respondent firms involved 20 to 45 divisions, while 11 operated 5 or less regional offices. As regards their market locations, the respondents were found to sell in the South States for 46%, in the Midwest for 28%, in the West for 19% and in the North-East for 6%. A very small part of their activity is dedicated to exports (1%) as only very few companies are selling outside the U.S.

The respondents were asked if they expected any changes regarding their sales' locations over the next five years. Only 7 of them answered negatively. The major part (15 out of 24 respondents) considered geographical expansion, mostly by means of acquisitions. As also noted in annual reports and during site visits, large U.S. homebuilders definitely expected growth over the next five years.

The less optimistic respondents expected a 5-10% growth rate a year for revenues and closings while 9 respondents expected growth rates in the 10-20% 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 currently range from 1650 to 3500 ft² (averaging close to 2300 ft²).

Overall, the respondents' production included 51% starter homes, 29% move-up homes, respectively 10 and 8% luxury and active adult homes and 2% vacation homes. Although the entry-level and move-up segments were the builders' main targets, the housing product mix reflected different marketing strategies. While 10 companies focused exclusively on starter and move-up homes, 2 respondents were diversified and addressed all five market segments; 4 offered four home types, and another 4 covered three segments. Very few respondents focused on only one type of housing unit. As a rule, no significant changes in unit types were planned over the next five years. Only 5 companies mentioned the possibility of changes, and this also reflected their strategic diversity, as one leaned towards active adult homes, one towards starter homes, and three towards an increase in move-up and/or luxury units.

3.2 Sectorial overview

3.2.1 Building techniques and materials

The 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 it impossible to estimate. Only a few respondents knew their consumption figures.

Table 2 presents the consumption of the Top 100 builders for various building materials in single-family residential construction (the estimates rely on average homebuilding consumption data; they

are not specific to large builders). Nevertheless, Table 2 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)	5.5 billion bf
Engineered wood products (1,300 bf)	511 million bf
Oriented strand board (OSB) (7,500 ft ²)	3 billion ft ²
Medium-density fiberboard (MDF) and particle board (2,500 ft ²)	1 billion ft ²

Source: Consumption per new housing start (National Association of House Builders, Housing Economics, 2003); Consumption by the Top 100: estimate.

The respondents were asked to describe their current structural framing techniques for roof, floor and wall systems.

For roof framing, trusses were heavily used; 18 respondents out of 24 used them in more than 90% of their units. While 4 companies used a more balanced mix of roof trusses and stick-built roofs, only 2 respondents used stick-built roofs, which they explained by the particularly low cost of labor in the state of Texas.

In floor systems, preassembly was much lower but the use of prefabricated floor sections was reported as an emergent technique. Only 5 respondents reported using mostly trusses. Stick-built engineered lumber such as I-joists and open web joists were reported as being heavily used. During site visits, such floor decks were observed, 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.

Concerning wall systems, about 50% of the homes built by the respondents in 2003 involved the use of prefabricated walls. Apart from the 2 companies using concrete for their walls, 11 respondents indicated using panelized walls in 30% to 100% of their units, while 11 other respondents reported building all their walls on site. Larger respondents 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. None of them made any use of

modular construction and 70% said they did not expect to use any over the next five years. Only 3 respondents were considering this possibility, while 4 respondents chose not to answer this question.

3.2.2 Procurement sources and trade agreements

The respondents were asked to identify their procurement sources regarding the type of products purchased and the kind of trade agreement favored in the current context as well as over the next five years. Difficulties were encountered in structuring the findings as respondents (1) often purchased similar products from several kinds of suppliers, and (2) purchased products in variable proportions depending on product and supplier types.

Table 3 shows, however, that most respondents bought their dimension lumber and structural panels from pro-dealers, whereas a few purchased them directly from sawmillers. In 3 cases, framers were found to fulfill the most part of the respondents' needs for dimension lumber and wood-based panels. Only 1 respondent reported using the services of brokers for a minor part of the company's needs.

For engineered wood products, pro-dealers also remained the preferred suppliers in most cases. Two large builders preferred dealing mainly with component manufacturers, however, and 2 others with framers for the same products.

With respect to roof trusses – which were most commonly used (21 out of 24 respondents) – procurement strategies were much more diverse: 9 respondents relied only on component manufacturers; 4 respondents on pro-dealers only; 4 respondents on framers only; 1 respondent bought half the trusses from component manufacturers and half from pro-dealers; 1 builder purchased them from its own truss plant for 80% of its needs and from pro-dealers for the rest; and finally, another builder produced a third of its roof trusses, and bought a third from pro-dealers and a third from component manufacturers.

The procurement channels for floor systems and panelized walls were less numerous, but these products were also of less common use. Only 12 and 9 respondents respectively were buying floor systems and panelized walls. For floor systems, 2 of the respondents purchased them from component manufacturers only; 3 from framers; and 5 from pro-dealers. As for panelized walls, 3 of the respondents purchased them from component manufacturers; 2 from framers; and 2 more from pro-dealers. One builder purchased half of its floor systems and panelized walls from pro-dealers, and the other half from framers; and 1 respondent purchased all of its floor systems and panelized walls from its own plant.

Table 3 - Procurement sources satisfying respondents' needs

Product	Number of resp.	Sawmiller	Broker	Comp. Manuf.	Pro-dealer	Framer	Homebuilder's own plant
Dimension lumber & structural panels OUT OF 23 (1 non-available answer)							
	2	100%					
	1	80%	20%				
	1	30%			70%		
	15				100%		
	1				70%	30%	
	3					100%	
Engineered Wood Products OUT OF 20 (2 non-available answers; 2 non-users)							
	1			100%			
	1			80%	20%		
	15				100%		
	1				70%	30%	
	2					100%	
Roof trusses OUT OF 21 (2 non-available answers; 1 non-user)							
	9			100%			
	1			50%	50%		
	4				100%		
	1				70%	30%	
	4					100%	
	1				20%		80%
	1			33%	33%		33%
Floor systems OUT OF 12 (2 non-available answers; 10 non-users)							
	2			100%			
	5				100%		
	1				50%	50%	
	3					100%	
	1						100%
Panelized walls OUT OF 9 (1 non-available answers; 14 non-users)							
	3			100%			
	2				100%		
	1				50%	50%	
	2					100%	
	1						100%

For most products, pro-dealers were by far the preferred supply source for large homebuilders. However, if 11 respondents did not expect any change regarding their procurement sources, 12 others, i.e. half of the respondents to this survey, indicated that they either might (4 respondents) or would (8 respondents) switch to more direct purchases from wood products manufacturers in the future. Direct agreements would likely be negotiated with forest products manufacturers, with distributors and pro-dealers continuing to play a role in the logistics of the arrangement.

Finally, Table 4 offers a visual overview of the 11 distinct procurement channels used for wood products, depending on who is the buyer (B), the seller (S) and occasionally the subcontractor (SUB), possibly in charge of assembly and installation.

In summary, the 11 different "routes" taking structural wood products into houses built by large homebuilders can be presented as follows. Wood products are sold either by a sawmiller (1), a broker (2), a component manufacturer (3), a pro-dealer (6) or a framer (11) to the large homebuilder. In other cases, a framer is subcontracted by the homebuilder to complete the assembly on site (4), and can also be in charge of buying the products (5) from a component manufacturer. The same scheme is found with the pro-dealer as the seller (7&8). Finally, products may be sold by a pro-dealer (9) to a component manufacturing plant owned by the large homebuilder (internal purchase in this case), and the plant delivers the systems directly to the site or subcontracts on-site assembly to a framer (10).

Table 4 - Current procurement channels for structural wood products

Channels	Sawmiller	Broker	Component Manufacturer	Pro-dealer	Framer	Large U.S. Homebuilder	
						Own compon. plant	
1	S						B
2		S					B
3			S				B
4			S		SUB		B
5			S		B+SUB		
6				S			B
7				S	SUB		B
8				S	B+SUB		
9				S		B	
10				S	SUB	B	
11					S		B

B: Buyer; S: Seller; SUB: Subcontractor.

Current purchasing agreements were essentially short-term based (less than one year) either for lumber (16 out of 23 responses), structural panels (idem), engineered wood products (16 respondents out of 21 users; 1 non-available answer and 2 non-users), roof trusses (16 out of 20 users; 3 non-available answers and 1 non-user), panelized walls (6 respondents out of 8 users; 2 non-available responses; 14 non-users) or floor systems (9 respondents out of 12 users; 2 non-available answers and 10 non-users). Only 1 respondent purchased lumber and structural panels on the spot market.

Six of the large builders surveyed bought lumber and structural panels through other forms of trade agreements. These agreements were either long-term arrangements (over a year) with short-term price adjustments (90 days for instance) or quarterly contracts. Three of the respondents also reported purchasing agreements for engineered wood products. In addition, 1 respondent reported purchasing engineered wood products through a long-term agreement of up to four years (price guaranteed by the manufacturer). Another respondent bought 50% of its needs on the spot market and 50% through short-term to two-year agreements with guaranteed prices. Furthermore, 2 respondents relied on long-term arrangement with short-term price adjustments for their roof trusses, panelized walls and floor systems.

When questioned about the future of their purchasing agreements, however, 16 of the 24 respondents clearly showed their intention to develop long-term relationships, pointing to longer term agreement possibilities with suppliers and, in two cases, exclusive arrangements. This observation about the expected development of longer-term trade agreements was further confirmed in site visits.

There was no consensus among the respondents on future prospects for the use of prefabricated components. Three of them thought that their use would spread, which was also the opinion of the companies met on site. For the majority, prefabricated components would not gain in importance over the next five years.

3.3 Emerging issues

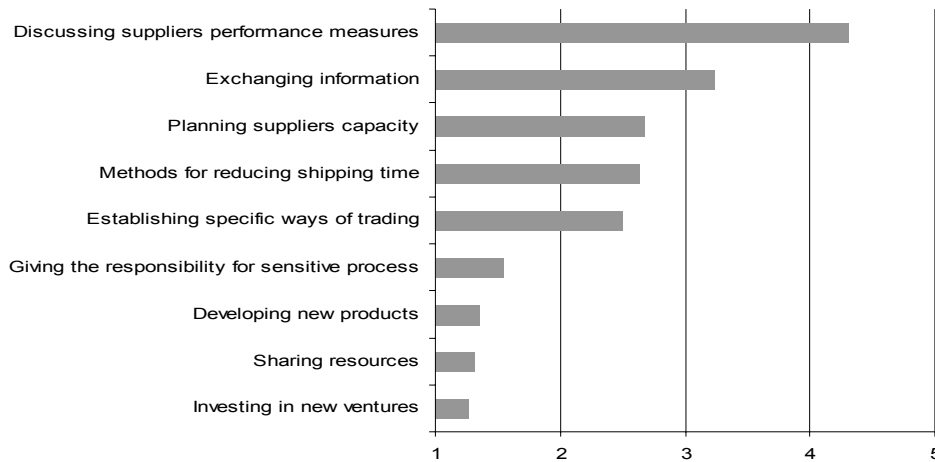
3.3.1 Cooperation with suppliers and subcontractors

The respondents were asked to rate the current level of cooperation they have with their suppliers and subcontractors on a scale of 1 (in full disagreement with current practice) to 5 (in full agreement). The results on different practices are presented in Figure 1 and they mostly describe types of information exchange. This indicates a surface level of interfirm cooperation between builders and suppliers/subcontractors. Cooperative activities entailing stronger involvement between builders and suppliers (such as developing new products and investing in new ventures) were rarely encountered.

However, 9 respondents added other cooperative practices such as communication on price trends and forecasting sales, as well as cooperation on schedules, which gave suppliers a broader perspective on demand (some could see six to eight months ahead thanks to this close cooperation

on schedule). Discussion on supply arrangements and ways to reduce lead times and costs were listed among cooperative practices. Finally, house value engineering with manufacturer assistance was also mentioned as a current cooperative practice with suppliers.

Figure 1 - Current cooperation between large homebuilders and suppliers
22 available responses, rated from 1 (in full disagreement with current practice) to 5 (in full agreement)



When questioned on the evolution of collaborative practices with their suppliers over the next five years, half of the respondents definitely agreed that they would experience growing cooperation, particularly in the form of increased information and idea sharing, partnering through alliances and above all the emergence of longer-term purchasing agreements.

Two of the largest respondents also acknowledged that they would aim for more control over product specification and purchasing, with subcontractors acting more as service providers. Several other respondents wanted shorter supply chains by means of more direct purchasing agreements with manufacturers in order to better monitor activities and reduce costs.

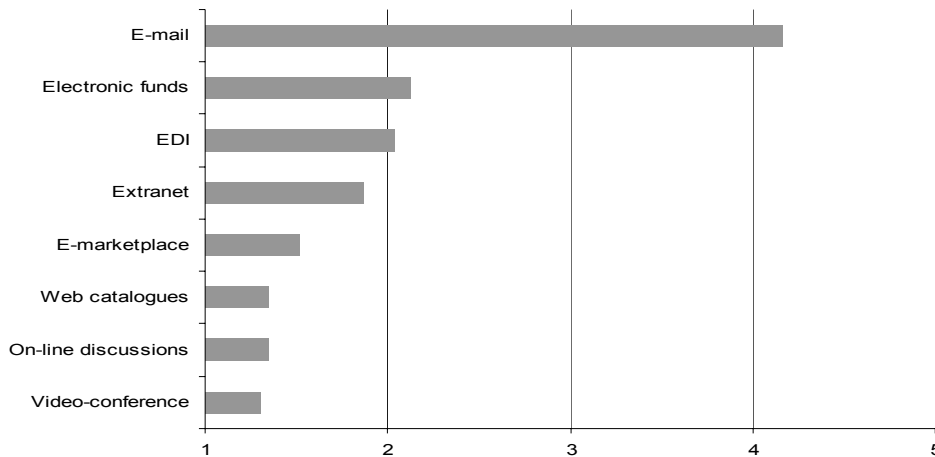
3.3.2 Electronic business and the use of information technologies

The respondents were asked to rate the main applications they used to interact with their suppliers, on a scale of 1 (no interaction at all) to 5 (full interaction). As Figure 2 shows, e-mail was, not surprisingly, widespread, while other types of electronic relationships were generally in their infancy.

However, the picture drawn is slightly different if only the largest of the builders in the survey are considered. Half of the Top 10 U.S. builders stated that they fully interacted with their suppliers and subcontractors by means of electronic mail, but also reported somehow interacting by Electronic Data Interchange (EDI) and electronic funds transfer (mean of 3.75/5) as well as using extranet

systems (3.25/5). This is in agreement with former findings on electronic business tools acceptance being usually higher in larger firms.

Figure 2 - IT applications used by large homebuilders with suppliers
23 available responses, rated from 1 (no interaction at all) to 5 (full interaction)



In addition, only a few respondents were negative or uncertain regarding changes expected in any further use of Information Technology. Fifteen of 23 respondents to this question indicated a trend towards an increase in the use of IT to interact with their suppliers and subcontractors, thanks to more electronic commerce, from electronic ordering and funds transfer to electronic scheduling.

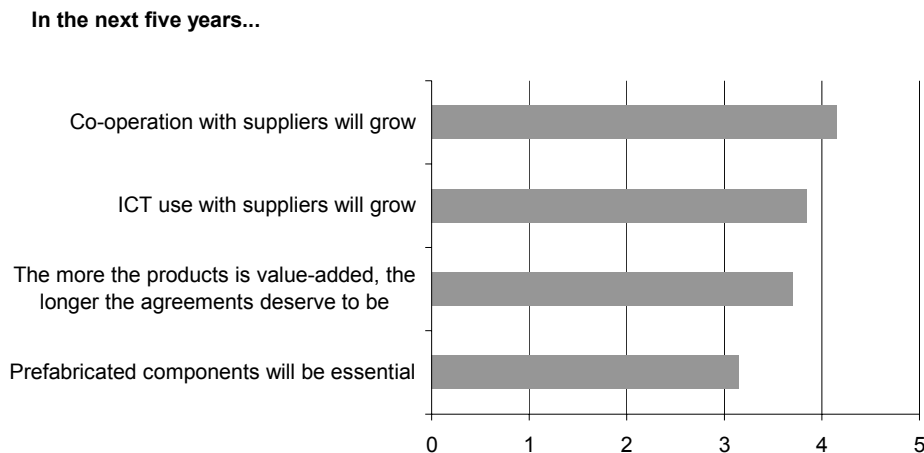
In conclusion, the respondents were in strong agreement with the suggestion that IT applications would gain importance in their relationships with suppliers over the next five years.

3.3.3 Five-year forecast on business practices and prefabricated components

Finally, the respondents were asked to indicate their opinions regarding various issues (Figure 3). They had to express their agreement/disagreement on a scale of 1 (fully disagree) to 5 (fully agree) with the four following propositions with respect to the next five years: 1) Cooperation will grow with suppliers, 2) The use of IT with suppliers will grow, 3) The more the product is value-added, the longer the agreement deserves to be, and 4) Prefabricated components will be essential.

As Figure 3 shows, the purchasing representatives of the large homebuilders were strongly expecting cooperation with suppliers to increase (mean of 4.15/5) as well as the use of IT to interact with suppliers (3.85/5). Furthermore, the results suggest the existence of a link between the type of product and the type of trade agreement. A majority of the respondents thought that products containing more value added should be covered by longer-term agreements (mean of 3.7/5).

Figure 3 - Respondents' opinions on trends over the next five years
20 respondents, rated on a scale of 1 (fully disagree) to 5 (fully agree)



Segmentation according to respondent size reveals an interesting difference between "superbuilders" and the other large builders. The answers to this survey from the 3 respondents among the Top 5 builders suggest that super large builders had a different and much more positive perception of the future development of information technologies, the expansion of prefabricated components as well as the link between the length of trade agreements (i.e. the continuity of the relationship between the buyer and the seller) and the nature of the products exchanged (more or less value-added). There was no significant difference between the two groups regarding cooperation with suppliers, both of them showing an equivalent perception of its further development (mean of 4.3/5 for the Top 5 respondents and of 4.1 for the others).

However, the 3 respondents among the Top 5 builders rated the statement about prefabricated components being essential in the future as high as 4.7/5, indicating their obvious agreement, whereas the average response of the other large builders was only 2.9/5, indicating a rather unfocused opinion regarding the proposed statement. The same can be observed for the growth of IT use, with obvious agreement (4.7/5) being indicated by the Top 5 respondents, whereas the mean for the others respondents only reached 3.7/5. Finally, the superbuilders obviously perceived a positive correlation between value addition to products and the length of trade agreements (4.7/5) while this seemed less clear to the rest of the respondents (3.5/5).

4 Discussion and future research

On the whole, the results of this study show that the respondents among the Top 100 U.S. homebuilders have developed highly varied strategies regarding home types and size, material uses and procurement sources. The rationales underlying such diversity in strategies could not be precisely identified in the context of this study but may obviously be the purpose of further investigation. However, it can be assumed that diversity is a characteristic of the transition period experienced by the homebuilding industry, in which the stakeholders try to adapt to change in their business environment without any clear and unique direction.

More specifically, the first objective of this study was to document current and prospective building techniques used by the largest U.S. builders. Previous research by Fell and Robichaud (2001) showing that large builders were more likely to use structural components than smaller ones finds support in this survey in as much as respondents massively reported using engineered wood products, roof trusses and, to a lesser extent, panelized walls and floor systems. In this sense, prefabrication indeed appears as an adequate answer to many of the large builders' expectations in terms of product attributes (availability, straightness, price volatility, etc.), waste reduction on site and ease/speed of assembly and installation.

However, the expected wider use of modular building systems among large builders is not supported by these results, as very few of the respondents have actually adopted modular construction nor expect to do so over the next five years. Furthermore, the fact that, on average, the respondents did not rate prefabricated components highly as an essential part in future construction

is something of a paradox in view of current use levels. This paradox has to be addressed and possible explanations are suggested below.

A first concern relates to a possible semantic misunderstanding regarding the term "prefabricated components" used in this study to refer to factory-built components, such as trusses for instance. It was also observed that other terms (i.e. "pro-dealer") were not familiar with some of the respondents, who employed similar but different terminology. Further research should address the issue of listing and clarifying multiple terms employed in both managerial and academic discourses.

Nevertheless, the paradox observed is more likely to be grounded in a belief among large builders that prefabrication would not gain any further momentum in replacing stick-built methods. If this is true, their rationale needs to be identified, and the existing or perceived barriers to massive adoption have to be further studied. One hypothesis might be that these barriers are related to industry structure and current business practices, rather than problems inherent to the technology or products' attributes. Indeed, recent work by Robichaud and others (2004) suggests that the current (and still evolving) distribution channel structure for wood products does not help builders make an easy transition from stick-built techniques. For instance, the presence of intermediaries prevents builders from communicating with product manufacturers to address callbacks when problems occur on site or after installation. This can be a major hurdle in view of the fact that, since the end of 2000 or so, homebuilders have had difficulty finding reasonable insurance coverage, in both financial and legal terms, and this has forced them to try and transfer risk to other parties whenever possible (Robichaud et al. 2004).

The results of the present study confirm the existence of a restructuring in the industry coupled with important changes in the way business is conducted between large builders and their suppliers. In this sense, conservatism and resistance to change in the homebuilding industry as well as in the upstream industries regarding the adoption of new business practices - combined with a lack of information on and understanding of the ins and outs of these new building techniques and their impact on business practices - have to be considered potential barriers. Research avenues are open to confirm this hypothesis and help overcome existing barriers to the industrial culture of these sectors moving towards innovation and the development of accurate business practices.

Another rationale may relate to a shift in the core business of large homebuilders, whereby they would evolve from powerful "hammer holders" into land developers and integrators providing turn-key houses. As a result, they might be focusing on issues other than just building techniques and materials purchasing. There might come a point where they want to outsource this activity or form strong partnerships with suppliers, which would then be in charge of choosing the relevant building methods and developing new products, including engineered wood products and prefabricated components and systems. This evolution in the core business of large homebuilders is also hypothesized as a major driver in reshaping the whole industrial landscape, and it has to be further studied.

Results from this survey relating to the two other research objectives (understand the procurement channels and describe relationships with suppliers) provide insights to further explore these avenues.

As already mentioned, previous research indicated that, as a result of consolidation, the larger builders had been expanding at the expense of mid-size players while small builders continued to flourish on niches. In addition, pro-dealers were said to gain market share in procuring materials to large homebuilders. The present study has confirmed the strong presence of pro-dealers as a main procurement source for large builders as well as the existence of a small group of "superbuilders", characterized by a largely optimistic vision regarding the future development of cooperation with suppliers and the use of IT with suppliers.

Key findings also strengthen elements found in the literature review regarding mergers and acquisitions as a means of pursuing growth and geographical expansion in the case of the large builders interviewed. Although a few actually operated vertically, many of the respondents gave preference to acquire competitors rather than integrate upstream players in the supply chain, such as component manufacturers. This is in line with the variety of procurement strategies emphasized by this study with respect to large builders.

Most of our respondents foresaw the development of closer, more direct and long-term business relationships with their suppliers and subcontractors supported by an increasing use of information technologies. These observations reinforce the hypothesis that major changes are about to transform the still-fragmented industry into a new structure, thus adding to previous work showing that the future success of suppliers may rely on going beyond products to offer "complete solutions"

(including the addition of insulation, installation and maintenance services, sharing the cost of warranties, insurance and litigation issues, and so on).

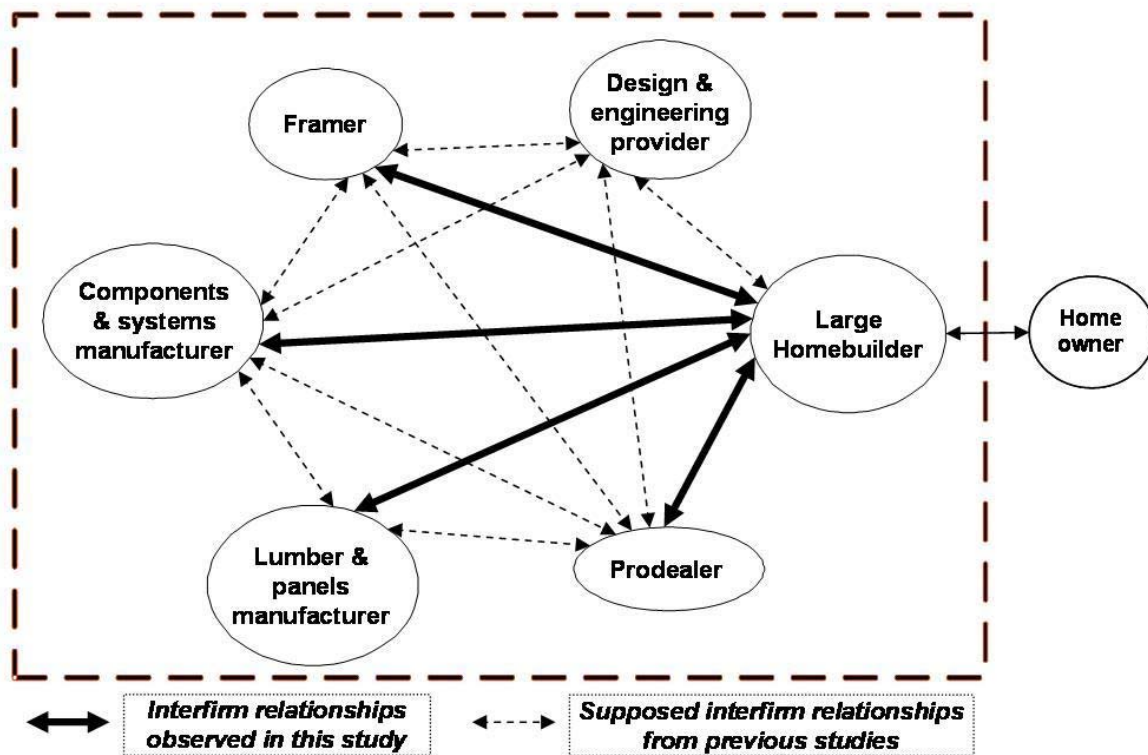
To open up discussions on this topic, it is suggested that this new industrial organization is probably better described by the emerging concept of "value-creating network" than by the now criticized "supply chain". Increasing concern has been expressed in recent years over the limitations of the supply chain concept in embracing the post-delivery, post-evaluation and overall relationship building aspects of the complex supply process (Al-Mudimigh et al. 2004). Critics have pointed out that the supply chain concept does not extend far enough to capture the customer's (end user) future needs, which are most critical in a market-focused economy. In different research fields (strategic management, marketing, logistics, operations management, etc.), this has led to a proliferation of new terms to design an "extended supply chain", such as "hyper-chain", "supply-network", "supply-chain network", "interfirm logistics network", "value creation systems", and so on. Among these new terms, the concept of value-creating network appears to be of special interest. A value-creating network is defined as "an entity aiming at producing superior value for end customers" (Kothandaraman and Wilson 2001) and emphasizes the importance of business relationships (Helander 2004). Now, the results of this exploratory study indicate that large homebuilders in the U.S. consider upcoming changes from this very perspective: increased cooperation and use of I.T. with suppliers, disintermediation of the procurement channels. Then, these results suggest that the evolution of business relationships is a major driver for the industries under scrutiny to keep on restructuring and developing more performing ways to be in business together, possibly into value-creating networks.

The emergence of value-creating networks and the evolution of interfirm relationships in these business markets are in need of further investigation. Although this type of industrial organization is supported in theory and has been observed to emerge in other industries, it remains to be proven that value-creating networks can be developed in the sectors under scrutiny. It is suggested that the partnerships recently formed in the U.S. between leaders among homebuilders and wood products manufacturers are embryos of value-creating networks. However, little is known on the satisfaction of the parties involved, or the success factors and difficulties encountered in the establishment of such partnerships in these sectors.

Many questions remain unanswered regarding the nature and features of the relationships required, efforts invested in building and maintaining such relationships, and the structure and distribution of power within these value-creating networks. Which are to be the nodes players and which the focal players? For now, it is possible to hypothesize that different value-creating networks are to emerge, including (1) large sawmillers having integrated the manufacture of structural wood components, pro-dealers and large homebuilders, and (2) component manufacturers, big box stores and small builders, for example. As for the focal players - in other words the players with a key role and great influence in the network - the question is wide open and addresses the positions of the homebuilders, pro-dealers as well as providers of engineering design and software solutions, which stand to gain considerably in importance from the adoption of factory-built structural products.

In an attempt to build on the observations made in this survey, and especially on the assessment of large builders' procurement channels (see Table 4), a visual representation of a possible value-creating network for structural wood products is presented in Figure 4. The figure shows in bold lines the relationships that builders (as buyers) have developed with framers, pro-dealers, component manufacturers and, directly, with lumber and panel manufacturers, as observed in this study. Other relationships suggested in previous research are shown in dotted lines, particularly those between builders and design and engineering providers (third-party design firms or architects, for instance). As concerns framers, it is assumed that they also have relationships with design providers, component manufacturers and/or pro-dealers (as buyers) to purchase products for large builders, as found in this study. As for component manufacturers, which are assumed to maintain relationships with design providers, they interact with lumber and panel manufacturers and/or pro-dealers (as buyers) on the one hand, and with framers (as sellers) on the other hand. In this network of relationships, lumber and panel manufacturers also interact with component manufacturers and/or pro-dealers (as sellers) as well as with builders. Finally, it is suggested that pro-dealers can be involved in business relationships with lumber and panel manufacturers and/or component manufacturers as well as with design and engineering solutions providers (as buyers), and with framers and/or large homebuilders (as sellers).

Figure 4 - A value-creating network for structural wood products – From the perspective of large U.S. builders



This overly simplistic representation of a value-creating network for structural products reveals many difficulties that further research will have to solve. It will be a real challenge to delineate the network, representing the flow of the different products, the activities implied, the actors involved (integrating the different activities to some extent) and their multiple buyer/seller relationships.

Other questions arise such as the interaction between firms and the coordination of activities in such a configuration. It will be necessary to investigate the various modes of interaction and coordination, the governance mechanisms (trade agreements, contracts and so on) and the tools (including Internet-based technologies and systems as underlined in the findings) allowing value-creating networks to emerge and to be efficient. Finally, the outcomes of this type of new structure, fostered by close and strong business relationships, are also to be considered. Many benefits have been associated in the literature with improved relationships between customers and suppliers, from innovation to satisfaction, responsiveness, flexibility and so on. One of the most recent trends observed has been a new emphasis on customization, and more specifically mass-customization, as one of the possible outcomes of value-creating networks. One may wonder to what extent this trend represents a potential avenue for builders, and large builders in particular, to consider.

5 Conclusion

This exploratory study of large U.S. homebuilders' procurement strategies for structural wood products has furthered academic knowledge of the current and prospective use of building materials and techniques, procurement channels and business relationships with suppliers. By offering an integrative approach to many current trends that was missing in the literature, it has provided deep insights into the fundamental changes that these builders are more than likely to drive in the homebuilding industry and consequently impose on upstream industries. At a time when the business environment grows incrementally competitive and selective, with large builders becoming larger as well as quicker and better at building homes, it is a matter of survival for wood products manufacturers to integrate these changes and catch up on the necessary adaptation.

One of the most promising avenues for structural wood products manufacturers to enhance this adaptation is to place interfirm relationships at the core of their strategic thinking. By doing so, they will face up to one of the most challenging tasks they need to address without delay: that of abandoning their age-old commodity production philosophy and becoming committed actors in the value creation process for homebuilders.

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