PANEL PRODUCTS: A PERSPECTIVE FROM FURNITURE AND CABINET MANUFACTURERS IN THE SOUTHERN UNITED STATES

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ABSTRACT

Particleboard and medium density fiberboard are primary composite panel products used in the manufacture of furniture, cabinets, millwork, molding, door parts, floor underlayment, laminate flooring, and many other products. The objectives of this study were to understand the southern U.S. furniture and cabinet manufacturer perspective in using these composite panel products relative to plywood (a non-composite panel) and to determine their selection criteria. The study addresses technical, economic, and performance characteristics. It was found that nearly half of the total value of raw materials used by respondents in 1997 was comprised of these three panel products. In all but one industry sector studied, respondents said they planned to increase usage of all three panel types. The main reason respondents use these products is that they are economical to use, while the main reason they are not used is customer objections.

Industrial composite panels including particleboard and medium density fiberboard (MDF) are widely used in the manufacture of furniture, cabinets, millwork, molding, door parts, floor underlayment, laminate flooring, and many other products. In 1997, total panel usage by these industry segments accounted for nearly 60 percent of industrial panel consumption in the United States and Canada (3,7). This is the result of increasing population and decreasing prime timber supply, which predicts a continuing shift to the use of composition boards in these industries (10).

In contrast to simple solid wood panels, composite panels exhibit a certain flexibility in properties, including consistent availability and uniformity in quality that is largely independent of the natural variability of wood (11). For example, particleboard panels can be made in a variety of sizes and densities, thus providing great opportunity to design products with the specific properties needed (8). The surface of MDF is flat, smooth, uniform, dense, and free of knots and grain patterns. The homogeneous edge of MDF allows intricate and precise machining and finishing techniques for superior products (9). Development of the composite panel industry has thus promised an ideal core material for veneered or overlaid panels for furniture, but its acceptance varies from manufacturer to manufacturer.

In 1968, Suchsland and Good (11) conducted a survey on the selection of panel materials (primarily particleboard) by furniture and cabinet manufacturers in Michigan and North Carolina. At that time, the particleboard industry had just become established in North America. Thus, reasons for acceptance or rejection of particleboard as core materials in furniture panels had important implications to further expansion of the particleboard industry. Suchsland and Good (11) divided the particleboard-using industries into three segments: furniture, kitchen cabinet, and store fixture manufacturers. The results of their study showed that economics, dimensional stability, no telegraphing, no warping, size and quantity availability, and uniform thickness were the top six reasons for using particleboard as core material for furniture and cabinet panels. The top six reasons for not using particleboard were difficult edge treatment, fastening problems, customer objection, sagging, low strength, and high weight. Since that survey, the particleboard industry has matured in production technology, and producers continue to make substantial progress in improving board characteristics such as fine and smooth faces. In 1993, Temple-Inland Panel Products Technology Center (4,14) con-

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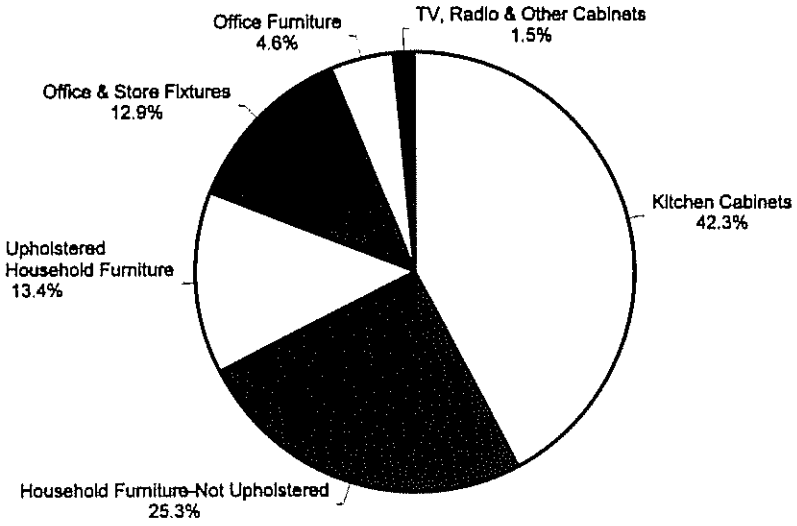

Figure 1. — Respondent manufacturing category (n = 194.)

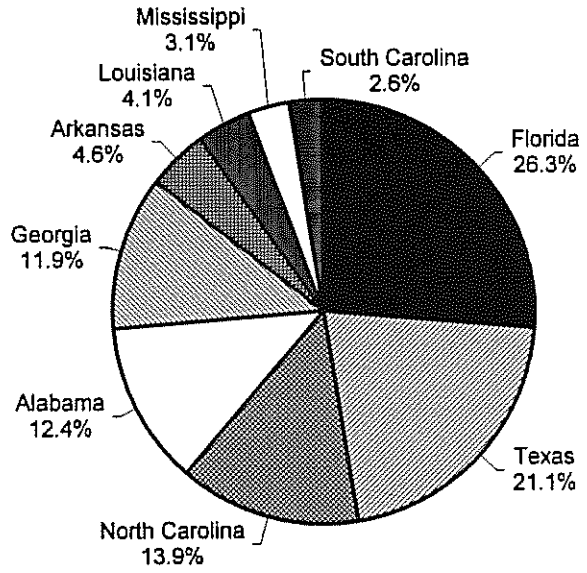

Figure 2. — Respondents by State (n = 194).

ducted a comparative particleboard study. In the study, 40 sample boards representing 15 companies and 25 particleboard plants were tested and ranked according to both physical and mechanical properties. The study showed a wide range of particleboard properties due to the different wood species, particle geometries, and pressing strategies used by different manufacturers. The variability in particleboard properties from different manufacturers may have contributed to a negative perception toward using particleboard. Ducker Research Co. (7) conducted a study evaluating demand, market drivers, and end-user market trends of North American industrial panels. The study showed that panel usage by manufacturers of cabinets, fixtures, doors, flooring, furniture, molding, millwork, and wall paneling was about 4.49 billion ft.^{2} in 1997 (3/4-in. basis), nearly 60 percent of panel consumption in the U.S. and Canada. Furniture makers used the most panels, followed by cabinet, doors, and display fixture industries. Particleboard is the most commonly used panel product, primarily used in the furniture industry. MDF is usually used in producing molding, millwork, display fixtures, and furniture. The study showed that the main issue facing the panel industry is the commodity perception of products. There is currently a lack of information about customers' needs for today's panel products, which hinders the development of new markets and makes it difficult for existing suppliers to address customer requirements.

The composite panel market is highly competitive with pressure from both producers and end-users. As a result, panel producers must better understand the customers' needs and focus on value-added applications such as melamine-paper coating, edge-banding, non-standard sizes, and improved moisture resistance. The objective of this study was to develop information on customer perspectives for panel products and determine the selection criteria used by manufacturers based on technical, economic, and performance characteristics. It is hoped that determination of reasons for acceptance or rejection of industrial panels as core materials in furniture panels could lead to further expansion of their uses and cost reduction in producing laminated panels by the furniture industry.

METHODOLOGY

We examined panel usage by value-added manufacturers in the southern United States (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas). The value-added manufacturers included were in six Standard Industrial Classification (SIC) categories.[1] A random sample of 1,700 companies in these SIC categories was drawn from the 1997 PhoneDisk PowerFinder CD-ROM directory (2). The study was conducted using mailed surveys. The survey instrument was modified from a 1995 study that examined the structure of the hardwood dimension and wood component industries (13) and a study that examined the structure of the furniture industry in the southern United States (12). Survey development and implementation followed methods and

[1] 2511: wood household furniture, except upholstered; 2512: wood household furniture, upholstered; 2521: wood office furniture; 2434: wood kitchen cabinets; 2517: wood television, radio, and other cabinets; 2541: wood office and store fixtures, partitions, and shelving.

procedures recommended by Dillman and described as the Total Design Method (TDM) (5). Accordingly, mail questionnaire procedures included pretesting, pre-survey notification of the initial mailing, a post-mailing reminder, and a second survey mailing. Of the 1,700 surveys mailed, 410 were undeliverable because the company had moved or had gone out of business. Of the remaining companies, 194 returned usable surveys, resulting in an adjusted response rate of 15 percent. Given that typical response rates for industrial studies range from 15 to 35 percent (1,6), a response rate of 15 percent in this study is considered adequate, although on the low side. Non-response bias was measured using two-tailed t-tests conducted on frequency of companies by state and by SIC category, comparing respondents and companies that fell into the non-response/undeliverable category. No difference in state distribution nor SIC category was detected at $\alpha = 0.05$.

Results and Discussion

Information about respondents by their self-identified major industry sector can be found in **Figure 1**. Just over 42 percent of respondents said kitchen cabinets were their major product line; another 25 percent was primarily in the non-upholstered furniture sector. Only 1.5 percent of respondents produced TV, radio, and other cabinets. With regard to geographic location, over a quarter of respondents were from Florida, followed by Texas with 21 percent (**Fig. 2**). Least represented states were South Carolina, Mississippi, Louisiana, and Arkansas with 2.6, 3.1, 4.1, and 4.6 percent of respondents, respectively.

Average 1997 sales for all respondents (n = 183) was $6.3 million. As shown in **Figure 3**, over 50 percent of companies had sales of less than $1 million. Just over 12 percent of respondents had sales over $10 million. Respondents that produced kitchen cabinets as their primary product had the highest average 1997 sales of $14.6 million and highest average number of employees (140 employees). This was followed by non-upholstered household furniture at $13.4 million and 124 employees. Office furniture producers had the lowest level of sales, averaging $1 million in 1997 sales in addition to having an average of 13 employees per firm.

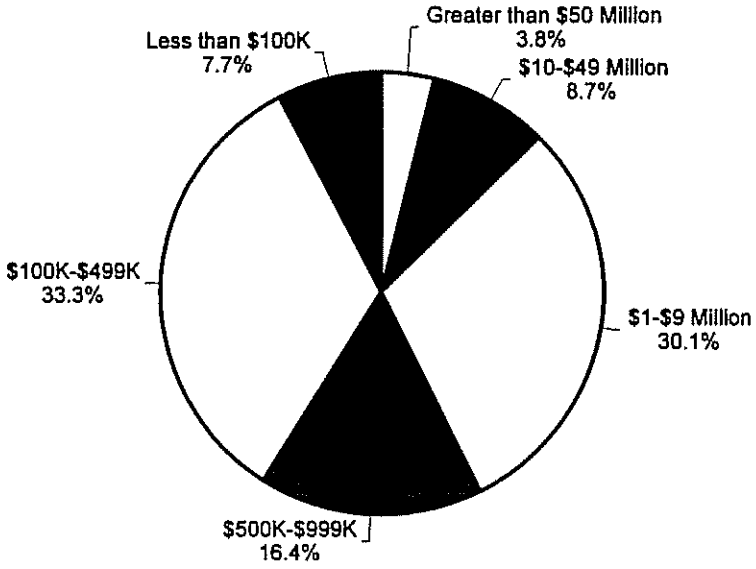

Figure 3. — 1997 Total company revenue (n = 183).

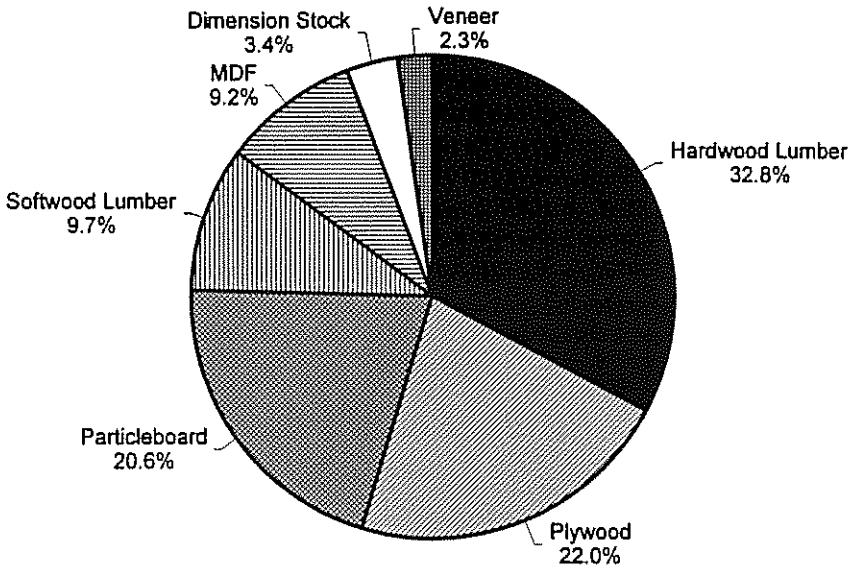

Figure 4. — Percent of 1997 total raw material usage by value (n = 183).

TABLE 1. — Percent of raw materials used (by value) by the manufacturing sector in 1997 (n = 183).

	Kitchen cabinets	Household furniture	Upholstered furniture	TV, radio, etc. cabinets	Office furniture	Office and store fixtures
	(%)					
Hardwood lumber	25	35	78	0	26	7
Plywood	28	17	11	65	13	17
Particleboard	23	9	1	0	19	54
Softwood lumber	8	19	4	0	7	2
MDF	11	5	0	2	26	11
Dimension stock	1	8	4	0	4	1
Other products	2	4	1	33	4	4
Veneer	2	3	1	0	1	4
Total	100	100	100	100	100	100

Hardwood lumber was the most-used raw material (by value) in 1997 by all respondents combined, accounting for almost a third of total raw material value (**Fig. 4**). Following hardwood lumber was plywood, particleboard, softwood lumber, MDF, dimension stock, and veneer. This relative ranking is nearly identical to findings made by Vlosky (12) in a study that included raw material usage in the furniture industry in the southern U.S. The only difference in that 1996 study is that the order of dimension and veneer were reversed.

When further broken down by industry segment, hardwood lumber was the most-cited raw material, by value, for kitchen cabinets, non-upholstered household furniture, and upholstered furniture. Plywood was most cited for TV, radio, and other cabinets, while particleboard ranked first for office and store fixture manufacturing, accounting for over 50 percent of raw materials used in 1997 (**Table 1**).

Respondents were asked if they planned to increase or decrease their usage of particleboard, plywood, and MDF in the future (**Table 2**). The percentage of companies that planned to increase their usage for these panel products is greater than the percentage of companies that planned to decrease their usage. This is the case for all panel products across all manufacturing sectors except for the office furniture sector, where 44 percent planned to decrease their use of plywood and 22 percent planned to increase their usage.

Respondents were asked the reasons that they use or don't use particleboard, MDF, and plywood. **Figure 5** shows that the main reason for particleboard use is that it is economical (77% of respondents). Second ranked is uniform thickness with over 50 percent of respondents. Towards the bottom of the list, but still with nearly 20 percent of respondents, are no waste, no warping, and good finishing characteristics.

TABLE 2. — Percent of companies that plan to increase or decrease usage of particleboard, MDF and plywood by the manufacturing sector.

	Kitchen cabinets (n = 82)	Household furniture (n = 49)	Upholstered furniture (n = 26)	TV, radio, etc. cabinets (n = 3)	Office furniture (n = 9)	Office and store fixtures (n = 25)
	(%)					
Particleboard						
Increase	46	18	8	33	33	52
Decrease	17	6	8	0	22	16
MDF						
Increase	52	10	4	100	44	56
Decrease	9	6	0	0	11	8
Plywood						
Increase	57	35	50	66	22	36
Decrease	9	8	4	0	44	20

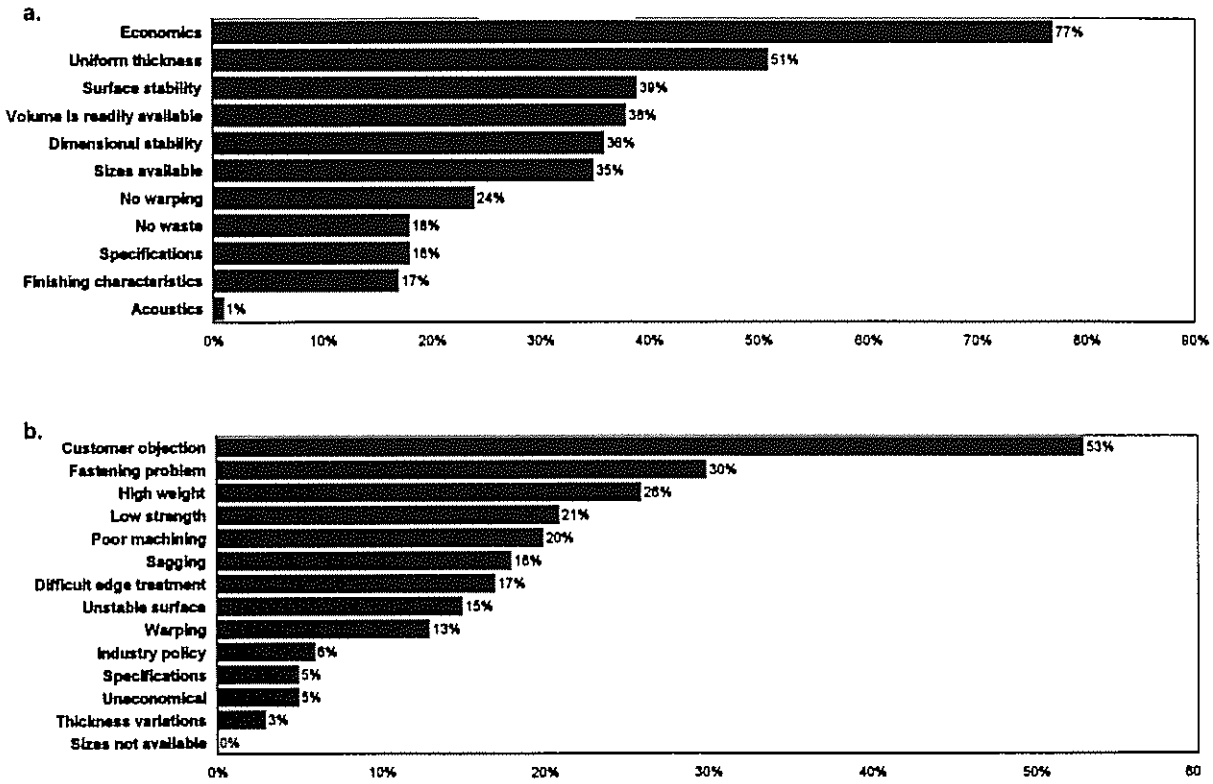

Figure 5. — a) Reasons for using particleboard; percentage of companies indicating each reason (n = 92). b) Reasons for not using particleboard; percentage of companies indicating each reason (n = 92).

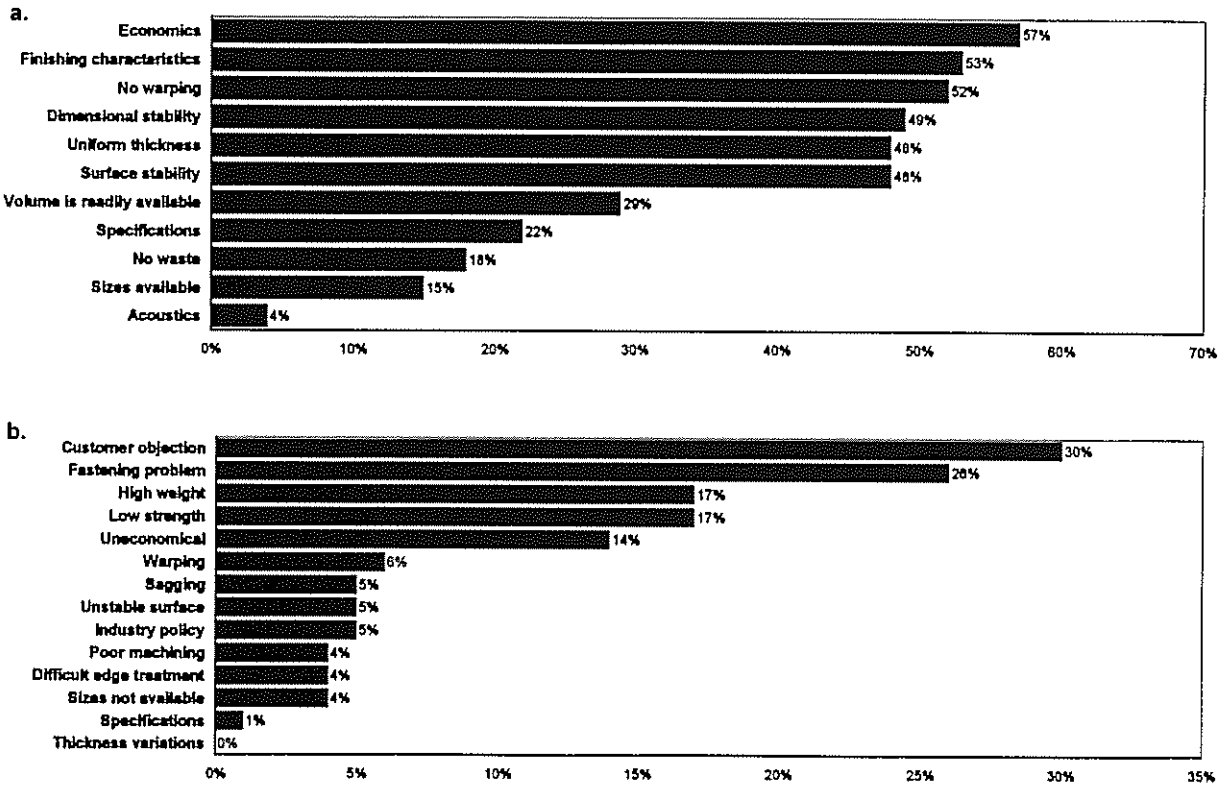

Figure 6. — a) Reasons for using MDF; percentage of companies indicating each reason ($n = 95$). b) Reasons for not using MDF; percentage of companies indicating each reason ($n = 981$).

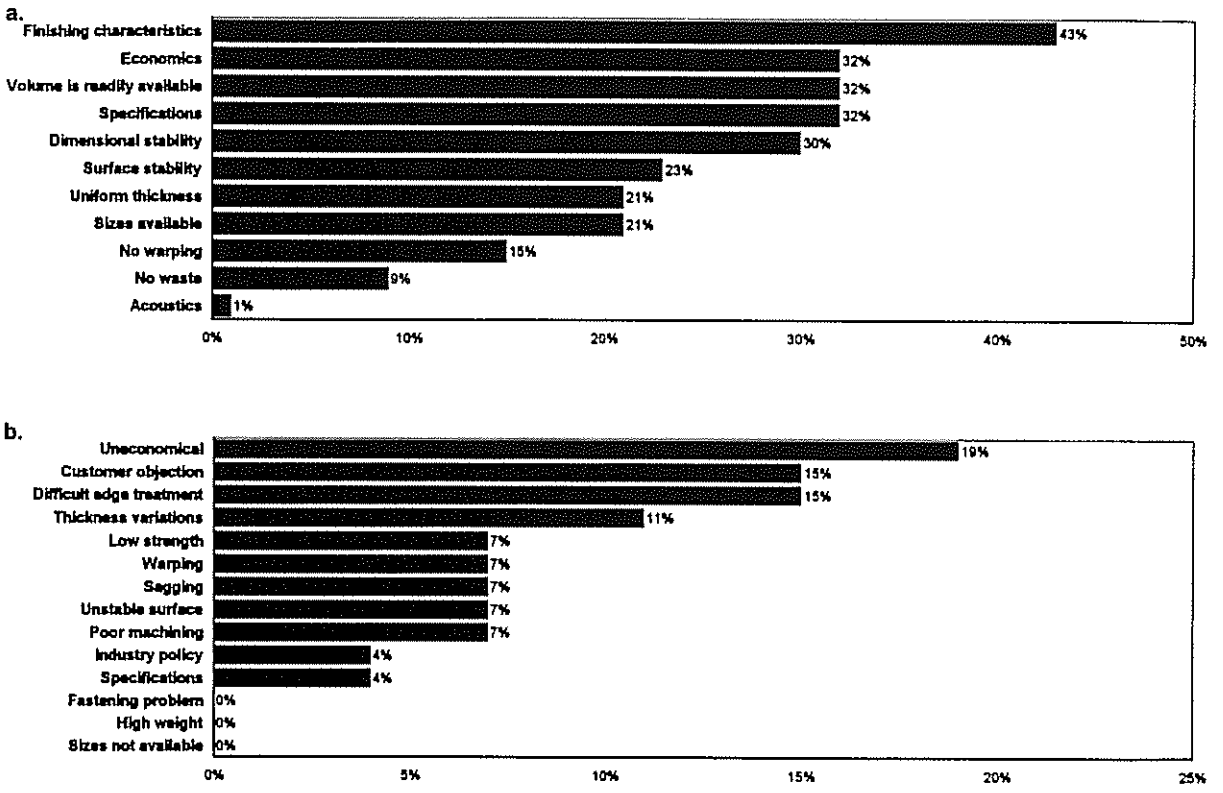

Figure 7. — a) Reasons for using plywood; percentage of companies indicating each reason ($n = 155$). b) Reasons for not using plywood; percentage of companies indicating each reason ($n = 27$).

The main reason that respondents do not use particleboard is customer objections (53% of respondents). Second ranked is fastening problems (30% of respondents) followed by high weight (26%), low strength (21%), and poor machining (20%).

With regard to MDF, 57 percent of respondents said they used this product due to economics, closely followed by finishing characteristics (53% of respondents) and lack of warping (52%) (**Fig. 6**). As is the case with particleboard, the main reason that respondents do not use MDF is customer objections (30% of respondents). Next ranked is fastening problems (26%), high weight (17%), and low strength (17%).

With regard to plywood, 43 percent of respondents said they used this product due to its finishing characteristics (**Fig. 7**). Nearly a third of respondents cited economics, readily available volumes, and availability to their specifications as the next ranked reasons for using plywood. The most cited reason for not using plywood was that it is uneconomical (19% of respondents) followed by customer objections (15%) and difficulty in treating edges.

Although customer objections exist for all panel types, just under half of respondents that use particleboard said that they actively promote this construction material to their customers. Of those that use MDF, 72 percent actively promote its usage to customers; 73 percent of respondents do so for plywood.

SUMMARY

Panel products such as particleboard, MDF, and plywood are important raw material inputs for the furniture, cabinet, and allied industries. Often these products compete for market share in the same application. This paper identifies the relative importance of panel inputs for six value-added secondary wood manufacturing industries. Respondents indicated the characteristics that encourage or discourage them from using these products. This information is useful to companies in the secondary industries discussed in the paper because it helps them understand their industry structure. In addition, the information is important to panel suppliers to value-added customers. By better understanding their customer concerns, needs, and manufacturing issues, panel suppliers can better serve their customers and compete in the marketplace.

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