Matching Innovative Panel Processing Technologies With Japanese Market Requirements

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Matching Innovative Panel Processing Technologies With Japanese Market Requirements

by

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Executive Summary

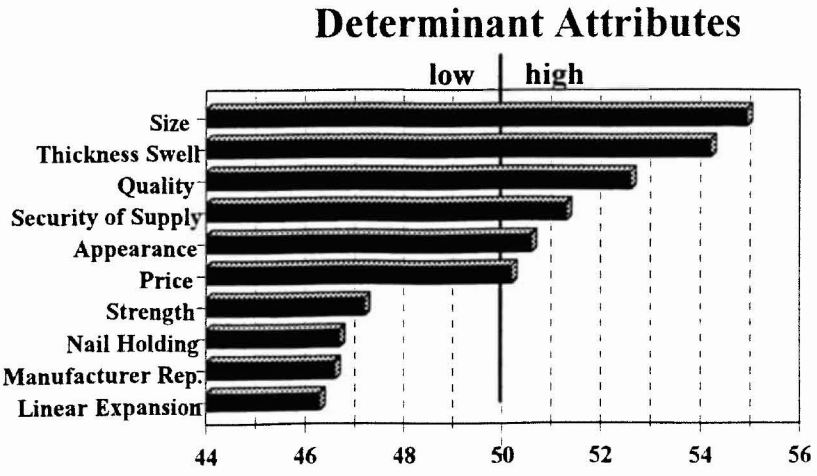
- Objective was to identify opportunities for Canadian oriented strand board (OSB) for the Japanese market

- Key criteria linking innovative panel technologies and Japanese customer requirements was panel product attributes relative to competing products

- Attributes of wood based panels examined in Japanese study:
  - Thickness Swell,
  - Manufacturer's Reputation,
  - Surface Appearance,
  - General Quality,
  - Price,
  - Nail Holding Ability,
  - Size (length, width, thickness),
  - Structural Strength,
  - Linear Expansion,
  - Long Term Supply

- Study examined ***determinant attributes*** i.e., those product characteristics that are ***both*** important and serve to discriminate between alternative products

- Results of Determinant Attribute Analysis:



- Three panel products examined: Lauan Plywood, Canadian Structural Panels (CSP) and Oriented Strand Board (OSB)

- Importance of attributes by panel products:

Ranking of Determinant Attributes

Attribute	Lauan	CSP	OSB
Size	1	2	2
Thickness Swell	2	1	3
Quality	2	3	1
Security of Supply	3	2	1
Appearance	1	2	2
Price	2	2	1

- The strengths of OSB in the Japanese market are:
  - security of supply,
  - consistency of quality, and,
  - price

- The weakness of OSB, relative to competing products are:
  - size,
  - thickness swell, and,
  - appearance.

- To access Japanese market for OSB Canadian firms need to:
  - establish OSB mills with flexibility to produce both 3 and 4 foot wide panels;
  - reduce thickness swell properties to less than 10%, AND;
  - promote the appearance of OSB in a positive light.

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1.0 INTRODUCTION

Opportunities continue to expand for increased trade in wood products from Canada to Japan. To date, the majority of trade has focused on solid wood products, either rough sawn lumber for re-manufacturing in Japan or finished solid components for use in Japanese construction and other industries. While the value of these solid wood components continues to increase (Cohen, 1992), opportunities exist to increase the types and value of wood products exported from Canada to Japan.

Changes in global wood supplies and demands are creating a window of opportunity to include new structural panels such as oriented strand board (OSB)in Canadian exports. The overall objective of this research project is to identify opportunities to develop a wood based composite panel specifically for the Japanese market. Changes in the structure of Japanese wood material imports combined with structural changes in the Canadian (and especially British Columbia) timber supply situation indicate that now is the time to take advantage of this window of opportunity.

1.1 CHANGING JAPANESE DEMAND

As global log supplies become scarce, the Japanese market for wood products (both lumber and panels) is undergoing fundamental restructuring that has little to do with economic recession or expansion (Widman, 1994). This restructuring includes:

- Industries previously based on importing large quantities of logs are being phased out as the "new Japanese sawmill" is based on resawing lumber suitable for re-manufacture, not logs.
- Japanese log imports remain stagnant or are decreasing. Increased demand for wood is being met by augmented imports of more finished products such as lumber, wood based panels and engineered wood products. Log supplies form Malaysia, the United States and the former USSR are expected to become less available and more costly.
- The Japanese plywood industry is substituting softwood for currently imported hardwood logs and has targeted a 30% replacement rate by 1997 (Japan Lumber Journal [JLJ], 1993b).
- Japan has become much too reliant on a single source for its wood panel (plywood) imports with over 90% of imports coming from Indonesia where drastic fluctuations in supply and price are customer irritants (JLJ, 1993a). Indonesian panel supply is expected to decrease.

The continued erosion of domestic Japanese plywood manufacturing due to the high cost and scarcity of imported logs combined with their almost total reliance on a single source of

imports creates market forces in Japan which encourage the adoption of new types of wood based structural panels from nontraditional supply regions. The window is open and part of this report details specific product characteristics that are required to take advantage of this open window.

1.2 CHANGING SUPPLY FROM BRITISH COLUMBIA

British Columbia currently is responsible for over 90% of all Canadian wood product exports to Japan. Changing from "sustained yield forestry" to "sustainable forestry" combined with an increasing array of "forest products" (both tangible and intangible) that society demands from provincial forest lands will decrease the volume of sawlogs available from traditional merchantable species to the wood products sector in British Columbia. Several avenues exist to maintain the health of the wood products sector despite decreased harvest rates in "merchantable" timber.

- A frequently heard solution is to "add value" to existing harvests through additional manufacturing. This route is being followed in the Pacific North West in the United States. Often ignored in the drive to specialty products is that if all producers shift to a specialty product, the product evolves into a commodity (e.g. Precision End Trimmed, Kiln Dried Studs evolved from a value-added specialty to a commodity referred to simply as Studs).

- An additional solution is to develop products and markets for currently "unmerchantable" timber. This includes thick grown stands of small diameter timber such as Lodgepole Pine and currently under utilized species such as Trembling Aspen.

This report examines the opportunities of using currently under-utilized timber resources in British Columbia and other parts of Canada to produce an oriented strand board designed specifically to meet Japanese product requirements. In order to ensure that the product/market is not developed by Canadian firms and then captured by a lower cost producer from outside Canada, technologies, which are either expensive or difficult to incorporate in existing facilities, will be examined to produce the product attributes identified in the market assessment stage of this report.

1.3 OBJECTIVES

The overall objective of this project is to identify opportunities to develop a wood based composite panel produced in Canada specifically for the Japanese market. The steps followed were:

1. A model was developed to assess the development and transfer of a product (OSB) that was new to a specific market (the Japanese market for wood based panels). -- Section 2 --

2. A procedure to gather the relevant market data for product attribute assessment was developed. -- Section 3 --

3. Specific attribute requirements for OSB to meet specific Japanese market requirements were assessed relative to competing panel products. Comparing product attributes relative to existing products and determining which attributes were critical to purchasing decisions (i.e., determinant attributes) was a key portion of this project. Market research in Japan provided the primary data necessary to develop the determinant attributes for wood based panels. -- Section 4 --

4. Technologies to produce these product attributes were evaluated and "appropriate" technologies are recommended to provide a window of reduced competition in Japan. -- Section 5 --

5. The model developed in 1) is then assessed to determine if it can be used as a standard method of developing new or modified products for specific export markets. -- Section 6 --

2.0 MODEL DEVELOPMENT

2.1 TRADITIONAL MODELS OF PRODUCT DIFFUSION

Traditionally the spread or diffusion of new products has been initiated by two methods: technology push or market pull (McCarthy, Shapiro and Perreault, 1986). Technology push assumes that research and development of new technologies initiates development of new products which are then introduced and diffused through society (Figure 1). Thus, the impetus for the evolution of innovative technologies comes from R and D departments. This is best summarized by the recent adage "If you build it, they will come". The development of Parralam© is an example of technology push.

The alternative theory is that market pull and increasingly sophisticated customers require new products which require certain innovative processes and technologies (see Figure 2). Impetus for innovative technologies is market driven and both process and product technologies are developed to satisfy customer needs.. This approach follows the recent trend in "customer-driven enterprises". The development of the Silent Floor System© is an example of market pull. Research has examined and supported aspects of both approaches (for a detailed summary of models of new product diffusion see Mahajan, Muller and Bass, 1990).

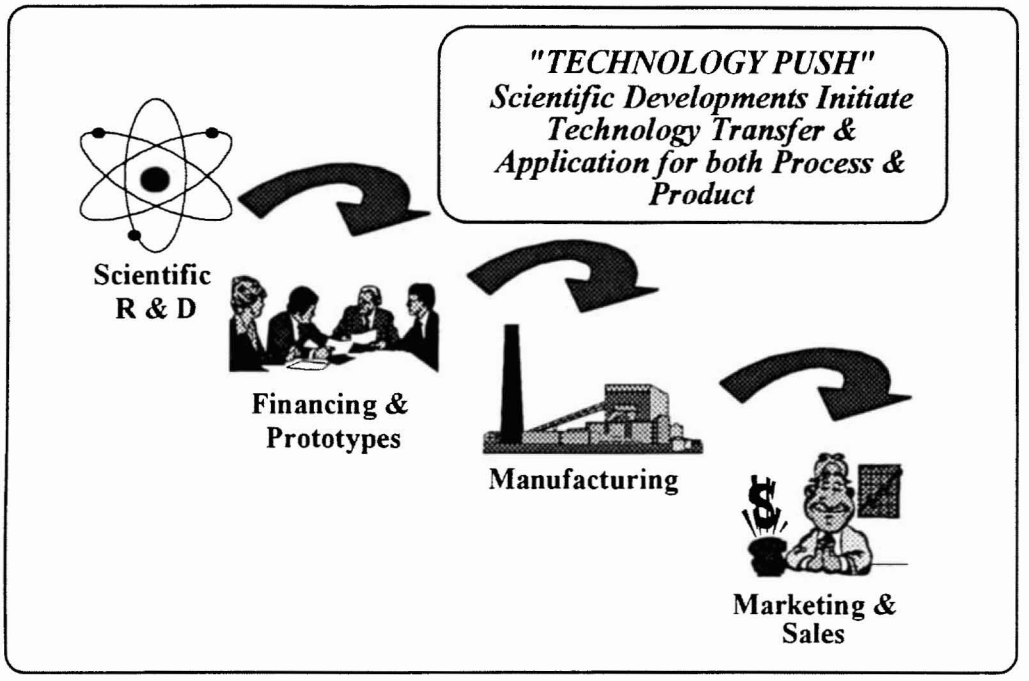

Figure 1: Technology Push

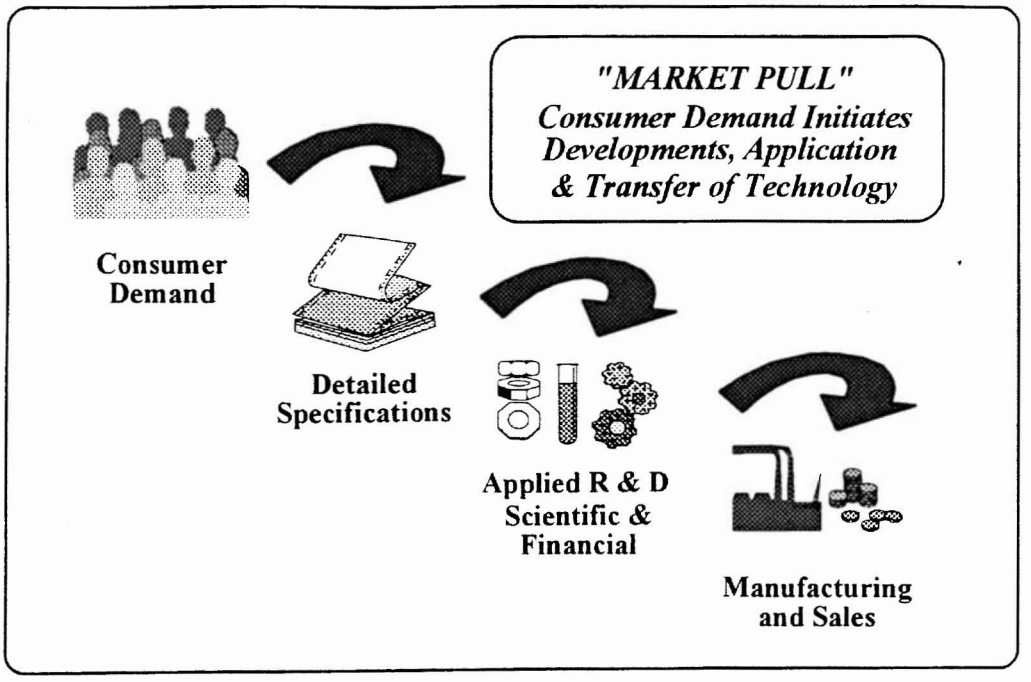

Figure 2: Market Pull

2.2 INTEGRATIVE MODEL FOR NEW PRODUCT DIFFUSION

The proposed model combines aspects of technology push and market pull using specific product attributes to connect these two differing perspectives. Market pull and technology push working in concert has been explored in the theory development by Kiel 1984, Capon and Glazer 1987, and Lambkin and Day 1989. The proposed integrative model is illustrated in Figure 3.

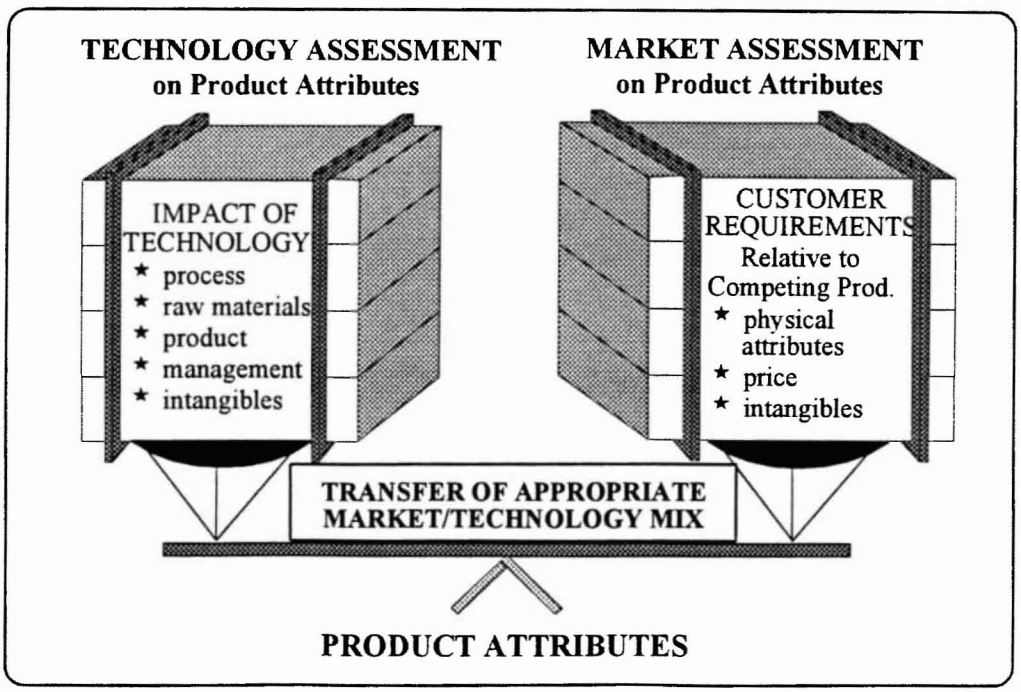

Figure 3: Generic Model of New Product Diffusion

Necessary criteria for use of the proposed integrative model are:

1. A specific market must be considered. The market must be defined as narrowly as possible either geographically, by industrial use, and/or by end-use segment.

2. Existing products currently being used in that specific market must be considered to establish benchmark product attribute requirements. The new product must be compared to existing products since customer inertia requires definitive product improvements (including a lower price) to initiate switching to a new product.

3. Appropriate technologies must be identified. It is critical that appropriate technologies and not necessarily the most sophisticated or "highest" technologies are identified. These must be evaluated based on their ease of implementation by existing and potentially competitive production facilities. The purpose of developing new products

using appropriate technologies is to attain a window of competitive advantage, recognizing that any product can be imitated.

4. The key criteria linking new and innovative technologies and satisfying specific customer segments is the specific product attributes relative to current competing products.

The generic model incorporates these four factors. The result is to develop an appropriate technology/market mix based on distinct product attributes for a specific market.

2.21 Generic Market Assessment

Assessing the market for a new product requires a definition of which market is being considered. What might be considered a new product in one market might be the status quo product in another market. For example, OSB is considered an established product in the North American construction industry but is a new product in the Japanese construction industry.

New products must be assessed relative to existing end products currently meeting customers needs. This assessment must be from the perspective of the customers. While this sounds simple, far too frequently producers assume that they understand what their customer wants better than the customers themselves. Far too often customers are not asked about competing products but are assumed to be ignorant and are treated as children needing education.

2.22 Generic Technology Assessment

It is important when assessing technologies that only applied and practical technologies are considered. Those that are still under development and have not yet progressed to be useful in practical industrial applications should not be considered. Claims for technologies must be substantiated and exist outside of theory development or laboratory models.

The critical information that must be gathered for each processing technology is the impact is has on product attributes and the cost of impacting these characteristics. Product attributes include tangible or physical characteristics such as strength, shape, colour, size, etc. However, intangible product attributes must also be considered. These can include such factors as appearance, "greenness", image, security of supply, manufacturer's reputation and warranties.

Cost of production is also a key determinant. However, current analysis indicates that costs have a tendency to be much more controllable than previously presumed as business networks and sophisticated supplier-buyer relationships are developed (Magnet, 1994).

Ease of imitation is an often overlooked but critical component of assessing technologies. If existing facilities with lower cost raw materials, labour, or government assistance can implement a technology upgrade to incorporate new technology with low costs and minimal disruption of production, then developing new products for new markets only plants seeds for competitors to harvest. Technologies which add little cost to new facility construction but are costly to integrate into an existing facility provide ideal technology opportunities. These are the types of technologies that the technology audit should identify.

2.3 Model Applied to Japan and OSB

As seen in Figure 4 this model can easily be applied to introducing an OSB product designed specifically for the Japanese market to compete with the current market favourite, Lauan plywood. This wood based plywood panel is produced both in Japan from predominantly imported logs and imported from Indonesia. A newly developed OSB panel must be different in product attributes from current imports of OSB which due to certain product attributes are restricted to usage as low quality packaging material. In addition, the technology to produce this product must differ in some material manner from the lower cost facilities located in the United States.

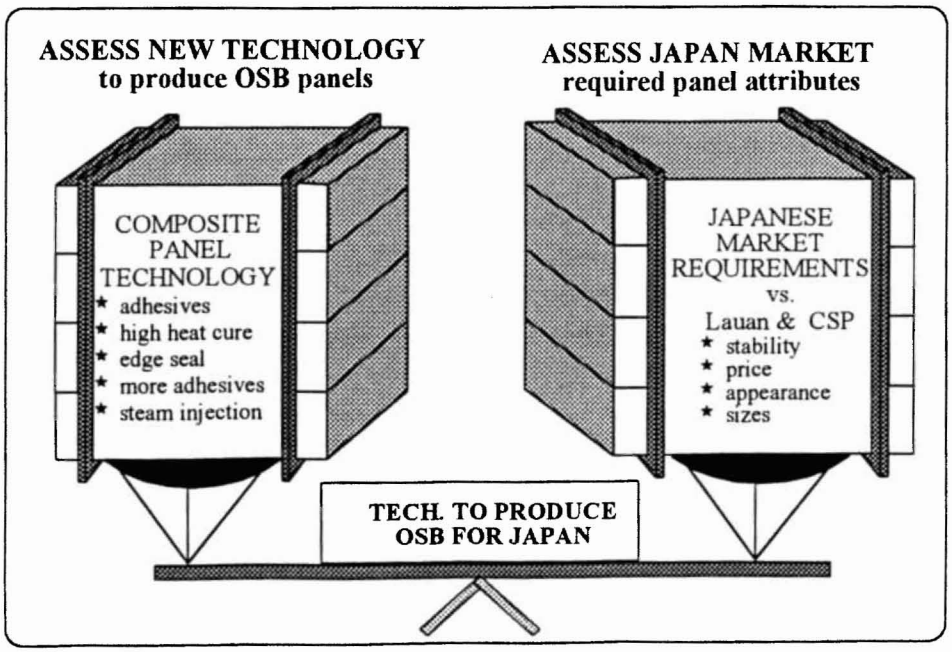

Figure 4: Diffusion Model Applied to Japan and OSB

This report will first present Japanese market requirements. Initial assessment of innovative technologies indicated that many were in the developmental stage and few were ready to be applied in anything other than a pilot plant. Assessing the market first provided some lead time for technological development and narrowed the list of those product attributes that were important to Japanese customers.

3.0 PROCEDURE FOR ATTRIBUTE ANALYSIS IN JAPAN

3.1 PROCEDURE FOR DATA COLLECTION

A 4 step process to collect primary data was used to assess determinant attributes of panels in Japan:

1. Determine a long list of wood based panel attributes. Narrow this list to a concise, short list of potentially critical attributes. This was achieved through a review of relevant literature and personal interviews with i) Canadian personnel stationed in Japan (e.g., COFI representatives), ii) people conducting business with Japanese purchasers of panel (Seaboard representatives) and iii) employees of Japanese companies stationed in British Columbia. The resultant short list of key attributes, both tangible and intangible, are shown in Table 1.

2. Develop a structured questionnaire to ascertain i) which attributes impact purchasing decisions and ii) how OSB compares to current wood panels in use --Lauan plywood and Canadian Structural Panels (CSP).

3. Develop a list of companies in Japan to interview and make appointments for interviews. A mix of large importers, small, medium, and large construction companies as well as a few current users of OSB were included in the list. February is the worst weather in Japan and correspondingly has the fewest North American business people visiting companies. This month was chosen to facilitate access to senior level, decision making individuals within targeted organizations. See Appendix 1 for a complete list of firms interviewed.

4. Collect data in personnel interviews, complete determinant attribute analysis and write report.

Table 1: Key Attributes of Wood Based Panels in Japan

Tangible Attributes	Intangible Attributes
Thickness Swell	Price
Linear Expansion	General Quality
Structural Strength	Surface Appearance
Size (length, width, thickness)	Manufacturer's Reputation
Nail Holding Ability	Long Term Supply

3.21 Key Japanese Attributes and Questionnaire Design

The survey was designed to determine the following 1) which of the attributes shown in Table 1 were most important to purchasers and users of wood based panels, and 2) how Japanese customers ranked three panel types (Lauan, CSP, and OSB) on these attributes.

While a number of product attributes may be important to the buyer, some are thought to be 'determinant' in the purchasing decision. A product attribute or characteristic may be important to the buyer and yet if there is no perceived difference between competing products with respect to that attribute then it is not determinant to the customer's purchasing decision. For example, strength might be very important but if all competing products are considered equal in strength then this characteristic would not impact purchasing decisions; it would not be a determinant attribute.

Alternatively, determinant attributes are those product characteristics that are important and also serve to discriminate between alternative products (i.e. customers do not perceive competing products to possess determinant attributes equally). For example, price may be only moderately important but if there are large differences in price between competing products it becomes a determinant attribute.

Determinant product attributes can be altered by the firm to impact on the relative competitive position of the firm's product in the market place. This can be accomplished by modifying production methods to eliminate weaknesses and/or build on strengths, by altering distribution channels, or by advertising campaigns.

There are a number of alternative methods for identifying determinant attributes. In a review and comparison of techniques (Alpert 1971), the direct dual questioning technique was found to be the simplest and best method for assessing overall preference. This method was chosen

for this study. As can be deduced from its name, the direct dual questioning technique involves asking the respondents two questions for each attribute. Specifically, each respondent is asked 1) how important each attribute is thought to be in determining the choice of product, and 2) how much difference they perceive between competing products on each attribute.

The underlying premise of the dual questioning technique is to account for the two dimensional nature of product attributes. The first dimension of an attribute is its importance to the purchaser, while the second is the perceived difference between products with respect to the attribute. Attributes that are rated high in terms of importance **and** difference are posited as determinant.

To summarize, the survey measured the importance and difference between products based on the 10 key product attributes shown in Table 1.

3.22 Selection of Interview Subjects

A judgmental sample of fourteen Japanese companies was selected with the assistance of Seaboard Timber and Plywood Asia Ltd. (Seasia)[1]. The small sample size employed in this research project is typical of industrial research studies of highly concentrated industries - such as the Japanese forest products import/wholesale distribution industry - where a small sample can comprise a significant proportion of the overall population. Under these conditions, one can be confident in obtaining representative data if sufficient care is taken during the selection of the judgmental sample.

In this research project, a judgmental sample was chosen over a random sample after weighing the trade-off between data validity/reliability and data collection costs. In light of the highly concentrated nature of the target population of Japanese importers and wholesalers, a random sample would not have improved data validity or reliability significantly. Furthermore, the incremental cost of interviewing a large random sample of Japanese companies would have been prohibitive. Given these circumstances, it was felt that the judgmental sampling procedure provided an acceptable trade-off between data quality and data collection costs.

The sampling procedure was designed to yield a representative cross section of Japanese companies involved in the import, distribution, and end-use of wood based structural panel products. The sample included both medium and large importers, wholesalers, and home builders located in Tokyo, Osaka, Sapporo, and Kyoto. As a result of the broad range of companies included in the sample, the potential for introducing significant bias was present. Of particular concern was the effect of weighting the responses from all companies equally, since there were considerable differences between companies in terms of the annual volume of structural panels each handled. To compensate for inter-company volume differences, post-hoc

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[1] Seasia - a wholly owned subsidiary of Seaboard Lumber Sales Ltd., Vancouver, B.C., Canada.

probability proportional to size (PPSS) sampling was employed in order to provide unbiased weights for subsequent data analysis (Cochran, 1977).

3.23 Statistical Analysis

Post hoc proportional to size sampling (PPSS) is a method to develop sufficient numbers for statistical analysis from a small selected, weighted sample (Cochran, 1977). A simple diagram is shown in Figure 5 and a brief explanation for PPSS follows:

1. Each respondent is weighted by the volume of panel products purchased in a given year. For example if a company that purchased 1,000 cubic metres of panels would be represented as a single sample from the population then a company that purchased 5,000 cubic meters would be represented as 5 samples from the same population. The entire population was then considered the weighted numbers of the sample.

2. Using random numbers, seventy-five companies were chosen, with each chosen company being replaced after selection. Thus companies with much higher volumes of purchases were more likely to be selected. This random sample of n=75 was drawn (with replacement) from the Proportional to size probability sampling distribution resulted in a data pool more representative of the overall population than the raw data pool representative of the 14 firms interviewed. All reported results are based on this random sample of 75 firms.

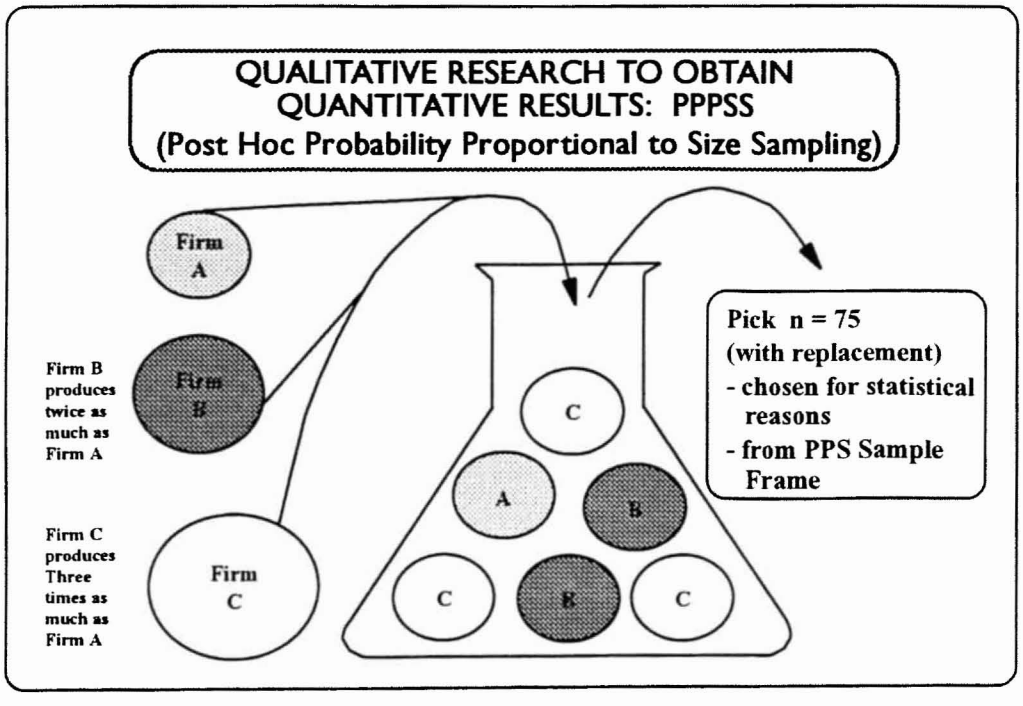

Figure 5: Pictorial Representation of PPSS

3. It must be noted that even though these 14 firms were responsible for almost 50% of panels consumed in Japan in 1990, the resultant information cannot be considered statistically representative of the total population of Japanese users of panels. However it can be considered to have substantive importance to suppliers of panels to Japan.

4.0 RESULTS OF MARKET RESEARCH IN JAPAN

4.1 RESPONDENT FIRMS

Interviews were conducted with key management personnel from each of the fourteen Japanese companies selected for the research study during February, 1991. All fourteen companies were involved in the import and/or wholesale of wood based structural panels, or purchased structural panels for use in home construction. Individual respondents were directly involved in the buying and selling of structural panels for their company and on average more than two representatives from each company were present during the course of the interview session. Interviews lasted an average of two hours.

Individual respondents included company presidents and a wide variety of purchasing and sales managers - including departmental/sectional managers, associate managers, assistant managers, general managers, and deputy general managers. Overall, forty-eight percent of the respondents belonged to the general category of senior management and were in a position to directly influence their firm's purchasing criteria. Other respondents represented technical or purchasing personnel who were also in a position to impact a company's purchasing policies..

When asked to describe their firm's principle business function, 50% of the respondents classified their firm as an importer[2], 21% as a wholesaler, and the remaining 29% were classified as home builders or manufacturers. Fifty percent of the companies indicated they were presently buying OSB/waferboard products, 36% indicated they were 'considering buying', and only 14% of the respondents indicated their company had no intention of buying OSB/waferboard at this time.

Total volume of wood based structural panels consumed in Japan during 1990 was estimated at 10.6 billion square feet on the 3/8" basis (BSF). The total volume of panels handled by all respondent firms in this study was approximately 5.7 BSF , or nearly 54% of total Japanese domestic consumption. Adjusting for potential double counting between importers,

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[2] All importers interviewed also performed a wholesale function in the Japanese distribution system.

wholesalers, and home builders, the respondent firms accounted for a total of 5.14 BSF (3/8" basis), or just over 48% of the total Japanese domestic consumption.

This volume data:

1) indicates the concentration of many of the panel product industries in Japan,
2) lends support to the selection of these specific 14 firms are a reasonable sample, and
3) provides credibility to the results despite the small number of firms interviewed.

4.2 IDENTIFICATION OF IMPORTANT ATTRIBUTES

Assessing the determinant attributes for OSB panels in the Japanese market first requires determining the relative importance of product attributes to customers. This section will first present the relative importance of attributes and then show which were determinant attributes after differences between competing products was considered.

As can be seen in Figure 6 there were only 4 attributes that respondents considered more important than average: size, thickness swell, quality, and security of supply. It is surprising that price was not considered above average for importance. However, this information does not take into consideration differences in these characteristics between the three competing wood panel products: OSB, Lauan plywood and CSP.

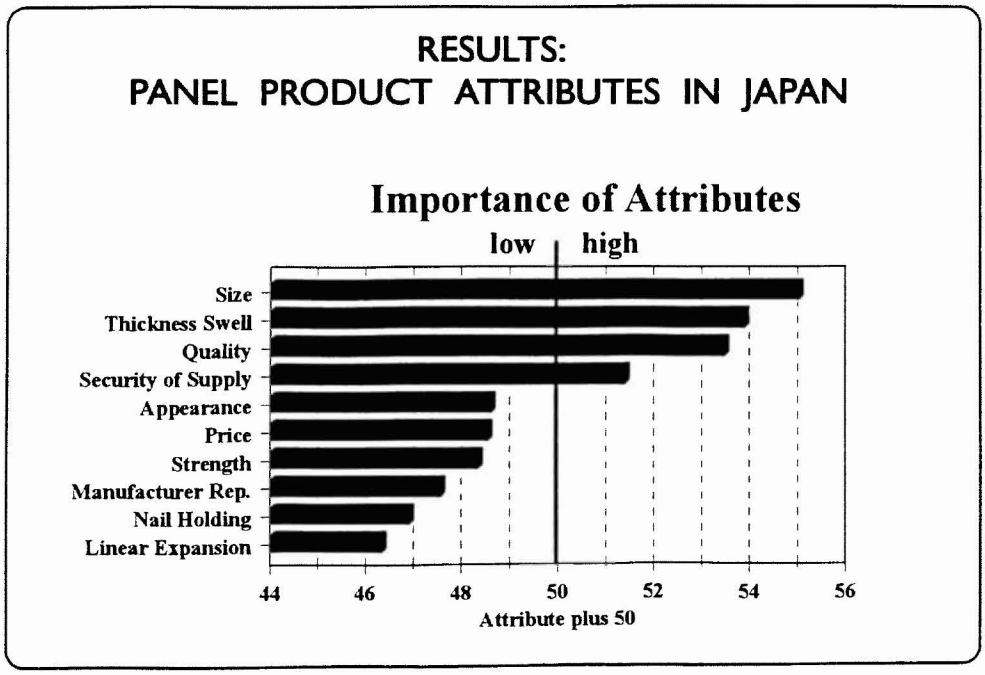

Figure 6: Relative Importance of Panel Attributes

4.3 IDENTIFICATION OF DETERMINANT ATTRIBUTES

Once the differences between competing products, as perceived by the customers, was taken into consideration the list of critical attributes grew. In order of relative importance the determinant attributes for Japanese customers in making purchasing decisions about wood based panels were: size, thickness swell, quality, security of supply, appearance, and price (see Figure 6)

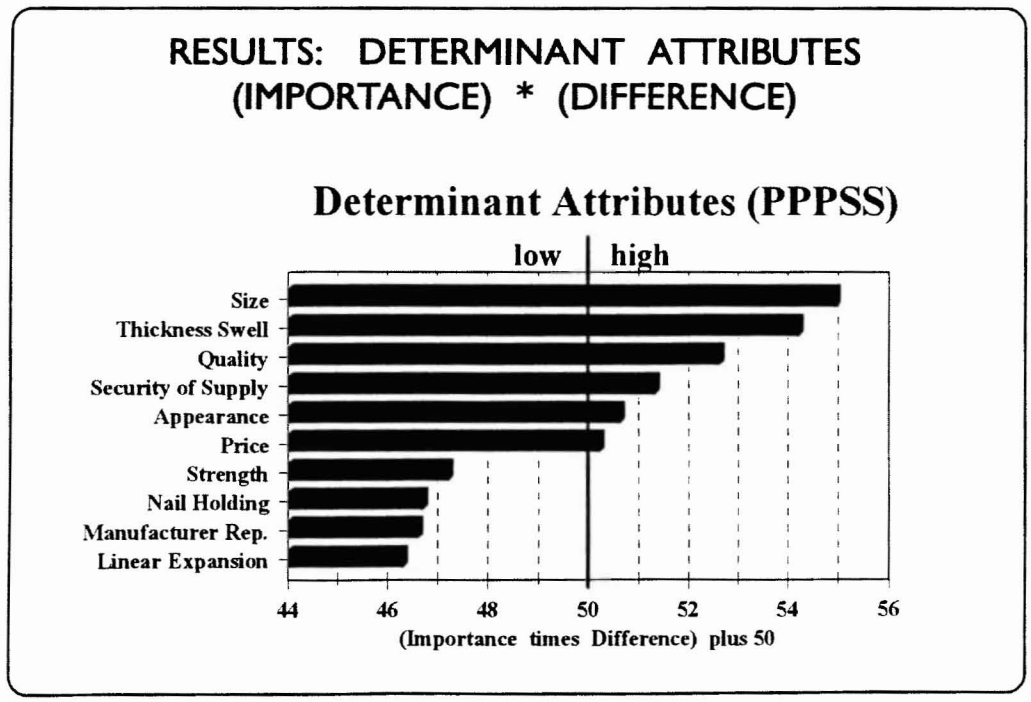

Figure 7: Determinant Attributes for Wood Based Panels in Japan

It is interesting to note that once the differences between the 3 competing panels for each attribute were considered, then appearance and price became characteristics which were of more than average importance in purchasing decisions.

4.31 Size

Japanese respondents considered size as the most important determinant attribute. There was no difference[3] between the two competing North American (NA) products: CSP and OSB. Lauan was most favoured in terms of size since it was available in metric sizes. Japanese house construction is based on the "tatami" or a 1 by 2 metre floor grid (Cohen, 1993). Wall panels are often based on a 3 by 8 foot standard (compared to NA 4 by 8 foot). This makes it difficult to cut a 4 by 8 foot wood panel into metric sizes. This result indicates that for any new OSB plant to target the Japanese market, they MUST cut in sizes based on the 3 by 8 foot or tatami standards.

4.32 Physical Stability (Thickness Swell)

In the second most determinant category there was little difference between Lauan and CSP, both of which were considered to have acceptable stability in terms of thickness swell. However OSB was deficient in thickness swell properties. During the course of interviews, respondents mentioned that it was North American representatives of OSB producing firms who kept mentioning thickness swell, not the technical departments of their own firms.

It is interesting to note that CSP was considered superior to both Lauan and OSB in physical stability in terms of linear expansion. OSB and Lauan were considered equivalent in this category. However all 3 products were within acceptable limits for the Japanese market.

4.33 Security of Supply

Respondents indicated a difference among all 3 product types in terms of security of supply. Lauan plywood was considered the most insecure product in terms of long term supply. OSB was considered the most secure long term source of structural panels for the Japanese market. CSP ranked in between these two extremes. This determinant attribute is one of the two strengths for OSB producers to build upon when marketing their product to the Japanese market.

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[3] Differences were calculated using t-test at alpha = .05 to determine statistical significant differences.

4.34 Quality

There was no statistically significant difference in respondents' perceptions of quality among the 3 products. However, OSB did attain the highest average in terms of quality, as shown in Figure 8, despite the lack of statistical significance (Statistical significance should not be confused with practical importance)

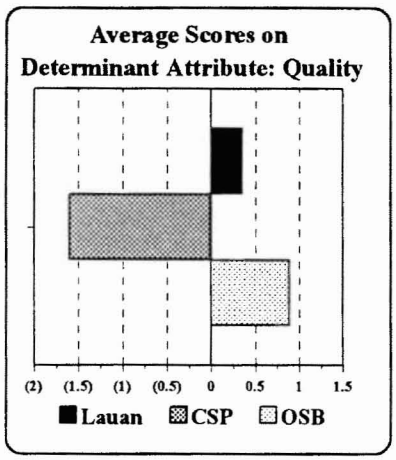

Figure 8: Attribute - Quality

4.35 Appearance

Appearance is a separate category from quality. Appearance is purely an intangible, an aesthetic appreciation of the overall visual impact of a material or product. Lauan plywood was ranked as the most superior product in terms of appearance. However it was surprising to find that OSB and CSP were considered equivalent in terms of appearance. Several comments from respondents indicated that OSB was more acceptable to certain of their clients than CSP. Canadian plywood, with its knots and plugs was often considered second class compared to Lauan plywood which had no plugs and was perfectly clear. However, OSB was considered a different or alternative type of product and not just inferior Lauan plywood.

4.36 Price

Price was the other category where OSB was significantly superior to Lauan and CSP (Figure 9). Respondents indicated that a 10-20% reduction from the erratic but increasing prices for Lauan plywood were required to make OSB attractive. Price stability was also mentioned as an important characteristic for OSB.

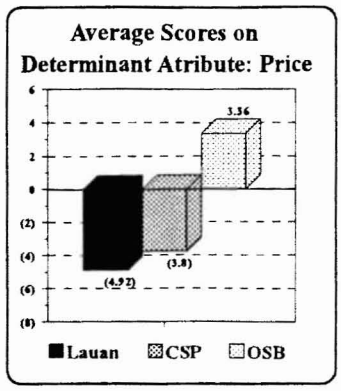

Figure 9: Attribute - Price

Shifts since 1991 in currency exchange rates, increases in the price of plywood quality logs from both Malaysia and New Zealand, and the general increase in operating plywood plants in Japan have resulted in a rapid, if irregular rise in prices for plywood in Japan. Regardless of these fluctuations prices for wood based panels in Japan are consistently higher by 25-100% than those in North America.

4.4 SUMMARY OF DETERMINANT ATTRIBUTES

Table 2 summarizes the ranking of determinant attributes. Products which received similar ranking are grouped together.

Table 2 : Ranking of Determinant Attributes

Attribute	Lauan	CSP	OSB
Size	1	2	2
Thickness Swell	2	1	3
Quality	2	3	1
Security of Supply	3	2	1
Appearance	1	2	2
Price	2	2	1

The strengths of OSB in the Japanese market are:

- ☑ security of supply,
- ☑ consistency of quality, and,
- ☑ price (both in terms of actual costs per unit volume and security of price over time).

The weakness of OSB, relative to competing products are:

- ☒ size,
- ☒ thickness swell, and,
- ☒ appearance.

Each of this weaknesses will be addressed in the next section on processing technologies.

5.0 RESULTS OF TECHNOLOGY ASSESSMENT

5.1 INTRODUCTION

The production of OSB has continually evolved since the initial technological developments that gave the industry its beginnings in the late 1960's. In almost every facet of production, second and third generation technologies have been integrated into nearly every OSB plant in North America. Although much of the technological change has been a continuous refinement of existing technology, recent developments have been more ground breaking and have resulted in new and innovative products. As manufacturers attempt to establish competitive advantages with new products such as parallel strand lumber and residential siding material, 'discontinuous' technologies such as steam injection pressing and wood fibre or paper overlay technology play an increasingly important role.

As one of the objectives of this research study, a survey of the technological horizon was undertaken. The inventory of emerging or innovative technologies forms the basis for matching promising (and hopefully) appropriate technologies with product requirements of the Japanese market for composite structural panels. This inventory included much proprietary information from actual mill tests, results from private research contracts, and unpublished information available only as preliminary results and unverifiable. Because of the large quantity of information and the proprietary nature of much of the results, only the conclusions from this analysis will be presented as they relate to the 3 weaknesses identified in the previous section: size, thickness swell and appearance.

The technologies reviewed for this study were grouped in the following general categories:

- Resin Technology
- Dimensional Stabilization Technology
- Pressing Technology
- Wafer Technology
- Overlay and Composite Technology
- Quality Control Technology

5.2 TECHNOLOGY AND PANEL SIZE

Both the quantitative analysis and qualitative comments indicated that it was essential for panels to be available in sizes suitable for Japanese style construction in a consistent manner. Current forming and pressing of OSB is based on a 8 by 24 foot panel which is then cut into 4 by 8 foot or specialty imperial sizes such as 4 by 10 foot. Current OSB products shipped to Japan mostly fit into the typical sizes shown in Table 3. Of these sizes 3 by 6 foot and 3 by 8 foot panels account for over 50% of Japanese panel usage. These sizes are currently cut from a

standard North American 4 by 8 OSB panel which results in substantial waste and/or low value off-sized pieces.

Table 3: Typical Japanese Panel Sizes

(all sizes converted to feet except where indicated)

2 x 6	**3 x 6**	4 x 5-1/3
2 x 8	**3 x 8**	4 x 8
	3 x 9	

A complete reliance on a single export market would make any OSB production facility a captive to external political and market forces. Ideally a production facility should be designed to provide the flexibility necessary to retain control of production and marketing decisions. It is important that an OSB plant be designed that can satisfy the needs of both the North American and Japanese markets.

The simplest solution to the size dilemma is to install a forming line able to meet both Japanese and NA size requirements. For the North American market an 8 by 24 foot forming line is needed. For the Japanese (and other Asian markets) a 9 by 24 ft. forming line is needed. The obvious applied technological solution is to develop and implement a forming line with flexible widths from 8 to 9 feet. Discussions with manufacturers of forming lines indicate that this is not an overly complex process and design has already been completed for a flexible forming line. The first Canadian production line is scheduled for start up in 1994. This adjustable forming line provides flexibility in forming "billets" which can be cut to size either for Japan or North America.

Producing two sizes of billet widths (9 ft. and 8 ft.) and a variety of panel widths requires a drying press able to accommodate larger oriented strand board products than current drying presses can accommodate. This change in the forming line requires large presses.

This technological solution (i.e. a flexible forming line and larger presses) adds minimal cost to the development and construction of a new OSB plant. However, it would be a very expensive upgrade to an existing plant currently producing only North American sized products. Thus a window of competitive advantage in the Japanese market can be established for new OSB plants in BC and the rest of Canada by selecting this type of technology (as discussed in Section 1.2, Item 3). Competition from lower cost production areas in the United States is limited to new facilities, not existing operations.

5.3 TECHNOLOGY AND THICKNESS SWELL

Examination of technologies to control thickness swell included mechanical solutions such as sealed steam pressing, new formulations of adhesives, a variety of new and exotic drying schedules, and simpler solutions such as adjusting the adhesive content in each panel. Analysis of all these technological solutions indicated that most mechanical technological solutions would be costly with little operational, empirical support for a positive cost/benefit ratio in panels of standard thickness.

Realistically, the most appropriate technological solution was also the simplest. To control thickness swell and reduce it to below 10% the following low cost, technologically appropriate solutions should be considered:

- ⇒ increase the adhesive content during panel formation,
- ⇒ ensure high quality wax based seals on all panel edges
- ⇒ in cooperation with adhesive companies, investigate new formulations of adhesives in an actual operating plant,
- ⇒ examine different drying schedules to reduce thickness swell to below 10%,
- ⇒ examine adjustments in the forming process to better control strand orientation, and,
- ⇒ examine advantages to single species, or controlled specie-mix of strands

These solutions do not necessarily utilize the most advanced technology but utilize existing and emerging technology in the most appropriate manner for operational success.

5.4 TECHNOLOGY AND APPEARANCE

Qualitative information gathered during the course of interviews uncovered interesting information concerning the appearance of OSB panels. Japanese customers did not consider that OSB had a negative appearance. In fact many of the people interviewed indicated that there was a market potential for appearance based products made from OSB. Samples of OSB products included:

- ✪ flooring; with OSB treated with hardening chemicals after staining and sold as "Active Floor" for basements,
- ✪ paneling; OSB was stained and sold as wall panels for children's rooms and basements

- furniture parts; including tops for school desks and end tables

Japanese respondents considered OSB much better looking than CSP, which they also perceived as inferior to Lauan plywood. OSB was perceived as a different type of product that could be used as a substitute for Lauan plywood. CSP was considered the same type of product as Lauan but of much poorer quality.

One of the key discoveries concerning appearance and the Japanese market was the tendency of North American suppliers to assume that NA biases about visual impact are the same in Japan. One executive interviewed could not understand why the sales representatives from NA firms producing OSB considered it ugly. Representatives for OSB producers must not carry their own negative impressions as part of the product they are attempting to export.

Technology cannot solve the impression of appearance but the strength of the visual aspects of OSB could be stressed. This include the complex and interesting surface pattern, the utilization of environmentally friendly, low value, renewable, materials, and the ability to make every piece very uniform since it is an engineered, re-constituted wood product.

5.5 SUMMARY OF TECHNOLOGY ASSESSMENT

There were three weaknesses identified in the Japanese market which impeded the rapid transfer of this new engineered panel product. Each of this weaknesses can be addressed, often through the use of appropriate technology in the following manner:

1) The need to produce panels that were 3 ft. wide for the Japanese market and 4 ft. wide for the North American market. Flexible forming lines and larger presses could meet both Japanese and NA requirements and provide costly technological barriers for short term competition. BC and Canada should establish OSB mills with the necessary flexibility to produce both 3 and 4 foot wide panels.

2) The need to reduce thickness swell properties to less than 10%. The most appropriate means was to combine a variety of low and high technological solutions. These would include increased resin content, modified pressing schedules, and controlled raw material mixes.

3) The need to promote the advantageous aspects of the appearance of OSB. This can be accomplished by proper training and education of sales and promotional personnel to ensure that negative stereotypical images developed in North America are not exported along with the tangible product.

6.0 MODEL VERIFICATION

Initial assessment indicates that empirical information provided by the more generic model applied to the specific case of producing an oriented strand board specifically for export to Japan is positive. Presentation of these results to two Canadian forest companies contributed to their decision to implement some the technological solutions identified in this report in facilities currently under construction. Ainsworth Lumber Co. has recently opened an OSB plant in August, 1994 using many of the technologies described meet the market requirements identified in this report. This facility, in 100 Mile House will be a test case to determine the applicability of this model.

In addition, Noranda Forest Products is building a facility in Mississippi using some of the results of this analysis to ensure that they can access the Japanese market in addition to the US market. Once operating results from these two facilities are known the initial positive assessment of this model can be empirically verified.

Currently exports of OSB to Japan has increased from 28,000 cum (cubic metres) in 1991, to 58,000 cum in 1993. Over 80% of the 1993 imports originated in Canada. The rapid increase is due to the expansion of use from packaging to substituting for plywood. The Japanese press expects the Ainsworth mill to "bring an explosive increase in supply" (all data from JLJ, 1994). This information is cause for optimism concerning both the model of new product diffusion and the specific case being studied.

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APPENDIX 1: COMPANIES INTERVIEWED IN JAPAN FEBRUARY 18-28, 1991

Company Name	Type of Company	Wood Products	Size of Company (conversion of ¥158/$US)
Marubeni Corporation	Trading Company	- produces, imports & exports MDF, LVL, panels, lumber, P & P	- in 1990 was 4th largest wood importer to Japan
Nichimen Corporation	Trading Company	- leading importer of Chilean logs & other wood products	- in 1990 largest wood importer
Kanematsu Corporation	Trading Company	- wood operations in globally - imports wood products	- total trading in 1990 = 35.5 billion $US)
Venichu Corporation	Large wholesale of building products	- imports logs, lumber, panels, & building products	- large wholesaler
Mitsui Home Company	Largest Japanese 2 by 4 home builder	- imported 117 MMBF in 1990: ~ 20% of all Japanese imports	- 9th largest Japanese wood importer 1990
Shimada & Company	Medium size importer on Hokaido Island	- imports lumber, panels, cants, & wood products	- small importer/wholesaler with staff of ~10
Kenzaisha Company Ltd.	Medium sized wholesaler on Hokaido Island	- sells full line of building materials	- small size company for Japan but major wholesaler in Hokaido
Taishin Home	Small building contractor	- builds 350 houses/year	- small home builder of traditional residences
Sekisui House	Large home builder of over 60,000 in 1990	- uses all types of imported & domestic wood products	- large home builder with focus on pre-fab building components

Company Name	Type of Company	Wood Products	Size of Company (conversion of ¥158/$US)
Daiwa House	Large home builder of over 40,000 in 1990	- uses all types of wood products, both imported and domestic,	- large builder of traditional homes
Nissho Iwai	Trading Company	- imports logs, lumber, & panels - international joint ventures	- 2nd largest wood importer,
Sumitomo Corporation	Trading Company	- imports logs and lumber globally - joint ventures globally	- 13th largest wood importer
C. Itoh & Company Ltd.	Trading Company	- imports all wood products - joint venture in Brazil	- 5th largest wood importer, 1990
Y. Higa Corporation	Small trading house focusing on North American lumber,	- imports CLS and cut-to-size N. A. lumber products	- sales of approximately 150 million $US in 1990