UBC Social Ecological Economic Development Studies (SEEDS) Student Report

Marketing Strategy for Small Diameter Douglas Fir

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ABSTRACT

"Marketing Strategy for Small Diameter Douglas Fir"

In the forest of northern British Columbia, small diameter Douglas fir trees creates several environmental problems including the interruption of mule deer grazing paths, reduction in the vigor of large diameter trees, and an increased potential for large forest fires. However, this timber creates a significant opportunity to establish a profitable wood product manufacturing facility. Due to the high logging costs, the selection of the optimal product was focused around high end, value-added products. After an analysis of all potential markets for the Douglas fir logs, an end grain product line was selected as having the largest market and price potential. The product line included a flooring system, acoustic-ceiling panels, RTA tabletops and rustic coffee tables. The target markets for these products were architects and interior designers, carpenters and finishing specialists, contractors, and homeowners. The distribution and promotional strategy for each of the four target markets are shown below. In addition, the suggested pricing information for all four products are illustrated in the figure below.

	TARGET MARKET			
	Architects / Interior Designers	*Contractors*	*Carpenters / Finishing Specialists*	*Homeowners*
Distribution	~ Direct Selling ~ Retailers	~ Direct Selling ~ Retailers	~ Direct Selling	~ Retailers
	Majority of product will be transported by truck to customers on west coast of North America.			
Promotion	~ Personal Selling ~ Point of Purcahse ~ Trade Shows ~ Magazines	~ Personal Selling	~ Personel Selling ~ Point of Purcahse	~ Point of Purchase ~ Magazines ~ Television

PRICING INFORMATION				
Product Description	*Selling Price*	*Profit Margin*	*% of Total Prod'n*	*Net Profit per Log*
Flooring Material	$ 12.50 per sqft	27.8%	80.0%	$ 18
Ceiling Tiles	$ 30.00 per sqft	47.1%	10.0%	$ 72
Table Tops	$ 30.00 per sqft	47.1%	5.0%	$ 72
Rustic Tables	$900.00 per table	48.7%	5.0%	$ 124
Total			100%	$ 31

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1.0 INTRODUCTION

The UBC / Alex Fraser Research Forest located in Williams Lake, BC is faced with a very large problem and yet a promising business opportunity at the same time. The problem, in summary, deals with finding a potential market for a large quantity of small diameter commercially thinned Douglas fir.

Surprisingly, the need to commercially thin Douglas fir is related to today's effectiveness of minimizing and eliminating forest fires in British Columbia. In the past, forest fires destroyed the majority of small diameter timbers in the northern BC forests. Today, most forest fires are contained before they are able to grow out of control and as a result, the small diameter trees life expectancy is much longer than ever before. Unfortunately, these small diameter trees compete for soil water with large trees and thus, reduce the vigour of the large trees.[1] In addition, without the overhead coverage of the large trees, mule deer spend large amounts of energy traveling through the deep snow which leads to malnutrition or even death of the animal. Consequently, commercial thinning is needed to tackle two major environmental issues facing today's ecosystems in the BC forests.

Unfortunately, the product and logging techniques of the small diameter Douglas fir trees provide significant challenges in finding a product or group of products that will be profitable for an enterprise. First, these trees have been harvested at an expensive rate of approximately two hundred dollars per cubic metre, nearly fives times greater than the average contractor's costs. Second, the logs not only have an average small end diameter of four inches, but also have a large amount of crook, displaced knots, and taper. Finally, the proportionately larger pith in small diameter logs as compared to large diameter timbers causes major problems in drying and manufacturing of wood products.

On the other hand, the small diameter Douglas fir trees have several appealing characteristics that could help market any products produced from these logs. First, since the small trees have been surviving in the under story of the canopy provided by larger more mature trees, the Douglas Fir has a very tight

grain structure. The tight grain structure means that the wood products produced from these logs are structurally sound and dense causing them to be more dent resistant and less prone to creep. Second, the stumpage rates on these logs are negligible because their diameter falls below the lower utilization size specification in the BC forest code. Finally, if a profitable product could be found to make out of the Douglas fir logs, the supply of these logs should continue for a minimum of thirty years to a maximum of an infinite number of years.

The goal of this report and those involved in the UBC and Alex Fraser Research Forest is to determine the most viable product that at the very least would offset the logging and manufacturing costs of commercially thinned Douglas fir trees. In addition, it is assumed that all the costs involved in starting a small scale business are available through the people involved with this current challenge. Due to the advantages and disadvantages of the small diameter Douglas Fir trees, the potential wood products produced are constrained by price and wood properties. With high logging costs, the product must sell as a high end wood product. Nonetheless, there are still an unlimited number of possible products that can be created from these trees and this report outlines the most viable, cost-effective products that can still command a relatively exclusive price.

2.0 PRODUCT OPPORTUNITIES

With the level of technology and innovation in the wood products market, the small diameter Douglas Fir logs could be converted into any number of primary and secondary wood products. Within the primary sector, logs could be cut into dimension lumber or broken down into smaller components that could be turned into engineered wood products, composites, pulp chips, or energy. Within the secondary sector, the logs could be used in variety of roundwood applications or any number of furniture, millwork, or interior components. Obviously, every application has its advantages and disadvantages and must be thoroughly examined before making any potential recommendations.

2.1 Dimension Lumber

Any log that has a diameter of four inches or greater can be converted into a 2x4 or at the very least a 2x3. Since most machine and equipment manufacturers anticipated a supply of smaller diameter logs, the technology available for processing small diameter timber has improved throughout the past decade. Nonetheless, most sawmills that have attempted to achieve profits from a strictly small diameter log diet have had limited success. "A study by Wagner et al. compared the potential economic value of small diameter sawtimber delivered to a conventional random-length sawmill, a studmill, and a high-speed small-log sawmill to produce 2x4's. Of the three mills, only the high-speed sawmill equaled or exceeded harvest and delivery costs."[2] Nonetheless, dimension lumber is a commodity product and as a result, most dimension lumber producers compete for pennies in a global market where the countries with the lowest labour costs usually are the only ones to survive. "Since 1971, commodity prices have dropped just over 50% in real US$ while sophisticated, value-added products have increased by 355%."[3] Considering the costs associated with the equipment needed to develop a high-speed small-log sawmill and the competitiveness of the market, dimension lumber is likely not the best use of the Douglas Fir resource.

2.2. Engineered and Composite Wood Products

Engineered or composite wood products provide a technology that suits the changing forest resource base. In most cases, these products best utilize the wood fiber of small diameter logs and produce products that have characteristics better than those products produced from old growth forests. In addition, the production of engineered and composite wood products has continued to increase due to rapid acceptance in the marketplace. However, the initial investment in the technologies required to product these products are usually considerable and likely out of the realm of the budget for this project. Furthermore, the market value of chips, particles, flakes, or strands is low making it almost impossible to turn a profit on selling the small diameter Douglas fir to a current manufacturing facility of composite or engineered wood products.

2.3 Pulp Chips and Energy

In the past, paper made out of pulp chips were a common product made out of all small diameter material. Currently, an even better use of these pulp chips is as fuel to produce energy in the form of electrical generation. Obviously, the demand for energy is high especially in parts of the United States such as California and as a result, the estimated price of energy is expected to increase in future years. However, once again the investment requirements to open a co-generation plant are extremely high. Furthermore, the current market value for pulp chips is only $30 per m^3, well below the costs of harvesting the small diameter Douglas fir logs. Consequently, converting these logs into pulp chips is not suitable for starting a profitable business.

2.4 Structural Roundwood

Considering the logging costs needed to commercially thin the small diameter Douglas Fir logs, it is essential that manufacturers of this resource move up the value chain in order to obtain profits. A simple value-added product that could potentially meet this requirement is structural roundwood. Structural

roundwood can be used for a variety of structural applications including trusses, beam-column elements for post and frame building systems, and pile foundations for residential structures. The advantages of using a four inch Douglas fir log are the end product is less susceptible to warp, natural taper makes it suitable to use in column applications, and processing costs are low. Nonetheless, the crook found in most of the Douglas fir logs could create problems in many of the structural roundwood applications. In addition, the market value for structural roundwood may still not provide the income to overcome the large logging costs.

2.5 Secondary Wood Products

A subsequent movement down the value chain leads to the fastest growing sector of the wood products business, the secondary industry. The secondary industry is composed of various wood products including furniture, doors, windows, flooring, and other millwork. During the five years between 1994 and 1999, world imports of primary wood products (logs, sawnwood, wood-based panels, and pulp and paper) grew by 14% while imports of secondary wood products rose by 54%.[4] In addition, our friendly neighbor to the south, the United States, has continued to dominate world imports of secondary products averaging 30% for nearly all segments of the market as shown in Figure 1 Furthermore, the market price of secondary products is higher and has fewer fluctuations as compared to most primary wood products. Today, the value of world trade of wooden furniture ($29 billion) exceeds that of sawnwood ($25 billion), and wood-based panels ($16 billion). Consequently, for the small diameter Douglas Fir logs some form of secondary wood product would allow for the greatest value recovery from our natural resource. However, with such a diverse number of value-added wood products, a further investigation into the secondary industry is essential in determining the optimal solution to our problem.

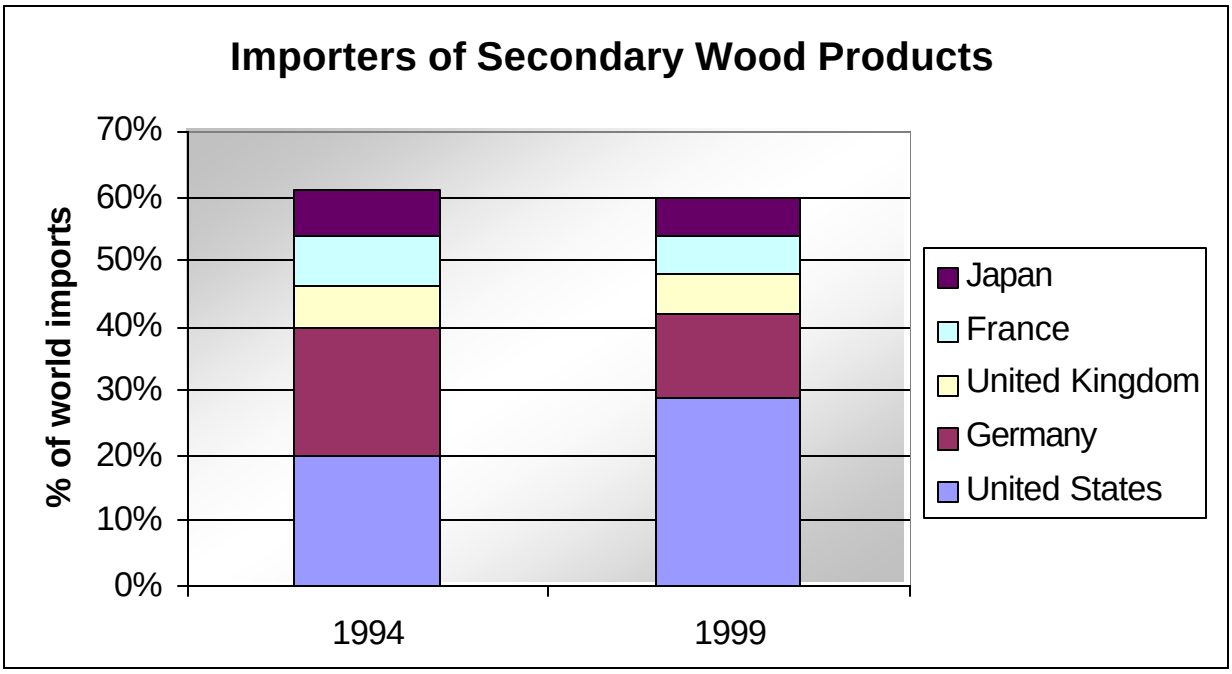

Figure 1Importers of Secondary Wood Products, 1994 and 1999.

3.0 SECONDARY WOOD PRODUCT MARKETS

As stated earlier, the secondary wood industry consisting of a variety of products ranging from doors to tables however, can break down into two major sectors: furniture and millwork. Both of these sectors have experienced growth during the past five years however, differ in many aspects including their supply pattern and regions of supply growth.

3.1 Furniture Sector

The furniture sector is a fast changing industry that will certainly be influenced by the emergence of China in the world markets. Although those countries focused on design intensive furniture such as Italy continue to be the world's largest exporters, countries with the lowest wages especially China have experienced the fastest growth in the industry. In terms of importing behavior, the country that imports the greatest amount of furniture is the United States with over $8 billion of furniture per year. Figure 2

displays the percentage of world imports for the five major importers in both 1994 and 1999. Of note, the U.S. has increased their level of world imports from 21% to 29%, however, only 27% of all imports to the United States are drawn from North America.

Since most developed countries cannot compete with the low wages found in developing nations in Asia and South America, the only profitable niche for Canadian small diameter Douglas Fir is in the high end furniture sector. Naturally, the United States is an ideal market for Canadian furniture due to its large market size and close proximity to the manufacturing facility. Nonetheless, Asia is continuing to gain market share in the US furniture sector and thus, a strong promotional campaign would be needed to create a market pull from the end consumers.

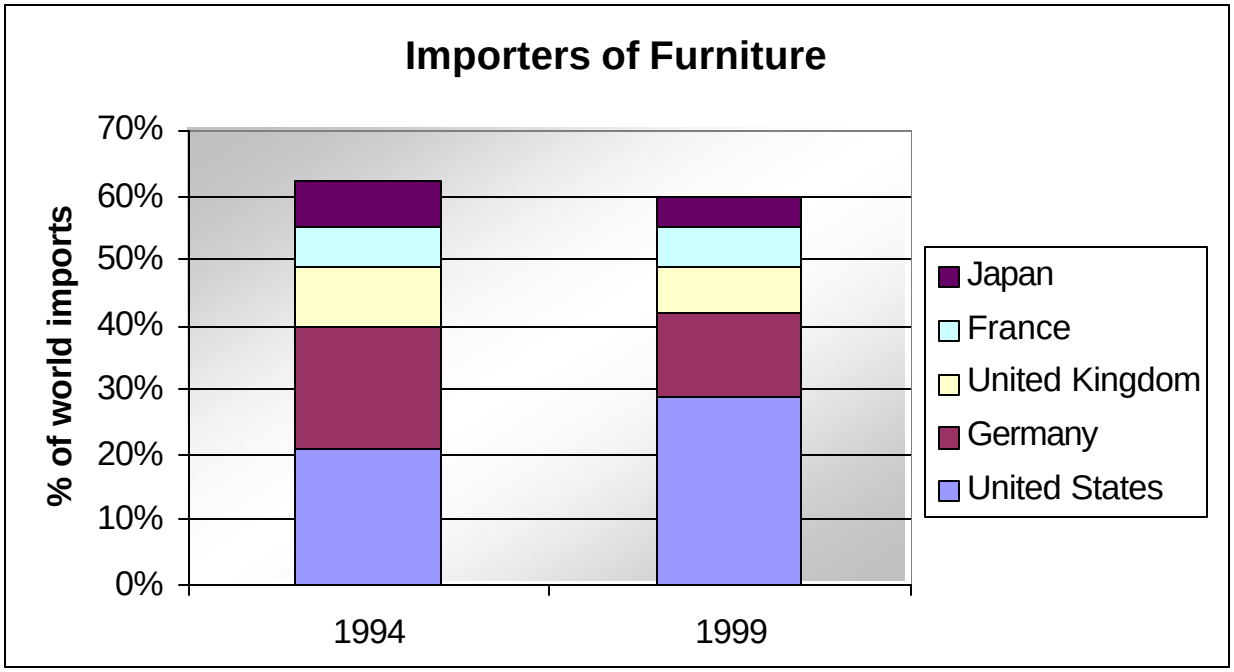

Figure 2Importers of Wooden Furniture, 1994 and 1999.

3.2 Millwork Sector

The main products in the millwork sector are doors, windows, flooring, and mouldings. In terms of supply, millwork has both similarities and differences when compared to the furniture industry. Similarly to

the furniture sector, the United States is the largest importer of millwork and has continued to grow in terms of this function as shown in Figure 3. On the other hand, the US draws 75% of its supplies from Canada as apposed to only 27% of furniture. The reason for this discrepancy is the fact that strong commercial links exist between Canadian sawnwood exporters and the United States. In addition, major sawnwood exporting nations such as Canada have shown the strongest growth in joinery supplies. This supports the notion that major sawnwood exporters' links with the construction sector have been much stronger than with furniture manufacturers.

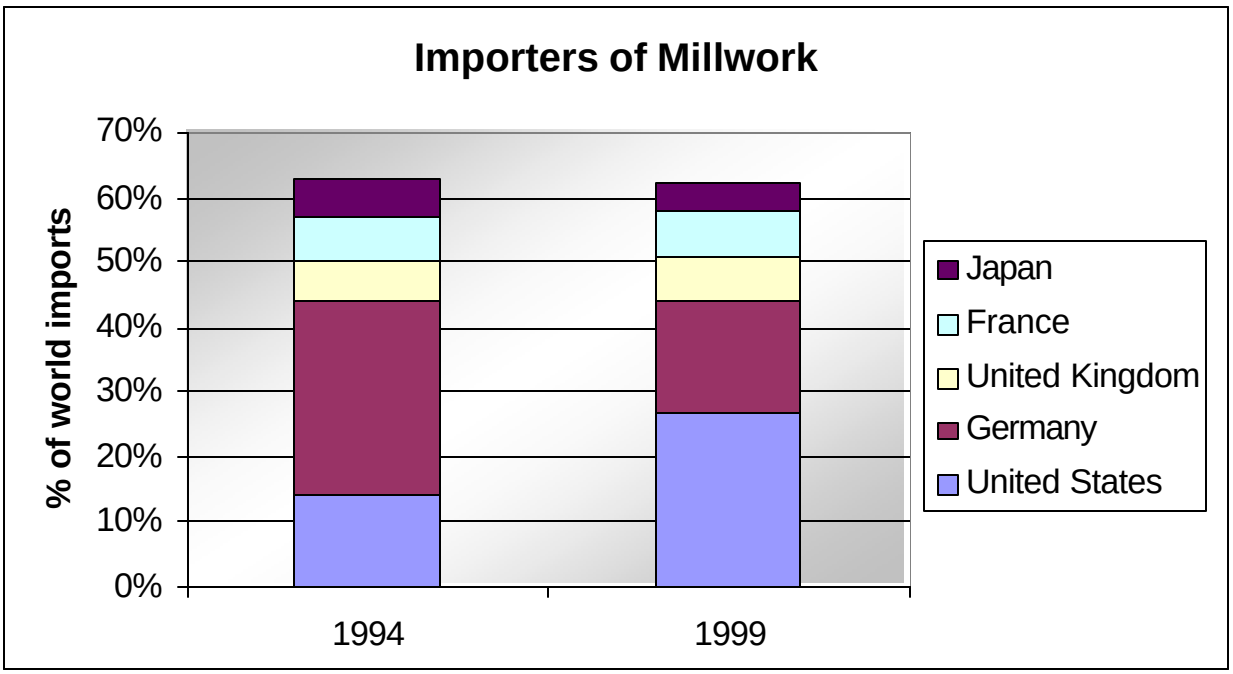

Figure 3Importers of Wood Millwork, 1994 and 1999.

Due to the close relationship between Canadian lumber producers and the US millwork industry, there appears to be a strong potential market for flooring, doors, windows, and mouldings manufactured from small diameter Douglas Fir logs. The market for millwork is composed of two separate segments: the renovation and new housing markets which have both experienced growth during the period from 1990 to present. As expected, the millwork demand from the new housing market in the United States is directly proportional to the housing starts in the US. Figure 4 shows the changes in total housing starts in the US

and also segregates the housing starts from Western US due to its close proximity to British Columbian products. From the graph, the housing starts for both the entire country and the west coast have remained consistent during the last twelve years illustrating the robustness of this market.

Renovation millwork consists of all wooden products supplied for remodeling and home improvement purposes. It is a market that is in the midst of endured growth with current sales topping $102 billion per year in the US. In addition, 36% to 57% of the total remodeling market can be made from small diameter softwood timber such as the commercially thinned Douglas fir found in the northern BC.[5] Obviously with both the renovation and new houses markets, if a popular millwork product could be manufactured from the Douglas fir logs, the consumer base that could be tapped in the US alone is staggering.

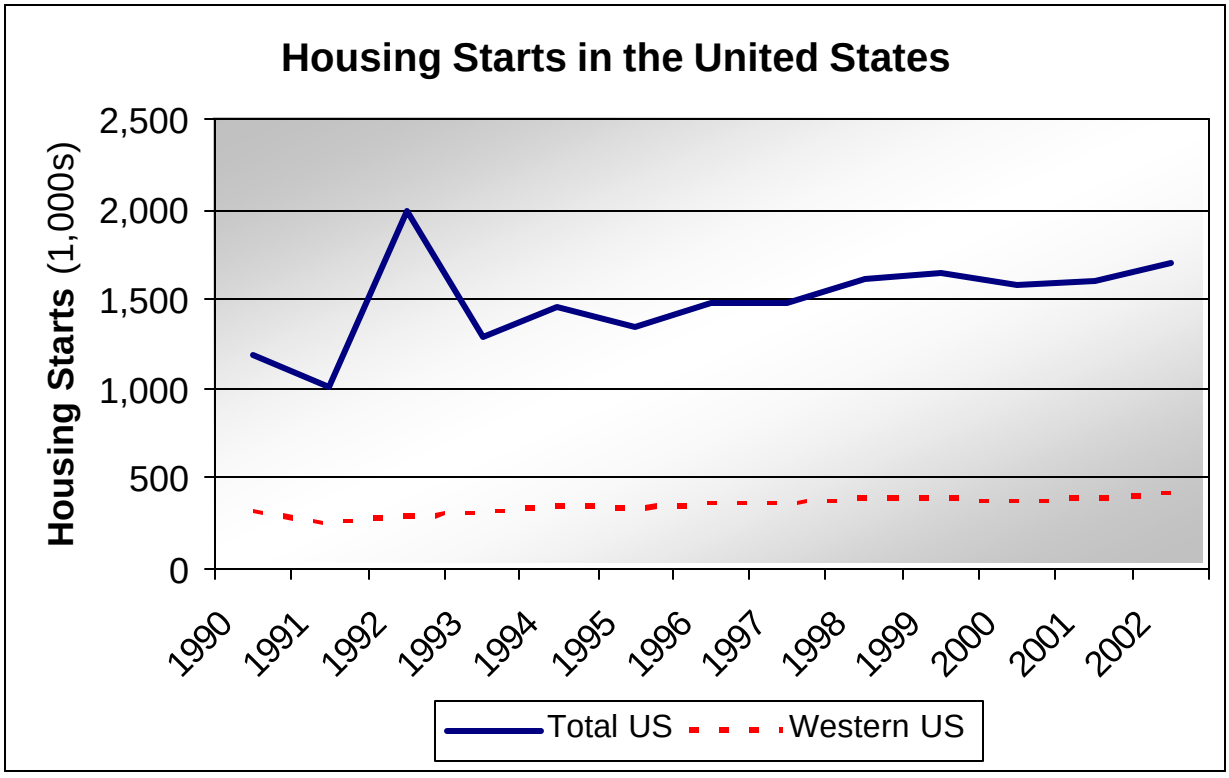

Figure 4Housing Starts in the United States, 1990 to 2002.

3.3 "Green Products"

Today, consumers of wood products are no longer only concerned with price and appearance but also its level of environmentally friendliness. The so called "Green Movement" has swept through architects, builders, and retailers around the world causing all producers of wood products to become increasingly aware of the origin and properties of their natural resource. In terms of the exact definition of the phrase, "green products" usually meet one of three goals: (1) efficient use of all resources including energy, water, and materials and minimization of waste, (2) conservation of natural environment, and (3) creation of healthy home environment for existing and future generations.[6] Based on this definition, millwork or furniture produced from commercially thinned Douglas fir logs could be marketed as a "green product". Not only would these products extenuate any new or remodeled home, but also, would pose no risk to human health, help restore the natural forest, prevent forest fires, and reduce threats to mule deer.

With the largest industry in British Columbia at risk, it is essential to change with the times and have forest companies move towards a more environmentally friendly approach. In a report produced by IBM Business Consulting Services, 30 customers from US, Japanese, European, and Canadian buyers who purchase more than $2 billion worth of BC forest products were surveyed. The survey indicated that forest supplier regions that do not respond to the "green shift" are at serious risk of losing market share. In addition, the IBM report states, "most customers believe that environmental procurement is here to stay and will become a standard practice."[7] Consequently, a promotional campaign revolved around the "greenness" of the products manufactured from the small diameter Douglas fir could lead to a successful product launch.

4.0 MARKETING ANALYSIS

The first step in a marketing plan is to determine the target markets for the desired product. Afterwards, the product range and application, promotional campaign, distribution, and price must be developed for each individual target market.

4.1 Target Markets

When looking at target markets it is essential to look specifically at who are the customers, more specifically, who will be buying the product, will anyone be referring a customer to use the product or will the customer ask for the products himself? Speaking specifically about the Doug fir used in an end grain panel product application, a list of the top four potential markets are listed below which would prove the most profitable or would create the largest customer demand in terms of a market pull. The important facts to take away from this market designation are that the majority of these customer market bases are people who are involved in the remodeling or redecorating area. More importantly the emergence of loft or studio spaces in highly populated metropolitan areas is possibly one of the markets which is essential to the success of this product, because of the demographic of the customers that usually renovate these spaces and the disposable income that is associated with these types of customers.

4.1.1 Architects and Interior Designers

In an emerging age where old-is-new and new-is-innovative, architects and interior designers are crucial to specifying which products are trendy and which products they will choose to use in their new projects. The Doug fir panel is a highly versatile product for this type of customer because of the exclusivity that is associated with a niche product. Also, because of its unlimited number of uses, a designer has the freedom to use the panel as a recurring theme in a room or and entire house. Architects such as Frank Lloyd Wright used wood not only as accent trim, but also as a focus piece that

was used throughout the house to create a free flowing, continuous design. In the case of the end grain panel, it could be used in the kitchen as flooring, in the living rooms as recessed ceiling panels and in the family room, living room or TV room as tables or again as flooring. The idea that's needs to be stressed here is that the Doug fir panel is a new and innovative product that is highly flexible and has an unlimited number of applications which could be furthered utilized by a skilled and experienced architect or interior designer.

4.1.2 Carpenters and Finishing Specialists

In new home construction or in large scale remodeling projects a contractor would hire and finish carpenter to install all the mouldings, base boards, millwork and wood flooring. These carpenters rarely have any input into the design of the project, but a large majority of the time the finish carpenters do a great deal of remodeling themselves or at some point they will start up their own business.

4.1.3 Contractors

This category can be divided into two sectors (1) new homes and (2) renovations. With new home construction a contractor does not have significant input into the products that are used in the new house, unless the contractor runs his own company and is building a series of houses for specific clients. The main focus in this area would be aimed at contractors in charge of remodeling projects. Most of these projects do not require and architect or interior designer to designate the specific material that will be used in the renovation, this is usually a function performed by the homeowner and the contractor co-operatively. Thus, there lies a great opportunity to have a contractor suggest a new product such as the end grain flooring for use in a remodeling project or if the contractor is informed about the product and the home owner specifically asks for a "different" flooring, then the contractor has the information that he can provide to the home owner.

4.1.4 Homeowners

Once again this category can be divided similar to the contractor sector, with (1) new homes and (2) renovations, but in this case the remodeling will presumably be a DIY project. The main force driving this market sector will be simple customer demand which will create a market pull situation, where the home owner asks specifically for the flooring product or purchases a table in a showroom or home center.

4.2 Product

All products incorporate a panel into the design to accentuate the tight end grain of the Douglas fir logs. The production process to manufacture these panels is shown in Appendix A including pictures to illustrate the approximate appearance of the product.

4.2.1 Flooring

The original and possibly most viable approach to this product is a finished flooring application. The pieces can be applied to the pre-existing substrate using flooring adhesive and while a tongue-and-groove hardboard application, which the squares come attached to, will protect the Doug Fir from fracturing due to fluctuation in moisture content.

4.2.2 Ceiling Panels

The next innovative idea to spawn from the end grain application was panel product similar to the flooring in design but used in a completely different application. A panel would be produced to meet design specifications and affixed to the ceiling with spacers behind the panel to provide distance between the ceiling and panel. These panels would be designed breakup the monotony of a boardroom space, while adding acoustic value.

4.2.3 Table Top

The idea using the panel in a tabletop application originated from the tremendous growth of the DIY market, which is outlined in the study done by the Freedonia Group which estimates the DIY market for finished wood products will have risen from $278 million in 1999 to $400 million by 2004[8] said that especially with such stores as Ikea and Home Depot. The same panel product used for the ceiling panels and flooring would have a solid piece of vertical grain Doug fir attached around the outside to hide the hard board. This solid wood could be produced from waste product not used for the end grain panels or could be made by taking the "baby-squares" which were cut from the original log. The table tops would made into a variety of sizes which would then be sold directly to the customer in a home center, where the average carpenter could either use it to make their own table application or simply use it to cover and old table and give it new character. However, this panel could be sold to a DIY store such as Ikea on a large scale for use whatever applications they feel necessary.

4.2.4. Natural Tables (Table Top with Crooked Waste Pieces)

The final and most complete application for the small diameter Doug fir involves using the same panels that were produced for the DIY table top, but the waste round wood that was not straight or large enough to turn into solid wood would be used as legs for support and cross members for dimensional stability. The small support members would be sold as either (1) a finished application where the bark has been stripped off using a drawknife or a drum debarker, or (2) in an unfinished state with the bark still in tact on the roundwood, however this use would still need to have a sealant applied to it, so the bark would not flake off when it dried.

4.3 Place

When designing a marketing plan it is important to first derive the product that will be produced, establish whom the product will be sold and then where will the customer be able to purchase or handle the product.

4.3.1 Architects

Interior designers and architects are very tactile consumers, they like to be able to handle their projects, which is an essential part of being an effective designer. Consequently, having a product display in a flooring retail store would be an effective way to ensure these specific types of consumers will at least handle the products. Another effective method for getting the product into their hands is personal selling, promoting through trade shows and business-to-business soliciting, making designers become familiar with the products.

4.3.2 Finish Carpenters

Finish carpenters are not likely to visit a retail store to handle the products he might be working with in the future. Therefore, the effective method would involve personal sales, where a salesman could ensure the finish carpenter would handle the product before he uses other flooring or millwork products. If there were any opportunity for this customer to suggest a new product, then he would be more inclined to choose a product used in the past or one that is familiar to the carpenter.

4.3.3 Contractor

A contractor would behave in the same manner as an architect, therefore the same methods could be assumed for this customer. Using direct selling and placing the product with a flooring retailer would increase the chances a contractor would use the products in a new project.

4.3.4 Home Owners

Homeowners are the most likely out of all the four customers to specifically demand the products for their new home or remodeling project. However, it is not as easy to encourage homeowners to visit a flooring or flooring retailer where they would receive the most exposure to the products, therefore it would be a wise decision to form a co-operative agreement with a home centre such as a Home Depot where potential customer traffic is high and the chance that a customer would have an opportunity to handle the products is greatly increased.

4.4 Promotion

With the emergence of new home markets such as studios and industrial inspired lofts, it is essential to know who the customer is, as well as the range of applications that he will be using your product. These varying customers each with their own characteristic demographics require specific methods of promotion to reach that customer. In regards to the architect and interior designers, the most effective means of promotion is magazine advertisements, although magazines such architectural digest and secondary wood products magazine can demand a high price for print ads, the effectiveness of this approach is very high as compared as compared to television ads. A report from Millward Brown found that magazine advertising produced three times the consumer awareness per dollar spent.[9] The figure below illustrates the contribution that television, magazines, and the combination of the two make on advertising awareness and their relative budget for the years 1996 and 1997. In addition, using magazine advertising for customer promotion would likely prove to be effective in creating awareness among women. The best magazines for these print ads are Martha Stewart Living, Home Digest, and Good Housekeeping.

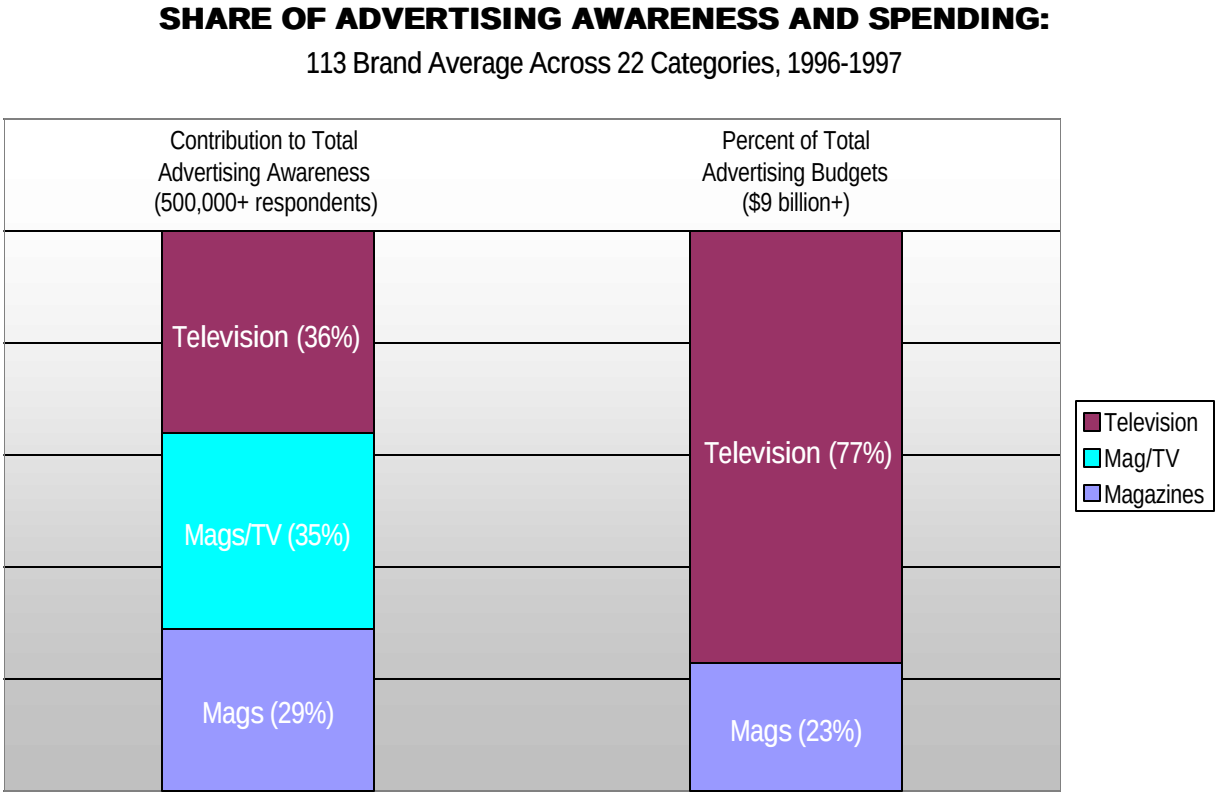

Figure 5Advertising Awareness and Spending for Magazines and Television.

While another form of promotion, architects in particular, is trade shows such as Ligna or other trade shows that feature a wide range of secondary wood products. Many different people frequent trade shows, therefore this method of promoting could be effective for a wide range of potential customers not just designers.

Also, a method of promoting to designers, homeowners and contractors alike is point-of-purchase. Outlets such as retailers or high traffic centres where designers frequent present a perfect opportunity to promote the products using large professionally designed displays, where tactile samples can be set up for the potential customer to handle, as well as examples of the products as they have been previously used other homes and businesses.

One method that would be effective for designers, finish carpenters and contractors is personal selling, although this method can be very slow and time consuming. However, personal sales are very

good method to get the customer to handle the product and with a salesperson present, any question the customer has can be answered on the spot and new applications the customer may not have known about can be spurred by open forum discussion.

A final method of promotion target mainly at the homeowner, but not exclusively, is television advertising. There are a large number of new remodeling and decorating home shows now on a number of channels and even entire networks devoted specifically to this genre of programming. If designers of these shows on networks similar to TLC use these products on the show, the amount of customers that would see the products would immensely outweigh any other form of promotion.

4.5 Price

The final price for all of our products was determined using a combination of a cost based and value based pricing system. All of our products will be marketed as a high end product targeting all trendy, wealthy homeowners. Therefore, the selling price was based on the value that our targeted customers would be willing to pay for our collection of products. In addition, an average markup or profit margin based on average industry averages was used to ensure maximization of profits. For all furniture, furniture components, and ceiling tiles, the profit margin is between 45% and 50% while our flooring product will have a profit margin of approximately 30%. The primary manufacturing costs were based on the *Chopsticks Small Diameter* Study completed by the partnership of Shasta-Trinity National Forest and the Watershed Center in California.[10] The additional costs were based on industry figures and estimates from past personal experiences. Figure 6 shows the selling price, profit margin, production breakdown, and net profit per log for all four products. The production breakdown predicts the percentage of logs that will be used to fabricate each product. Currently, flooring is the dominant theme will 80% of the log supply used to make this manufactured good. It should be noted that ceiling tiles are not yet fully customized acoustic panels and therefore, the selling price is low. However, the goal with this product line is to move into the

high end, high priced acoustic panel market once the infrastructure and technical expertise is developed.

Finally, an in-depth cost structure for all four products is provided in Appendix B.

PRICING INFORMATION				
Product Description	Selling Price	Profit Margin	% of Total Prod'n	Net Profit per Log
Flooring Material	$ 12.50 per sqft	27.8%	80.0%	$ 18
Ceiling Tiles	$ 30.00 per sqft	47.1%	10.0%	$ 72
Table Tops	$ 30.00 per sqft	47.1%	5.0%	$ 72
Rustic Tables	$900.00 per table	48.7%	5.0%	$ 124
Total			100%	$ 31

Figure 6 Pricing information for all four products.

5.0 CONCLUSION

Albert Einstein once said, “From every problem comes great opportunity.” This quote perfectly exemplifies the problem as presented in this case; the Douglas fir timber that is being harvested from the forests in Williams Lake present a major problem to mule deer, but at the same, due to extremely low stumpage rates and the high quality of the lumber, these trees become a potentially profitable business venture and if the products that have been outlined in the marketing analysis are produced, a great deal of money stands to be made.

Although there are an unlimited number of products that can be produced from small diameter softwood, the products that have been analyzed have been selected because of their innovation, price potential and apparent market demand. The main products are an end grain flooring system, acoustic-ceiling panels, RTA tabletops and natural coffee tables; all of which have a hardboard backing.

The majority of these products are directed towards high-end niche markets, where they will easily demand competitive prices, in an attempt to counter balance the high harvesting cost associated with this type of timber. There is wide range of profits, from $18.00 per log for the flooring system up to $124.00 per log for the natural tables. The important point to note is that with increasing profit, comes increase costs, all of which may have not been fully realised in the analysis, but these costs can be produced through further testing and prototyping.

In summary, the products that have been outlined in this report are by no means the best items to produce, but they are products which have shown great potential and have met the primary objective of turning a profit on the current problem. However, there are objectives that are more important than money including mule deer and the better well being of the UBC research forest which will only be maintained with a sustainable manufacturing process such as the one proposed.

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