Department of Forest Products

An analysis of the North American market for wood scanners

En analys över den Nordamerikanska marknaden för träscanners

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Abstract

Innovativ Vision AB develops and delivers quality and production control systems for the woodworking industry. North America is emerging as one of the most important markets for Innovativ Vision AB and their scanner WoodEye. Since 2001 Innovativ Vision AB has an office in the USA for customer service and support. In 2004 they also established a local sales and distributions office in USA. Innovativ Vision AB is in the process of developing WoodEye's new software Edger, Planer and NHLA. A market analysis is necessary in order to establish suitable plans of actions for further launching of the new software in the North American sawmill industry market.

The objects of this thesis are: 1/ To establish which segment areas are potential markets for Innovativ Vision AB. 2/ Investigate which aspects of what is being offered to the customer from scanner optimizing manufacturers are most valued by the customers and how these aspects affect the feeling of trust and commitment between the manufacturer and their customers. The chosen associations for visits were restricted to the east coast, while associations in other parts of North America were contacted by telephone and mail.

The outcome of this thesis provides an overview of, and an introduction to, the North American market for Innovativ Vision AB. Nine semi structured qualitative interviews were performed in North America, five with associations and four with sawmills. Other than these, an additional interview was performed with a Swedish sawmill prior to the trip, providing a total of ten interviews as a basis for this market analysis.

The main conclusions drawn are that there are no investments being made by sawmills due to the current downturn in the housing sector. However, there is a huge demand for an optimizer that grades southern yellow pine accurately. A few competitors in Canada represent a large proportion of market share and that bad service can be disastrous for an optimizer manufacturer's reputation. When asking the associations about optimizers fitting the description of Innovativ Vision AB's new software, Edger, Planer and NHLA, the most common reaction from the respondents was that they were not experts on that area and could not give a detailed answer. A natural continuation would be to make a more thorough analysis of competitors and potential customers in a restricted geographic area.

Key words: Optimizer, sawmill, grading association, trust, competitive forces.

Sammanfattning

Innovativ Vision AB utvecklar och levererar system för kvalitets- och produktions kontroll till träindustrin. Nordamerika är på väg att bli en av de viktigaste marknaderna för Innovativ Vision AB och deras scanner WoodEye. Sedan 2001 har Innovativ Vision AB ett kontor i USA för kundservice och support och år 2004 etablerade de dessutom ett lokalt kontor för försäljning och distribution. För närvarande håller Innovativ Vision AB på att utveckla de tre nya mjukvarorna Edger, Planer och NHLA, som appliceras till scannern WoodEye. En marknadsanalys är nödvändig för att fastställa hur man bäst bör lansera de nya mjukvarorna på den Nordamerikanska sågverksmarknaden.

Denna uppsats har som syfte att; 1/ Fastställa vilka sågverkssegment som är potentiella kunder till Innovativ Vision AB och deras nya mjukvaror Edger, Planer och NHLA. 2/ Undersöka vilka aspekter i erbjudandet till kunden från skannerproducenter som uppskattas mest av kunderna och hur dessa aspekter påverkar känslan av förtroende mellan säljaren och kunden. Dessa syften uppnåddes genom intervjuer med virkesmätnings organisationer inom olika regioner av Nordamerika. Intervjuerna begränsades till östra Nordamerika. Åsikter från övriga virkesmätningsorganisationer i Nordamerika skulle samlas in genom telefonsamtal och e-mail. Nio kvalitativa intervjuer utfördes i Nordamerika, fem med graderingsorganisationer och fyra med sågverk. Dessutom utfördes en intervju med ett sågverk i Sverige innan avresan till Nordamerika. Denna uppsats baseras alltså på totalt tio intervjuer, samt på sekundär information. Resultatet av denna uppsats erbjuder en överblick och en introduktion till den Nordamerikanska sågverksmarknaden.

De viktigaste slutsatserna utifrån denna uppsats är att sågverken inte gör några investeringar så länge marknaden för husbyggande är svag. Det finns dock ett stort behov för optimeringsscanners som kan gradera den amerikanska syd tallen (Southern Yellow Pine) på ett korrekt sätt. Ett litet antal konkurrenter representerar en stor andel av scanner marknaden i Kanada och att dålig service kan få förödande konsekvenser för en scanner producents varumärke. När de intervjuade tillfrågades om åsikter angående optimeringsscanners som passade in på beskrivningen av Edger, Planer och NHLA, så var den mest vanliga responsen att de ej var tillräckligt insatta för att kunna ge ett svar. Resultatet av detta arbete har därför blivit bredare än vad som ursprungligen var syftet. En rekommenderad fortsättning vore att intervjua ett större antal sågverk inom en begränsad geografisk yta för att bättre kunna beskriva olika kundsegment och deras behov.

Nyckelord: Optimering, sågverk, graderings organisationer, konkurrens krafter, förtroende.

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1 Introduction and Background

1.1 Innovativ Vision AB

A scanner is “a device that takes pictures of an image, breaks it down into dots and records it as a digital file for use with a computer”. (www, de.webjunction.org, 2008). A “wood scanner” is a scanner for wood, normally sawn and planed. The wood scanner works as a quality and production control system that optimises and inspects wood.

Innovativ Vision AB (hereafter referred to as IVAB) develops and delivers quality and production control systems for the woodworking industry. WoodEye is a scanner, sold and manufactured by IVAB that inspects and optimises sawn and planed timber at full production speed. The different customer needs and demands are met by applying various software systems to WoodEye. Examples of present software systems are WoodEye Sorter, WoodEye CrossCut and WoodEye Rip. (www, woodeye.se, nr:1, 2008). WoodEye optimises the value yield with respect to a large number of factors in the production chain simultaneously which results in a more consistent quality in every product range and a higher volume. WoodEye is supposed to be simple to use and flexible. IVAB offers maintenance and service of WoodEye which reduces the risk of an unplanned operational stoppage resulting in an expensive loss of production. Through constant training measures of sawmill personnel by WoodEye all the system’s functions and possibilities are attained. IVAB has a helpdesk service for provision of quick, cost effective troubleshooting. They answer customer questions by telephone and can connect direct to the customers system and work online. IVAB will visit the customer’s factory for technical support on site if necessary. (www, woodeye.se, nr:2, 2008).

IVAB has over 20 years of development work and experience. North America is emerging as one of the most important markets for their scanner WoodEye. Since 2001 IVAB has an office in the USA for customer service and support. In 2004 they also established a local sales and distributions office. Examples of present customers are JD Irving Ltd, Boulanger & Cie Ltee, Styline Industries and TI Industries. (www, WoodEye.se, nr:3, 2008). IVAB is at present developing WoodEye’s new softwares *Edger, Planer* and *NHLA.* Other than an overview study of North America made by the Swedish Trade Council in 2005, little is known by IVAB on what demands there are on the North American market by sawmills. Little is also known on and which competition is to be faced on the North American market. *A market analysis is necessary* in order to establish different customer segments, scanner competitors, threat of substitutes and supplier power for set up suitable plans of actions for further launching of the new software in the North American sawmill industry market.

1.2 Background material

1.2.1 The new software

This is a short description of the three new softwares applied to WoodEye:

Edger: A scanner that optimises the edging while taking other, possibly limiting, defects on the board into consideration for a total optimal edging decision with minimal wastage.

NHLA: A scanner that optimises and calculates the number of fine cuttings available in a board according to the NHLA standards for hardwood.

Planer: A scanner that optimises the planing of construction wood.

1.2.2 Business Opportunity Project (BOP)

In April 2005, the Swedish Trade Office (Canada) Inc carried out a project based on a survey within the Swedish Trade Council's Business Opportunity Project. The project was partly financed by the Swedish Trade Council. (Swedish trade office, 2005). The objective of the Business Opportunity Project (BOP) for IVAB/WoodEye was to conduct a brief market check regarding the North American sawmilling industry and to prepare and carry out a visiting program to various sawmills in 2006. The priority of the study was to get an overall picture rather than in-depth knowledge in a particular area. **"**The scope of the study will remain on the Canadian market with a focus on sawmills with annual output of 50,000 cubic meters." 50000 cubic meters is around 21 million board feet (www, translatorscafe.com, 2008). Figures 2 and 3 are examples of the results from the study, showing sawmill concentrations in USA and Canada.

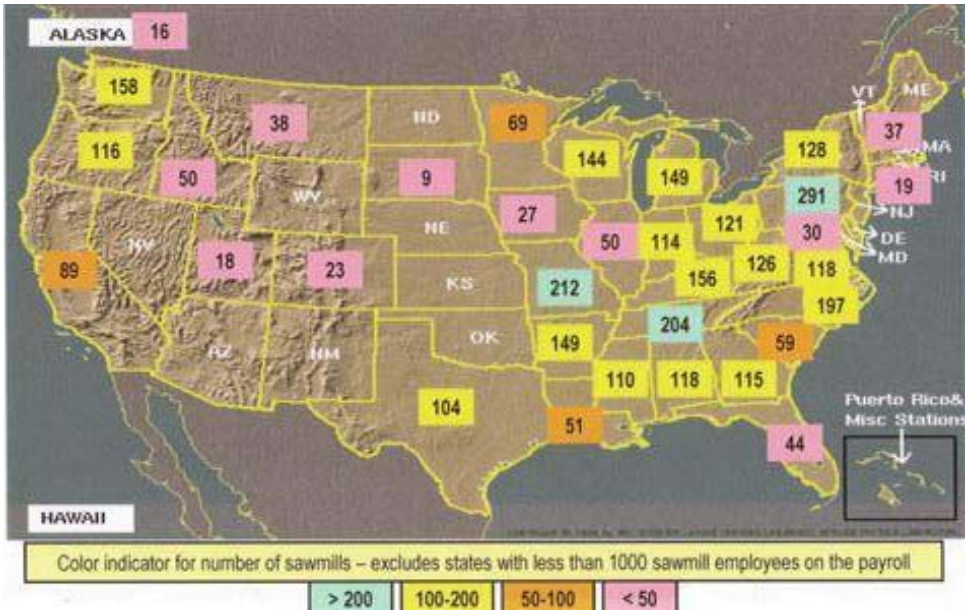

Figure 1. *The picture from the BOP-study shows the concentration of sawmills and the number of employees.(Swedish Trade Office, 2005)*

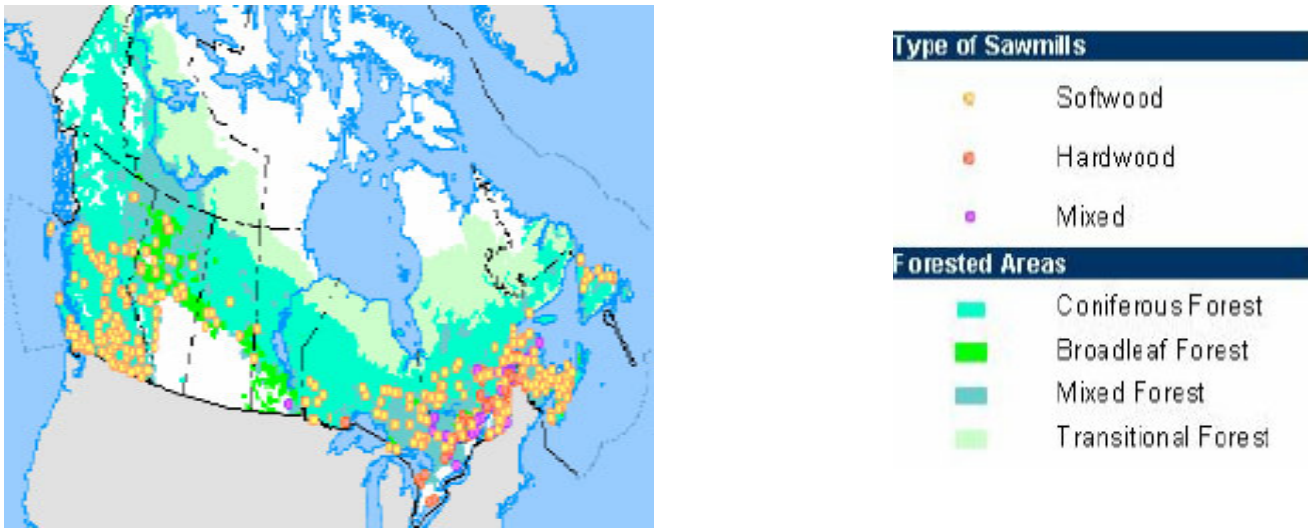

Figure 2. *The sawmill concentrations in Canada are mostly located to the coastal and forest regions. (Swedish Trade Office, 2005)*

The project offers a good overview regarding key industry sectors, sawmill concentrations (also registering their production, number of employees and size), forest regions and timber harvest in North America. The illustrations below are examples from the BOP study that were helpful for evaluation of the most interesting and relevant areas in North America for this thesis.

1.2.3 Previous research on perceptions of wood scanners

In 1999 a survey covering the whole of the United States was performed with the purpose of examining the three hardwoods sawmill technologies edger-optimizer systems, future edger-optimizer systems and future automated grading systems. (Bowe et al, 2002). The survey had the purpose of "determining differences between user groups and to identify user groups for advanced scanning and optimizing technologies". Company size, sawmill technology and National Hardwood Lumber Association affiliation were the three comparison groupings that were used in the survey. A mail questionnaire was sent to over 2000 hardwood sawmills. In total 600 questionnaires were returned of which 424 were applicable, bringing the response rate to 23,5 percent.

The results from the hardwood lumber scanning and optimizing study from 1999, that are most interesting for comparison with my results, are "*Acceptable cost for future edger-optimizers*"(appendix 1, table 4), "*Acceptable cost for automated hardwood grading systems*"(appendix 2, table 5) and "*Feature selection for future edger-optimizer systems*"(appendix 1, table 2). Although the study results are getting a few years to their name, there are several important results that one can assume have not changed considerably over the years. Another factor that needs to be taken into consideration is that the study participants were all from the hardwood sawmill industry. The results of the hardwood lumber scanning and optimizing study from 1999 offer a more objective view than my qualitative interviews and are therefore brought up in my discussion episode as a complement.

1.3 North America's sawmilling industry

In economic aspects USA's situation at the present time can be regarded as out of the ordinary. Share prices are falling due to increasing unemployment, high credit losses, decreasing housing prices and low expectations for the future (www, Morningstar.se, 2008). The housing market is debilitating, with falling prices and decreasing new building, and is along with high energy prices and a federal budget deficit seen as the underlying reason behind many of the above mentioned factors (www, Morningstar.se, 2008). During a recession companies are more vulnerable due to increased competition and pushing of prices. Historically the forest industry in particular has periodically suffered from this increased competition. (www, Aktiespararna.se, 2008)

The factor having the most effect on the sawmill industry is the *decreased new building of houses in the USA* (www, hud user.org, 2008). From 2006 to 2007 there was a massive debilitation in the housing market in USA. The fourth quarter results of 2007 show a decrease in the number of building permits, starts, completions and existing sales by as much as 30 to 50 percent in comparison with indicators of 2005 (www, hud user.org, 2008). Figure 3 shows that the number of housing permits more than halved during the period of 2006 and 2008.

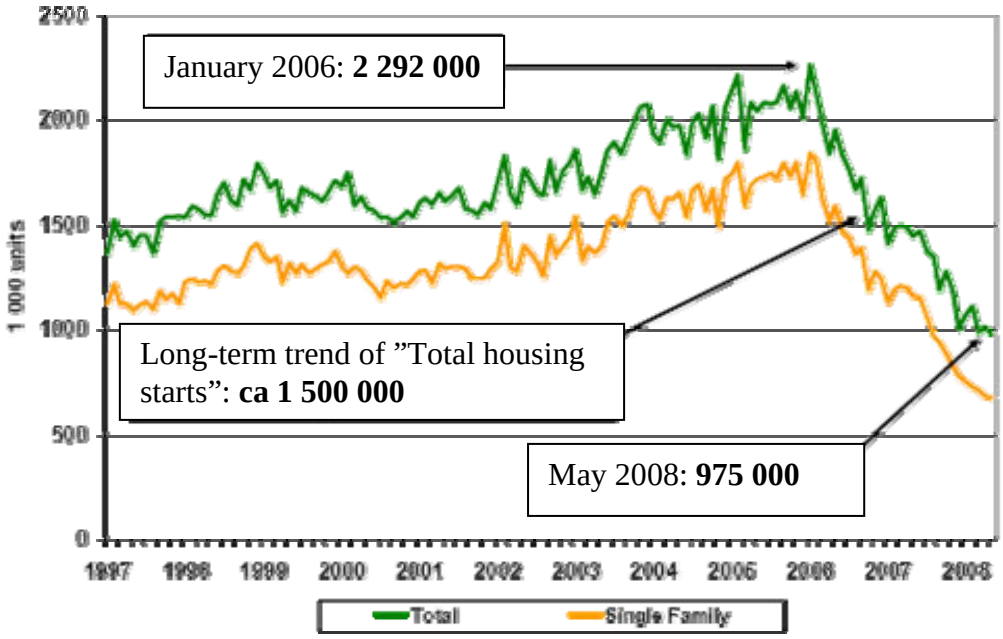

Figure 3. *The number of housing units produced in the US has declined rapidly since 2006. (www, skogsindustrierna.se, 2008)*

The underlying reasons for the worsened housing market conditions are many. (www, Patrick.net, 2008). Yearly rents are less than three percent of purchase price while mortgage rates are 6.5 percent which means that in present it is cheaper to rent a house than to own a house. The inflation in food, energy and wealth care has been much grater than the rise in salaries which leaves less money for investments in houses. The interest rates have risen from five to seven percent in some cases, which means a 40 percent rise interest payments. The house prices would have to drop proportionately in order to compensate. In addition to this there is a shortage of first time buyers and a large amount of “baby boomers”, born between 1946-1964. One-third of the baby boomers have zero retirement savings other than the ownership of their house, so they are much more likely to sell their house than to buy a new one. Not only is the housing market record low, but in addition the log market is becoming tougher and tighter. There are several underlying reasons for this. The slump in the U.S. housing market and the huge oversupply of logs because of this has *reduced prices* for lumber products to 15-year lows (www, Reuters.com, 2008). Figure 4 and 5 show just how much the production of sawn softwood has gone down since 2006. The resemblance of the trend in Figure 4 and 5 with Figure 3 is unmistakable, which clearly indicates the number of housing starts and the production of sawn softwood go hand in hand.

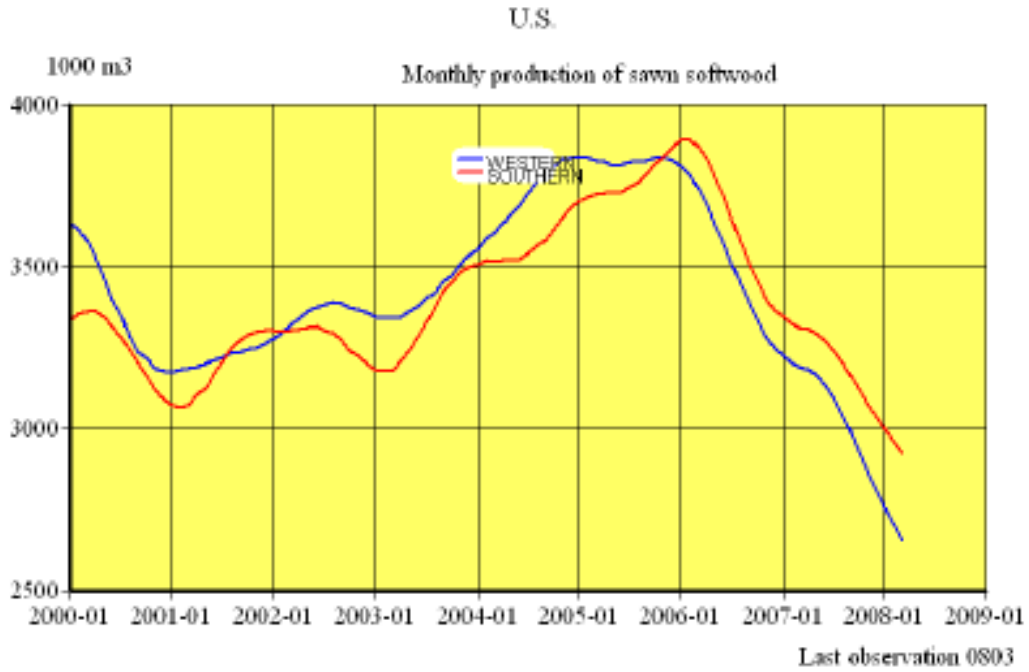

Figure 4*. The production of softwood in the US has nearly halved since 2006. This is mostly due to the decreased new building of houses in the US. (www, skogsindustrierna.se, 2008)*

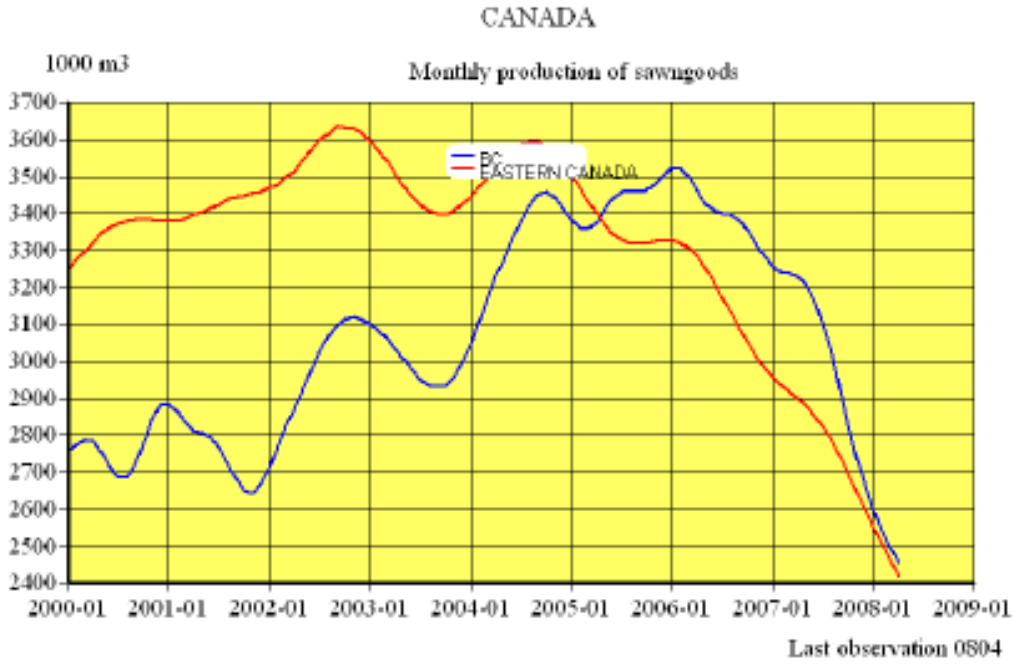

Figure 5. *The production of softwood in Canada is reaching record low levels. (www, skogsindustrierna.se, 2008)*

The province of British Colombia in Canada represents about 20 percent of North America's wood supply (www, canadianwoodproducts.ca, 2008). On a *short term* basis there will be a huge oversupply of wood in Canada when trying to recover as much as possible from trees affected by the *mountain pine beetle*, primarily in British Colombia. The mountain pine beetle are attracted to mature trees over 80 years old and emerge from an infested tree over the course of the summer into early fall and transmits a fungus that stains a tree's sapwood blue (www, for.gov.bc.ca, 2008). However, because of the mountain pine beetle the region's wood

supply is dropping at a very high rate and on a *long term* basis there is risk of a shortage of softwood supply which is expected to last for decades. (www, canadianwoodproducts.ca, 2008). The shortage is expected to be worsened in combination with the housing market bouncing back. According to the Wood Products Group in Fredericton, Canada, the companies that survive from this will be those able to compete in global markets for high-value finished and semi-finished products.

2 Objectives

By achieving the *objectives mentioned below* a more thorough and in depth knowledge of the North American scanner market will be accomplished. Since sawmills are the customers of scanners, the aim is also to gain knowledge on the sawmill market. The BOP study described earlier offers an overview of the North American sawmill market.

1. W*hich segment areas are potential markets for IVAB*? In order for this objective to have a satisfying result, the following questions must also to be answered;

- *Is there any demand for Edger, Planer and NHLA by sawmills in North America?*
- *What are the main competitive forces in the North American scanner market*?
- *Are there any possible distributors for IVAB in North America?*

These results will later be used as a foundation for further introduction (marketing and sales) of the new software in North America.

2. *How do different factors in the offering affect buyer-supplier trust?*

Research which aspects of what is being offered to the customer, from scanner optimizing manufacturers, are most valued by the customers and how these aspects affect the feeling of trust and commitment towards the manufacturer. Aspects to be discussed in what is being offered are: product, service, logistics, advice and adaptation.

These results will help launch new strategies on how to manage relationship marketing between IVAB and their customers.

3 Theory

The objective of establishing the main competitive forces are on the North American scanner market can best be accomplished through the use of "*Porters five forces of competition*". By evaluating the forces of buyer power, threat of entry, threat of substitutes, supplier power and industry rivalry, one can get a picture of which forces are most important to consider when expanding on the North American scanner market. David Ford's "T*he Marketing Course*" (Ford. D, 2002), is a suitable theory for establishing which aspects are most valued by the customers of that which is being offered to the customer by scanner optimizing manufacturers. The theory brings up factors other than the actual product, such as service, adaptation, logistics and advice. All of these factors, according to Ford, determine the customer satisfaction. In order to determine which aspects affect the feeling of trust and commitment between the manufacturer and their customers, "*The Commitment-Trust Theory of Relationship Marketing*" (Morgan and Hunt, 1994) is applicable. The theory links factors that affect both relationship commitment and relationship trust.

3.1 Analysing industry attractiveness - Porter's five forces of competition

The Porter's five forces of competition framework is a suitable model for determining an industry's profitability and competition. (Porter, 1980). As the model shows there are three horizontal forces (threat of entry, industry rivalry and threat of substitutes) and two vertical forces (supplier power and buyer power). This model was chosen since it brings up all the factors and forces involved in a market analysis and it will be used in order to determine which of the forces are strongest when it comes to the scanner industry in North America.

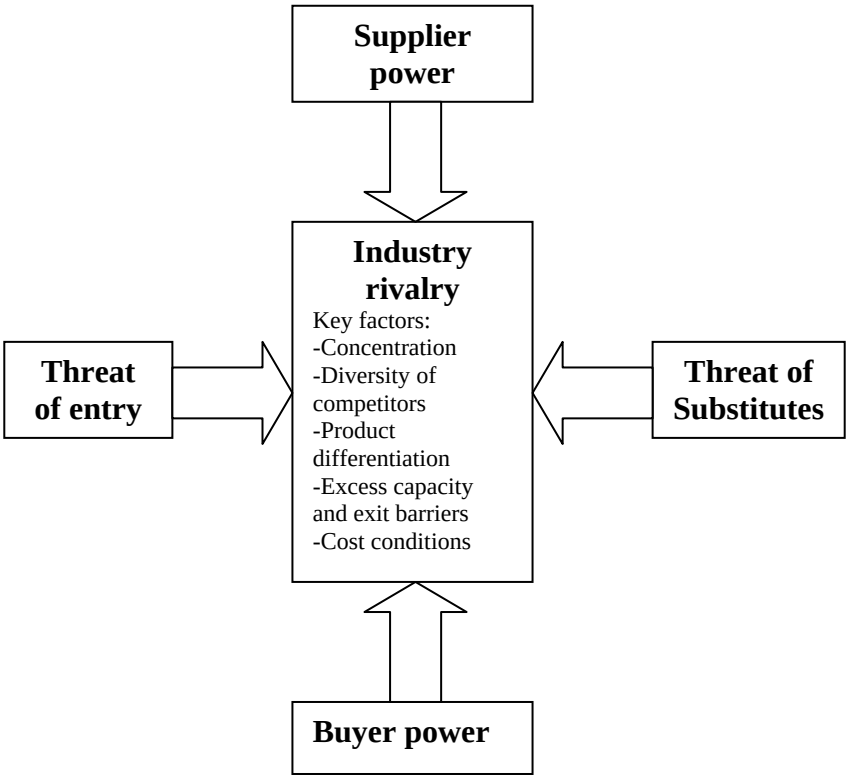

Figure 6. *Illustration of Porter's five forces of competition. The profitability of an industry is determined by the above mentioned five forces of competitive pressure. The strength of each competitive force is determined by various key factors. (Grant., R, 2008).*

3.1.1 Supplier Power

Suppliers are the suppliers of inputs to the producer. (Grant. R, 2008). Suppliers are usually small companies relative to the producers and therefore this force is normally not very strong. The key determinants for the strength are how difficult it is for the producer to switch supplier. Hence, the suppliers gain strength if they are dominated by a few firms and are more concentrated than the purchasing industry. This way, if the suppliers engage in cartelization they will gain greater bargaining power. The more important the suppliers product is for the producers business, the larger their power. Also, the suppliers of complex, technically sophisticated components are more likely to obtain strong bargaining power. This is especially relevant in the case of suppliers of scanner equipment as cameras and lasers are involved. Labour unions are also an important source for supplier power. The key in the analysis will be to determine if a scanner manufacturer can choose from several suppliers. As we will see, this partly depends on how easy it is to transport the supplied material.

3.1.2 Threat of entry

An industry will attract firms outside the industry if it earns a return on capital in excess of its own cost of capital. (Grant. R, 2008). If it is relatively easy to access an industry it will result in the entry of new firms making the profit fall to its competitive level. If there do not exist any barriers to entry or exit an industry it is contestable and profits and prices tend to fall towards the competitive level. This is to say that all barriers of entry are to the advantage of firms already established in the industry.

Examples of factors that increase the barriers of entry are propriety knowledge and patents, the extent to which the firms production equipment can be used for to produce other products if the investment fails, the amount of market share necessary for minimum efficient scale, capital requirements and regulations from governments (www, quickmba.com, 2008). Since IVAB themselves are a relatively new entry on the North American market the threat of entry may not be one of the greatest forces for them to consider.

3.1.3 Industry rivalry

In many markets the rivalry between established competitors plays a determining role on the profitability and competition of the industry. (Grant. R, 2008). The competition can take the form of price pushing, advertisement, innovation, quality, and etcetera. If a firm wants to gain advantage over its competitors it can change its prices, improve its product differentiation, exploit relationships with suppliers by putting high pressure on them, or they can find new ways for distribution. (www, quickmba.com, 2008). Examples of factors that increase the industry rivalry are slow market growth, high fixed costs, large number of firms, high exit barriers and low possibilities for differentiation.

3.1.4 Threat of substitutes

The price sensitivity of buyers is partly dependent on the availability of substitutes on the market. (Grant. R, 2008). The threat of substitutes comes from products outside of the industry that perform the same function as the product of the industry. If there are substitutes to a product, customers are likely to switch in cases of price increase or in cases where the other product works better through for example improved technology. Hence, if the price for scanner optimizers increases, the customers would look for substitutes and perhaps go back to manual grading. This way, substitute products create a ceiling within the industry for how much they can charge their customers.

3.1.5 Buyer Power

The transaction that occurs when a firm sells their goods or services to customers creates value for both buyers and sellers. (Grant. R, 2008). The two factors that affect the customer's buying power are price sensitivity and bargaining power.

The customers' price sensitivity is determined by four factors:

- Buyers will be less sensitive to prices if the seller's product is of high importance for the buyers' product or service quality.
- The customers' price sensitivity will rise for undifferentiated products with many potential suppliers.
- The higher proportion of total cost that an item represents, the higher price sensitivity the customer will have.
- High competition among buyers also leads to high demand for price reduction among sellers.

How the power is divided between buyer and seller is decided by the credibility and effectiveness of how each party makes the threat of refusing to deal with the other party and the relative cost that each party sustains from the transaction not taking place.

3.1.6 Criticism of Porter's model

Porter's five force model has received some criticism since it was developed in the early eighties. (www, themanager.org, 2008) The criticism has partly been based on the fact that the model is getting old and that times have changed since it was first developed. Some of the other most important criticism points have been;

- The model assumes a classic perfect market which means that it is not that usable if the market is regulated.
- The model assumes that the market structures remain static which is not the case in many of today's markets. For example, entry barriers and relationships may change.
- The model does not take strategies like strategic alliances, virtual enterprises etcetera into consideration, but is rather based on the assumption of competition among the different actors on the market.
- In cases of complicated market structures, such as industries with multiple correlations and by-products, the model is not especially applicable.

These points are worth taking into consideration when applying the model to the scanner market.

3.2 Ford's Marketing Course

David Fords theory, "The Marketing Course" examines the course of the offering, from seller to buyer. The problems that a customer is faced with are very rarely solved by purchasing a physical product alone. While traditional marketing focuses on products and commodities, relationship marketing views the product as only one part of a firm's offering, as shown in the figure below. (Ford. D, 2002)

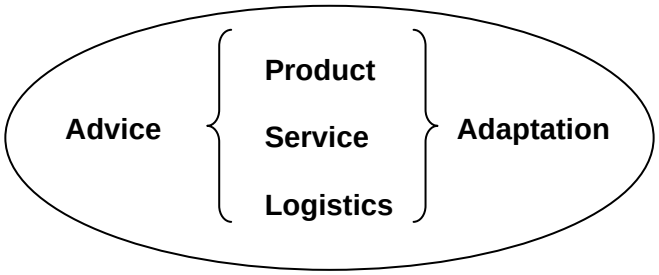

Figure 7. *The model lists the various aspects included in a sellers offer to the customer. (Ford. D, 2002)*

- ***Services:*** Services can function as a major part of the offering. They can also strengthen the perceived value of the product if they are closely associated with it. However, these days many buyers view the product as a form of service and thereby in general buy services rather than products. (Ford. D, 2002)

- ***Products:*** The product fulfils the actual physical experience in the offering. The customer can see and touch the product, and in many cases the offering would not be much use without the product. (Ford. D, 2002)

- ***Logistics:*** In cases where it is difficult for competitors to differentiate their products the logistics can be the most important part of an offering. Good logistics can result in a more cost and time effective supply chain, and thereby be a competitive advantage. (Ford. D, 2002)

- ***Advice:*** Advice and counselling have the purposes of increasing the customers understanding of the product and service so that they can use the full capacity of the offering and experience it as the seller has intended. (Ford. D, 2002)

- ***Adaptation:*** This aspect occurs when the seller makes an adjustment in the offering so that it better fits the needs of the customer. This is a very important aspect for building long term relationships with a customer. (Ford. D, 2002)

In his article Ford also addresses how to define the *quality* of the offering. The quality can be measured by the extent to which it solves the customers problem. Hopefully the offering will fully solve the customers problem (offering=problem) but there are occasions when only part of the problem is solved (offering<problem) or when the offering exceeds customer expectations and results in added value (offering>problem). (Ford. D, 2002)

An offering is a supplier's commitment to solving a customer's problem. (Ford. D, 2002). In order for the supplier to design and evolve an offering to solve the customer's problem the supplier needs access to *resources* (physical, financial and technological) and access to an established *network* with other companies in order to gain access to their resources for example. A *good relationship* with the customer is also crucial in the quest of establishing a perfect offering, otherwise lack of or bad communications will result in important information being missed. The actual drive in developing an offering is of course the customer *demand*, which means a demand is critical for development of an offering.

3.3 The Commitment-Trust Theory of Relationship Marketing

During the past decades the term "Relationship Marketing" has become a common phrase which has received increased attention. (Morgan and Hunt, 1994). Relationship marketing can be explained as "establishing, developing, and maintaining successful relational exchanges". In order to understand relationship marketing one must first understand the difference between a discrete transaction and a relational exchange. A discrete transaction has a distinct beginning, short duration and sharp ending, whereas a relational exchange is "longer in duration and reflecting an ongoing process". A relational exchange is most important in markets where each purchase is very important for the buyer, for example the automobile market or in this case the *scanner market*. In these cases the product costs a relatively high amount of money and the purchase is not made often. In commodity markets such as for potatoes or paper the individual buyer is not as affected or dependent on each individual purchase, and therefore trust and commitment are not as important. There are several different forms of relationship marketing divided in to lateral and internal partnerships as well as partnerships with suppliers and buyers. Internal partnerships include exchanges with functional departments, employees and business units. Lateral partnerships include exchanges with competitors, non profit organisations and governments. Buyer partnerships include exchanges with intermediate customers and ultimate customers. Supplier partnerships include exchanges with goods suppliers and service suppliers. Trust and commitment are two factors that are critical for a relational exchange. Figure 8 shows an illustration is shown of factors affecting commitment and trust in a relationship, as well as the outcomes of commitment and trust.

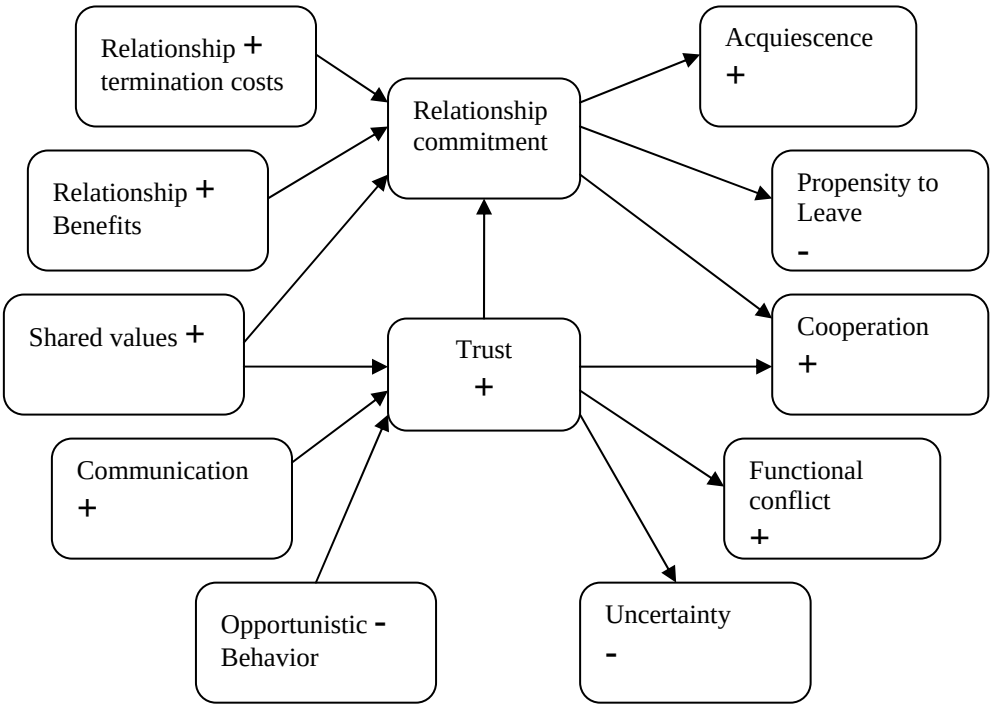

Figure 8. *A high level of trust will increase the commitment of keeping the relationship alive. To the left the influences of trust and commitment are shown, and to the left the right the outcomes are shown. (Morgan and Hunt, 1994).*

Commitment and trust will create effectiveness, productivity and efficiency, if they are both present. (Morgan and Hunt, 1994). According to Robert M. Morgan and Shelby D. Hunt "*commitment and trust are key* because they encourage marketers to work at preserving relationship investments by cooperation with exchange partners, resist attractive short term

alternatives in favour of the expected long term benefits of staying with existing partners and view potentially high risk actions as being prudent because of their belief that partners will not act opportunistically." This means that when both trust and commitment are present they promote efficiency, productivity and effectiveness through a higher level of cooperation. The key mediating variable model of relationship marketing shows inputs to relationship commitment and trust which in turn result in positive outcomes. (Morgan and Hunt, 1994). The only negative inputs in the figure are opportunistic behaviour and the only negative outcomes are propensity to leave and uncertainty. Morgan and Shelby define *commitment* as an exchange partner believing a relationship is so valuable it is worth putting maximum effort to endure it, and having the purpose of maintaining it indefinitely. They define trust as "one party has confidence in an exchange partners reliability and integrity". With a high level of trust, the commitment will automatically increase. Identifying commitment and trust as key variables is a prerequisite for successful relationship marketing.

3.4 Method of approach

Porters model on the five competitive forces will be used in order to determine what the main forces in the North American scanner market are. Hence the model will only be used in connection with *objective one*.

The relationship marketing model and the commitment trust theory will be applied to *objective two*. The relationship marketing model is a good tool for determining which factors should be included in a scanner offering in order to get a long-lasting relationship with sawmills. The commitment trust theory will inform on the advantages of having trust and commitment in a relationship with sawmill customers and the circumstances that lead to trust and commitment.

The questions of whether there is any demand for Edger, Planer and NHLA by sawmills in North America and whether there are any possible distributors for IVAB in North America can only be solved through straightforward questions in the questionnaire.

4 Method

4.1 Selection procedure

One method of performing this market analysis was interviewing the present and potential customers of the scanning equipment; the sawmills. The problem with this method is that there are thousands of sawmills in North America, each one unique, and it would take a great number of interviews with each segment of sawmills, in order to generalise the results over the rest of North America. When performing segmentation of sawmills one would have to consider not only, the size and tree species of each sawmill, but also their current possession of equipment and end product etcetera. Considering the time and resource limit of this study, it was decided through discussion with IVAB that the most effective way to go about the market analysis would be to interview the major wood grading associations in different regions of North America.

The original idea was that the selection of interesting associations should be made based on three factors; their number of sawmill members, the sawmill members area of refining (softwood, hardwood, construction or furniture) and their knowledge of scanners. These three factors would result in a good overview of sawmill groups and knowledge of different kinds of sawmill scanner customers. During the preparation process it became clear that the factor of associations' knowledge of scanners would be the determining one for which associations to interview since the knowledge of associations in many cases turned out to be very limited. The associations' knowledge of scanners was established through phone calls made to the various associations prior to the trip. If an association claimed to have a very restricted knowledge on the scanner market, the association would sometimes refer to another association with broader knowledge. The associations chosen and arranged for interview are shown in Table 1. Further description of the associations can be found in Appendix 2.

Table 1. *The table shows the associations with which interviews were arranged. The associations were chosen for interview on the basis of their knowledge, availability for a visit and how interesting their covered member area was considered to be*

Association	**Location**
TPinspection	Georgia
Southern Pine Inspections Bureau (SPIB)	Florida
Quebec Forest Industry Council (QFIC)	Quebec
Ontario Lumber Manufacturers Association (OLMA)	Ontario
Forintek	Quebec

In order to keep the costs on an appropriate level, the chosen associations for visit were solely on the east coast. The aim was to reach and get the opinions of other associations in parts of North America by telephone and mail. Because of the low number of associations with knowledge on scanners it was also arranged to visit four sawmills of various sizes and specialities. These are shown in Table 2.

Table 2. *Selected sawmills for interview*

Sawmill	**Location**
Robbins Lumber	Maine
Cumberland Ridge Forest Products	Maine
Maschino and Son Lumber	Maine
Portbec company (Forest Products LTD)	Quebec

The selected sawmills were intended to be of different sizes and production procedures. The selection of sawmills was also based on how close they were to associations arranged for interview. Since none of these sawmill companies had WoodEye equipment an interview was conducted in Sweden, prior to the America trip, with Karl Hedin AB in Krylbo. The Karl Hedin sawmill in Krylbo has been in possession of a WoodEye scanner since four years back, and this interview was intended as a evaluation of the questionnaire and as a comparison interview with interviews performed in North America.

4.2 Questionnaires

Questionnaires were sent out via e-mail to a dozen wood grading associations across North America. When there was no response the questions were modified and sent out again. Only three questionnaires were returned, although they were returned incomplete. Two of them had answers regarding the activities of the associations and one gave names of possible competitors to IVAB in North America. These answers are presented in the Results section and in Appendix 6. After the third time without almost any response some of the associations were contacted by telephone.

The final version of the questionnaires sent out to sawmills and associations can be seen in Appendix 7 and 8. In the first version sent out the questions were quite detailed and linked to IVAB's new software. In order to adapt to the associations level of knowledge the questions were made broader and more general in the final version. The reasons behind the scarcity of returned questionnaires can be divided into three categories; 1. Associations' lack of knowledge on the topic, 2. Associations' policy of not giving information for the gain of an individual company and 3. lack of time. The associations' lack of knowledge on the topic of scanners was probably the main cause of drop outs and this was confirmed by several associations. One association responded that they had gotten suspicious that it was an individual scanner manufacturer that was behind the questionnaire and therefore could not answer because of the policy of not giving information for gain of an individual company. Most neutral associations have this policy, however it is not considered the major factor behind the fall out since IVAB never was mentioned in the questionnaire. The third factor, lack of time, is probably contributing to the fall out. The respondents are busy at work and there is also a chance that the questionnaire repeatedly was sorted to the respondents spam folder.

The lack of returned questionnaires means that the reliability of the results of this study is limited to the interviews and secondary information. Most of the secondary information was gathered prior to the trip.

4.3 Gathering of Data

The secondary data already exists at the time of the analysis, it has been gathered and put together in a previous context. The main gains from the use of secondary data are the low costs and time required when gathering, which results in more time to evaluate and verify the

data. Secondary data was collected through sources on the internet, books and lectures. (Christensen et al, 2001)

Visits and interviews with the five associations on the east side of North America shown in Table 1 were successfully arranged. Evaluating which geographic areas in North America were most interesting was done through study of the Business Opportunity Project (BOP), made in 2005 by the Swedish Trade Office. The visit to North America lasted for one and a half week. The interviews with the associations and sawmills shown in Table 1 and 2 were conducted in a semi structured qualitative manner. A semi structured interview is when the interviewer has got an interview guide, a list of themes to be touched during the interviews progress. The questions asked during a semi structured interview are open questions where the respondent can answer freely. These open questions can be followed by follow up questions. Some more detailed questions were asked concerning the technical aspects of IVAB's new software. Each interview took around one hour. The questions asked were assessed through discussions with IVAB and my supervisor and can be found in Appendix 7 and 8. The intent was to ask clear and well formulated questions so that the respondent could answer clearly and intelligibly. When successful, qualitative interviews are probably the best way to generate valuable data. The process is relatively quick and during the interview one has the opportunity to ask follow up questions or explain when something is unclear. (Christensen et al, 2001)

A qualitative interview is a method used in market analysis when the purpose is to (HaPerson C.J, 1989):
-examine the underlying reasons for consumer behaviour in situations when the reasons are not approachable through directly aimed questions.
-obtain insight regarding a product or market.
-obtain an idea of what the preferences of a relatively unknown market are.
-widen the perspectives and increase the understanding in areas where conventional methods have failed.
-stimulate creative thinking in connection with marketing launching.

The main characteristic of qualitative interviews is that their focus lies on the entirety and the examined context, rather than on specific parts or words. Another characteristic is that in some ways the analysis and gathering of data occur simultaneously. In order to evaluate the qualitative interview one has to look at its validity, which means how well the results match with reality and to what degree the results can be generalized. In order for the results to be generalized onto other areas the information must be complete and include a lot of information. It is the analyser's task to determine of the results applicability. The interviews were documented through sound recording and by taking notes. The main advantages of recording an interview are that you get correct information that can be replayed and that the interviewer can concentrate on asking questions and listening. The disadvantages of recording are few but include the fact that the respondent can be affected in a negative way and that technical problems may occur. (Christensen et al, 2001).

After returning to Sweden the results were written down and sorted into different categories. When this was done the analysis was made by combining the results with the theory. Comparisons with other studies were made. The discussion ends the thesis and is intended to provide a conclusion based on the results.

5 Results

The first and second section of this chapter (5.1 and 5.2) attempts to answer if there is any demand for Edger, Planer and NHLA by sawmills in North America and which segment areas are potential markets for IVAB. Section 5.3 attempts to give further knowledge on industry rivalry in order to distinguish what the main competitive forces are in the North American market. Hence, section 5.1 – 5.3 of this chapter are the results on the problem areas listed for objective one; w*hich segment areas are potential markets for IVAB*?

Section 5.4 are the results on objective two "*How do different factors in the offering affect buyer-supplier trust?"*

5.1 Research of market and the required qualities in optimizers

5.1.1 List of interviewed people

Associations
Person A, TPinspection
Person B, Southern Pine Inspection Bureau (SPIB)
Person C, Ontario Lumber Manufacturers Association (OLMA)
Person D, Quebec Forest Industry Council (QFIC)
Person E, Forintek

Sawmills
Person F, Maschino Lumber and Son sawmill
Person G, Portbec company
Person H, Cumberland Ridge Forest Products sawmill
Person I, Robbins Lumber
Person J, Karl Hedin AB, Krylbo

5.1.2 Market Change

This section partly concerns the market changes on the sawmill market and partly market changes on the optimizer market. The two markets have huge effects on each other.

Person A at TP inspection is responsible for a grade stamp program in US and elsewhere. He had seen a dramatic slowdown in shipments of timber from overseas since the dollar had declined. The US market is forecast to *remain the same* through 2008, some people think it will improve mid-spring to summer 2009 or perhaps 2010. The sharper the downturn the higher the upturn so the mills that weather the storm and are sitting on a warehouse full of lumber when the market comes back will make a lot of money when that happens. Since it is just a matter of time before it will turn, Person A thought that now is really the time to make optimizing investments. He added that there would probably not come much overseas lumber for the next couple of years.

Person B at SPIB said that these days producers want to produce the most square edged lumber possible with the best fibre and grade recovery possible, so that they can sell it to *huge depots* that sell to home owners and smaller contractors. People who buy from those depots want the wood to be square and without wane, which is why the *large sawmills* emphasize grade number two and better. The *smaller* family-owned mills want the yield of number one and the better appearance of the boards. The smaller the mill's niche, the better the quality. Also Person E from Forintek explained that sawmill products are changing since the market is

becoming a *commodity market*, mostly selling the dimensions of 2 by 4, 2 by 5 and 2 by 6 to huge depots. However, in the softwood industry there are also some tendencies to become specialized in producing specific market demands. An optimizer is necessary to produce what the customers are demanding in an efficient way, which is hard to do since the logs are delivered in a mixture of qualities together. Person I at Robbins Lumber, informed that the area in optimization that is growing is technically more *complex* equipment with great cameras and software.

Person C at OLMA, stated that in the last 15 years consolidated enterprises have decreased in number but increased in size. The smallest sawmill in Ontario today in the structural lumber business is about 80 million board feet per year. Some are as large as 400 million board feet per year. About half are privately owned. The motivation of most of the sawmills is volume and not value, which has resulted in sawmills producing *one or two items at low cost instead of ten or twelve individual items* as they did 20 years ago. The two or three best sawmills in Ontario today produce 2 by 3, 2 by 4 and 2 by 6. There are fewer than six privately owned sawmills left in Ontario. Person D of QFIC agreed that increased volume is the most important factor also in the Quebec province.

Both Person F at Maschino Lumber and Son sawmill and Person G at Portbec Company Sawmill stated that with the housing market down, nobody right now would like to increase production or make any investments in Canada or north eastern USA.

5.1.3 Comments about IVAB's new software Edger

(IVAB or WoodEye as a trademark was not mentioned at all in the description)

Person C at OLMA said that he had heard people talk about edger scanners coming out on the market, probably from the manufacturer *USNR*, that match the description of IVAB's new edger. Person C said that most of the time the decision was based not on the edging or the wane, but on the length of the board. The broken piece on the end made a great difference. On the other hand, Person B from SPIB had never heard of an edger scanner like IVAB's new software, but would expect a *huge demand* for such equipment if it reached the market.

Person D at QFIC knew that manufacturers are working on new edger optimizers, similar to IVAB's, but he did not know of any of these on the market today. He also said that there was no system that grades visual defects at the edger with rough lumber. He did not think it was possible yet but believed there would be a huge demand for such a system. Sawmills that have bigger logs use edger optimizers to a higher degree. The Northern Province has smaller logs. Generally *the bigger mills have the smaller logs*. 40-45 dm^3 per logs is an average size for northern sawmills. Edgers are more common among medium sized mills using bigger logs down in the south. Person E of Forintek agreed with him.

5.1.4 Comments about IVAB's new software NHLA

(IVAB or WoodEye as a trademark was not mentioned at all in the description)

Although the interviewed grading associations mostly had softwood sawmills as members, they were asked to comment on the hardwood scanner NHLA.

Person A at TPinspection explained that he did not know if such an optimizer existed on the current market, but he would guess there would be a *huge demand* for such a scanner. Person

E at Forintek said that there were systems for hardwood that do visual grading, but he had not heard of any based on the NHLA grading system.

Person H from the hardwood sawmill Cumberland Ridge Forest Products dismissed hardwood optimizers because they are so *volume focused* and he publicly promoted *manual grading* to increase quality. He found the idea of a value optimizing scanner at the board very interesting if such equipment could be developed that actually worked . He claimed that if an optimizer worked, that was value based on NHLA grading, it would be necessary in more parts of the sawing line than at the board, such as at the edger, trim saw etcetera.

5.1.5 Comments about IVAB's new software Planer

(IVAB or WoodEye as a trademark was not mentioned at all in the description)

Person A at TP inspection would mostly recommend sawmills to invest in an optimizer at the planer. Most sawmills already have one installed. He had not seen an optimizer at the planer that could replace humans. The machines were good at geometrics, measuring width and thickness for cant ness and wane at the edges. But he had *not seen a machine that could measure the knots of the southern pine properly*. Most upgrades on planers are on the hydraulic feeds because of fluctuations between hot and cold. People are taking the hydraulic feed drives out and replacing them with an electronic direct couple drive. Most people buy old planers that have been refurnished. A planer usually runs for forty or fifty years. Person D at QFIC on the other hand described how most optimizers are located at the planer mill in Quebec, replacing one or two workers for visual grading. *Splits are generally not seen* by the machine in planer optimizers. The wane or missing pieces are easily seen by the machine. Person E at Forintek explained that only two or three sawmills in Quebec had the new planer technology. He guessed that such a planer optimizer would cost between *half a million and one million US dollars*.

Person C from OLMA said improvements in planer lines were in the *sensitivity in reading* rather than the finite difference between wane on the edge and wane on the length. A mechanism that puts the best face upwards would generate a huge difference. Then you would get rid of the saddle wane on top and the bad wane on the edge.

5.1.6 Suggestions for partnership in North America

Gabriel Payant, sales manager for Autolog, would be the one to contact for discussion of partnership with Autolog. Autolog also market their scanners in Sweden. Gabriel Payant informed that they were currently cooperating with Gunnarssons Verkstäder AB in Vislanda.

Comact and CoeNewnes/McGehee were also contacted, regarding who to contact in the case of a partnership, but with no response.

Person C at OLMA thought that Comact and CoeNewnes/McGehee worked as distributors for other manufacturers of optimizing equipment. They offer to build a whole sawmill, which means they need a lot of contractors. Person G from Portbec backed up this information by saying that *he believed Comact to be cooperating with Rema* and other smaller suppliers which was one of the reasons why they were able to offer the whole package. Person G did not, however, know how official this was. In the interview with Person I it was also stated that *Autolog collaborates with Scanware/Finscan*.

5.1.7 General comments on which qualities the sawmills in the south east of USA are looking for in the optimizing equipment

Person A at TP inspection explained how some European machines work well in Northern USA and Canada but have problems with the southern yellow pine. The most difficult defects to see and evaluate are *knots*, (they are easy to see but there are so many different kinds), *decay, splits, worm eating pitch* (when a grub makes a hole which fills up with sap and sawdust), and *timber breaks* (fractures across the grain which show in white lines, pitch accumulates on the sides of the white line). Other defects are wane, skip, off size and crook. To be successful in the southeast Person A said an incoming company like IVAB should make a machine that *grades knots* consistently, throughout the different regions of the US. That was the key! There are different timber regions in the US which all have southern yellow pine. For example the Northern Florida, southern Georgia and southern Alabama region, have different timber then north Carolina and south Carolina region, which also has different timber from the Mississippi, Louisiana and Texas region. The knots look a bit different, the wood looks a bit different. So you have to be able to adapt to the different localities. Southern Pine grows in a vast band across the Southern United States, from East Texas to Virginia. The four main species are shortleaf (Pinus echinata), longleaf (Pinus palustris), loblolly (Pinus taeda) or slash (Pinus elliottii). However all of these species go by the name of Southern Yellow Pine (www, southernpine.com, 2008). Person A said that any manufacturer can measure geometrics. He also said that the biggest *advantage* to be obtained from getting an optimizer on the grading side would be the ability to follow market trends and prices, and also adjust to sawmill inventory. Differences on grading between sawmills in Sweden and USA are that in Sweden the grading is usually done in the sawmill, which gives a more homogenous product. It is easier for optimization grader to work in Europe because of the homogeneous product. Person B at SPIB agreed with Person A that knots are the biggest problem for visual value graders to get right, since Southern Pine has a lot more wane and other defects in comparison with European lumber. So-called "*blind areas*" around knots are often not recognized on visual grading. Blind areas are parts of the knot having the same colour as the surrounding wood, and therefore being missed. They also had problems with *density variation and knots inside of the board*. The optimising of bucking and edging generally works well but when the board is planed, the optimizers have problems with the grading. Southern pine is harder then most other species in the world and heavier that it takes a heftier machine. Coastal grown long leaf is exceptionally strong and will beat up the machine.

5.1.8 General comments on which qualities the sawmills in eastern Canada are looking for in optimizing equipment

Person D at QFIC described how most of the new technology works very well for geometric features. Knots are generally not a problem but wane, splits, coloration, decay are more usual defects. 60-80 % of the pieces are graded according to wane and dimensions of the log. Volume increase is the most important factor in Quebec.

Person G at Portbec Sawmill Company in Quebec stated that the most valuable aspect of an optimizer is measured by net value per operative hour. Of greatest interest is the decision on how to saw up the log in the most lucrative way. Possible areas for improvements in their mill are improving the flow of the wood and removing present bottlenecks.

Walt Pastorus of Laser Measurement International (LMI) stated that "Reliability in the harsh environment" was the first requirement from sawmills and that "as the need for higher production increases the industry is requesting faster scan data". (www, machinevisiononline.org, nr:1, 2008) . Yvon Hubert of Comact Optimisation, Inc., Broisband,

Quebec, Canada commented that "Optimum recovery, value, flow control for a higher piece count", were the industry's highest rated factors. Porter Engineering, Ltd., Richmond, B.C. Canada added "Reliability, correct data generated from scanner, repeatability of data." Walt Pastorus of Laser Measurment International (LMI) stated "North America has been the most aggressive in adopting 3D technology. This is due to the economies of scale and the need to meet the cutting rules".

5.2 Customer segments- approaching sawmills and their purchasing process

5.2.1 Which sawmill segments are adopting the new optimizer technology in North America?

According to Person A at TP inspection the sawmills adopting new optimizing technology are corporate facilities and larger privately owned mills. Currently *30-40 %* of larger sawmills have the equipment already. He said that the general opinion was that modern equipment was the future, and that everyone would be using it. *An optimizing machine costs around 500 000 to one million US dollars.* Smaller mills were still holding out and paying people to grade their lumber instead, although he estimated that 30-40% of small sawmills would adopt this in the future**.** The rest would either continue to pay people and find their niche or drop out of the market. Smaller sawmills could pay *100-200 000 dollars*. A small sawmill is defined by TPinspection and ALSC as producing 25 million board feet per year or less, a medium sawmill produces 25-75 million board feet per year, large more than 75 million board feet per year.

Person B at SPIB explained that the larger sawmills have more production equipment like electronic sensors, sorters, optimizing equipment, scanners etcetera whereas some smaller sawmills have very old equipment. The larger sawmills are usually corporate but sometimes family-owned. Family-owned sawmills usually produce around 150-200 million board feet per year. The family-owned that do not have optimizing equipment have not seen the need, either because their manpower is sufficient or because they do not have the capital. He said it was hard to say how much they would be willing to invest. Some of them were investing in upgrading, looking for a turnaround in the current lumber situations, but most were not. The larger the sawmill the larger the gain on the investment. Some corporations buy mills and run them as hard as they can and then sell them without making any investments or improvements. Family-owned and medium-sized sawmills tend to be steady in their upgrade because they understand that in order to stay in business they have to decrease their operating costs. He said it was not necessarily the larger corporations who were most likely to make new investments. *Usually when sawmills buy another mill the first thing they do is check what they need to do to improve the mill, since the mill apparently was not working too well before the purchase.* These are the ones who are most likely to make new investments. Most equipment comes directly from the manufacturers, and not through distributors. He said initial cost is not that important, rather the return on investment. A six month return is pretty good. Two years would be considered a long time, since the buyer usually has to repay a loan. Some companies are looking for recovery and increased volume, others are looking for the dollar value in the higher grades.

Person D at QFIC explained that very few sawmills in Quebec have the latest equipment of optimizers because of the decrease in the housing market during the last five years, which means they have not had investment capital. He said the only ones right now with the latest equipment were the really *big sawmills*. Small sawmills, producing less than 50 million board

feet per year, generally did not have new equipment because of the cost of investments. Also affecting purchase decisions were the returned profit and the price of lumber. Cant and trimmer optimizers were the most common in Quebec.

5.2.2 IVAB competitors opinions on which sawmills are adopting the new technology

Walt Pastorus of Laser Measurement International stated "The early adopters were the big companies due to the higher budgets available. Today in North America, it is a standard product. The small independent may have budget restraints but they know they need the 3D scanning and optimization if they have any chance of competing, especially in the high production mills." (www, machinevisiononline.org, nr:2, 2008). William J. Briskey of Lucidyne Technologies, Corvallis, OR, observes "Larger companies can better afford the cost and the payback is shorter with the higher volume a larger company puts through their operation." And Karl Gunnarsson of Integrated Vision Products, Woodenville, Washingon, states that medium sized companies ”that have the competence and resources”" are also applying the technology.

Walt Pastorus of Laser Measurement International states that “since softwood is more abundant and softwood plants are generally larger than hardwood plants, the migration of 3D scanners into the softwood market has been faster than in the hardwood market.” Walt Pastorus also says, "Softwood has always had a larger budget for optimization due to the quicker paybacks from higher production." (www, machinevisiononline.org, nr:3, 2008). Another barrier in the hardwood market suggested by Karl Gunnarsson of Integrated Vision Products, Woodenville, Washington is "For hard wood the cost of raw material and in many cases the requirements for higher accuracy has made it harder to implement a complete inspection system." Another barrier for the hardwood market suggested by William was "hardwood mills are generally smaller and have less capital. Technology is thus slower to move into the hardwood producers."

5.2.3 The sawmills’ views on scanner investments in the east of Canada and northeast of USA

According to Person I, the Robbins Lumber sawmill is struggling like everyone else with the housing market down. They are trying not to spend money in times like these. However if they see an opportunity that will pay back they generally jump fast and invest. The size of the payback matters, and sometimes they cannot afford not to invest. A fast payback would be *under two years*. They have no optimization in the planer line. Adding an optimizer in the planer mill would provide a better quality grade to the customer, but the payback is uncertain. According to Person I, since their edger was 20 years old it could not communicate so well with their present scanning equipment Scanware/Finscan. This meant an investment in a new edger would be more likely than an investment in a planer optimizer. He also said that Scanware/Finscan and CoeNewnes/McGehee were the only two working on visual grading at the time of purchase.

Person G at Portbec company said that changing manufacturers if not satisfied was not easy when the systems were integrated as they are at Portbec. This would not be a pressing issue until they were thinking of changing sawing lines for example. Changing the sawing line was not on the cards at present. Portbec were the first or second to have Comacts new plus grader machine in the Quebec province.

Person F at Maschino and Son Lumber stated that their customer orders were different from day to day. However, with his present old equipment he was able to program within seconds what he wanted to produce each day. “The optimizing equipment on the market is too expensive and too volume focused” he said. Quality is of high importance for the people of Maine. They would have to produce a much higher volume for it to be profitable to have an optimizer value grader. 35-40 000 board feet a day is what they do right now. They would have to do 80 or 90 000 board feet a day. No other sawmills of that size not have equipment either. Initial cost is not the most important factor for purchasing decision. What is most important is *pay off time, sawmill adaptation and how the optimizer company go about selling it*. Person H at Cumberland Ridge Forest Products had very similar comments, although his mill produces hardwoods. They have been in the business for 30 years and have a small sawmill producing about three million board feet per year. Person H stated that the optimizing machines cost about 0,5 to 0,75 million dollars and most hardwood mills cannot afford this. The optimizing equipment for hardwood that he had seen had increased the volume but given the wood a lower grade. Person H said that by focusing on quality, sawmills could make money even though times were hard with the housing market down. People needed to be taught to get the best quality out of less volume.

Person J at Karl Hedin in Sweden gave their main reasons for why they purchased a WoodEye and not a competitor. One was the fact that a WoodEye *fitted physically* in their production premises and fitted logistically with their production process. If the logs had gone through WoodEye crossways, like in for example a FinScan, the scanner would not have fit. This factor was hardly a coincidence. Another decisive factor was that a WoodEye was *cheaper* than some competitors, although it still held a very high quality.

5.2.4 Contracts

Person B of SPIB informed that if the buyer of equipment was not satisfied the sawmills would try to make the manufacturer live up to the promised standard. Or they would tell the supplier to take it out and perhaps file a lawsuit. The sawmills would probably include in the contract that “if the equipment does not perform in accordance to the specified standard and the grade rules, it must be removed by the supplier”. The sellers present in good faith, but quite often the machine does not perform. This can be because of change in resources, the people or the hot humid climate in the South East. The associations very soon find out if one of their member mills equipment is not working. Person E of Forintek and Person C of OLMA had similar views on the importance of the contract and risk of the seller being sued. Person A gave an example of a sawmill suing Finscan/Scanware because of inconsistency in the finished product and problems with the knot detection, and how “the million dollar equipment is now just sitting in the yard”.

5.2.5 How and where to approach and make contact with sawmills

Person C at OLMA said that in order to gain trust, a manufacturer of optimizing equipment *should not* put on a demonstration, bring in a piece of novel technology and show everyone. That diminishes sawmill’s confidence in doing things properly. Rather they should find a way to be invited, look around and complement on the mill, and then say “by the way why don’t you do like this”, or “haven’t you heard of this”. The seller should not tell them they are doing anything wrong. Person C added that it is not necessary for a manufacturer to speak French in Ontario. In north-western Ontario there are even a lot of Finish speaking people.

Person D at QFIC informed that every year QFIC and Forintek arrange a workshop in Quebec City at the end of November for the industry where manufacturers present their new products.

Person I at Robbins lumber in Maine, and Person F from the small sawmill Maschino and Son Lumber, also in Maine, informed that they go to equipment shows in order to look at new optimizing equipment. For example they have both travelled the long distance to Atlanta and Portland, Oregon for North Americas biggest equipment show which takes place once a year. Next year it is in New Orleans.

5.3 Competitors

See Appendix 4 for a list of the US and Canadian manufacturers of optimizing equipment from Timber Processing (July/Aug. 2007) magazine. The list informs on which stages of the production line that the manufacturers optimize in, their telephone number and headquarter state/province.

5.3.1 Who the main competitors are and opinions on their functionality

Eric Gee (e-mail, 2008) from The Southern Forest Products Association (SFPA) responded via mail with the following names of actors on the market being competitors to IVAB: Autolog, JoeScan, LMI Technologies, CoeNewnes/McGehee, USNR and Hermary Opto.

Person A at TPinspection said Comact, Autolog, Lucidyne, Scanware/Finscan and CoeNewnes/McGehee all *had problems with knot detection*, especially over regional differences, on the southern yellow pine. The geometrics, measuring wane and scant, from these five competitors were usually satisfactory. Person A pointed out that he had not had much experience of inspecting Lucidyne machines. He questioned whether Comact, Scanware/Finscan and other linear machines were using the best methods for using crook. He described grading machines as a good concept but felt that there was more to be done in this area of development.

Person I at Robbins Lumber informed that they had a Finscan optimizer and that it did not work well regarding *detection of rot* and some *dimension problems*. They had to mark for rot. A manual detector easily spots moisture but the Scanware does not. Scanware works well on bird peck, pitch, knots and bark. Streaky defects, like rot and blue stain, are hard for the machine to detect. Along the length of the Scanware scanner there are four thickness centres, two looking down, two looking up. They detect the thickness and look at the edges, but they mostly do it in those four areas where the detection cameras are. This can cause stops in the planer for example, as the scanner may wane as a thin board. Robbins Lumber also has a length scanner. Person I said transverse scanning takes more time than lineal. CoeNewnes/McGehee and USNR have a lineal scanner. The boards must go through really fast. If they were to invest in an edger with vision scanning they would probably look at Coe CoeNewnes/McGehee, even though Scanware also do edgers, (transverse) The reason is that they have not been too happy with a few things and Scanware have not resolved them. Robbins lumber have realised that the equipment they invested in will soon be out of date since the development is rapid.

Person C at OLMA said that the principal companies in eastern North America that helped them in optimizing were the CoeNewnes/McGehee Company and Comact. The CoeNewnes/McGehee company is now in Salmon Arm BC and the Comact company is in Saint-Georges Quebec. CoeNewnes/McGehee and Comact are in the “volume business”, because that is what they do best. They offer the full range of optimizing, from the primary breakdown, rough mill length and edge optimizing and in the finishing mill. The fact that they offer the whole sawmill makes it easier to fit the machines together. This reduces bottlenecks, improves flow and decreases downtime. He said that these two companies *bought out*

everyone else involved in optimizing in different parts of the sawing line and were more or less the only competitors left on the market. The CoeNewnes/McGehee machine company concentrated on machine stress rated lumber and finger joint structural lumber. Comact concentrated on primary breakdown. His view was that they did their best job in taking the log and profiling it, putting it through primary breakdown. When it came to edging and trimming optimizing they were *less sophisticated*. Many contractors would say that USNR from Takoma, Washington was more efficient in the further breakdown after the primary breakdown. Several Ontario sawmills have tried to combine the Comact and CoeNewnes/McGehee primary breakdown with the USNR in the secondary breakdown. However they have not been particularly successful because both companies try to make themselves *proprietary*, and sell the whole sawmill, which makes combining brands more complicated. Every sawmill *talks to others* on how the equipment is working. When OLMA has meetings the sawmills do not come there for business as much as to discuss how the equipment works. There are no secrets on that area. Also Person D from QFIC confirmed that larger companies are buying up smaller ones in Canada, as well as small companies integrating into larger companies. He gave Autolog as an example of a company buying up smaller ones.

5.3.2 For planer lines

The 17 planer optimizer/scanner manufacturers listed in the Timber Processing magazine, covering USA and Canada (July august number, 2007), can be seen in Appendix 4.

Person E at Forintek explained that at the planer mill there were three major manufacturers with optimizers considering *not only the shape but also the visual surface*. These were Autolog, Comact and CoeNewnes/McGehee -manufacturing. Only two or three sawmills in Quebec had this new technology at that time. Such a planer optimizer probably cost between *half a million and one million* Canadian dollars.

Person C at OLMA said the CoeNewnes/McGehee company was among the first to offer *visual grading* system in a planer mill. By identifying and grading wane, knot clusters and sizes, usually about 85 percent of the grading was taken care of. Although split check or unsound wood could be a problem for optimizers, human grading was still highly simplified by the machines identifying wane, sizes and knots. After proving this to sawmills the CoeNewnes/McGehee sold a lot of equipment the following year. The CoeNewnes/McGehee company were more adept in the planer mill than Comact. They had very good planer service and were always available. Person B at SPIB mentioned that CoeNewnes/McGehee's optimizer "LPO" worked well for planer lines. The Lucidyne also worked well for planer lines. Person B continued with "The rest of the manufacturers however are not doing that well for planer lines", but cold not be more specific about what he meant.

5.3.3 For edgers

The 25 edger optimizer/scanner manufacturers listed in the Timber Processing magazine, covering USA and Canada (July august number, 2007), can be seen in Appendix 4.

Person D at QFIC claimed that the two major brands for edgers were Comact and Autolog. Others were PHL, USNR, Inotech and Delto Gilbertech.

Person C from OLMA said the CoeNewnes/McGehee company were among the very first companies to improve length optimising and edge optimizing through electronics and camera sensing.

5.3.3.1 Information from competitors on their edgers

Microtec is in the process of developing an updated edger which is expected to be ready for sales in August 2008. The updated edger will take other defects on the board into consideration when calculating how much trimming should be done in order for the board to measure up to the standards of a certain quality. (e-mail; Armin von Grebier, 2008). The scanner will not have an ex-ray function but other equipment such as three dimensional scanning.

Scanware, has developed "Boardmaster" which is a sorting system that optimizes value with consideration to a number of defects on the board, including edging. Jörgi Lager from Scanware informed through e-mail; "The edging can be specified for different qualities and since the system optimizes value the quality or dimension which results in highest value will be chosen. The system notes other defects such as deformation, knots, cracks etcetera which are included in the optimization. Our present markets where we have sales offices and service are Sweden, Norway, Finland, USA and Canada." Yet another competitor is the in X systems and their "Optigrader". Mattias Karlsson of Rema Control informed through e-mail; "Optigrader is a camera system working with value optimizing of all cuttings. Two sides are scanned through the edger application and with consideration to edges, knots, blue stain etcetera the value of the board is optimized. The basis for the optimization is a price list where all products, including chips, are noted."

One of the effects from the Mountain Pine Beetle is cracks in the wood of affected trees. As a consequence of this scanning will be come more and more important to detect these cracks in the refining industry (pers.com, Dr Antii kari). *Laser Measurement International* is one company seeing possibilities in the aftermath of the Mountain Pine Beetle and they are making a point by marketing their new edger in terms that would attract affected sawmills. Their Dyna Vision chromascan 3300 sensor which works as an edger optimizer detects cracks that can be edged or trimmed out (www, machinevisiononline.com, 2008)

5.3.4 General information from competitors' websites

This paragraph is intended to offer more insight on some of the most frequently mentioned competitors.

Autolog has equipped sawmills throughout North America and Europe, since 1987. The systems offer an average payback of less than one year. The have more than 85 employees. Offices in south-eastern and south-western USA as well as south-eastern and south-western Canada. Members of the Southern Forest Products Association. Autolog has more than 62 linear planer optimizers installed and 35 edger optimizers installed. (www, autolog.com, nr:1, 2008).

CoeNewnes/McGehee have 26 Linear high grader systems sold, 16 with knot sizing, all others can be upgraded. Replacement parts available, 24 hours a day, 7 days a week. Onsite technical assistance for emergency situations. Onsite services during installation and start-up. More information on: www.coenm.com

On their website *USNR* claim; "We supply product and service solutions for sawmills around the world, including Canada, Chile, Japan, Australia, New Zealand, the US and many other countries." They have more than 30 years experience in the industry. USNR employs hundreds of individuals at its six locations in Washington, Arkansas, Florida, Michigan, British Columbia, and Quebec. More information on: www.usnr.com

Scanware/Finscan have sold 295 board master systems worldwide. 139 of these have colour vision. 48 of these are sold in Sweden and Norway. They have 13 employees and were founded in 1988. On their website they show a map of sold scanners in North America (http://www.finscan.fi/swe/index_swe.html). The map shows that they have 20 sold scanners in USA and four in Canada. It also shows that they have concentrated their sales on the north west of USA. More information on; www.finscan.fi and www.Scanware.se

On their website, *RemaControl* claim to have more than 50 years of experience and more than 4000 systems installed. More information on; www.rema.se

5.3.5 Comments on WoodEye

Person A at TP inspection thought WoodEye machines did a good job at pulling out finger joint segments and identifying defects, but not classifying the defects into a specific grade.

5.4 Competitor Service

Person A at TPinspection said that in order for optimizer manufacturers to supply the right service it was necessary to have customer *service representatives in multiple location*s, near the sawmills. If not they should be ready to fly someone there immediately with no additional costs for the sawmill. He gave Autolog as an example of a company offering that kind of service and said they were based in Canada but also had technicians in the southwest. The person flown down from Autolog was a local person, typically from that area, who understood what the mill owner was up against. He continued; "Americans tend to think that Europeans know what they are doing" so the manufacturer does not have to be American.

Person G at Portbec explained that Comact was chosen as a supplier since they had had good contact with them and since their office was located not far (20km) from Quebec, which meant they received the best possible service. Comact offered the whole range and package of equipment. Comact were quick to be at the sawmill and fix problems, although the *best service was provided in the installation phase*, where knowledge was gained on how to solve the problems themselves and get to know the manufacturer. The equipment was bought about the same time and installed at the end of the 90's and had since then been upgraded. Comact is cooperating with Rema and other smaller suppliers which is one of the reasons why they can offer the whole package. Speaking French is essential for doing business in Quebec. Comact's collaboration with smaller manufacturers also helps the smaller manufacturers in factors such as language barriers. Other established companies in Quebec are Conseption R.P, but they are more into carpeting, planers and finger jointing. Hewsaw is a Finish company which has had much success in Canada. One of the keys to their success is that their equipment deals with the small timber, which almost looks like pulp wood and of which there is quite a lot of in Quebec. Hewsaw deals with service and sales through local Quebec people who know the area and language.

Person C at OLMA felt that service from the optimizer manufacturer worked very well from Comact, CoeNewnes/McGehee and three or four other companies. They have people on the road all the time and could be there the next day to help out with maintenance and technology. Between e-mail and satellite technology the information spread goes extremely fast. Small service events matter a lot for the lasting impression. What does not work well in service is most commonly *waiting a long time*, having to *remind* about service and *incapable* service personnel. Person C considered bad after-sales service to be the biggest trust destroyer. Comact's success depends on three things according to Person C: 1/ they pay attention 2/ they have strong robust machines 3/ they find and fix problems quickly.

Person I at Robbins Lumber sawmill (Robbins Lumber have a Scanware/Finscan optimizer. Scanware cooperates with Autolog) made the point that although they have previously found both Scanware and Autolog to be satisfactory, they have recently felt let down, and been dissatisfied with service. Person I stressed the fact that good service from a manufacturer is vital. “Service is not really a contract issue, it is about trust and people. Actions speak larger than words.” said Person I. If Robbins Lumber were to find a supplier that provided more reliable service, they would be inclined to change. For the full interview with Person I regarding their views on Scanware service, see Appendix 5. The interview provides detailed information on which aspects in service are important, *from a sawmill’s perspective.*

According to Person B at SPIB, bad service is the seller not having technical staff, not adequately engineered, available or not listening to sawmills concerns. Even worse is if the seller blames the sawmill for occurring problems. Sales people are inclined to make promises that are not followed up when the equipment has been installed and does not perform. This is quite common and this destroys the company trust. In order to gain trust the manufacturers must understand the difference between the logs in Europe and logs in South East USA and how the optimizer operates and evaluates them. Differences are strength, flexibility, knot size and presence of pitch. Most manufacturers understand the process from converting a log to lumber and when it comes to geometrics, sweep, skip and thickness, most optimizers do not have a problem with different species. However, when it comes to *visual grading* machines, there are significant problem depending on which region the machine will operate in. It is necessary to evaluate the machine thoroughly for every region it will operate in. Another factor that manufacturers need to consider when giving training and service is the difference in the sawmill peoples *backgrounds and training*. Some have a maintenance philosophy and understanding on how the machine operates to a higher degree than other sawmills. Sawmills with lesser skills on how to operate new equipment could be sawmills of any size, from the local area. According to Person B, the staff in the south east of USA the staff is not always as committed to the job as they are in the north east.

5.4.1 WoodEye service

The importance of support was also discussed during an interview in Sweden with Person J at Karl Hedins. (Pers.com, Person J). The general impression at Hedins of IVAB service is positive, although it was pointed out that the support line is closed at night and at weekends, which can lead to prolonged costly stops in production. He admitted, however, that the staff at Karl Hedins sometimes had to blame themselves for the long production stops as they would sometimes rather try to fix the problem themselves before phoning the IVAB support line. The reason for this was not the reception at IVAB but rather pride and personal interest. Another criticism was the feeling that there should be some continuity in the service provided. If the same group of people from IVAB performed the service visits and were referred to in cases of emergency, IVAB would be able to offer quicker and more reliable help. This group of people at IVAB would gain specific knowledge of Krylbo sawmill’s production chain and needs, which would improve the standard of service considerably. Generally, it is difficult to explain wood defects over the phone and it makes it even more difficult if the person on the other end does not have that much experience of wood refining and wood working. So some experience of refining and wood working is a desired quality among service personnel. This would in turn increase the Karl Hedin employee confidence in IVAB and improve the relationship commitment.

5.4.2 More on service and trust in general

Person A at TP inspection stressed that trust in the manufacturer of equipment is a huge issue for the purchasing investment. Trust is gained through having the right customer service. “I have seen some manufacturers of scanners that have not had the right service after the sale, which has killed their reputation in the market.” High quality customer service is of utmost importance for the reputation of a manufacturer and may even be worth paying a slightly higher price for the equipment. The main key to success, according to Person A, is a quality product, which works and is user friendly and that the manufacturer shows how it works. A thorough introduction on how to run the machine and good customer service is the way to gain trust on the market. If something goes wrong customer service is absolutely essential. The main issue in gaining and retaining trust and customer service is keeping promises. If a promise is made to send down someone to fix the problem then someone that knows what they are doing should be sent down to fix the problem. If a service person does not know what he is doing, sawmills will notice and are less likely to continue doing business with this company as a result. Person C at OLMA also stressed the importance of keeping one’s word.

Person G at Portbec stated that good service is defined by quickly resolving problems at a low cost. They have to find local parts so sawmills do not have to wait for equipment from, for example, Finland. *Personal contact, adapting to each individual sawmill, proven capabilities and good references* are the best way to gain trust among potential buyers. The word gets around very fast among sawmills on what equipment is working and which service is good.

6 Analysis

The analysis is based on the results in chapter five. The analysis will begin with applying Porters five forces of competition to the results of the North American scanner market (6.1). In section 6.2 and 6.3 Ford's Marketing Course and the Commitment - trust theory will be used in order to determine how different factors in the offering affect buyer-supplier trust.

6.1 Analysing industry attractiveness - Porter's five forces of competition

This section applies the Porter model (Figure 5) with the gathered results from sawmills and associations in North America. Hence, it is a five forces analysis of the North American scanner market. As Figure 5 shows the supplier power, threat of entry, threat of substitutes, buyer power and industry rivalry will be analyzed in order to determine which forces are the most dominant on the North American scanner market.

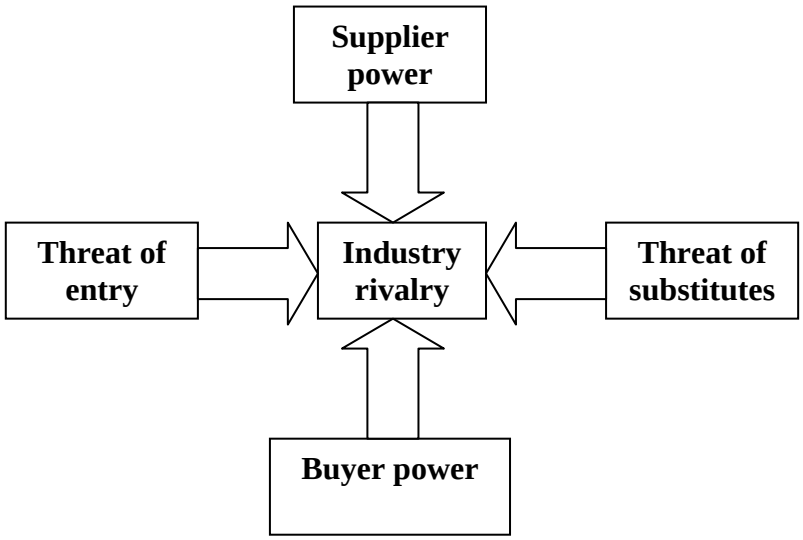

Figure 9. *The illustration shows a simplified picture of Porters five forces of competition. (Grant., R, 2008).*

6.1.1 Supplier power

Small. There is not a high quantity of material required for a scanner optimizer, and the "shell" is mostly made of steal which is a common material and relatively cheap. The complicated equipment, such as cameras, required for a WoodEye is produced by IVAB in Linköping. The company has high technical production skills which originates in the company's collaboration with Linköpings University since the 1970's regarding computerized image processing. The complicated equipment is relatively small in size and can most likely be produced in Sweden or elsewhere for easy transport to North America, which means that IVAB should not be dependent on local producers of complicated equipment.

6.1.2 Threat of entry

Relatively small. Since IVAB themselves are trying to enter the North American market the threat of entry towards them is not especially relevant. Most European manufacturers, including IVAB, already have some kind of market in North America. However, the need for distribution channels, local knowledge and especially the necessity of speaking French in Quebec means that the entry barriers for a non American manufacturer are quite high. This

means that the fact that IVAB already have a service and sales office in North America gives them an advantage to competitors that have not yet established themselves at all in North America. Although the entry barriers also make it more difficult for IVAB to spread on the North American market which means a disadvantage for IVAB in comparison to competitors with a greater level of establishment such as Comact, Autolog and CoeNewnes/McGehee.

6.1.3 Threat of substitutes

Small. Several respondents have answered that optimizing and scanning equipment is the future. However optimizers are not yet considered prize worthy by smaller mills, especially among hardwood sawmills. *Manual grading* is evidently still a common method among small sawmills. Among small sawmills in Maine USA, finding a niche to specialize in seems like a popular alternative among both hardwood and softwood mills, instead of, as they see it; "buying an optimizer and becoming volume focused". Person H at Cumberland Ridge Forest Products said that the optimizing equipment that he has seen coming to hardwood has increased the volume but given the wood a lower grade. This is why he is encouraging hardwood sawmills not to invest in optimizing equipment but still gain higher profit. Also Person F, from the softwood mill Maschino and Son Lumber, claims quality products is his niche and that this is why he does not invest in an optimizer. If IVAB can prove to these sawmills that their equipment will pay off even with low volume production, by focusing on quality and value grading, they should have a huge market in North America. The initial cost and payback time is a huge factor for smaller sawmills. If IVAB's equipment cost more than the sawmills can afford it will overshadow the value optimizing and there is a risk sawmills will either choose cheaper competitors with shorter payback time, or choose the substitute of manual grading. The cost that sawmills are willing to pay will be further addressed in the discussion section.

There are several x-ray technologies on the market. x-ray technologies have the advantage that they consider defects inside of the log or board, whereas scanners like WoodEye solely look at the surface. (www, sp.se, 2008) Defects beneath the surface are very important when sawing logs and timber, but decreases in importance the smaller the pieces get. For this reason x-ray methods are mainly used on logs. Since WoodEye is used on sawn and planed timber the x-ray technologies are generally not competing on that part of the production chain. The same goes for acoustic measuring methods.

6.1.4 Buyer Power

Strong. At first glance the optimizing scanner equipment industry gives the impression that buyer power is not great. There are so many potential buyers among the thousands of sawmills in North America, and the number of manufacturers seems very low in comparison. This relation usually gives the seller more power and advantages (Grant. R, 2008). However many interviewed sources emphasize the importance of the manufacturer *keeping his word*, because reputation gets around fast and can have devastating effects on a manufacturers trademark. Quoting Person C; "When OLMA has meetings the sawmills do not come there for business as much as talking on how the equipment works. There are no secrets."

Comparing the sales of optimizing equipment with the factors from Porters model that gives high or low buyer price sensitivity shows mixed results. The *sellers product, IVAB's scanners, can be considered of high importance for the buyers product quality*, which should give a low buyer price sensitivity. However; *an investment in an optimizer usually represents a high proportion of total cost for sawmills,* which should result in high customer price sensitivity according to Porters theories. The more IVAB can differentiate their products from their

customers, the lower the price sensitivity according to Porters model. Small sawmills, selling to local retailers rather than huge depots, are generally more concerned about high product quality. An investment in optimizers represents a high proportion of their total cost. Both of these factors indicate high price sensitivity for small sawmills. Only by differentiating their product can they lower the price sensitivity and sell equipment to a price profitable for both IVAB and the small sawmill market. The best and most convincing way of differentiating is offering a *short payback time*, and managing to keep this promise. The payback time is for obvious reasons more important than the initial cost. More on this issue in the discussion section.

6.1.5 Industry rivalry

Very strong. Timber Processing magazine lists 52 optimizing/scanner manufacturers in the USA and Canada. 17 of these sell planer optimizers and 25 of them sell edger optimizers.

In north-eastern USA and south-eastern Canada the most significant development on the rivalry side has been that the companies Comact, CoeNewnes/McGehee and Autolog have bought up almost all competition. These two companies also have an advantage in Quebec as it appears to be absolutely necessary to be fluent in French in this area. There are also indicators that these companies collaborate with smaller, more specialized manufacturers in this area, which could mean it is not just an increased rivalry coming from these companies, but some opportunities as well. They may have local connections and knowledge making them suitable as distributors in areas difficult for establishment. Person Cs view is that “they do their best job in taking the log and profiling it, putting it through primary breakdown, but when it comes to edging and trimming optimizing they are less sophisticated.” This indicates they are most likely to look for partnership in the secondary breakdown, which is IVAB’s area of specialization.

In the southeast of USA there were no indicators from the respondents that a few competitors were dominating the market in the same way. However, judging from the competitor list mentioned, companies such as USNR, Advanced Sawmill Machinery, Cooper Machine Co, Inovec, Joescan, LMI Technologies Inc, MPM Sales Corp Morris Industrial Corp and Softac Systems Ltd offer optimization in almost all of the production chain, which could be an indicator that they have bought up smaller companies. The Timber Processing magazine list does not give any clues on how well the companies do their job or how appreciated they are, but it is clear that there are a lot of competitors on the North American market.

The factors indicating a high industry rivalry according to Porters model are the relatively high number of competitors, the low possibilities for differentiation and high exit barriers. The possibilities for differentiation are better than in some markets, since it is a fast growing market and room for improvements. Yet there are indicators that the most important factor is not only offering the best and most innovative equipment, but rather having the reputation of offering the best solutions to the sawmills problems both before and after the purchase. This brings us in to service which is a topic continued below.

6.2 Ford’s Marketing Course

The results of this study have shown that a product alone is not enough to satisfy the customer’s needs. All of the aspects mentioned in Ford’s model in the theory section, have been brought up as important by the respondents.

A good quality *product* with a long system lifespan, a short payoff time, and which is in alignment with the sawmills goals of production are some of the most desired product qualities of a scanner optimizer. These factors probably make the aspect of the product the most important for the actual purchase decision of the sawmill. However, in order for these factors to be maintained after the purchase a chain of other aspects included in the offering need to work as well. If these other aspects do not function, the reputation of the scanner manufacturer maybe ruined and the promised product qualities no longer trustworthy the next time the manufacturer tries to sell.

The importance of good *service* has been repeatedly emphasized by all respondents, from directors of big associations to owners of small sawmills. Person A at TPinspection said "that in order for optimizer manufacturers to supply the right *service* it is necessary to have customer service representatives on multiple locations, near the sawmills". Not only is the quality of the service important but also its *adaptability*. Quoting Person B; "what the manufacturers need to consider when giving training and service is the difference among the sawmill peoples backgrounds and training. Some have a maintenance philosophy and understanding on how the machine operates to a higher degree than other sawmills." This quote exemplifies the need to adjust to the many local variations such as wood defects and employee knowledge. Sawmills highly value service that is provided quickly and which is adapted to the individual conditions and specific requirements of each mill.

Having service people and spare parts close to the customer also shows the need for and appreciation of *logistics*. Even during the installation phase it is imperative that a relationship of trust is established between manufacturer and sawmill. The manufacturer can offer *advice* and instruction which will enable sawmills to make their own minor adjustments and amendments, and deal with lesser problems themselves. According to Person G at Portbec, the best advice and training is given in the installation phase, where knowledge is gained on how to solve the problems themselves and also getting to know the manufacturer.

Person I at Robbins Lumber described their experience of having to wait repeatedly for service from Scanware and this description is a good, yet warning, example of not only bad service, but also bad adaptability and advice. This interview can be found in appendix 5.

A comparison of the analysis with IVAB's offering to its customers show positive results. The offering from IVAB to its customers consists of the scanner WoodEye that optimises the value yield with respect to a *large number of factors* in the production chain simultaneously. WoodEye is supposed to be simple to use and *flexible*. Maintenance and *service* reduce the risk of an unplanned operational stoppage. Through constant *training* measures of customer personnel all the system's functions and possibilities are attained. IVAB has a helpdesk service for provision of quick, cost effective troubleshooting. They *answer customer questions* by telephone and can connect direct to the customers system and work online. IVAB will *visit* the customer's factory for technical support on site if necessary. (www, woodeye.se, nr:2, 2008)

6.3 The Commitment - Trust Theory

According to Morgan and Hunt's article, relationship marketing can be explained as "establishing, developing, and maintaining successful relational exchanges". The model shows how commitment and trust will create effectiveness, productivity and efficiency, if they are both present. As described in theory, a discrete transaction has a distinct beginning, short duration and sharp ending, whereas a relational exchange is "longer in duration and reflecting

an ongoing process". If a scanner optimizer purchase by a sawmill is seen as a discrete transaction by the scanner optimizer seller, there are several indications in this study that the scanner optimizer seller will not last long in business. An optimizer seller has to be committed throughout the relationship. Selling scanner optimizers therefore is a relational exchange, and the actual sales is only the beginning of a process requiring good communication and a lot of work in order for it to be successful.

The optimizing industry causes high termination costs for both parties. It is very possible to terminate the cooperation, several interviews have confirmed, but it is a costly process. Exemplified by Person G, integrated systems raise termination costs. This, according to the Morgan and Shelby model, should increase the relationship commitment. Relationship benefits also increase the commitment. The relationship benefits are of course what all of the optimizing manufacturers are trying to prove to sawmills in order for a purchase to take place. However, the optimizer manufacturers must remember to maintain the relationship benefits after the purchase have to maintain once the investment has been achieved. This brings us to the factor of "opportunistic behaviour". "Opportunistic behaviour" is the first described trust destroyer in the model. It proves the importance of maintaining a sawmill profit and satisfaction after sales. An example of dissatisfaction from opportunistic behaviour is the belief that a manufacturer is more interested in satisfying the big sawmills which still had room in their operation for more equipment than the other customers. Several interviewed expressed "not keeping what you promised" as the biggest trust destroyer. In other words promising benefits from the equipment that are later not realised will damage the brand name severely. For this reason it is important to test the equipment in different environments before making guarantees.

The only factor in the model that is necessary in order to increase both commitment and trust is "shared values". Once again the importance of service people who know the local customs is relevant, as brought up by associations in the south of the USA. The factor of "communication" also has to do with understanding local customs, but also language barriers as in Quebec, and, with offering a 24/7 quality service that includes competence and adaptability. Low commitment leads to "propensity to leave" Sawmills in North America are not afraid to put their foot down and sue if promises are not fulfilled. This is however detrimental to both parties and is used as a last resort. Sawmills have high commitment for making the relationship work, but the manufacturers of sawmill equipment should be aware that sawmills can and will break out if not satisfied. Comact and CoeNewnes/McGehee, as well as other companies, appear to have found a way to decrease the propensity to leave, by selling whole production lines to sawmills. This results in the equipment being integrated and making it more difficult to put in a competitor's equipment in the middle of the production chain. It also increases the termination costs, since the sawmill might have to abort the whole production line in order to abort the cooperation with a manufacturer. According to the model, if a manufacturer and the sawmill have good communication, shared values and absence of opportunistic behaviour, this will increase the trust and the likelihood of functional conflict.

As a conclusion trust in the scanner manufacturer is extremely important because of the huge investment that a scanner is for most sawmills, the effect it in many cases has on the production line and the long term partnership that is necessary for a lasting satisfaction. Building trust is done through having a good reputation, good manufacturer knowledge, high customer interest and keeping what you have promised.

A view point on the model and indication is that knowledge is not included as a factor. B*ad knowledge or bad understanding* on the part of the optimizer manufacturer can be interpreted as low commitment or even nonchalance from the sawmills perspective, even if the commitment from the manufacturer is high. This in turn underlines the need of seller knowledge, regarding specific sawmills processes and technical skills. Lack of confidence in the manufacturer can destroy the customer relationship entirely.

7 Discussion

7.1 Objective 1 - Which segment areas are potential markets for IVAB ?

7.1.1 Is there any demand for Edger, Planer and NHLA by sawmills in North America?

Edger - Most respondents claimed they did not have enough knowledge of edgers in order to provide an opinion on the market potential of one fitting the description of IVAB's new software. Neither could most of them give any clue to which segment of customers were most likely to invest in such an edger. The most interesting comments came from Person D who claimed that he knew that manufacturers such as USNR were working on edgers, similar to IVAB's, optimizers, but he doesn't know of any of these on the market today. Competitors' web pages, such as USNR, Scanware/Finscan and CoeNewnes/McGehee, give the impression that they have similar edger offerings. A more detailed technical analysis of the competitors' edger offerings is needed in order to evaluate IVAB's product advantages. Person D and Person E at Forintek also indicated that *larger logs result in a larger need for edger optimizers*. Larger logs are normally grown in the southern part of Quebec and since the larger mills are generally in the northern part, it is small to medium sized mills that use the big logs. Big logs are also common in western Canada, which may be a contributing factor to the spread of the mountain pine beetle in this area (www, for.gov.bc.ca, 2008).

The hardwood lumber scanning and optimizing study from 1999, gave interesting results on what the hardwood mills considered desirable features in a future edger-optimizer system (Appendix 1, table 2). "Improved raw material recovery" rated lumber one with 78,5 percent, "increased lumber revenues" rated number two with 77,1 percent, and "reliability" rated number three with 75,7 percent. If IVAB can make an optimizer fulfilling these requirements as well as *grading the southern yellow pine knots* in an accurate way over different regions they will be likely to have a high demand for their product.

When the respondents were asked about a *suitable price* for the edger optimizer, all of them replied that they did not know and could not guess. For this reason it is once again interesting though to look at the results of the hardwood lumber scanning and optimizing study from 1999, concerning future edger-optimizer systems. Even though the answers all come from hardwood sawmills, they are still interesting to consider for softwood mills. The results in the study on what sawmills were willing to pay for future edger optimizers are shown in Appendix 1, Table 4. Small companies rated initial cost and operational costs higher than did large companies. When the respondents were asked if they would consider installing future edger-optimizing technology 68 percent answered yes. When asked about a specific prize that sawmills were willing to pay, 37 percent chose the lowest category, "less than $100 000". It is worth noticing however that the authors of the article admit that they should have had an alternative answer for companies not interested in buying a future edger optimizer, since this category probably chose the lowest cost category instead. It was clearly stated that the price included the scanners, computers, and edger but not the material-handling system. 29,4 percent chose the category of "$100,001-250,000" and 22 percent chose the third category of "$250,000-500,000". 10,6 percent chose the category of "$500,000 -1000,000". The expected payback time for future edger-optimizers was 3.6 years.

Assuming these results are similar for softwood mills, WoodEye's new edger should be highly in demand since it is relatively cheap in price and its function will both improve raw material recovery and increase the lumber revenues.

NHLA **-** The National Hardwood Lumber Association (NHLA) were contacted for an interview but they unfortunately refused. No organisations dealing with hardwood were among the interviewed, which means that very little primary information on the demand for a NHLA grader, is coming out of this thesis. However, when this issue was mentioned to softwood associations during the interviews the response was generally very positive. *Manual grading* is still common among small mills and hardwood mills. Small mills often have the assumption that optimizer scanners are *volume focused*, which means they would have to increase there production for it to be profitable. Increasing production is especially difficult with the present bad market. Small mills are there for "focusing on quality", and do not believe there to be optimizers good enough. If IVAB can prove to these sawmills that their equipment will pay off even with low volume production, they should have a huge market in North America. It is important however to carefully test the NHLA in different locations and establishing a skilled service network. A high adaptation is required for different tree species and local variations. When approaching small mills it is important to remember that they take huge pride in their work and that trust in the seller and the equipment is a huge factor for purchasing.

Once again it is interesting to compare these results with the hardwood lumber scanning and optimizing study from 1999's research about future automated hardwood lumber grading systems, since IVAB's software NHLA is an automated hardwood lumber grading system. The results on what the hardwood mills considered desirable features in a future hardwood lumber grading system (Appendix 1, Table 6), showed that "accuracy of grading" was voted most important, followed by "system lifespan", "durability" and *interestingly* "NHLA grading rules" on fourth place. (Bowe et al, 2002). "Initial cost" came in on place six. In the same study the respondents were asked which an *acceptable cost* was for an automated hardwood lumber grading system. The results from this are shown in Appendix one, table four. One has to be aware that this time the respondents were not asked what they were willing to pay for future systems, so the answers are credible for 1999 currency and equipment. 48,5 percent answered "less than 100,000$", yet once again the authors of the study from 1999 admit that they should have had an alternative answer for companies not interested in buying a future edger optimizer, since this category probably chose the lowest cost category instead. It was clearly stated that the price included the scanners and computers but not the material-handling system. 31,2 percent answered "100,001-250,000$" and 15 percent answered "250,001-500,000$". Only 5,4 percent answered "500,001-1000,000$" in 1999.

Comparing these "acceptable costs" with what Person H from Cumberland Ridge Products mentioned on the subject, shows that the results coincide. Person H said that today most hardwood optimizers cost 0,5 to 0,75 million dollars and most hardwood mills cannot afford this, which is accurate with the hardwood lumber scanning and optimizing study from 1999 since the results show that only 5,4 percent were willing to pay this amount in 1999.

Planer **-** Optimizers for planer lines was the software where the least amount of information could be gathered. As with the other software this was partly due to the lack of knowledge in this area by the interviewed, but also due to non specific information from IVAB on what characterises the new planer software. Person H from Forintek informed that only two or three mills in Quebec had the most modern planer optimizer equipment, optimizing both shape and

visual surface. This should mean there are a lot of *potential customers* in this area. Such equipment was said to cost 500,000-1,000,000 Canadian dollars according to Person E. The respondents also informed that in Canada the present planers had problems seeing *splits* and that *the sensitivity in reading* needed improving. The sensitivity in reading can be interpreted as a demand for *advanced visual grading* of defects, rather than just measuring wane. There was also a demand for planers that identified the best side of the board, before putting it through the planer, since in many wood products only one side of the board is visual. To my knowledge this is one of the qualities of the WoodEye scanner, and one of many indicators in this study showing that IVAB offers very technological advanced equipment.

In the south east of USA USNR, CoeNewnes/McGehee and Lucidyne were considered to be the main competitors for planer optimizers, although knowledge was vague.

7.1.2 What are the main competitive forces in the North American market?

The Porter analysis showed that the "supplier power" and "threat of entry" were not great in relation to the remaining three powers. The "threat of substitutes" is not irrelevant as there currently seems to be public promotion for manual grading among hardwood mills. However the reason for this is that sawmills seem to consider optimizers as "volume focusing". Hence, this power would only be a threat of importance to IVAB if they were trying to sell volume focusing optimizers. To my knowledge, the IVAB software applications are *value optimizing*. If IVAB can present this to the hardwood sawmills they could turn this "threat" to an advantage. The "buyer power" is, for reasons brought up in the analysis, a force it would not be wise to neglect. Apparently, sawmills have good communication with each other and put great value in other sawmills' experience of equipment and after sales service. Interview participants in all of the visited parts of North America clearly stated how sawmills' experiences with optimizers spread and have huge effects on the *reputation* of optimizer manufacturers.

The force of "industry rivalry" was also brought up in the analysis as a strong force. There are a lot of competitors on the North American market (see Appendix 4), producing similar products to those of IVAB. Technical skills are required in order to evaluate the competitors' optimizers' practical strength and weaknesses in relation to those of WoodEye's. If IVAB can offer a quality scanner that works as well as was promised with robust equipment and good after sales service, they should have no problems persuading sawmills to buy their scanner. Or in the words of Person A; "The main key to success is a quality product, which works and is user friendly and that the manufacturer shows how it works". However, most of the competing companies in Appendix 4 are either American, or have strong distribution channels in America. If IVAB is to succeed in America they not only need a *competitive product*, but *distribution channels* and *local knowledge* in their target geographic area.

7.1.3 Are there any possible distributors for IVAB in North America?

When asked about possible distributors for WoodEye all of the nine respondents interviewed, as well as the dozen associations contacted by mail responded that they did not know. One respondent stated that most commonly the equipment comes straight from the manufacturer and not through distributors. However, it has been informed that the market leaders on the optimizer market in North America, such as Comact, CoeNewnes/McGehee and USNR, cooperate with smaller, more specialized, companies in order to offer as wide an area of services as possible. Autolog, Comact and CoeNewnes/McGehee were contacted through e-mail on a general cooperation inquiry. Only Autolog responded and the *name and telephone number of person to contact* can be found in Appendix 3.

Judging from the descriptions of Comact, CoeNewnes/McGehee and USNR on their websites, they are not significantly larger than IVAB. This could result in IVAB being considered a threat if approaching these companies for cooperation. However it has been determined that Scanware/Finscan are cooperating with Autolog and that RemaControl probably is cooperating with Comact. By attacking companies presently in cooperation with market leading companies IVAB could take over their position in cooperating with the market leaders. Scanware/Finscan is an international company, not too different from IVAB in terms of their size and Nordic origin. Scanware/Finscan's success and failures in North America can offer a *valuable lesson* on which opportunities and threats IVAB should aware of when expanding on the North American market.

Cultural differences were acknowledged in both the southeast of USA and the southeast of Canada. In Canada it was recommended to adapt the service and training carefully to the specific sawmills working process and skills. Apparently the backgrounds and attitudes among sawmill workers vary a lot. It was also important to pay attention to *local variations* of Southern Pine. It seems to be a species that comes in all shapes and forms. In Quebec the *language spoken* is French. This was clear during my visit and apparently even more relevant when communicating with sawmills. These two cases are clear indicators that some kind of *local distributor is necessary* in these areas.

7.2 Objective 2 - How do different factors in the offering affect buyer-supplier trust?

For the service to be successful goodwill, 24/7 service and availability are not enough. The service person must understand the *local environment*, the skills of sawmill workers and the qualities of the wood produced in that region. It is also expected that the service person is *dedicated* to a specific mill, and understands their specific production process, values and visions. This is not only a way of raising the efficiency of service and advice, but also showing respect to sawmills for the enormous investment an optimizer scanner means to many of them. This fits well with Morgan and Shelby's model, where communication is the factor increasing trust, and opportunistic behaviour is the one factor decreasing trust. When speaking to the associations and sawmills, "not keeping what you promised" is regarded as the biggest of *trust destroyers*, and is likely to be seen as "opportunistic behaviour" from manufacturers, who promise more than they can hold while trying to sell equipment. The case study of Scanware/Finscan gradually destroyed relationship with the Robbins Lumber offers a *good example* of the disastrous effects of underestimating service and adaptation. This is why manufacturers must be very careful and precise with what they promise. This means testing the equipment in the exact conditions where it is to be used. In cases where sawmills feel the manufacturers have not kept what they have promised, it may often be without any foul intention whatsoever from the manufacturer.

7.3 Evaluation and recommendations

The first objective of this thesis; "*Through application of theory and gathering of data be able to establish which segment areas are potential markets for IVAB",* cannot be considered to be fully achieved. The reason for this has been limitations in time and resources as well as the limited knowledge that the interviewed associations have had on optimizing equipment. Most respondents began their answer of the questions regarding the new software with a dismissal of their knowledge on the topic, but continued with "but I am guessing there would be a huge demand for such a scanner if it was to reach the market". This was also noticed in the results from the questionnaire forms sent out via mail prior to the trip. A *positive* way of interpreting

this reaction from the respondents is that it is an effect from IVAB's new software being is so advanced and new on the market, that this is why the respondents felt they were not familiar or knowledgeable enough about it. A suggestion for advance on this, the first objective, would be to interview a high number of sawmills in a limited area, regarding how IVAB's new software would practically fit and work in accordance with their specific operational goals, and which maintenance and reparation service they are expecting after sales. This method of approach would result in more applicable solutions for IVAB.

The second objective of this thesis; "*How do different factors in the offering affect trust between buyer-supplier?",* has had a higher level of achievement. The subject was brought up independently by all respondents and this was the subject where they had the most to say. When speaking on this area the respondents got engaged and gave examples from real life experience. The interview with Person I offered examples of service experienced in a very bad way by Robbins lumber, but which may not have been experienced in such a bad way by their manufacturer.

The associations offered very valuable information on the optimizing market which should assist in a successful expansion in North America for IVAB. Although this thesis mostly offers an overview, it has still succeeded in its objective of establishing a more detailed and in depth analysis than the previous BOP study made by the Swedish Trade council. Even though the associations visited may not be experts on optimizers, they know an enormous amount about the forest industry in general. They were very helpful and had a welcoming reception. Another area interesting for further investigation is if it is possible to define sawmill segments needing a linear optimizer scanner, like WoodEye, as this would immediately diminish the competition from manufacturers like Scanware/Finscan, producing transverse optimizer scanners.

In retrospect, this quotation from Christensen et al 2001 offers a lot on which important aspects need to be taken into consideration in order for a market analysis to be successful; *"One of the difficulties when performing a market analysis is that there is no given standardised structure, technique or method for how it should be performed. The main reason for this is that a market analysis should be governed by the marketing problem. Therefore there will be a vast number of situations demanding decision taking that will probably affect the oncoming decisions needed to be taken. The most important aspect is to always keep focus on the goals of the market analysis that are to be reached. For this to be successful a close relationship with the market analysis contractor is necessary."* (Christensen et al, 2001)

8 Conclusion

8.1 The six most important remarks

8.1.1 No investments with housing market down

The drop in the housing market has had a huge effect on the sawmill industry in North America and in many areas some have even had to shut down. This in turn has affected current investment capacity at the present time. Although some interviewed have stated that it would actually be a great time for sawmills to make investments in present time, so that they have the right equipment when the market *does* bounce back. However, they have also stated that sawmills are generally not listening to this advice. Opinions on when the market will bounce back vary, but the general opinion is that it will come back within the next two years. Until then it will be difficult for manufacturers like IVAB to sell equipment, although they still have possibilities for marketing and making their brand name known through participating in expos etcetera.

8.1.2 Massive demand for optimizer that grades southern yellow pine knots accurately

In the southeast of USA the main demanded quality in optimizers, was ability to grade the southern pine knots accurately and consistently *over different regions*, as the knots of the southern pine vary from region to region. They specially have a problem with so called ”*blind areas*” around the knot, which are parts of the knot having the same colour as the surrounding wood, and therefore being missed. The present optimizers also have huge problems with *density variation* and *knots inside of the board*. Other defects causing problems with the southern yellow pine are *decay, splits, worm eating pitch* and *timber breaks.* There are no competitors on the market today able to grade the southern pine knots in a satisfactory manner.

8.1.3 A few competitors in Canada represent a huge proportion of market share

The biggest companies on the Canadian, market such as Comact, Autolog, CoeNewness/McGehee and USNR can be to IVAB’s advantage if they are willing to cooperate. This way IVAB would automatically acquire local knowledge and the chance to be a part of a bigger offering. A closer examination of what exactly these big companies offer, especially regarding their edger and planer optimizer functionalities, is necessary in order to determine whether to attack them or seek cooperation.

8.1.4 Bad service can be disastrous for a manufacturer’s reputation

Throughout the interviews, respondents raised the tone of their voice when bringing up the subject of service. Obviously, it was a very important subject which aroused a lot of feelings. A manufacturer’s work is not done when a sale is accomplished. Indeed, this is when the work *begins*. The investment in an optimizer scanner is a major one for most sawmills, and they expect to be treated with respect and efficiency in the after sales service. Information apparently *spreads* very quickly between sawmills and a manufacturer has to put a lot of energy into its service, adaptation and advice in order not to ruin its reputation. Apart from bad reputation, a manufacturer that dismisses service is also likely to get a *lawsuit* to their name.

8.1.5 Newly purchased sawmills are likely to make investments

When speaking generally of modern optimizing and scanning equipment, there still seem to be many potential customers. Sawmills adopting new optimizing technologies are often corporate

facilities and larger privately owned mills, which is not strange since the larger the sawmill, generally the larger is the gain. Respondents indicated, that currently 30-40 % of larger sawmills have modern equipment. However, some big corporations buy mills and run them as hard as they can and then sell them without making any investments or improvements. Family owned and medium sized sawmills tend to be steady in their upgrade because they understand that in order to stay in business they have to decrease their operating costs. *Newly-purchased mills*, medium sized or privately owned in particular, are a customer segment likely to be looking for new equipment since it is natural to amend and improve the factors which were not working for the previous owner.

8.1.6 Owners of both big and small sawmills travel far to visit equipment expos

Sawmill equipment expos are visited by large and small sawmills from all around North America. Both Person I and Person F informed that they had been to the big expo in Atlanta in 2007, and these two guys operate one small and one medium sized mill all the way up in Maine. These expos offer an excellent opportunity to show up IVAB's competitive advantages and quickly make a name for them in North America.

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Personal comment

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Pictures and Figures

Figure 1: Bussines Opportunity Project, Swedish Trade Office (Canada) Inc, April 2005,

Figure 2: Bussines Opportunity Project, Swedish Trade Office (Canada) Inc, April 2005,

Figure 3, 4, 5: Skogsindustrierna, Collected 2008-07-21 <http://extranet.svenskttra.org/login/login.asp> Published 2008-07-21

Figure 6: Contemporary strategy analysis-sixth edition, Grant.R, page blackwell publishing, TJ international, Padstow 2008, page 73

Figure 7: David Ford, March 2002, The Business Marketing Course, John Wyley and Sons

Figure 8: Robert M. Morgan & Shelby D. Hunt, July 1994, The Commitment-Trust Theory of Relationship Marketing, Journal of Marketing, vol. 58, page 22

Figure 9: Contemporary strategy analysis-sixth edition, Grant.R, page blackwell publishing, TJ international, Padstow 2008, page 73

Cover picture: Woodeye, *Woodeye Rip*, Collected 2008-05-19 <http://www.woodeyeinc.com/products_rip.asp >, Published 2008-05-19

10 Appendixes

Appendix 1

Tables from the hardwood study

NOTICE: Tables sourced from the report “A segmental analysis of current and future scanning and optimizing technology in the hardwood sawmill industry” from *1999 by SCOTT A. BOWE, ROBERT L. SMITH, D. EARL KLINE and PHILIP A. ARAMAN*

Table 1
Current edger-optimizer factor rating group comparisons.

		Large vs. Small	
Factor	All	Large	Small
Improved raw material recovery (*)(a)	6.5	6.7	6.3
Increased lumber revenues (*)	6.5	6.6	6.3
System lifespan	6.0	5.9	6.1
Improved lumber quality	5.9	5.9	5.9
Ability to upgrade	5.9	6.0	5.7
Availability of vendor support (*)	5.8	6.0	5.6
Increased production levels	5.8	5.8	5.8
Ease of use	5.7	5.7	5.8
Improved lumber consistency	5.7	5.7	5.8
Initial cost	5.7	5.6	5.8
Maintenance costs	5.2	5.2	5.3
Existing mill layout restrictions	5.2	5.2	5.1
Training from vendor	5.1	5.2	5.0
Operational costs	5.1	5.0	5.2
Installation down time	4.8	4.9	4.8
Advice from production supervisors (*)	4.7	4.8	4.4
Training of new operators (*)	4.6	4.4	4.8
Advice from customers	4.4	4.3	4.5
New mill installation	4.1	4.0	4.3
Advice from sales department	3.7	3.6	3.8

Table 2

Feature selection for future edger-optimizer systems (n = 424).

Improved Raw Material Recovery	78.5%
Increased Lumber Revenues	77.1%
Reliability	75.7%
Initial Costs	67.0%
Ease of Use	66.0%
Product Consistency	60.1%
Flexible Grade Programming	59.2%

Availability of Vendor Support	58.0%
Maintenance Costs	57.5%
Increased Production Levels	54.2%
Training from Vendor	51.4%

Note: Table made from bar graph

Table 3
Acceptable cost for current edger-optimizers (n = 362).

Less than $100,000	49.4%
$100,001 - $250,000	26.0%
$250,000 - $500,000	15.5%
$500,001 - $1,000,000	8.8%
Greater than $1,000,000	0.3%

Note: Table made from pie chart

Table 4
Acceptable cost for future edger-optimizers (n = 282).

Less than $100,000	37.6%
$100,001 - $250,000	29.4%
$250,001 - $500,000	22.0%
$500,001 - $1,000,000	10.6%
Greater than $1,000,000	0.4%

Note: Table made from pie chart

Table 5
Acceptable cost for automated hardwood grading systems (n = 359).

Less than $100,000	48.5%
$100,001 -$250,000	31.2%
$250,001 - $500,000	15.0%
$500,001 - $1,000,000	5.3%
(Greater than $1,000,000)	0.0%

Note: Table made from pie chart

Tabel 6
Factor ratings for future automated hardwood grading systems.

Factor	Rank	Mean importance	Subsets (alpha = 0.05)
Accuracy of grading	1	6.6	* (a)
System lifespan	2	5.9	
Durability	3	5.9	

NHLA grading rules	**4**	**5.8**
Ability to upgrade	**5**	**5.8**
Initial cost	**6**	**5.8**
Reduction of grading costs	**7**	**5.8**
Tallying capabilities	**8**	**5.8**
Simplicity of operation	**9**	**5.7**
Ease of use	**10**	**5.7**
Ability to modify NHLA grading rules	**11**	**5.7**
Availability of vendor support	**12**	**5.6**
Speed	**13**	**5.6**
Training from vendor	**14**	**5.5**
Ability to quickly switch species	**15**	**5.5**
Equipment warranty	**16**	**5.4**
Compatibility with existing equipment	**17**	**5.4**
Sorting capabilities	**18**	**5.4**
Training of new operators	**19**	**5.3**
Color sorting capabilities	**20**	**4.8**

Appendix 2

Information about Associations and their sawmills members

This information comes from the respondents of this study and has not been verified with websites or other sources.

TPinspection
Person A from TPinspection (08.03.26) says they are a member of the American Lumber Standard Committee (ALSC). ALSC have 30 accredited third party members such as TPinspection. Their task is to control that TPinspection are doing their job. TPinspection may go into a sawmill once a year for grade inspection. ALSC goes to the same sawmill about once a year, not for grade inspection but to check up on TPinspection oversight. TPinspection has not had any complaints from ALSC so far. All over the world sawmills use the TPinspection stamp, including Sweden. Five pieces of information are needed on a grade stamp. ALSC also travel around the world to do checkups. ALSC can do check ups on material from for example Sweden, destination checks, at ports. TPinspections competitors in Europe are WCAIB, which started in Europe three or four years before TPinspection. TPinspection has been in Europe since 2001. They can recommend scanners and optimizing equipment to sawmills that are accurate with TPinspection's grading. A machine has to demonstrate to TPinspection that they can grade it properly and keep it less than 5% below grade in order to get the TPinspection stamp on the wood. Then they will qualify the machine.

Southern Pine Inspections Bureau (SPIB)
The SPIB is a non-profit industry sponsored, third party inspection agency, established by sawmills in order to monitor that the quality of lumber produced is the same in every mill. SPIB do the third party inspection of mills, grade rules, qualifications of mills at certain quality level. They have 180 sawmills members from small in size to very large. The biggest member produces 230 million board feet per year, the smallest does 250 thousand board feet per year. Medium mills produce 150 million board feet per year. Most of the total volume is produced by larger mills. Some of the sawmills have been their members since the 1940s. The majority of members produce dimension lumber, grade number two or higher, two inch thick, for structural uses. SPIB covers all of the southern pine producing region. They do random inspections, comparing human graders with how a specific machine is catching defects. Typically the machines are coming close, but are still not optimizing to the same extent as the human graders. A good human grade is usually 2% below grade and 2-3% above grade; 5% over all. Some machines have a higher percentage, mostly because of difficulties in judging knots. SPIB evaluate products from sawmills with visual grading how the machine is doing. They try not to recommend certain machines to sawmills, but they do give information on how certain machines work.

Quebec Forest Industry Council (QFIC)
Person D at QFIC explains that QFIC is an association which gathers the pulp and paper cardboard, OSB, hardwood and softwood lumber industry. 95% of the forest industry is members of QFIC. They are doing interventions with the government to speak in the name of the industry when there is a new law coming up. QFIC are responsible for that the rules and standards from NLGA are applied and making sure that the grades on the lumber are in accordance with the NLGA. 30 people working for QFIC are doing inspections in sawmills and teaching them. QFIC are monitoring the hardwood a little bit but noting the same way as with softwood. They have big mills doing 200 million board feet a year, and a lot of small

sawmills doing 50 million board feet per year. Some of the small sawmills are doing value adding. Typically the bigger sawmills have more optimizing equipment than the smaller once. The average size is 75-100 million board feet per year.

Ontario Lumber Manufacturers Association (OLMA)
Person C states that OLMA have been in business for about 40 years. They have three main core business: Lumber quality insurance, trade issues and forest policies. OLMA are not allowed to recommend optimizing equipment.

Under federal statute they provide lumber quality and quality insurance under the national grade rule. There are three different types of lumber manufacturing in Ontario, three different industries.: 1/white and red pine 2/hardwood 3/ boreal forest of spruce and pine forest. All are mostly used as construction wood.

Forintek
Person E explains that Forintek is operative in Canada only. Two main areas are in Quebec and one in British Colombia. USDA is a similar organisation in the USA. Forintek are often involved in the testing of equipment to see if what has been promised is delivered. Forintek can also be used to the optimizer manufacturers advantage in cases where they prove how good the optimizers are. Comact or Autolog usually do tests in the sawmills, through the help of Forintek, to prove what they can do which is a good way to gain trust. The sawmills want to see their specific wood of different sizes, in this region for example southern pine, fir, spruce, tried out in the machine for a real try to get numbers and a feeling for how to work the machine before they buy it.

Portbec, Forest products LTD
Person G explains that Portbec started as a buyer and seller of wood but bought a sawmill 15-20 years ago and then bought another sawmill which is one of the largest in Quebec in present time. They are mostly active on the North American market with headquarters in Quebec and three sellers in USA. Although they also have one agent in England and one in Germany. The sawmills are located south of Quebec city, close to the border of Maine. The timber that they handle is quite thick and mostly white spruce. Not that much balsam fir, and no jack pine. The finishing product is construction wood 2 by 3, 2 by 10 and boards 1 by 3 to 1 by 6. A lot of wane which wouldn’t be allowed in Sweden is allowed here. They mostly produce grade two or three.

Robbins Lumber
Robbins Lumber produce 27million board feet per year. 115- 120 000 board feet per day. 40-45 percent is standard grade and 20 percent premium grade and perhaps 10 percent becomes select. They mostly sell standard grade. 98 percent of what they produce is 4 quarter and all eastern white pine, P*inus Strobus*. They have 135 employees. The mill is very old, 127 years. The grading rules for white pine compared for the grading rules for dimension. White pine is a very difficult soft wood to dry. The black knot and pitch usually grade the board.

Appendix 3

Contacted associations, competitors and distributors

Visit
Ontario Lumber Manufacturer's Association www.olma.ca
FPInnovations/forintek www.forintek.ca
TPinspection www.tpinspection.com
Quebec Forest Industry Council www.qfic.ca
Southern Pine Inspections Bureau www.spib.com

Mail
Canadian Mill Services Association www.canserve.org
Forest Industry Suppliers and Logging Association (RISA) www.resourcesuppliers.com
Canadian Hardwood, Plywood & Veneer Association www.chpva.ca
Forest Products Association of Canada www.fpac.ca
National Lumber Grade Authority www.nlga.org
American Lumber Standard Committee www.alsc.org
Southern forest pine association www.sfpa.org
Logging & Sawmilling Journal www.forestnet.com
Apawood- The Engineered Wood Association http://www.apawood.org/
British Colombia community forest Association http://www.bccfa.ca/resources.php
The California Forestry association http://www.foresthealth.org/
The Council of Forest Industries www.cofi.org

Telephone and mail
North American Wholesale Lumber Association www.lumber.org
Canadian Wood Council www.cwc.ca
National Hardwood Lumber Association www.natlhardwood.org
North-eastern lumber manufacturers association www.nelma.org

Contacted competitors
Joescan
ASM
Autolog
Pfs Corporation
Hermary Opto Electronics
LMI, sensors that see
USNR
Scanware/Finscan
Comact
Autolog
Coe Newnes/McGehee

Distributors
Gabriel Payant is the sales manager for Autolog. Autolog also market their scanners in Sweden. His phone # is 450-434-8389 in Quebec. E-mail: gabriel.payant@autolog.com. Gabriel Payant informs that they are currently cooperating with Gunnarssons Verkstader AB in Vislanda. Tony Gunnarsson can be contacted at telephone number 472 343 30.

Appendix 4

List of optimizer manufacturers

A list of the US and Canadian manufacturers of optimizing equipment from Timber Processing (July/Aug. 2007) magazine. Informing on which stages of the production line that they optimize in, their telephone number and headquarter state/province.

Optimizer/Scanner manufacturers

1. Bucking
2. Cant (gang)
3. Carriage
4. Chop-saw
5. Edger
6. End-Dogging
7. Grade
8. Planer
9. Ripsaw
10. Sharp chain
11. Trimmer

P= For planers
E= For edgers

	Manufacturers	**Area of optimizing**
P, E	Advanced sawmill Machinery: FL 850-537-5333	1-5,8, 10, 11
	Arklatex Mill Supply Inc: LA 800-344-7297	1,2,6,9,11
P, E	Autolog Production Management: QC 450-434-8389	1-3,5,8,10,11
	Barr-Mullin Inc: NC 800-457-3411	4,7,9
E	Baxley Equipment: AR 501-623-0065	2,5,10,11
P, E	Coe newness McGehee: BC 250-832-7116	1,2,4,5,7-11
P, E	Comact Equipment Inc: QC 418-228-8911	1-3,5-8,10,11
	Concept systems Inc: OR 541-791-8140	
	Conception R.P. Inc: QC 418-871-6016	4
E	Cone Machinery Inc: GA 229-228-9213	1-3,5,10
E	Cooper Machine Co. Inc: GA 478-252-5885	1,2,5,6,10,11
E	Corley Mfg. Co: TN 423-698-0284	2,3,5,10,11
E	Digital Electronics LLC: WA 509-427-4005	2,5
E	Esterer WD USA-Koenig Inc: TN 901-332-0915	3,5,9,11
	GEMOFOR: QC 418-274-2244	
	HASKO:TN 423-648-5200	4,9
E	HMC Corp: NH 603-746-4691	3,5
P, E	Hermary Opto Electronics: BC 604-517-4625	1,2,5,6,8,11
	Hurdle Machine Works Inc: TN 901-877-6251	3
P, E	Inovec:OR 541-485-7127	1-11
P, E	JoeScan: WA 360-993-0069	1-3,5,8,10,11
P, E	LMI Technologies Inc: BC 604-636-1011	1-11
	L-M Equipment Co. Ltd: BC 604-431-8800	1,4
	LandEast Machinery: UT 800-545-5677	
E	Lewis ControlsInc: OR 503-648-9119	3,5,6,10
	Linden Fabricating Ltd: BC 250-561-1181	1

P	Lucidyne Technologies Inc: OR 541-753-5111	4,8,9
P, E	MPM Sales Corp: BC 604-575-0048	1-6,8,10,11
P	Machinage Piche Inc: PQ 819-367-3333	4,8,11
	Maxi Mill Inc: OR 541-926-4449	6,10
	McDonough Mfg, Co: WI 715-834-7755	3
	Menominee Saw& Supply Co: MI 906-863-2609	3
	Mereen-Johnson Machine Co: MN 612-529-7791	9
	Mid-Oregon group LLC: OR 503-788-4847	4,9,11
P, E	Morris Industrial Corp: AL 251-675-4636	2,3,5,7,8,10,11
P, E	Nelson Bros, Eng: WA 360-951-2737	1-6,8,10,11
E	Owens machine manufacturing: WA 360-895-0900	5,6,9
E	Paul Saws: GA 678-444-5000	4,5,9
	Paw.Taw-John Services: ID 208-687-1478	3
	Porter Engineering Ltd: BC 604-273-1868	1,2,4,6,10
	Progressive Mill Supplies Ltd: BC 604-599-9598	
E	Salem Equipment Inc: OR 503-581-8411	1-5,10,11
P	Scanware/Finscan Inc: OR 503-601-8880	8
	Silvatech Corp: VT 802-234-5174	
E	Softac Systems Ltd: BC 604-8889507	1-3,5,7,11
P	Southwest Machine & Supply: MO 800-981-2919	8,9,11
	Tree-D Inc: FL 866-906-9335	1,2,10
	Tri-Tech Machine Ltd: BC 604-524-4711	4
P, E	USNR: WA 800-BUY-USNR	1-11
P	VAB Solutions Inc: QC 418-834-0606	7,8
E	Valley Machine works Ltd: NB 506-575-2231	5,11
	Weinig Group: NC 704-799-0100	4,9

Appendix 5

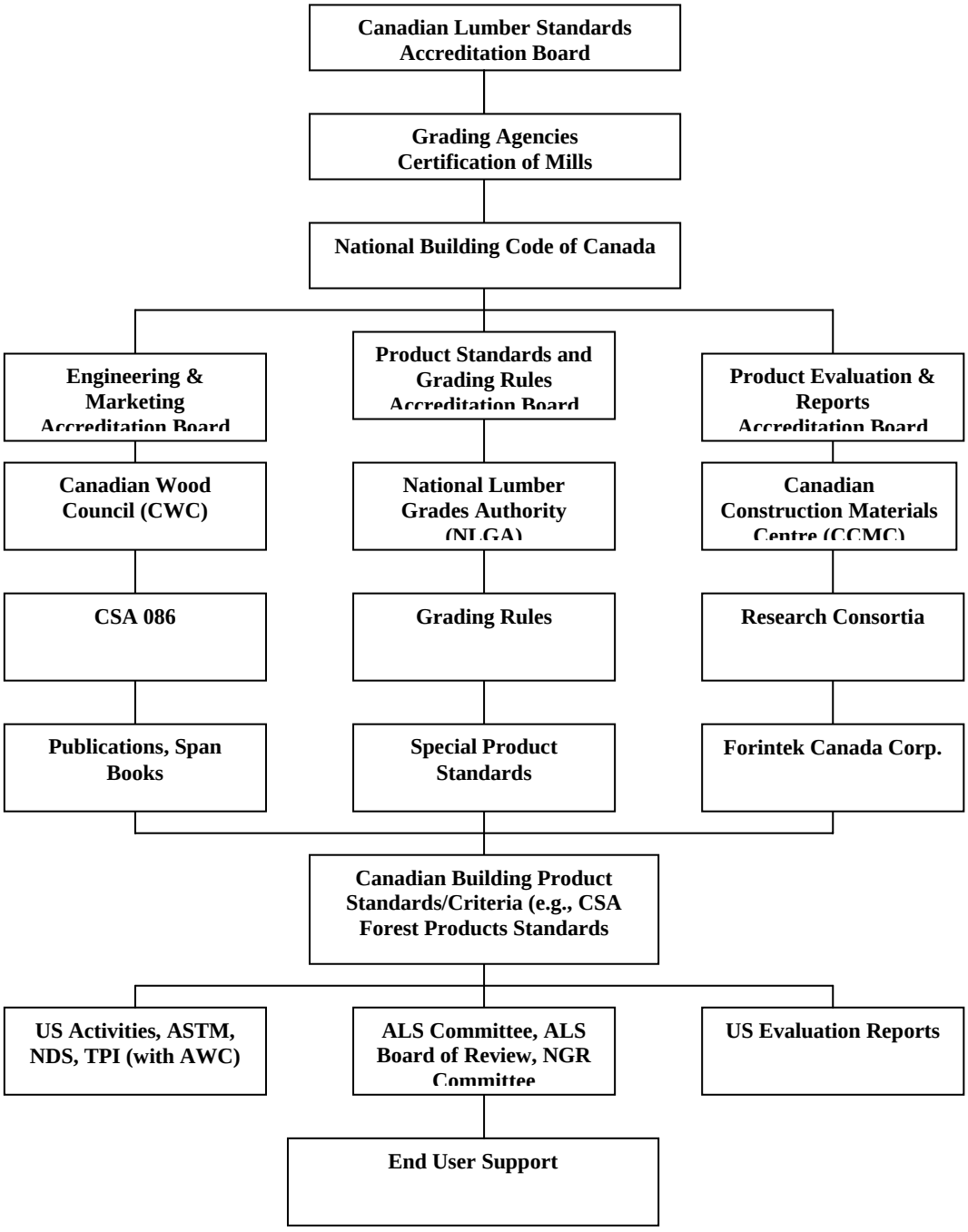
Interview with Jeff Casswell of Robbins Lumber

Interview with Person I of Robbins Lumber on their experience of manufacturer service

Person I at Robbins Lumber tells that they can phone Scanware/Finscan anytime of the day and week. They might not get them on the first time but they phone back. Autolog from Quebec does the control system and Scanware/Finscan hand of the solution to Autolog who fit the controls on the trimmer and the sorter. You can phone Autolog anytime of the week as well. Within 15-20 minutes usually someone will be on the phone. Person I from Robbins lumber says Eastern white pine is quite hard to grade compared to other softwood like Douglas fur and White fur. If they have a functionality issue any guy at Scanware/Finscan can help them with computer or hardware issues. For grading issues there are perhaps a couple o guys there that they speak to. However back in January hey had a problem and Scanware/Finscan told him to change bulbs and save images of problems so they can investigate the problem and compare it with another computer, which they did and sent the images out there. This was two months ago and they still haven't heard anything. They are starting to get really upset with their bad service. They have a yearly guarantee to get service in case of catastrophic scenarios (like if a camera breaks) and they pay a fee for it. In the contract there is no limit on the service. Scanware/Finscans explanation was that someone was on vacation etcetera, however Robbins lumber does not consider that their problem. They have got so used to the bad service that if a manufacturer had really good service that would make an enormous role for their impression of the company. "Service is not really a contract issue" says Person I, it is about trust and people. Actions speak larger than words. If they would take legal actions for contract abortions then of course it would destroy the relationship with the manufacturer. There is another example of bad service from Scanware/Finscan which evidently have affected Robbins lumbers perception of Scanware/Finscan. When they bought their machine they hadn't converted their rip and edging solutions to colour, which Robbins lumber wanted. They wanted this upgrade and were willing to pay for it. When Scanware/Finscan got the software ready the salesman that finally came to Robbins Lumber didn't understand what all the options meant. They finally got it right after nine months, by this time Robbins lumber had threatened to sue to have the money back, which according to Person I was the main reason why Scanware/Finscan started working faster. They also have problems with ghost wane, which is wane that the equipment sees but just doesn't grade and register in the soft ware. They are waiting for upgrade for this and it is getting to the point once again where they are feeling they have to really put their foot down and threaten for some kind of change. He is going to compare notes with another mill, also having Scanware/Finscan and they might gather together for action. They recommend a manufacturer coming in the market to put effort on service, even small details, because the word spreads quickly. Scanware/Finscan are targeting the really big mills on the west coast, according to Person I, this is because the big mills are in a position to buy more equipment.

Appendix 6

Structure of the Canadian Lumber Quality system



(Prepared for the Canadian Lumber Standards Accreditation Board by F. G. Clarke, P. Eng. – 1991. Revised by D. G. Person C, RPF – 1994.)

Appendix 7

Questionnaire associations

1. Could you tell me a bit about your association's activities and how you work?
-What is your relation to optimizer manufacturers?

2. Could you give a general *description* of your member group, examples of who your members are? How many members do you have and where are they located?
How would you describe:

- The size, in terms of number of employees and yearly turnover, of your members? (roughly)
- How old are the companies (roughly)?
- Which products and qualities are your members producing?

3. Are there any significant differences in terms of their production processes?
- What is the reason for the difference? (for example: species/end customers/size of company, or other)
- Which sawmills generally have edger/planer optimizers?

4. Which member segment would you consider more likely to invest in new optimizing equipment? How would you describe this group and why do you believe they are more likely to make such investments? - Are there segments which are currently in possession of more optimizing equipment than others? What do you believe to be the reason behind this?

5. Which areas of improvement are needed in present optimizing equipment?
- Would you consider there to be a demand for "IVAB's edger"? Why/why not?
- What is the demand for optimizers for planer lines?

6. How important this initial cost for different segment groups? How much are different segment groups willing to pay for an optimizer?

7. Could you specify which characteristics constitute *good service* from a scanner optimizer supplier? How important do you believe that manufacturer service is in comparison with optimizer functionality? How should an optimiser manufacturer gain trust on the NA market?

8. Could you name your members' present *main suppliers* of edgers optimizer systems for sawn and planed timber? Comments on performance of different suppliers and their products?

9. Could you please name your members' present *main suppliers* to planer lines? Comments on performance of different suppliers and their products?

10. Can you see any *trends* to which the products of your members and qualities of these are changing towards any different direction?
- Can you see any trends to which the production processes of your members are changing towards any different direction?
- Which trends can you see in terms of certificating wood, and the qualities which are demanded by the market?

Appendix 8

Questionnaire sawmills

1. Could you briefly describe your production chain, from incoming lumber to product.

2. Which optimizing equipment do you have in your production chain? Where is it and what is its function? What has been working well with your present optimizing equipment and what needs improving?

3. Are you planning to change your production chain in the future in any way which could affect your demands on optimizer equipment?

4. Which is the supplier of your present equipment?

5. Which are the main reasons behind your purchase of optimizing equipment? Which were the reasons behind your specific choice of optimizer and choice of supplier?

6. What are the aspects of the optimizer that you value the most? Examples.

7. Do you believe the following equipment could be of interest to you? Why/why not?

- Scanners that optimise edging while taking other, perhaps limiting, defects on the board into consideration for a total optimal edging decision with minimal wastage.
- Scanners that optimise and calculate the number of fine cuttings available in a board according to the NHLA standards for hardwood.
- Scanners that optimize the planning line of construction wood.

8. How do you value supplier service? What defines good manufacturer service?

9. How should a manufacturer of optimizing equipment gain your trust?

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