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Business Administration, Lappeenranta
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MARKET SOLUTIONS FOR REJECTED RAW MATERIAL: A CASE STUDY

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ABSTRACT

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Market Solutions for Rejected Raw Material: A Case Study, 61 pages, 7 appendices

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The subject of this thesis was determining whether a Russian paper-mill's accumulating reject wood problem might be solved by marketing the reject wood in Finland. The study's main research question was: what are the current product markets which could best utilise the mill's reject wood in a way that fulfils its aim of solving the accumulating reject wood problem strategically?

Marketing research and marketing strategy theories were used to guide and underpin the achievement of the objective. Qualitative market research was undertaken which was delimited to wood-using industries in the South-Eastern area of Finland.

Following desk research into the market areas available, 20 questionnaires were sent (9 respondents) and 3 (of 5 proposed) interviews were undertaken to examine the low-grade wood market in depth. The desk research, questionnaires and interviews highlighted the emergent woodfuel market as having the best potential. Analyses of the market including a SWOT analysis identified that forest certification could be used as a strategic marketing point.

Five marketing recommendations were made: use of the woodfuel market to solve the accumulation problem; niche marketing using forest certification; marketing primarily during winter; consider selling directly to Biowatti or VAPO; consider converting the reject roundwood into woodfuel chips.

Keywords: Energy-wood, International Marketing, Low-grade Wood, Market Research, Marketing Strategy, Woodfuel, Wood Residues

FOREWORD

The author would like to extend his gratitude to all those who assisted in the production of this study, but especially to those necessarily anonymous individuals who completed and returned questionnaires, and who gave their time, patience and knowledge in interviews.

Thank you.

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1 INTRODUCTION

The marketing of by-products by manufacturing organizations is now a well known and common practice in today's business-world. It is a practice that makes sense on many levels: production efficiency is improved through increased raw-material recovery; the creation of another saleable product which helps to off-set production costs; the organization's environmental management is improved as by-production reduces the volume of waste ending up in refuse tips; improved environmental management also improves the organizations external image; by-production also often creates raw-materials for other manufacturing organizations reducing the burden on shared resources. Sawmill sawdust used in the production of wood based panels and the production of wood heating pellets, and the spent grains remaining after brewing beer used in the production of cattle feed, are two well known examples of by-products.

This thesis focuses on raw-material which, in this case, cannot be converted into a final product because it does not conform to minimum requirements for processing. Although not technically a by-product, a by-product style solution is sought by the manufacturer to address the problem. The thesis is produced in co-operation with the manufacturer, a paper-mill in Russia.

Establishing if markets exist for by-products requires, it is assumed, the same processes as establishing if markets exist for primary products. The point being that efficient entry into a market with either a primary product or by-product requires some investigation into the markets involved if the venture is to have a reasonable chance of success. Does the proposition justify the financial and time requirements in a way that satisfies the needs of the marketer?

1.1 Background

The paper-mill (hereafter referred to as 'the mill') in question is one of Russia's largest and most modern paper- mills. The mill produces office and offset papers, liquid packaging board and bleached chemical thermo-mechanical pulp mostly for the Russian market. The mill sources its raw material, roundwood, from north-west Russia.

The mill currently has a problem with accumulating reject roundwood which cannot be used in paper production. Roundwood is rejected if it is not of the correct species, if it is not of the correct size and dimensions, if it contains too much rot, or if it has other defects. In the roundwood procurement process every load of delivered roundwood inevitably contains, for a number of reasons, a small percentage of unacceptable material. Further tightening of the procurement procedure would have a detrimental effect by reducing the volume of acceptable material arriving at the mill.

One solution to the accumulating reject roundwood problem would be to market the reject wood as a product, if a regular and profitable market could be found. The mill has previously sold some reject wood as firewood but only on an ad hoc basis. If the reject wood could be marketed then the procurement procedure could be relaxed which would have the benefit of widening the procurement net for acceptable material. The associated increase in reject material would not be such an issue as it would not accumulate, instead, being sold on to other users and generating income.

Initial and cursory market investigations have highlighted that the reject roundwood might possibly be marketed in the new woodfuel markets developing in Finland. This would be a near market for the Russian mill as it is situated fairly close to the Finnish border. Of course, the woodfuel markets of Finland may not be the only market outlet and there may be other suitable market areas.

The mill is also seeking a strategic solution. In whichever market the roundwood finally ends up, there should be a competitive gain for the mill and the buyer,

and a resulting long term relationship. There are obviously sound economic and management reasons for this approach.

1.2 Objectives

This thesis has one main objective: **to determine the possible markets for the mill's reject wood**. This objective has been chosen as it expands upon the mill's original feeling that a suitable market outlet for the reject wood may already exist. This study plans to explore whether this assumption is correct by studying the available markets systematically and, through this study, it hopes to ascertain whether a suitable market exists for the mill's reject wood that conforms to their own parameters for selection.

The objective, formulated in conjunction with the mill, contains the underlying assumption that marketing is the best way to solve the mill's problem of accumulating reject roundwood. Alternative solutions may exist but the mill is currently more inclined towards a marketing solution.

The use of the term 'market' is common and widely understood. However there is merit in defining its meaning in the context of the mill's needs. Here we are defining market (or markets) as a place where the mill can sell its reject wood.

1.3 Delimitations

The mill is part of a large multi-national company with worldwide coverage. This thesis deals exclusively with its Russian mill.

The study will focus its research on the south-east region of Finland (the area covered approximately by a 150km radius from Lappeenranta), and on product areas that do not require the raw material (in this case the reject wood) to be highly processed. The reasons for this are:

- The south-east region is the closest Finnish region to the mill with a number of border crossing points. There is also a concentration of wood-based industries in this area including an existing and potential woodfuel market.
- The reject wood is a low value wood product and will almost certainly be marketed in low value product areas. As such, long haulage distances would be economically unviable.
- The solution should be simple as the mill does not want to distract itself from its main line of business. Ideally the reject wood should be marketed 'raw' or, if necessary, should undergo a minimal amount of processing. If required, the processing should involve little investment or be able to be sub-contracted. As such only those markets that require simple further processing, such as chipping, grinding, cross cutting, splitting, chunking, *etc.*, will be considered.

This study potentially covers a wide academic area including forest products, bio-energy, marketing, and strategic planning. Due to the constraints of time, the theoretical part of this study will focus purely on market research and marketing strategy as these subjects are the most relevant to the main research questions. The literature review will also be delimited, for reasons of time and pertinence, to similar research undertaken within forest industries.

1.4 Research Questions

What is primarily at stake here is whether the mill can sell the reject wood. A secondary but also important consideration for the mill, as stated above, is that if a market can be found it must also fulfil their objectives of strategy. For this particular problem a strategic marketing solution is seen as selling into a market where both the seller (the mill) and the buyer achieve long term gains: the mill has a regular and reliable customer with whom a long term resolution to the reject wood problem can be achieved; the buyer has a regular and reliable supplier and through buying the reject wood some competitive advantage is gained.

Hence the research question to answer is:

What are the current product markets which might best utilise the mill's reject wood in a way that fulfils the mill's aim of solving the accumulating reject wood problem strategically?

Of course, to answer this question a number of sub-questions must be answered. In fact the number of possible sub questions is quite large, but this thesis will concentrate on answering those which have most relevance to achieving the main aim. The following sub questions will be answered in this thesis:

- i. What are the size, value, form, and trend characteristics of the available markets?*
- ii. Who are the main customers for these markets?*
- iii. Who are the main suppliers within these markets?*

Of particular use to the mill is information on which product form offers the greatest scope for rapid market entry and profitability (i.e. existing viable market, low investment need, low cost base)? This additional sub-question will be discussed and explored during the last section of this thesis.

1.5 Theoretical Framework

As already discussed, to achieve the aims and objectives of this study, two main tasks must be undertaken: market research to find suitable and available markets; and research and analysis within the suitable and available markets to ascertain the market that has the best strategic fit for the mill, according to their own definition of strategic. Hence there are two main theoretical elements which are relevant to this thesis and underpin its development: Market Research and Marketing Strategy. These will be discussed in detail in Section 2.

It should be pointed out at this stage that the terms “market research” and “marketing research” are used interchangeably, but some see them as separate disciplines. McDonald (2007) describes marketing research as being specifically concerned with marketing processes whilst market research is concerned specifically with markets. McQuarrie (2005) defines market research as the gathering of information about markets or customers in an organized fashion and as being an important element of business strategy. In this study both terms will be used but the focus will be as defined by McQuarrie (2005).

1.6 Research Plan

The research will be qualitative and will be undertaken in three parts. A qualitative research method has been chosen for several reasons. The main aim of the study is to produce an answer which is qualitative in nature. Although some quantitative questions need to be answered along the way the general thrust is to describe current markets. In this study there is no hypothesis to test rigorously with statistically significant data samples. Eriksson and Kovalainen (2008, p. 5) explain that “qualitative approaches are concerned with interpretation and understanding whereas quantitative approaches deal with explanation, testing of hypothesis, and statistical analysis”. Full descriptions of the research methods for each part will be described later in the relevant sections. The following summarizes the methods involved for each part.

The first part will consist of collecting data by desk research accessing as much as possible of the relevant publicly available material. In accordance with the delimitations outlined in section 1.3 above, the desk research will focus on those product areas that do not require the raw material (in this case the reject wood) to be highly processed. The desk research hopes to gather all information on low--grade roundwood markets, woodchip markets and woodfuel markets. This part aims at building an overall picture of the current market options.

The second part aims at expanding the description of the market by probing deeper. Twenty questionnaires will be sent to a predetermined list of key companies, institutions, and individuals, with the aim of obtaining more specific information.

The third part extends the questionnaire research by undertaking 5 key interviews. The interviewees will be chosen based on their overall influence or expertise on the current markets in question. The interviews will be structured around the results of the questionnaires; e.g. the questionnaires might expose a line of enquiry that has not been considered and which needs further discussion. The interviews will be mostly structured with an option for more open-structured questions for some respondents.

The questionnaire research methodology has been used before in several similar studies with varying degrees of success (Yocom, 1973; Alderman, 1998). This study differs in that the number of questionnaires that will be sent will be minor in comparison, and by the addition of interviews. Yocom (1973) followed up some of his questionnaires with phone calls, but primarily to capture questionnaire data from key respondents who had not returned the original questionnaire. Sending a larger number of questionnaires would yield a greater amount of data but it is hoped that the key interviews in this study compensate for the reduced number of questionnaires by supplying more in-depth data.

1.7 Study Structure

So far we have discussed the problem from which this study arose, looked at the aims and questions of this study, discussed the relevant theories and explained how we intend to undertake our research. It is useful at this juncture to be explicit on how the study will progress and fit together to form a credible logical discourse.

Section two will provide the theoretical framework for this study by discussing the theories of market research and marketing strategy. It will also contain a literature review that places this work into context in the general academic pic-

ture and will show how this study contributes to the ongoing development of academic work in this field.

Section three describes what the mill has to offer to the market. An overview of the mill's wood procurement and reject-wood handling practice will be presented. This work is necessary if we are to understand how and where the reject-wood can be marketed.

Sections four and five contain the method descriptions and results of the desk research and the empirical research. These form the main body of this thesis. The research results will be analysed and presented in a way that demonstrates how conclusions were made. .

Finally, in section six, the thesis will end with market recommendations for the mill's reject roundwood, and a discussion on the wider implications of the thesis and its results.

The development of this thesis is summarised in Figure 1 (after Pykäläinen, 2007).

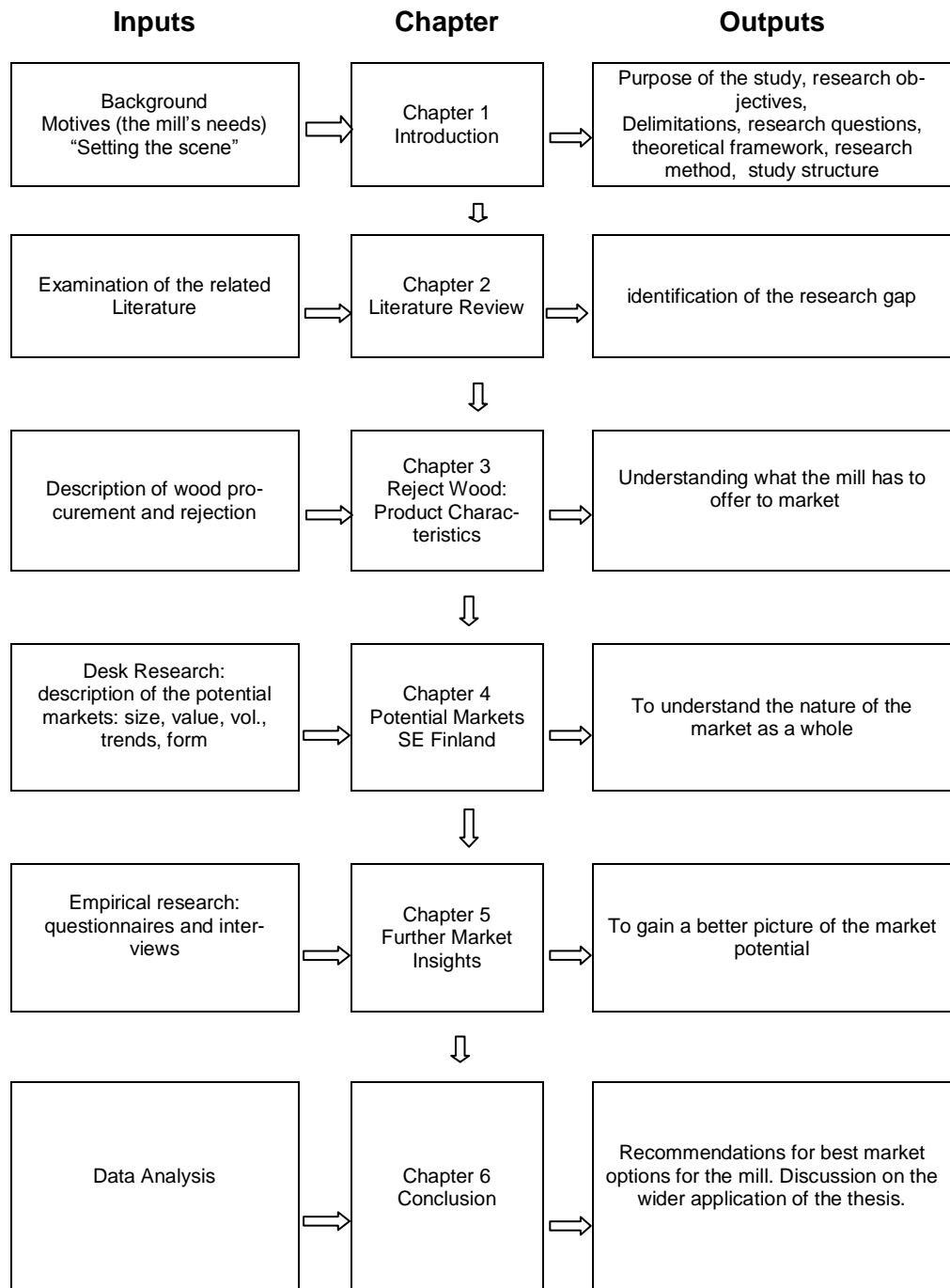


Figure 1. Thesis Development Model.

2 LITERATURE REVIEW

This literature review section covers four topics. Firstly, it will take a closer look at marketing research and at marketing strategy, the two areas that provide a theoretical framework for this study. Secondly, it will examine the previous research undertaken in marketing wood residues. Thirdly, because of the mill's original idea that a woodfuel market offers the most probable solution, it will review recent publications on the woodfuel market. Lastly, it will discuss an apparent research gap that the literature review has highlighted.

2.1 Marketing Research

Marketing research is a well established business practice which originated in the United States in the 1930s as a result of increased competition. There are a number of prominent writers in the field who all describe the theory of marketing research practice, and offer valid variations on the definition of marketing research. Hague & Hague (2004), two of the more recent contributors to the field, define marketing research as "the systematic collection, analysis and interpretation of information relevant to marketing decisions".

The essence of market research is that it sheds light on general consumption patterns. Marketing research is used by businesses as a marketing support tool to reduce the risks in business ventures. As a simple example, marketing research can tell a baking business if their customers prefer their product in white or red packaging. Hague & Hague (2004) consider marketing research to be an essential component in marketing paradigms.

The scope of marketing research is wide and has a number of applications. Ansoff's products/markets matrix demonstrates this application (Figure 2).

New Products	Market research can show the likelihood of adoption of new products	Market research can show unmet needs and provide an understanding of unfamiliar markets
Existing Products	Market research can measure consumer satisfaction to find out how to maintain a competitive edge	Market research can find new territories for products and services
	Existing Markets	New Markets

Figure 2. Ansoff's Matrix (in Hague & Hague 2004)

Hague & Hague (2004) also discuss how marketing research can be used to fine-tune product marketing as the product or service progresses from 'youth' through to 'maturity' along its life cycle. For example, during the mature phase, marketing research can be used to determine how the product could be updated to rejuvenate sales, thus prolonging the product's life cycle.

Marketing research also impacts upon the four cornerstones of marketing, the so-called 4Ps – product, price place, promotion. Marketing research can be used to test the validity of each cornerstone decision. For example, is the market receptive to the product; at which price level would the consumer begin to consider alternative products; which is the most effective place to market the product; which promotion activity is best suited to the product? (Hague & Hague 2004).

Marketing research can be quantitative or qualitative in nature and quite often marketing research combines elements of both research types (Hague & Hague 2004). Some marketing research has employed a two phase approach of quantitative research followed by qualitative research. In these examples the quantitative data provides a general picture and the qualitative provides a deeper understanding of the research subject (Hague & Hague 2004; Eriksson & Kovalainen 2008). This type of approach has been criticised in cases where the qualitative research is seen as a poorly thought-out minor addition to the quantitative research which misses the point of the value of qualitative research (Eriksson &

Kovalainen 2008). In well designed research, quantitative and qualitative methods should complement each other.

Ultimately marketing research should provide information which is relevant to those needing to make a marketing decision. Hague & Hague (2004) make the point that the most effective marketing research is that which clearly defines the type of outcome desired and focuses and restricts the research to what is crucial for the marketing decision. In practice the marketing research process begins with a brief which should achieve this level of definition; as the adage goes, a problem well defined is a problem half solved.

The brief is usually provided by the 'sponsor' to the marketing researcher who in turn creates a proposal which is a plan detailing the research design, resources required and timescale of the project. The marketing research process is summarised in Figure 3. The process is used for both ad-hoc and continuous research (Hague & Hague 2004).

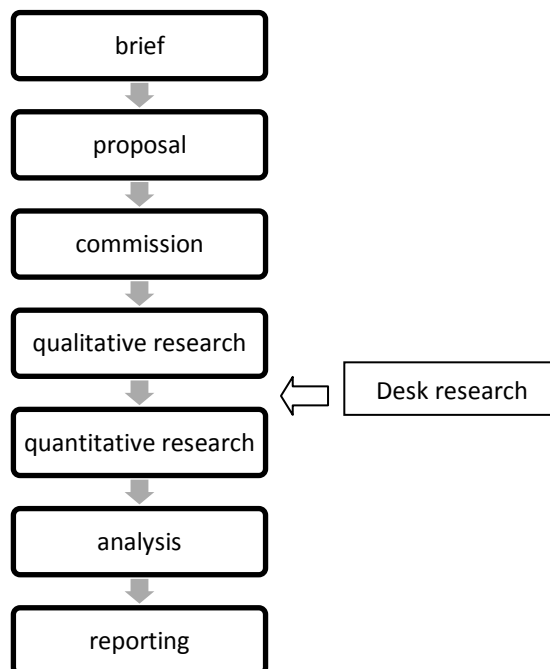


Figure 3. Marketing research process (Hague & Hague 2004).

In practice the marketing researcher uses a variety of techniques to fulfil the commission: desk research, telephone interviews, face-to-face interviews, self-completion questionnaires, focus groups and observation. A number of well established special techniques also exist for selecting research samples and analysing data (none of which will be described here). The marketing researcher will also adapt the research according to the market from which information is sought; B2C markets (i.e. business-to-customer, generally consumer, markets) involve much greater volumes of data than B2B (i.e. business-to-business markets) which will be much smaller, and consideration must be made for the difference in national regions and in international enquiries.

2.2 Marketing Strategy

Surprisingly, strategic marketing as an independent business discipline is a relatively new arrival in the business world. Strategy has ancient origins. The word derives from an ancient Greek word roughly meaning 'generalship of army' (Paley 2007) and the military association to strategy is still prominent; the Oxford English Dictionary's main definition of strategy is 'the art of war' (OED 1990).

Marketing strategy was born out of the increasing competition that characterised the global market place during the 1970s. Its formative origins can be traced back to the 1950s during the post-war rebuilding period. At that time the demand for consumer goods was high and the competition low. Corporate planning was based primarily around financial and production plans created by the higher executives of organizations. Lower level managers made independent short-term plans to satisfy the demands of the market. (Paley 2007).

The 1960s saw the advent of the first strategic plans, the expansion of European markets and the emergence of third world markets. Consumer demand was still very strong in the US, and competition limited. The strategic plans now involved lower ranking executives in the formulation process. However, longer term plans and the shorter term plans of middle management were still created separately. (Paley 2007).

The post-war rebuild was largely completed by the 1970s and as a result European and Japanese companies needed new markets to absorb their production capabilities and began to look for and expand rapidly into worldwide markets. The Japanese were especially aggressive, penetrating every major industry. Faced with this massive upsurge in competition, the market reacted by creating marketing plans and proper competitive strategy. (Paley 2007).

The marketing plans of the 1970s merged and streamlined previous individual plans (e.g. promotions, sales, etc) and also began to consider market segmentation, demographics and psychographics. Marketing as an independent business field expanded, and began to be defined. The marketing plan became a more encompassing document that was used to communicate an organization's marketing plans to its members. (Paley 2007).

By the late 1970s the process had evolved into strategic planning. The strategic plan contained elements of the long term plans of the 1960s plus the newer strategic focus. The strategic plan was "the managerial process of fitting together an organization and its market opportunities". Strategic plans specified:

- Organization's mission or strategic direction
- Objectives and goals
- Growth strategies
- Business portfolio – markets and products. (Paley 2007).

By the 1980s global competition had increased to such a level that non-strategic planning types became largely redundant. Long term strategic plans were merged with short term marketing plans to create strategic marketing plans. (Paley 2007).

The increasing competition in all markets saw the advent in the 1990s of firms re-organizing, down-sizing and adopting lean-management methods. As a result, middle management was asked to contribute to and develop strategy plans. (Paley 2007).

Marketing strategy is the “process that can allow an organization to concentrate its limited resources on the greatest opportunities to increase sales and achieve a sustainable competitive advantage” (Baker 2008).

There are many models in existence which describe marketing strategy in theory and in practice. Successful strategies have common traits as demonstrated in Figure 4 (Grant 2005). Marketing strategies are encapsulated in multi-year plans, the time horizons of which are reducing to keep pace with the current trend in short product life cycles (Aaker 2008). Plans also contain a tactical section describing the specific actions to be undertaken within more immediate time frames (Aaker 2008).

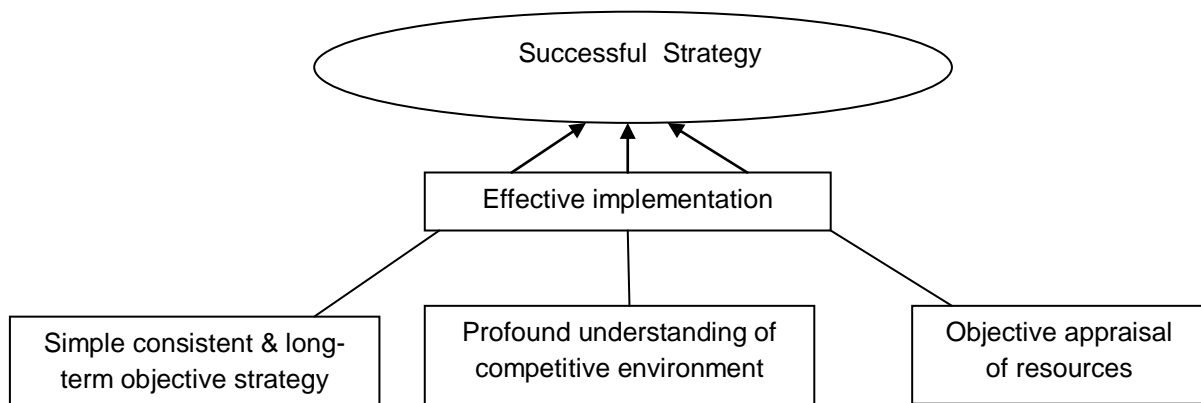


Figure 4. Common elements of successful strategies (Grant, 2005).

Variations exist in marketing strategy both in theory and practice, but the basic process is the same. The process begins with careful consideration of the internal and external environments, usually through a SWOT analysis (Grant 2005, Aaker 2008). The analytical phase provides the information required to enable the firm to choose a suitable strategy which maximizes the firm’s ability to compete. The third step is in the implementation of the chosen strategy. The implementation step is critical to the overall success of the strategy. Many marketing strategies, although preceded by sound analysis and strategy choice, fail due to poor implementation (Ikävalko 2009). The process is not necessarily as linear

as portrayed here, and may be much more dynamic. Figure 5 summarizes the basic marketing strategy process.

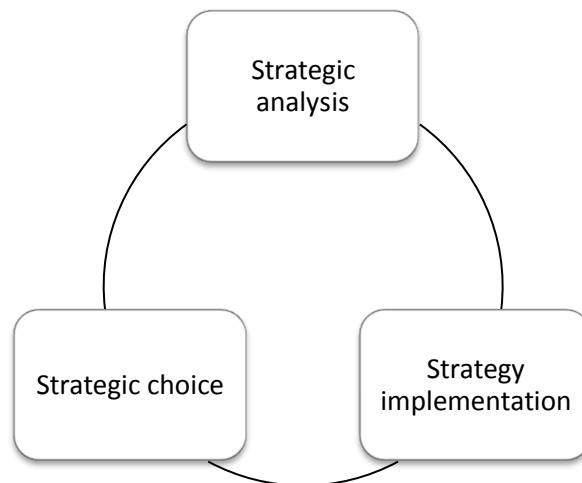


Figure 5. Basic model of strategic management (Ikävalko 2009).

The number of strategy choices is at least as long as the number of factors that affect its choice. The detailed individual characteristics of different strategy choices will not be explored here but it is useful to provide a summary of those more commonly applied.

‘Leader’, ‘challenger’, ‘follower’, and ‘niche’ strategies based on market share or dominance are commonly used (Cheverton, 2004; Sherlekar & Sherlekar, 2010).

Strategies based on the work of Michael Porter are already well embedded in the business world. ‘Product differentiation’, ‘cost leadership’, and ‘market segmentation’ also include the dimensions of scope (penetration) and strength (sustainable competitive advantage) (Porter, 1980; Cheverton, 2004).

Innovation strategies are especially widespread in technological sectors. Strategies of ‘pioneer’, ‘close follower’ and ‘late follower’ are based on how cutting-edge the firm or its business model is (Cheverton, 2004; Kalicanin, 2008).

'Horizontal', 'vertical', diversification', and 'intensification' strategies govern how the firm should grow (Cheverton, 2004).

Military based business strategies, or marketing warfare strategies, are also used. These employ military thinking in a business setting e.g. striking at a competitor's weakest point, or avoiding full frontal attacks (i.e. direct competition) (Paley, 2006).

Proctor (2000) offers an alternative viewpoint for strategic choice based on the concept of strategic windows (refer to Proctor 2000 for a complete description of strategic windows). Competitive strategy consists of six parts of which four are generally applicable. The firm needs to determine:

- 1) The product market in which the business competes (i.e. internal and external factors)
- 2) The level of investment, in terms of:
 - a) invest to grow
 - b) invest to maintain position
 - c) milking through minimal investment
 - d) recovery through liquidating or divesting
- 3) Functional area strategies
 - a) product line strategy
 - b) positioning strategy
 - c) pricing strategy
 - d) distribution strategy
 - e) manufacturing strategy
 - f) IT strategy
 - g) segmentation strategy
 - h) global strategy
- 4) Strategic skills or assets, where skill is something that the business does very well and where an asset is a resource such as a brand name.

Finally it is worth mentioning the practice which has been referred to as 'coarse marketing'. This is the term given by some practicing marketers to real-life marketing which is loosely based on theory but relies heavily on the irrational

thinking processes of experienced marketing managers who use 'gut instinct' in deciding on an appropriate course of action.

2.3 Previous Research in Marketing Wood Residues

Yocom's (1973) study, the earliest examined in this review, most closely matches the purposes of this study. In Yocom's (1973) study a solution was sought to the increasing volume of wood waste generated by primary wood processing industries. This was to be accomplished by assessing the market potential with a view to encouraging investment to meet the potential. In this way the aim was much more generic than the aims of this study which is to identify suitable existing markets to solve a problem of a single enterprise.

Yocom's (1973) study was divided into three areas: assessment and location of the resource; a market study based on wood residues being used to replace existing materials in four product areas; and an economic analysis of processing and distributing wood residues. His theoretical framework was built around the possible uses for the wood residues. .

In his empirical research, for the market study, Yocom (1973) sought through questionnaires, the knowledge and experience of Illinois based manufacturers, suppliers and buyers in four product areas. Yocom's (1973) results indicated that wood residues had significant potential to displace other materials in these four product areas.

A significant time lapse of 25 years occurs before we encounter Alderman's (1998) work on the assessment of wood residue resources and markets in Virginia, USA. Alderman (1998) approached his work from the perspective of supplying information for business and government planning. He provided a thorough account of the sources of wood residues (predominantly chips, bark and sawdust) and their Virginian markets in 1998. The work does not describe how the material is marketed or the marketing channels. As in Yocom's (1973) work the primary data is secured through questionnaire based research.

The study produced the following year by Wahl *et al.* (1999) provides a closer link to this study in its objectives and structure but not in its subject. Wahl *et al.* (1999) studied the Japanese wood flooring and wood window market with a view to produce information for British Columbian manufacturers considering entering the market. The study aimed at providing market information in both product areas on: product attributes; industry structure; and determination of volume consumption. Wahl *et al.* (1999) framed their work upon a general description of the Japanese housing market.

In their empirical research Wahl *et al.* (1999) favoured personal interviews because research indicated that much more complete and qualitative information could be obtained. The interviews, which were conducted through a translator, were based on structured questionnaires. Thirteen out of fourteen respondents took part.

An important consideration in this study is the strategic element. Toppinen *et al.* (2007) looked at how woodworking firms in Northwest Russia derive competitive advantage. Although the study of Toppinen *et al.* (2007) covers a much broader application of strategy and is more applicable to SMEs (small-medium enterprises), their study has relevance to this study in the following areas: it deals with specialised products of wood-based firms; it concerns Russia based firms, possibly exporting; and it concerns strategic marketing. The study's theoretical framework has an interesting standpoint. It is based around resource-based view (RBV) strategic choices (refer to Toppinen *et al.* (2007) for the original references) where competitive advantage can be derived from the unique tangible and intangible ingredients that make up firms, e.g. the firm's human resources, organization, operating networks etc. The theoretical framework was 'operationalized' in Toppinen *et al.*'s (2007) empirical survey by asking respondents to rank a given list of factors that were perceived to contribute to competitiveness. The results showed that there were three perceived areas of competitive advantage: closeness to main markets; good logistics; and access to large markets.

2.4 Woodfuel Markets

The original aim of the mill was to explore the possibility of supplying the reject wood to the Finnish woodfuel market. The development of woodfuel technology and markets is now quite advanced and the idea of exploring this market is well founded.

A doubling in demand for woodfuel (by 2010) in Finland was already noted by Ranta *et al.* (2005) in 2005. In their study they forecasted that forest chips would account for one third of all types of woodfuel by 2010. Additionally, potential demand was predicted to outstrip supply in all Finnish provinces.

Helynen *et al.* (2007) largely corroborated the findings of Ranta *et al.* (2005) adding that forest chip woodfuel would find particular demand in the provinces of Etelä and Pohjois Savo, Kainu and Pohjois Karjala.

In their overview of biomass fuels in Finland, Heinimö and Alakangas (2009) pointed out that there is increasing government support for renewable fuel forms to help Finland achieve its renewable energy target of 38%. The drive to reduce carbon emissions stimulated the woodfuel market. Woodfuel in Finland accounted for 20.7% of the nation's primary energy source. However, two thirds of this was consumed by the forest industry for their own energy needs. Approximately 50% of the generic woodfuel energy source category was in the form of solid wood or wood pellets. Woodfuel had greatest potential for those areas not served by the natural gas pipe supplying Southern Finland (e.g. those areas identified by Helynen *et al.* 2007).

2.5 Research Gap

It has already been mentioned in the introduction that establishing if markets exist for by-products requires, it is assumed, the same processes as establishing if markets exist for primary products. This assumption is based on the idea that others have researched and written about this process. If this is correct, then we should have little problem in finding previous research of this kind.

However, what we actually find is a research gap. A multitude of keyword searches containing relevant search variables and arranged in different orders yielded very few relevant results from the number of different research databases used. A relevant result being viewed as one which matched the assumption described above or the purposes and objectives of this study. Surprisingly, it would seem that this study might be one of the first of its kind. Of course the lack of results could be due to a poor choice of search keywords or due to failing to access the right research databases. Moreover, it is more likely that similar research has been carried out previously but has never reached the public forum because of commercial sensitivity or because it has not been carried out in a formalised or academically acceptable way (refer to 'coarse marketing' at the end of section 2.2 above).

As such, this study hopes to close this gap by furthering the knowledge of using market research and strategic marketing for wood-based by-products and wood-based manufacturing waste. With this additional aim, the research in this study now takes on a broader role in that it provides both the data to answer the research questions but also it begins to fill the gap that has been identified above. This study hopes to further the knowledge of using market research in strategically marketing wood-based by-products and wood-based manufacturing waste.

3 REJECT WOOD: PRODUCT CHARACTERISTICS

So what exactly does the mill have to market? A key principle in successful marketing is thorough knowledge of the product on offer. An examination of the mill's wood procurement helps us to understand where the product comes from and how it is produced.

As already mentioned in the introduction the mill is a leading producer of value added office papers and liquid packaging boards. The business's set-up includes pulp lines, paper machines, A4 and A3 sheeting machines, and wood procurement activities (forest.ru 2011).

The mill uses virgin fibre sourced from the surrounding regions of Leningrad Oblast, Novgorod Oblast, Vologda Oblast and Arkhangelsk Oblast (forest.ru 2011). The mill also leases 200,000ha of near forest concessions (Kotilainen *et al.* 2006) which it manages and harvests itself. The average transportation distance from wood-source to mill is 150km; most of the raw material is transported by rail.

The mill's virgin fibre is sourced either as sawmill residues (sawdust or slabwood) or as roundwood (wood harvested from the forest as logs, which have been stripped of branches and cross-cut into lengths). The mill accepts Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies*), silver birch (*Betula pendula*) and aspen (*Populus tremula*). The mill consumes approximately 1 million cubic metres (RWE – roundwood equivalent) of wood per annum (forest.ru 2011).

Roundwood obtained outside of the mill's forest concessions are normally bought delivered (on truck or by rail) to the mill. The forest owner thus arranges the harvesting and transport. In this arrangement an agreement of sale is made between the mill and the owner (or agent) regarding volume and species assortment. It is up to the owner to conform to the mill's quality specifications. The quality specifications state the roundwood's maximum and minimum log

lengths, maximum and minimum log diameters, acceptable knot sizes, and acceptable volume of rot (percentage).

The mill's reject wood problem lies in the deliveries of aspen it receives from outside of its own forest concessions. Although generally considered to be a secondary species to birch for hardwood pulp, aspen is nonetheless important and valued in pulp manufacture for its colour and wood structure which are suitable for finer and brighter grades of paper like those which are produced at the mill. However, by its nature it is a fast growing tree which often results in trees which are much larger in bole diameter than other trees of a similar age growing in the same forest stand. In the clear-cut forestry harvesting systems which predominate in Russia, all trees from the target area are removed. In fact, under Russian forestry law, minimum harvesting volume limits are imposed (to prevent 'creaming') and fines issued if the requirements are not met (personal communication, 2009). Aspen is also susceptible to heartwood rot as it increases in size and age. It is these characteristics of being oversized (from an industrial processing point of view) and being partially rotten that create a tendency for aspen to fail the mill's quality requirements. Also, the forestry harvesting practice of removing a minimum volume adds to the problem of sub-optimal aspen arriving at the mill.

Deliveries of roundwood arriving at the mill are measured and graded. Those deliveries with a high percentage of unacceptable roundwood are rejected and not admitted to the mill. Deliveries with a lower acceptable percentage of unacceptable roundwood are separated into the material which will go forward for conversion and into material which will be stored in the reject pile – the source and subject of this study.

Continuity of wood sourced from outside of the mill's own forest concession is important, especially as the concessions only supply between 8-10% (in 2005) of the mill's annual need (Kotilainen *et al.* 2006). The inclusive quality screening policy of accepting a proportion of unacceptable material, allows the mill to maximise its wood procurement.

In 2009 the mill was rejecting between 4 and 5 thousand cubic metres of aspen per month. A conservative estimate suggests that, if these deliveries could be accepted, then an additional 10 to 15 thousand cubic metres of acceptable wood could accrue annually.

The rejected material, now as the material to be marketed, consists of assorted aspen logs which may display one or all of the following characteristics:

- oversized (>55cm butt diameter)
- undersized (<8cm top diameter)
- include a high volume of rot (>50% of central core)
- large knots
- no straight form - curved, bent, forked or misshapen.

Furnished with this knowledge we can begin to identify the market areas which might be suitable. We can limit the market areas further by excluding those markets which have significant entry barriers for the mill based on the additional costs incurred in conversion or other treatment (e.g. drying or removal of rotten wood). In product terms, the mill's reject wood can be categorized as low-grade roundwood. The next section of this study will look at markets which are involved in the use of this product.

4 POTENTIAL MARKETS

The purpose of this section is to review and analyse the current data available on potentially suitable markets. To recap, potentially suitable markets are seen as those which:

- Are close enough to result in economic transport costs
- Can accept low-grade aspen and other hardwoods
- Can accept roundwood or other simple processed form (e.g. woodchip).

Aside from small ‘cottage industries’, low-grade aspen and hardwoods have few market opportunities in SE Finland. Table 1 below summarizes the most likely markets that adhere to the parameters outlined above.

Table 1 identifies seven possible market areas which may be suitable. Some of these markets are described as being small, micro, limited or specialist. These types of market are eliminated from our enquiries as, because of their size, scale and national distribution, they provide limited scope for addressing the problem. Additionally, the statistics and data available on these types of markets are scant, limiting the ability to properly analyse their potential. Markets of this nature do not, moreover, match the kind of mutually strategic business relationship model sought in this work. Table 2 below summarizes the selected possible market areas into which the mill’s reject wood could go. These markets will be the subject of further scrutiny.

Table 1. Possible markets for low-grade aspen logs

Grade	Possible Markets	Comments
Unprocessed roundwood of varying lengths	Firewood Solid woodfuels Composite boards/materials Low-grade pulp	Drying required. Drying preferred. Size may be a problem. Limited market for roundwood. Size critical. Limited market. Size critical.
Split lengths up to 1m	Firewood	Drying and conversion required.
Split domestic logs 20-50cm	Firewood	Drying and conversion required
Ungraded chips	Solid woodfuels Liquid biofuels Horticultural mulch Equestrian usage Recreational usage (e.g. play parks)	Conversion required. Drying preferred. Conversion required. New market area. Conversion required. Specialist small scale market. Conversion required. Micro market. Conversion required. Rot may be a problem. Specialist micro market.
Graded chips – e.g. graded according to size, species, moisture content	Solid Woodfuels Composite boards/materials Low-grade pulp	Drying and conversion required. Conversion needed. Rot a problem. Conversion needed. Rot a problem. Limited market.
Grinded grades	Wood-pellets Composite boards/materials Liquid biofuels	Conversion needed. Drying required. Rot unacceptable. Bark a problem. Conversion needed. Rot a problem? Conversion required.

Table 2. Summary of Main Market Areas

	Market Area	Definition (for the purposes of this study)
1	Firewood market	Split logs for mainly for domestic heating
2	Woodfuel market	Woodchips mainly for larger scale heating, CHP production, or industrial heating
3	Composites market	Composite products where wood is a major component, e.g. fibreboard
4	Liquid biofuel market	Primarily transportation fuels derived from wood biomass, e.g. ethanol, biodiesel

The available data on each of these main market areas will be examined and presented to build a general picture of the nature of these markets in terms of:

- Volume - from the statistics and publications available. Volumes will be rounded-up for neatness of presentation. Value – as reported in the statistics, or calculated from relevant available data (e.g. volume * average reported unit price)
- Trend – as a measure of volume growth or decline against five years previous (or other stated date)
- Form – a description of the most common raw-material traded in the market

It will be stated where estimates have been used. These estimates should be taken as the author's own. Additionally, where it is possible, information specifically about the local (south-east Finland) market will be added.

4.1 Data Sources

Obtaining the information required involved desk research accessing the wealth of publicly available data related to this subject. The process was quickened by the fact that most of this material was made available freely via the internet. The potential data-set was very large and the focus of the desk research had to be narrowed to obtain data which was:

- Accurate
- Reviewed
- Relevant
- Recent
- Quickly obtainable

Hence, the desk research was focused on the following specific data sources via the internet:

- National and other public body statistics
- Statistics and data collected and held by research and educational institutions
- Trade association information
- Professional associations
- Company information

It is stated where data could not be obtained on any particular area.

4.2 Finnish Roundwood Market in General

It is worth placing low-grade wood into context by examining the Finnish roundwood market in general. Table 3 provides a summary of the market's highlights.

Table 3. Finnish Wood Consumption 2010

Total wood consumption	77.9 million m ³
- Roundwood	59.4 million m ³
- Wood residues/by-products	18.5 million m ³
Total roundwood consumption	59.4 million m ³
- Domestic	52.1 million m ³
- Imported	7.3 million m ³
Main uses of roundwood (approx)	
- Pulping	30 million m ³
- Sawmilling	19 million m ³
- Energy production	8 million m ³

Source: Finnish Statistical Yearbook of Forestry 2010

From the general description provided in Table 3, low-grade wood markets are represented by wood residues/by-products and energy production. It is easily identifiable that the low-grade wood market is potentially large. As a percentage of roundwood, low-grade wood accounts for 13%, and as a percentage of the total wood consumed, 34%.

4.3 Structural Market Change

It has been widely mooted that the current wood volumes used in pulpwood and energy production will significantly change, with pulpwood diverted to energy production (Metsäteho, 2008; Metsälehti, 2010). This scenario has an obvious impact on the low-grade wood market. The drivers for this change have been twofold: over capacity in the paper industry, which has resulted in mill closures and planned reductions in capacity; and the adoption of the EU 20-20-20 emissions policy by the Finnish Government (Metsäteho, 2008).

4.4 Firewood Market

Both the firewood and the woodfuel markets could be seen as synonymous. However, they are two distinctive markets which can utilize the same raw materials. The firewood market is defined here as domestic and small scale heating which utilizes small dimension split logs. However, as a point of note only, the firewood market could also include forest chip and wood pellet use (see Table 2, item 1, above). Table 4 shows the current market position.

Table 4. Firewood market in Finland 2010

Item	Description	Source
Volume	4-6 million m ³	1, 2
Value	€60 million Current prices per cubic metre (solid equivalent): domestic firewood approx €40-50 (undelivered) Much of the firewood used is sourced outside of the firewood market, e.g. forest owners using their own wood. The value of the firewood market here corresponds to what is traded through the normal firewood market channels.	2 2, 6
Trends	+9% change in volume from five years previous	1
Form	Split short length (up to 35cm) unpeeled logs Moisture content <25% Birch preferred. Aspen, alder and coniferous species also used	1,2
SE Finland	From forestry centre statistics, SE Finland consumes approximately 7% of the national total. Based on this, SE Finland estimated figures are Volume: (estimated) 0.35 million m ³ Value: (estimated) €1 million	1
Etelä-Karjala	<u>Etelä-Karjala</u> sources 62% of its energy need from wood-based fuels. This is 3 times the Finnish average. 79% of this comes from black liquor and the remaining 21% comprises solid woodfuels Volume: Domestic firewood estimated to generate 0.5TWh, which is approximately 7072 m ³ solid wood (at 25% moisture content). Value: Domestic firewood, estimated at €0.28 million	3 3
Sources	1. Finnish Statistical Yearbook of Forestry (2010) 2. Kallio, Erkillä & Raitila (2007) 3. Tynkkynen (2010) 4. Metsäteho (2008) 5. Pöyry (2011) 6. MottiNetti (2011)	

4.5 Woodfuel Market

The woodfuel, or energy wood, market is potentially very large. The whole area has grown rapidly over the past 15 years in response to the increasing cost and scarcity of oil and in an effort to combat climate change. As mentioned above woodfuel is treated here as distinct from firewood (see Table 2, item 2, above). Not all woodfuel types are solid; a liquid residue from the pulp industry, known as black liquor, is the largest contributor to this segment. Table 5 shows the current market position.

Table 5. Finnish Woodfuel Market 2010

Item	Description	Source
Volumes	<p>2.65 million m³ roundwood <u>10.81</u> million m³ by-products/wood residues 13.46 million m³ - approx 8 million m³ solid equivalent liquid woodfuels - approx 6 million m³ solid woodfuels</p>	<p>1 1 1</p>
Value	<p>Approx €200 million total energy wood market - €114 million liquid woodfuels - € 86 million solid woodfuels - Current solid woodfuel prices per cubic metre (solid): - forest chips approx €35 - by products approx €31</p>	<p>1, 2 5 5</p>
Trends	<p>+13% change in volume from five years previous Woodfuel prices have increased 15% since 2007</p>	<p>1 4</p>
Form	<p>Most common solid-woodfuel forms are i) residues and by-products (sawdust, offcuts, bark etc) from mechanical wood processing industries ii) wood chips for automated domestic, commercial, and industrial heating systems - from chipped small diameter roundwood - from harvesting residues (e.g. branchwood & stumps left after clear cutting operations)</p>	<p>1, 2</p>
SE Finland	<p>From forestry centre statistics, SE Finland consumes approximately 20% of the national total. Based on this, SE Finland estimated figures are Volume: (estimated) 1.2 million m³ for solid woodfuels Value: (estimated) €17 million for solid woodfuels</p>	<p>1</p>
Etelä-Karjala	<p><u>Etelä-Karjala</u> sources 62% of its energy need from wood-based fuels. This is 3 times the Finnish average. 79% of this comes from black liquor, 17% solid woodfuels and the remaining 4% from firewood and other wood. Volume: Solid woodfuels are estimated to generate 3TWh, of which approximately 423,000m³ is solid woodfuel Value: Solid woodfuels, estimated at €5.8million</p>	<p>3 3</p>
Sources	<p>1. Finnish Statistical Yearbook of Forestry (2010) 2. Kallio, Erkillä & Raitila (2007) 3. Tynkkynen (2010) 4. Metsäteho (2008) 5. Pöyry (2011) 6. MottiNetti (2011)</p>	

4.6 Composites

Chipboard, particle board, and medium density fibreboard (MDF) are all well known products that have been utilizing low-grade wood for many years. However, the markets are in decline. Both the particleboard and fibreboard markets have been steadily declining since their heydays in the 1970s (FFIF, 2011). Puhos Board Oy, one of the remaining significant manufacturers of wood based panels, announced on 29.9.2011 that it was filing for bankruptcy (Puhos Board, 2011).

Table 6. Finnish Wood Composites Market

Item	Description	Source
Volumes	400,000 m ³ roundwood equivalent - particle board - 4,000 m ³ of roundwood - 69,000 m ³ imported chips - 195,000 m ³ by-products/wood residues - fibreboard - 92,000 m ³ by-products/wood residues	1
Value	Estimated €12 million - by-products currently cost approx €31 per m ³	2
Trends	-67% change in volume from five years previous	
Form	This market primarily depends on the by-products and wood residues of the mechanical wood processing industry, i.e. sawdust and saw milling chips	
SE Finland	No data available	
Sources	1. Finnish Statistical Yearbook of Forestry (2010) 2. Pöyry (2011)	

4.7 Liquid Biofuel Market

The inclusion of liquid biofuels for examination as a potential market is based on the growing interest in this area and on its possible potential. Currently in Finland, the production of liquid biofuels for transportation is limited but bio-ethanol production tripled between 2000 and 2007 and biodiesel increased eleven-fold, and it is predicted that growth will continue (Alakangas *et al.*, 2010). As part of Finland's 2020 renewable energy targets, 10% of all traffic fuels must be derived from biomass – this potentially equates to approximately 1.2 million m³ of wood, if wood is to be used (Pasanen *et al.*, 2008). A number of pilot projects are currently running, testing the viability of wood-based liquid biofuels. The forest company UPM have already announced their intention to develop wood-based liquid biofuel technology (UPM, 2009). Table 7 below summarises a potential, and not actual, market. This market area is changing very quickly and it is likely that a low-grade wood market that provides feedstock for this industry will soon come into being.

Table 7. Potential Liquid Biofuel Market

Item	Description	Source
Volumes	420,000 m ³ roundwood equivalent (2008)	1
	NOTE: It is likely that the majority of this volume consists of vegetable oil based biofuels; wood residue derived biofuels count for a much smaller fraction	2
Value	Estimated €13 million - based on average cost of forest chips and wood residues at €33 per m ³ - this figure is likely to grow significantly within 5 years	
Trends	+1650% change in volume from five years previous	1
Form	Wood residues, forest chips	3
Sources	1. Finnish Statistical Yearbook of Forestry (2010) 2. Heinimö; Alakangas (2006) 3. Pasanen, <i>et al.</i> (2008)	

4.8 Summary

The main markets for low-grade wood that conform to the delimitations of this study were highlighted and their raw-materials and products described. The objective of this section of the study was to highlight markets that had the potential to achieve the study objectives. As a consequence the market areas were assessed and short-listed, removing those with least hypothetical potential, to create a focus group of potential markets. The short-list included four main potential market areas:

- firewood
- woodfuel
- wood composites
- liquid biofuels.

The characteristics of these four market areas were described through desk research highlighting, amongst others, their volumes and values. The desk research was conducted by utilizing publicly available peer reviewed data available through the internet. The following section of this study discusses the empirical research undertaken to establish which of these markets offered the greatest potential.

5 FURTHER MARKET INSIGHTS

Although statistics can provide a wealth of information they cannot give us a truly complete picture of the subject of interest. We have reviewed the statistics and secondary data available on the markets of interest and we have gained an outline of their shape and potential. To gain a better understanding of the nature of the low-grade wood market we must delve deeper. This need to delve deeper is the subject of the main task of this study: undertaking qualitative market research.

Qualitative market research involves the collection and analysis of qualitative data. In this study we wanted to obtain the data through two methods: questionnaires and interviews. The use of questionnaires and interviews is already established as a common method of data collection in qualitative business research (Eriksson & Kovalainen, 2008).

Due to a limited time scale, the number of questionnaires and interviews had to also be limited. Limiting the number did not necessarily mean that our data quality suffered as a result. In reality we were dealing with quite a small market area, in terms of product types, suppliers and buyers, and we focused our interest on a particular geographical region. Hence, although the number of questionnaires and interviews appears to be small, the data yielded are still valid because they represent a high proportion of the actual number of potential data sources.

5.1 Questionnaires

Twenty questionnaires were posted to a pre-determined list of recipients. The recipients were drawn from businesses known or suspected (because of their declared area of business operation) to be using low-grade wood, which were operating roughly within 150km of Lappeenranta. Personal knowledge of operating companies and public business listings were used to compile the list of businesses. The aim was to include a representative of each business type

given in Table 2 (above). Where it was not possible to find a business within 150km then the next nearest business was included. Generally all the recipients had operational units within roughly 250km of Lappeenranta.

All of the questionnaires were identical, in Finnish, and were designed to provide easily comparable information on low-grade wood markets within which the recipient operated, or considered operating in. To encourage participation it was important to maintain respondent anonymity, hence the recipients were not asked to identify themselves or the organization they represented, nor were the questionnaires marked to identify repliers. Recipients were given roughly 4 weeks within which to return the questionnaire. A copy of the questionnaire can be found in Appendix A.

5.2 Questionnaire Results and Discussion

Of the twenty questionnaires sent, nine were returned. The results are summarized in table 8 which shows the individual responses to each summarized question in an easily comparable way.

From table 8 we can begin to draw some generalizations based on the questionnaire data, about the low-grade wood markets available to the mill. Firstly, respondents 1 and 8 (shaded grey on table 8) must be excluded from our analysis; respondent 1 is not buying wood at all and respondent 8, although buying wood, is not involved in low-grade wood markets.

What is initially clear is that an active market exists for low-grade wood. In terms of size, according to our sample, the average annual volume of this market is roughly 500,000 cubic metres and consumption per user ranges from 80,000 to 1.3 million cubic metres per annum. All the respondents stated that they were interested in purchasing low-grade wood. The most common purchased forms of low-grade wood were roundwood and green chips. It is also clear that these products were required for the generation of energy or for energy and

Table 8. Questionnaire Results

Question	Brief Question Description	Respondent								
		1	2	3	4	5	6	7	8	9
1	Wood buying status	Not buying	buying	Buying	Buying	Buying	Considering buying	Considering buying	Buying	buying
2	For which products? State if other	/	Other Chipboard	Energy, heat, sawn Sawn wood, veneer, chipboard	Other Fibreboard, composites	Energy, heat	Energy, heat	Energy	Other Lampposts	Energy
3	Will purchase LG wood?	/	Y	Y	Y	Y	Y	Y	N	Y
4	Which form(s)?	/	Green chip, dry chip, milling waste	Roundwood, green chip, dry chip, milling waste	Green chip, milling waste	Roundwood, dry chip, milling waste	Roundwood, dry chip, milling waste	Dry chips, milling waste	Long poles	Suitable for combustion
5	Which Species?	/	Spruce, pine, mixed conifer	Not selective	Mixed conifer	Not selective	Not selective	Spruce, pine, birch, mixed conifer, mixed broadleaf	Pine	Not selective*
6	How much? Unit?	/	300,000 Cubic metres	1,300,000 Cubic metres	240,000 Cubic metres	1,000,000 Cubic metres	10,000 Cubic metres	80,000 Cubic metres	300 Poles	1,000,000 Cubic metres
7	Which defects acceptable? High rot content Low rot content Large knots Bark Other defect or info	/	N N Y N Must be clean	Y Y Y Y Must be clean	N N N Y(8%)	N Y Y Y Accept dry snags and scorched wood	n/a Y Y Y Scorched wood, dry snags	n/a Y Y Y	N N N N	Y Y Y Y
8	Which supply contract?	/	Ad hoc	Ad hoc*	Short term	Long term, short term	Ad hoc	Long term	Long term	Long term
9	Supply requirements Local Certified Domestic	/	N Y N	N Y N	N Y N	N N N	Y N N	Y n/a N	N Y Y	Y N N
10	Future consumption	/	Significant increase	Significant increase	No change	Significant increase	Significant increase	No change	No change	No change
11	Position of respondent Responsible for buying?	Buyer n	Buyer y	Bioenergy buyer Y	Production manager y	Project manager n	Managing director y	Managing director y	Network chief n	Managing director N

Notes:

/ = not applicable

n/a= not answered

*=interpreted answer (original answer didn't match answer options available)

heat. Hence our sample suggests that by far (roughly 70%) the largest market area is woodfuel. Five of the seven remaining respondents indicated that they could accept broadleaf low-grade wood (aspen fits into this category). Only the respondents involved in composite materials could not accept rot in their wood. The respondents involved in woodfuel did not have a problem with low rot content (<50%), large knots and bark. High rot content (>50%) seems to be more of an issue with the same respondents. Ad hoc, short and long term wood buying contracts had been used by the respondents; no real preference for a single type could be noted. With regard to wood sources, forest certificated and local wood was not sought by all buyers (roughly 50:50), and none of the respondents saw imported wood as being a problem. All of the respondents reported either stable or increasing future demand.

To add credibility to the data, the questionnaire asked for the respondent's position and whether they were responsible for wood buying. The stated positions and responsibilities suggest reasonable credibility.

None of the respondents listed biofuels or liquid fuels as their product area. We can therefore assume that those asked declined to respond, or that they masked their identity by stating energy as their product area. Of the respondents that listed composites as their product area, one indicated an increasing future demand for wood. This does not agree with the secondary data obtained on the composites market (in general decline). We should assume that the respondent feared that the questionnaire would expose negative information relating to the true position of their business and so included a more favourable response.

5.3 Interviews

Originally, the research plan was to interview five of the questionnaire recipients. Interview candidates were to be selected following receipt of completed questionnaires. It was hoped that the questionnaires would facilitate two things:

- help to shape the interview questions – the questionnaires providing base data and therefore highlighting what additional questions needed to be asked to obtain a fuller insight into low-grade wood markets
- highlight those sectors, companies or individuals, who have the highest potential for interviewing – the idea being to interview those who appeared to have the greatest insight into low-grade wood markets.

5.4 Change of Plan

Unfortunately, none of the questionnaire recipients agreed to be interviewed, possibly because of the short-notice involved and possibly because the interview was to be conducted in English. It was still felt that, as per the original research plan, interviews were necessary to achieve the level of detail sought after. A contingency plan was quickly assembled which resulted in contacting other suitable interview candidates. It was essential that the new interview candidates would offer relevant and valid insights into low-grade wood markets. It was decided to approach representatives from the research and development field who had been involved in low-grade wood markets and to approach others involved in buying low-grade wood who had not participated in the questionnaire. In the short time-scale available three interviews were secured; two with low-grade wood specialists from the research and development field and one with a wood buyer with extensive experience in wood procurement, including low-grade wood and wood residues. Both private and publicly funded research fields were represented which provided a balanced view-point.

5.5 Interview Method

The interviews were conducted over the phone. Before each interview a Pre-Interview Statement (Appendix B) was read to the interviewee stating that the interview was to be conducted in confidence and outlining the method of the interview. The interviews then followed a structured and standardized format based on a set list of questions (Appendix C). Interviewees' responses were recorded in written note form and transposed to typed text immediately following the interview whilst the information was still fresh.

As per the original research plan, the interview questions were based on the data received from the questionnaires. A structured and standardized format was chosen for ease of analysis. However, as it was not possible to interview questionnaire respondents, the focus of the questions had to be altered slightly. It was hoped that the questionnaire respondents would have offered greater information on their own low-grade wood markets. Instead, we now had a panel of experts to interview, so the focus of the questioning was to verify and hopefully to expand upon the data already received from the questionnaires.

5.6 Interview Results

To obtain useable data from the interviews, the respondents' answers needed to be presented in an easily digestible form. A 'quantitative-informed' (Eriksson & Kovalainen, 2008) approach was used. Hence the respondents' answers were grouped into:

- Areas of convergence – where the answers of all three respondents to an interview question were the same or very similar. The areas of convergence formed the common market facts. Describing the convergent data as common market facts was based on the cross verification of interview data and questionnaire data, i.e. the data-sets were similar in nature leading to the assumption that the data collectively was from a shared common knowledge.
- Areas of divergence – are the different and new answers given by each respondent, providing extra information about the market. They are treated as facts unless there is obvious contradiction with other sources of information, in which case the piece of information was excluded. The areas of divergence widen the market knowledge, coming from the interviewees' individual experiences and knowledge, providing key insights into the market area.

5.6.1 Areas of Convergence

The following is a summarized narrative of the areas of convergence.

A market exists for low-grade wood, commonly as the raw material for CHP (Combined Heat and Power) production. Forest chips, derived from logging residues, stumps from clear-cut areas, and small diameter roundwood thinnings, provide the main source for the CHP raw material. Wood residues from the mechanical wood processing industry are also important. The annual volume of the market ranges from 3-5 million cubic metres (solid), achieving an average price of about €35/cubic metre at the factory gate (chipped), depending on the season; prices range from €30-€40/cubic metre. The forest chips are most commonly sourced through integrated industrial roundwood harvesting (see Appendix D for a full description). As such, the main suppliers in this field are the larger forest companies (Metsäliitto, Stora-Enso, UPM), and the Finnish Forest Management Associations. The main buyers are VAPO (bioheat and biofuel producer) and Biowatti (woodfuel agent and bio-energy producer). The woodfuel market is an emerging and growing market. The effect of carbon trading on this market is, as yet, unknown, but it might have an impact in the future. The market has benefited from government subsidies, aimed at achieving renewable fuel targets, which have expanded the market. Removal of these subsidies is seen as a significant limiting factor in this market, and removal would result in market decline in forest chip supply. In theory there is no lack of availability of raw material for this market. The market has, in theory, a basic quality requirement: dry forest chips; in practice the CHP producers are utilizing any wood chip which is combustible. The overall outlook for this market is very promising with growth expected to continue.

5.6.2 Areas of Divergence

The areas of divergence are presented in table form found on Appendices E, F and G, one for each interviewee. Each table shows a summary of the divergent response against its original question. It should be noted that only the divergent

parts of the responses are included in the tables. Convergent areas have been removed and are included in section 5.6.1 above.

The tables contain a lot of interesting and relevant information. However, there are several main points of interest to be gleaned from the data:

i) The performance of the woodfuel market is dependent upon the availability and cost of alternative renewable fuels, most notably peat, but also wood residues from the mechanical wood processing industry. Peat availability is decreasing and it is likely that peat availability will especially be problematic in the eastern and south-eastern areas of Finland.

ii) Regarding the availability of wood residues it is important to keep in mind the effects of industrial action (strikes) and the trend of mill closures and pulp and paper industry restructuring, which have limited the availability of supply.

iii) As there are not many competing markets for these products, the users have the buying power. However, it was reported that what some of the users are actually paying for woodfuel at the factory gate might be a lot more than the average prices suggested by statistics.

iv) The merits of forest certification in this market seem still to be open to debate. Amongst the interviewees there seems to be some agreement that forest certification is not a buyers' requirement, but, also an indication that buyers regard domestically sourced wood as sustainable. Imported woodfuel is not likely to enjoy this *de facto* status and some kind of certification may be required.

vi) If key places, such as Helsinki, switch to woodfuel this will undoubtedly stimulate the market as they provide further models, promote woodfuel's use, and of course, further market growth.

5.7 Interview Discussion

The aim of the interviews was to gain greater in-depth knowledge of the low-grade wood markets. This has been achieved to some degree but, because of the necessary change of plan (see section 5.6) our data perhaps lacks the kind of information we originally expected to achieve. In the terms of the research questions outlined in section 1.4, one key area was strategy. The mill was looking for a strategic solution that would result in benefits for seller and buyer alike. Usually this is achieved through the trade contract, the one area in which we could not question our panel of experts, but could have asked the questionnaire recipients who were actually buying low-grade wood.

5.8 Results Discussion

Combining the questionnaire and the interview results provides the information required to build a picture of the market available to the mill. The questionnaire round provided our base data and we expanded upon this through interviewing key individuals. In the main, the interviewed panel of experts corroborated the basic market picture constructed from the questionnaire data, but also added to the picture. To summarize generally, the low-grade wood market could be described thus:

- Essentially a woodfuel market supplying CHP production
- Estimated average volume of consumption within 250km of the mill is 500,000 cubic metres (solid)
- Woodfuel most commonly bought and consumed as green forest chips, with no particular quality requirement other than the fuel being 'clean' (i.e. no earth, stone or other non-woody contaminants)
- The average (CHP) factory gate price is €35 per cubic metre (solid); prices increase significantly during the winter heating period and a shortage of alternative fuels will of course increase prices
- Availability of peat is a major factor in woodfuel price and demand

- The majority of woodfuel is supplied by forest companies involved in integrated industrial roundwood harvesting; VAPO and Biowatti are important buyers
- If the woodfuel is imported it is likely that some level of proof of sustainability will be required
- The market is expected to grow.

6 CONCLUSIONS

In market research terms we now come to the reporting phase of our study. In our conclusion we are faced with the task of providing some recommendations to assist the mill in resolving their accumulating reject wood problem.

The conclusions below are the result of the interaction between the theoretical framework and the empirical research. For example, the market research undertaken here has been the systematic collection, analysis and interpretation of information for marketing decisions as defined by Hague & Hague (2004). This study has also undertaken the same step-by-step process outlined in Figure 3 (Marketing Research Process). Figure 2 (Ansoff's Matrix) demonstrates how marketing strategy and market research merge. Figure 2 shows that market research can provide an understanding of unfamiliar markets when dealing with, as in our case, new products in new markets. The use of market research has made the potential markets more familiar and offered an opportunity to diversify. However, it is problem solution and not business diversification that the mill is seeking in this case. Likewise with marketing strategy, as will be shown below in section 6.2, SWOT analysis and Michael Porter's 4Ps (product, price, place, promotion) have enabled us to highlight where the mill can make the strategic connection they have sought in the resolution of this problem. With the theoretical framework and empirical research combined we have been able to achieve the main objective of this study – to determine possible markets for the mill's reject wood.

6.1 The Right Market

Section 4 and 5 above researched and analysed the low-grade wood markets that had the potential to achieve the aims of this study. The results indicated that the woodfuel market was the largest and most active market available. Hence it is suggested that the woodfuel market has the greatest potential to use the mill's low-grade wood because:

- The market is large with high levels of local volume use and predicted volume growth, i.e. there is demand.
- Entry into the market is relatively easy with little or potentially no further processing required to the mill's reject wood.

It is interesting to note that it was assumed at the very beginning that this was likely to be the case.

6.2 Strategy

We must also turn our attentions to the fact that the mill requires the solution to be strategic. Strategic, as defined by the mill itself, must include benefits for buyer and seller alike. Only in this type of business arrangement is there likely to be lasting benefit. Accordingly we can exclude from our search all the smaller enterprises using low volumes, which are feeding into limited markets, and which have limited bargaining power.

As discussed in section 2.2 above, marketing strategy focuses on concentrating limited resources on the greatest opportunities (Baker, 2008). A key step in this process is to scrutinize the internal and external factors that influence the marketing decision (Grant, 2005; Aaker, 2008). Table 9 presents a SWOT analysis of potentially marketing the mill's reject wood as woodfuel in Finland.

Several points in Table 9 have been highlighted (shaded grey). Of particular interest in the 'strengths' box is the material's low cost base and the fact that the mill's wood supply has an FSC credited certificate of sustainability. It has already been mentioned above in section 5 that, regarding imported wood from Russia, certification is likely to be required, if not now, then almost certainly in the future. The data also suggests that buyers are not adverse to imported wood but Russian imported wood is not generally certified. This point already gives the mill a competitive edge over other suppliers. A key element of marketing strategy theory, and as introduced in section 2 above, thus comes into effect: Michael Porter's product differentiation strategy. This strategy is also de-

scribed as having strength, i.e. sustainable competitive advantage (Porter, 1980). This is exactly the kind of strategy that the mill has sought. Using the mill's certified status provides the basis for a niche marketing strategy.

Table 9. SWOT Analysis of potentially marketing the mill's reject wood as woodfuel in Finland

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> - Available wood supply - Low cost raw material - Close proximity of market - Wood fits required quality parameters - Solves accumulating wood problem - Low investment costs - Relative ease of market entry - Certified wood supply 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> - Further processing most likely to be required - Cross border tariffs/taxes - Securing a market - Supply may not meet demand - Limited local market size
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> - Developing new income stream - Developing new business connections - Potential to expand business - Potential to learn skills in new business area - Potential to be one of the first to market sustainable woodfuels from Russia 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> - Cross border trade could be halted at any time by Russian government policy - Potential cost of investing in chipping equipment - Withdrawal of Finnish woodfuel subsidies could contract the market

6.3 Market Entry

Another key requirement for the mill was that the market should be easy and rapid to access. The markets already exist; feeding into them simply requires offering the right product at the right cost. A low investment need and low cost base were also important requirements. Hence product form and operational cost need to be examined.

Our data from section 4 suggests that roundwood is accepted by a number of woodfuel users. However, although the mill's reject wood is available as roundwood, chipping should be considered as the majority of buyers look for forest chips. Chipping would incur either contractor's costs or chipping equipment investment costs.

The viability of exporting wood from Russia as woodfuel is dependent on the sale price versus the combined costs of export tariffs, transportation and raw material. The tariffs may ultimately be the limiting factor in this type of venture. Currently (Nov 2011) Russian export tariffs on roundwood or woodchip stand at €15 per cubic metre and the Russian Federation has already indicated that this figure is likely to increase. Transportation costs vary considerably but delivery by road has been reported as the cheapest method at €15.8 - €18.5 per cubic metre within a 200km radius from source (Gerasimov & Karjalainen, 2009). The cost of chipping at roadside in Finland with a chipping contractor is currently between €5 and €7 per cubic metre (personal communication, 2011). At an average factory gate price of €35/ cubic metre, exporting to Finland and chipping would be a loss making exercise. These problems are highlighted in the SWOT analysis, Table 9.

6.4 Potential Buyers

Taking into consideration the factors of suitable market, proximity, strategy and ease of market entry, Table 10, below, was constructed featuring prominent potential buyers in the woodfuel market situated within 150km of Lappeenranta.

The table shows the buyers' details and their woodfuel related business activities. The table also shows information which needs to be verified: their current woodfuel buying status ascertained from public company information, and their assumed or stated current supplier information. Table 10 provides an 'at-a-glance' view of those who could be contacted in the first instance to discuss the potential of a business arrangement. Those included within Table 10 are considered to be those who have the best strategic fit potential for the mill. Table 10 is not a comprehensive list of woodfuel buyers situated within 150km of Lappeenranta.

Table 10. Potential Buyers

Company Name	Address	Relevant Business Activities	Woodfuel Status	Supplier information
Bio-Esme	Bio-Esme Oy Ristiinantie 1 50100 Mikkeli	Woodfuel buyer	Buying woodfuels and wood residues on the open market	Various
Biowatti	L&T Biowatti Oy Sentnerikuja 1 00440 Helsinki	Woodfuel buyer	Buying woodfuels and wood residues on the open market	Various
Etelä-Savon Energia (Pursilan voimalaitos)	Etelä-Savon Energia Oy PL 166 50101 Mikkeli	CHP Production	Buying woodfuels and wood residues on the open market	Various
Fortum	Fortum Power and Heat Oy Joensuun voimalaitos Iksenvaarantie 2 80260 Joensuu	CHP Production	Buying woodfuels and wood residues on the open market	Various
Imatran Energia	Imatran Seudun Sähkö Oy Karhumäenkatu 2 55120 Imatra	Potential CHP Production.	Not currently buying. New biofuel CHP station planned for construction.	-
Kaukaan Voima (Pohjolan Voima)	Kaukaan Voima Oy Kaukaankatu 30 53200 Lappeenranta	CHP Production	Woodfuels sourced through its partner UPM. Unknown if they are purchasing woodfuels from the open market	UPM wood harvesting and wood residues
Kymin Voima (Pohjolan Voima)	Kymin Voiman voimalaitos, Kouvola Selluntie 3 45700 Kouvola	CHP Production	Woodfuels sourced through its partner UPM. Unknown if they are purchasing woodfuels from the open market	UPM wood harvesting and wood residues
Lappeenrannanenergia	Lappeenrannanenergia Oy Valtakatu 25 A 53100 Lappeenranta	Lämpö	Assumed to buy woodfuels and wood residues on the open market. Lappeenrannanenergia is also a partner in Kaukaan Voima	Assumed various
VAPÖ	Vapo Biopolttoaineet Eteläinen alue Äyritie 8 D 01510 VANTAA	Woodfuel buyer, biofuel heating plants in Kouvola and Lappeenranta	Buying woodfuels and wood residue on the open market	Various

6.5 Recommendations

With the above factors in mind, a number of recommendations are offered which aim to provide a market solution to resolve the mill's accumulating wood problem.

Recommendation 1: As discussed in 6.1 above, the current Finnish woodfuel market has the ability to deal with the mill's accumulating reject wood, and should be considered as a solution.

Recommendation 2: The reject wood should be marketed as a certified wood-fuel. This provides a niche marketing point and the foundation for further sales and growth if required; the mill should take advantage of its certified status.

Recommendation 3: The reject wood should be marketed during the winter heating season when the higher purchase prices on offer can overcome the high cost of exporting. Stockpiling would need to be managed and could be organised in a way that sold the driest wood parcels first; drier wood results in higher MWh (MegaWatt hour) content and therefore a better conversion rate.

Recommendation 4: Because of their speciality as woodfuel agents and their nationwide level of operation, Biowatti and VAPO may be in a better position to offer longer term arrangements as they have better access to a multitude of woodfuel markets. Sales to these organizations could be in roundwood.

Recommendation 5: The mill should consider investing in chipping facilities; chipping in Russia is likely to be cheaper than in Finland.

6.6 Study's Wider Relevance

The primary aim of this study was to undertake market research on behalf of the mill to ascertain if a market solution could be found for accumulating reject wood.

In the course of this study we looked at market research and identified a research gap in market research for strategically marketing wood based by-products and wood-based manufacturing waste. It is hoped that this study goes at least some way in providing an example of how a qualitative research approach can be used to undertake international based market research for by-products, by following the same systematic process used in this study, of:

- Understanding what the product to market is
- What the market options are for the product
- Examining the market through desk and empirical research
- Making an assessment of the marketing environment
- Identifying factors that can be used strategically
- Marrying the strategic factor(s) with the best fitting market for the product
- Making marketing recommendations based on all the analyses.

6.7 Final Words

Nine potential markets and 5 marketing recommendations have been identified to help the mill resolve its accumulating reject wood problem. Perhaps it is appropriate at this stage to point out that these alone will not solve the problem. The next step is to reinforce what has already been mentioned: many marketing strategies, although based on sound analysis and strategy choice, fail due to poor implementation (Ikävalko, 2009).

The timescale of this study prevented a larger sample being taken. A more comprehensive result would be obtained through a higher response rate which

could have been achieved through an increased number of questionnaires and interviews and, as mentioned, interviewing more of those already involved in purchasing low-grade wood.

The natural next step for further work in this field would be to follow the implementation of the recommendations of this study and to devise a model for general application.

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APPENDIX A (1 OF 2)

Hyvä vastaanottaja,

Osana Saimaan ammattikorkeakoulussa suorittamaani MBA –tutkintoani teen tutkimusta vähäarvoisten puiden markkinoista. Olisin kiitollinen, jos voisitte auttaa minua tutkimuksessani vastaamalla alla olevaan kyselylomakkeeseen. Kyselyn täyttämiseen menee noin 10 minuuttia. Kaikki vastaukset käsitellään luottamuksellisesti, eikä suoria lainauksia yksittäisiin vastauksiin tehdä julkaistussa tutkimuksessa. Tutkimukseni etenemisen kannalta olisi tärkeää, jos voisitte palauttaa täytetyn lomakkeen syyskuun 30.een päivään mennessä. Ohessa myös postimerkillä varustettu vastauskuori.

Kiitos ajastanne ja vastauksestanne jo etukäteen.

1. Mikä on organisaationne tämän hetkinen tilanne puunhankinnassa?
 - a. ostamme puuta
 - b. mietimme ostamista tulevaisuudessa
 - c. emme osta emmekä suunnittele puun ostoa lähitulevaisuudessaVASTAUS: _____

Jos vastasitte a tai b, olkaa hyvä ja täyttäkää loput kyselylomakkeesta. Jos vastasitte c, siirtykää suoraan kysymykseen 9.

2. Mihin alla olevista käyttökohteista tällä hetkellä tai tulevaisuudessa tarvitsemanne puu käytetään
 - a. energiantuotantoon
 - b. lämmöntuotantoon
 - c. nestemäisen biopoltoaineen tuotantoon
 - d. kiinteän biopoltoaineen tuotantoon
 - e. puukomposiitin tuotantoon
 - f. muuhun (erittele: _____)VASTAUS: _____
3. Olisiko organisaationne kiinnostunut ostamaan vähäarvoista puuta (esim. selluksi tai sahatavaraksi kelpaamatonta puuta).
VASTAUS: KYLLÄ / EI
4. Missä muodossa ostamanne puutavaran tulisi olla?
 - a. pyöreänä puutavarana (esim. katkottuina ja karsittuina puina)
 - b. tuore hakkeena (kosteus > 20%)
 - c. kuiva hakkeena (kosteus < 20%)
 - d. sahausjätteenä (esim. sahapuruna, hakkuujätteenä, yms.)
 - e. muuna (erittele: _____)VASTAUS: _____

5. Mitkä puulajit kelpaavat toimintaanne?
 - a. vain kuusi
 - b. vain mänty
 - c. vain koivu
 - d. vain haapa
 - e. vain leppä
 - f. sekahavupuut
 - g. sekalehtipuut
 - h. sekahavupuut ja sekalehtipuut
 - i. muut (erittele: _____)VASTAUS: _____

6. Kuinka paljon organisaatiosi ostaa tai suunnittelee ostavansa puuta vuosittain?
VASTAUS: (määrä) _____ (yksikkö) _____
[Esimerkki vastaus: 1000 kuutiota]

APPENDIX A (2 OF 2)

7. Pystyttekö puunkäytössänne lainkaan hyödyntämään puutavaraa, joissa on seuraavia vikoja? (Ympyröi oikea vaihtoehto.)

- | | | | |
|----|------------------------------------------|---------|------------|
| a. | >50% laho | VASTAUS | KYLLÄ / EI |
| b. | 5-50% laho | VASTAUS | KYLLÄ / EI |
| c. | isot oksapuut | VASTAUS | KYLLÄ / EI |
| d. | kuorta | VASTAUS | KYLLÄ / EI |
| e. | muut hyväksytyt viat (määrittele: _____) | | |

f. muut hyväksymättömät viat: (määrittele: _____)

8. Minkälainen puunostosopimus organisaatiollanne on tällä hetkellä tai harkitsee tekevänsä?
a. pitkäaikainen (3-5 v.) sopimus enintään kolmen puutavarantuottajan kanssa
b. lyhytaikainen (1 v.) sopimus enintään kolmen puutavarantuottajan kanssa
c. tarpeen mukaan tilannekohtaisesti (ei lyhyt- eikä pitkäaikaisia sopimuksia)

VASTAUS: _____

9. Ostaessanne puuta onko seuraavilla asioilla merkitystä puunhankinnassanne?

- a. Puun pitää olla paikallista (alle 60km säteellä jatkokäsittelystä)

VASTAUS: KYLLÄ / EI

- b. Puutavaran on oltava sertifioitu (esim. FSC, PEFC-merkit)

VASTAUS: KYLLÄ / EI

- c. Puun pitää olla kotimaista

VASTAUS: KYLLÄ / EI

10. Miten uskotte organisaationne nykyisen tai suunnitellun puun kulutuksen muuttuvan seuraavien viiden vuoden aikana?

- a. Huomattavaa kasvua kulutuksessa
b. Huomattavaa vähenemistä kulutuksessa
c. Ei suuria muutoksia

VASTAUS: _____

11. Missä asemassa/työtehtävässä toimitte organisaatiossanne?

Asema/työtehtävä: _____

Oletteko suoraan vastuussa puunhankinnasta organisaatiossanne? (Ympärii sopiva vastaus.)

VASTAUS: KYLLÄ / EI

Kiitos yhteistyöstänne.

Francis Prior

MBA International Business Management

Saimaa University

APPENDIX B

Pre-Interview Statement

Preliminary:

Respondents are reminded that the interview will be treated in the strictest confidence. No direct reference will be made to the interview or the responses in the published material and the exact content of the interview will not be divulged to any third party.

Background:

As mentioned in my email, I'm conducting market research into low-grade wood markets for my MBA thesis at Saimaa University. For the purposes of my research, low-grade wood is defined as those wood grades which are not suitable for pulping or for sawn timber.

Interview Objectives:

The objective of this interview is to get a deeper understanding and better picture of low-grade wood markets from your own knowledge and experience. As my research is qualitative I would appreciate it if you could avoid straight yes or no answers and give me as much information as possible. However, please feel free to say that you do not wish to answer a question.

Interview Format:

I have a set list of questions that I will ask you and I will make written notes as you respond. I may ask you to repeat something. Your response may also generate additional questions. I will try to keep the interview to no longer than 30 minutes.

APPENDIX C

Interview Questions

No.	Question
1	Do markets exist for low grade-wood in Finland?
2	What are these markets? What is the low-grade wood used for?
3	In what form is the wood bought for these markets? E.g. as woodchip? Moisture Content? Roundwood?
4	Do you have an idea of the volumes involved in this/these markets?
5	What about prices? What is the price range offered at the factory gate for these products? Units?
6	Can you describe the supply chains involved? What is the most common wood source? Is the wood source domestic? From private or corporate forests? What harvesting methods are involved? How is the product marketed?
7	Are you aware of any key players in this field? Main timber growers? Main suppliers? Main buyers? Agents? Other players?
8	What effect does carbon trading have on the levels of supply and prices within the low grade wood markets?
9	Does forest certification have an important role to play? Is the effect limited? Is it cross-border?
10	Is this market still emerging, or maturing? Do you think that there will be growth or decline?
11	(If not already mentioned) How is this market affected by the government's renewable fuel targets?
12	What are the limiting factors in this market area?
13	Can continuity of supply be maintained?
14	What species and quality requirements have to be met?
15	Are you aware of any innovations which may impact upon this market area?
16	What is the outlook for this market?

APPENDIX D

Integrated Industrial Wood Harvesting and Energy-wood

Integrated industrial wood harvesting is a common method through which wood processors receive their raw material. It combines a number of processes which are managed in an integrated manner by forest companies who produce forest products, manage their own and third party forests, and have a wood procurement and wood harvesting capability. A number of integrated roundwood harvesting models are used. The following is one example:

In the case of clear-cutting wood from private forests, the forest company and private grower agree on a contract of sale usually based on the forest company removing the wood from the private grower's forest, also known as 'stumpage sale'. In this process the forest company primarily engage harvesting contractors to fell and move the timber to roadside. In the felling and conversion process, the contractor separates the wood into different wood grades (i.e. sawlogs, pulp wood, energy-wood) and these are presented in different piles at roadside. The forest company then engages contractor hauliers to transport the materials to the forest company's own production units (i.e. sawmills, pulp and paper factories, or biofuel power plants). If the forest company's own production units do not have any requirement, then the wood grades are marketed to third-party companies. This is quite common with the energy-wood grade if the forest company does not have any biofuel power plant located close to the harvesting site. Following the clear-cut the forest company may also remove a proportion of the remaining branchwood and stumps from the harvesting site, also as energy-wood.

APPENDIX E

Interviewee A's divergent responses

Interview Question	Summary of Divergent Response
What are these markets? What is the low grade wood used for?	Not many competing markets. Limited markets in board manufacture and panel industries.
In what form is the wood bought for these markets? Chips? Moisture Content? Roundwood?	Forms vary significantly. Some recycled wood is used. Roundwood is also used. There are many different forms and systems for processing wood into heat and energy.
What about prices? What price range is offered at the factory gate for these products? Units?	Still quite an unknown area. What the factories are actually paying is 'large' and differs from the available statistics. The difficulty in reporting prices is in the variability of the product and its grades.
What effect does carbon trading have on the levels of supply and prices within the low grade wood markets?	Political. As carbon tonnes value increases so the price for fuelwood increases. Complicated issue. Possible negative impact as using biomass increases carbon emissions. Depends on the calculation adopted by governments to measure emissions. Could also have a positive impact on the market.
Does forest certification have an important role to play? Is the effect limited? Is it cross-border?	Would expect some level of certification. Regarding imports from Russia certification is more problematic and will take time to resolve. Currently there are checks to ensure that imports are from legal authorised sources. Certification would limit imports.
What are the limiting factors in this market area?	Unclear security issues: what lies in the future? What incentives, EU regulation, general economic activity? Product definition, pricing, supply chains. Current market mechanisms do not make entry easy. Scale can be a problem as there are many small scale users. The market needs development.
Are you aware of any innovations which may impact upon this market area?	Apart from liquid biofuels, not really. Expect innovations in heating systems, small and large scale.
What is the outlook for this market?	In 10 years hence this will be a much more significant market.

APPENDIX F

Interviewee B's divergent responses

Interview Question	Summary of Divergent Response
Do markets exist for low grade wood in Finland?	In the space of just a few weeks Finland has just lost 300-500,000 cubic metres of by-product capacity with the closure of Puhos Board and VAPO pellet mills. This market may collapse.
What are these markets? What is the low grade wood used for?	Composite boards market.
What about prices? What is the price range offered at the factory gate for these products? Units?	During the winter heating season prices can climb. Prices paid are dependent on the cost of logistics: anything over 100km generally uneconomical.
What effect does carbon trading have on the levels of supply and prices within the low grade wood markets?	Affects end user more. Hasn't really affected working on day-to day basis.
Does forest certification have an important role to play? Is the effect limited? Is it cross-border?	Becoming increasingly important, e.g in composites market where e.g. UK buyers demand FSC. Considered that domestically sourced wood is certified. Some CHP companies have declared that their feedstock is certified because of 100% domestic wood although they are known to be using imported uncertified wood.
Is this market still emerging, or maturing? Do you think that there will be growth or decline?	By-products in the composites market is probably collapsing.
(If not already mentioned) How is this market affected by the government's renewable fuel targets?	Market has been engineered politically to meet the 20-20-20 markets which led to the closure of one of the composite boards manufacturers. Government financial support to the energy-wood market has artificially elevated the prices of by-products. Market is politically motivated.
What are the limiting factors in this market area?	Potential lack of demand for existing energy-wood raw materials. Strikes (such as experienced a few years ago) drastically reduce the availability of by-products into the market
Are you aware of any innovations which may impact upon this market area?	Biodiesel plants proposed for Finland. Personal opinion is that a better market should be found for mechanical wood processing by-products which are cleaner, graded and sorted, and more easily handled. These should not be used as woodfuel feedstock.
What is the outlook for this market?	Needs innovation.

APPENDIX G

Interviewee C's divergent responses

Interview Question	Summary of Divergent Response
In what form is the wood bought for these markets? Chips? Moisture Content? Roundwood?	Moisture contents: 50-55% logging residues, 35-40% stumps and small diameter roundwood
Do you have an idea of the volumes involved in this/these markets?	6.5 million cubic metres has been reported for energy-wood.
What effect does carbon trading have on the levels of supply and prices within the low grade wood markets?	Not really known yet. Might have an effect in the future. The availability of peat has a greater effect – e.g. next winter there will be a lack of peat increasing woodfuel prices. Peat availability is decreasing.
Does forest certification have an important role to play? Is the effect limited? Is it cross-border?	Most CHP units assume that the wood is certified if it comes from Finland. No one is asking for FSC <i>per se</i> , and it is doubtful whether anyone is asking for proof of certification from Russian wood. No demand for certification at the moment.
What are the limiting factors in this market area?	Price! Cost in comparison to mechanical wood processing residues (saw-dust and bark) and peat. Kemera availability. Forest chips from logging residues and stump removal would most likely continue without Kemera. Likely that in this scenario Russia will pick up the slack, perhaps with pellets from the new Viipuri pellet factory.
What species and quality requirements have to be met?	For smaller CHP plants they seem to prefer chips from small diam roundwood as these tend to give more regular chip sizes. In bigger plants the high moisture content and mineral soil content in stump wood can be a problem.
Are you aware of any innovations which may impact upon this market area?	Biodiesel production is still too far away to be of short term impact
What is the outlook for this market?	20-20-20 targets of course helping. Current hot topic is how the Helsinki area will adopt to woodfuel CHP production. Currently heated with coal and current boilers can only use a limited amount of wood. Talk of totally new plant. Currently wood gas is being used to be burnt in the coal boiler.