

Dissertationes Forestales 114

Dimensionality of quality from a customer perspective in
the wood industry

Ritva Toivonen

Department of Forest Sciences
Faculty of Agriculture and Forestry
University of Helsinki

Academic dissertation

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Author:

Ritva Toivonen

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Thesis supervisor:

Professor Anne Toppinen, University of Helsinki, Finland

Pre-examiners:

Docent, Director Juha S. Niemelä, Centre for Economic Development, Transport and the Environment, Finland

Professor Anders Roos, Swedish University of Agricultural Sciences, Sweden

Opponent:

Senior Researcher, Dr. Anders Q Nyrud, Norwegian Institute of Wood Technology, Norway

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ABSTRACT

This research analyzes product quality from a customer perspective in the case of the wood products industry. Of specific interest is to understand better how environmental quality is perceived from a customer perspective. The empirical material used comprises four datasets from Finland, Germany and the UK, collected during 1992 – 2004. The methods consist of a set of quantitative statistical analyses.

The results indicate that perceived quality from a customer perspective can be presented using a multidimensional and hierarchical construct, with tangible and intangible dimensions, that is common to different markets and products. This applies in the case of wood products but also more generally at least for some other construction materials. For wood products, tangible product quality has two main sub-dimensions: technical quality and appearance. For product intangibles, a few main quality dimensions seem detectable: Quality of intangibles related to the physical product, such as environmental issues and product-related information, supplier-related characteristics, service and sales personnel behavior. In the case of wood products, environmental quality and information are often perceived as being inter-related.

Technical performance and appearance are the most important considerations for customers in the case of wood products. However, organizational customers in particular also clearly consider certain intangible quality dimensions to be important, such as service and supplier reliability. The high technical quality of the tangible product may be considered as a “license to operate”, but product appearance and intangible quality provide potential for differentiation for attracting certain market segments. Environmental quality may not have been used to its full extent to attract customers, and one possibility is to increase the availability of the environment-related information, or to develop environment-related product characteristics to also provide some specific individual benefits. The results indeed indicate that wood products markets are segmented with regard to quality demands.

Keywords: total product, perceived quality, environmental quality, product appearance, information technology, perceived value

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Eura, February 2011

Ritva Toivonen

To my family and friends

LIST OF ORIGINAL ARTICLES

The thesis is based on the following articles, which are listed below, and referred to by Roman numerals. Articles **I-IV** are reproduced with the kind permission from the publishers. Article **V** is the author version of the manuscript.

I Toivonen, R. 1999. Planning The Use of Information Technology in Marketing: The Case of Finnish Forest Industries. *Forest Products Journal* Vol.49(10):25-30.

II Toivonen, R. & Hansen, E. 2003. Quality dimensions of wood products - perceptions of German organizational customers. In Helles et al. 2003. *Recent Accomplishments in Applied Forest Economics Research*. Kluwer Academic Publishers, Forestry Sciences. Vol. 74. p. 219-226.

III Toivonen, R., Hansen, E., Järvinen, E. & Enroth, R.-R. 2006. The Competitive Position of the Nordic Wood Industry in Germany - Intangible Quality Dimensions. *Silva Fennica* 39(2):277-287.

IV Toivonen, R. 2007. Perceived Environmental Quality of Wood Products: The UK markets. *Journal of Forest Industry Business Research* Vol(4)2:27 p. On-line journal. www.forestprod.org/jbfr-online.html

V Toivonen R. 2010. Product Quality and Value from the Consumer Perspective – An Application to Wooden Products. Manuscript.

Contributors to the original sub-studies of the dissertation are presented below.

Article	I	II	III	IV	V
Study idea	RT	RT, EH	RT, EH	RT	RT
Study design	RT	RT, EH, RRE, EJ	RT, EH, RRE	RT	RT, RRE
Data collection	RT	EJ	EJ	EJ	PH
Data analysis	RT	RT	RT	RT	RT
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EH = Eric Hansen

EJ = Erno Järvinen

PH = Paula Hirvonen

RRE = Raija-Riitta Enroth

RT = Ritva Toivonen

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1. INTRODUCTION

Global and European markets for wood products and the Finnish wood products industry

The trend in the global production and consumption of forest industry products has been on the increase for about a hundred years. This regards particularly paper and board and wood-based panels, despite the fact that the trend has been broken for some paper varieties at least in North America. However, the production of sawn wood has increased more modestly. At a global level, production has experienced clear downward and upward cycles. Currently, global production of sawn wood is on a much lower level than at the end of 1980s. In 2007, the global production volume was about 318 million m³, which is about a third less than in 1990 (Finnish statistical yearbook of forestry 2009).

This development is partly due to severe economic downturns in the early 1990s and late 2000s, but also to increasing competition between wood and substitute materials. The structure of competition and production of the forest industry is rapidly changing because of slow consumption growth in Europe and North America, but rapid growth in Asia, particularly China and India and also Latin America. Pulp production growth is concentrating in Latin America whereas paper production growth is concentrating in China. Plantations are increasingly important in supplying wood fibre for pulp and paper production. This may have an impact on the global structure of the wood products industry, too. It is possible that an integrated forest industry company is no longer necessary from the point of view of efficient round-wood procurement.

The wood industry (hereafter referred to as wood industry or wood products industry) has experienced significant changes in Finland and in Europe during the 1990s and 2000s. These developments have been partly in contrast to global trends: Production in Europe increased by 68 million m³ (to 155 million m³, of which softwood was 135.5 m³) from 1990 to 2007, an increase of over 75%, while the global production volume declined (FAO statistics, Finnish Statistical Yearbook of Forestry 2009). During the same period, the consumption of sawn wood in Europe also increased, but at a more moderate pace. Thus exports of sawn wood increased considerably, and Europe became a net export area of sawn wood.

However, competition tightened markedly during the latter part of the 2000s, when the US dollar weakened considerably against the euro, and the demand for sawn wood decreased due to the global economic recession. Increased demand for round wood had resulted in upward pressure on prices, and prices for energy also developed upwards. As a result, the wood industry's production volume decreased in Europe. In Finland, sawn wood production decreased by over 40 % between the years 2003 and 2009.

The European wood products industry faced increased competition due to a faster growth in supply than consumption during the 1990s and 2000s. This originated partly from strong investments in increasing the production capacity in several European countries. Partly the development originates from slow growth or even stagnation in consumption. The supply of various engineered wood products (EWPs) can be expected to grow (Rämö et al. 2003). This may result in intensified competition even among different wooden products, even though the competitive impact on the Finnish wood products industry in the

early 2000s was estimated to be low. Non-wood substitutes remain a considerable competitive force in the marketplace.

A special motivation for this study is to encourage the development of marketing among wood products producers in the Nordic countries, particularly in Finland. The wood products industry in Finland and Sweden is strongly export oriented, with about three fifths of the total production volumes being exported. In 2007, about 58 % of total sawn wood production was exported from Finland (Finnish Statistical Yearbook of Forestry 2009). Even though the structure of the export markets changed during the 1990s and 2000s, the main market area is still the European Union. The UK and Germany have traditionally been among the most important target markets (for more on this, see for example Viitanen and Hänninen 2010).

As pointed out above, the production of sawn wood in Finland decreased markedly during the latter part of the 2000s due to unfavourable market conditions. In 1990, the total production volume of sawn wood in Finland was 7.6 million m³, and a historical peak was reached in 2003, with the 13.7 million m³ volume. In 2008, the total production was 9.8 million m³, but in 2009 the production volume had fallen to about 8 million m³, which is comparable to annual volumes during the 1970s and 1980s. The financial result of the Finnish wood products industry was negative in 2008.

However, there has been a clear upward trend in the domestic consumption of wooden products in Finland since the 1950s. In 2007, domestic consumption was more than double the volume of about 2.5 million m³ during the 1970s. Naturally, domestic annual consumption also fluctuates in response to economic fluctuations; the peak was in 2004 with an annual consumption of 5.6 million m³ (1.06 m³ per capita per year): in 2008 the respective figures were 4.7 million m³ (0.88 m³ per capita per year) (Finnish Statistical Yearbook of Forestry 2009). The main reasons for volatility originate in larger export markets, and ultimately in fluctuations in the global economy.

Japan became one of the most important market areas for Finland, and for the North European sawmilling industry in general, during the 1990s after the collapse of Soviet Union. However, otherwise, exports to Asian markets have remained modest, even including China with its rapidly growing construction market. On the other hand, Northern Africa has become an increasingly important export area with volumes similar to those of Asia. This means that Europe has remained the most important market area for the Finnish sawmill industry.

In Europe, the UK has remained the largest export market area for Finnish sawn wood, with exports for example to Germany decreasing. The changes reflect general economic fluctuations, including fluctuations in foreign currencies against the euro, and changes in construction activity. A good example is the levelling off of the strong construction activity in Germany after the reconstruction that followed the unification of East and West Germany. However, another significant factor is the growth of domestic sawn wood production in Germany, including wood-based panels and engineered wood products. This phenomenon also applies to Austria and the Baltic countries (for more on this, see, for example Viitanen and Hänninen 2010).

Globally, the wood products industry is generally more fragmented and consists of a relatively large number of small and medium sized companies compared to, for example, the paper industry. This applies to the Nordic countries as well as the whole of Europe. For example, in Finland there were about 60 large companies (average turnover about 57 million euro), and about 2,600 small or medium sized wood industry companies operating in 2006, and the average turnover of these companies was less than one million euro. Of the

larger companies, three large multinational forest industry companies differ considerably from the others regarding production volumes and turnover (Hänninen et al. 2007).

The Finnish wood products industry markets its products via several channels. A large share is exported, however the export share differs markedly depending on the product category. On the domestic market, the largest companies market their products via their own wholesale and retail chains, while most companies sell their products to intermediary organizational customers (such as Do-It-Yourself construction material retailer stores (DIY-chains or home centres), or construction hardware retail chains, or to the processing industry, which either markets their products themselves or via various retail chains). An ordinary consumer buys their wood products, including sawn wood, mainly from retailers of various kinds. Only some of the smallest or most specialized sawmills continue to serve ordinary consumers directly.

In the UK and Germany, intermediaries of the wood product market consist mainly of DIY-chains, construction material retailers, and specific wholesale and retail businesses specializing in wood products (e.g. Järvinen et al. 2001, Toivonen et al. 2008). Quite commonly the latter are smaller and private businesses while DIY-firms (home centers) tend to belong to larger chains, which may be multinational. Large importers may also market their products directly to larger organizational end-users such as large construction or building product manufacturing companies via the importers' own sales offices, as well as via the above mentioned kinds of wholesale and retail businesses.

In Germany, the structure of the wood products market is, roughly, of a similar type. Wood products imported from the Nordic countries may be marketed via large and increasingly multinational DIY-chains, or construction material retailers, or sold directly to larger construction businesses or manufacturers by the companies own sales offices. There are a large number of co-operative wood product wholesale and retail businesses, which serve both consumers and organizational customers such as smaller wood product or furniture manufacturers, and building companies. In general, the majority, or at least a large share, of the sales of DIY-companies is directed to consumers, while other types of organizations mainly serve merchants, other manufacturing/processing firms or industrial construction companies.

This research focuses particularly on the wood products industry and analyses quality from the point of view of customers: organizational customers (companies or business units of larger companies) trading wood products and potentially other construction materials (intermediary customers or marketing channel members) and individual consumers. The main differences from the marketer's point of view in these markets is that the number of organizational customers is clearly smaller, and thus the market is more concentrated. The buyers are much larger, professional and less heterogeneous than individual consumers. The relationships between buyer and seller may be long-term, and based on various contracts. The demand by intermediary organizational customers is derived from the original markets, in the case of wood products largely from the housing and construction markets, and related activity such as demand for joinery products, furniture and packaging and transport services. It is also typical that markets fluctuate considerably.

The consumer market for wood products (end consumption) is globally determined by population and income growth, which maintain a modest growth trend in demand. However, issues related to cultural traditions, taste and trends, competing substitute products and materials, advertising, price, incomes and other similar factors impact regionally on demand and consumption, in addition to economic fluctuations having an impact on construction and housing market activity. For example, annual per capita

apparent consumption of wood products varies strongly even within Europe: it is about 1.0 m³ in Finland while it is only about 0.2-0.3 m³ in Europe on average (FAO statistics 2005).

Quality from a customer perspective is critical

For the wood products industry in Finland and in other Nordic countries, it is crucial to find ways to remain competitive in volatile export markets, mainly in Europe, and in the domestic market. It is important to understand a company's performance and that of its competitors from the customer perspective. With this information suppliers may benchmark themselves against their competitors and be able to recognize areas requiring investments to improve competitiveness.

Accordingly, attempts to improve the quality of the tangible product have been a common response to intensified competition. One common argument is that for the Finnish wood products industry, a promising road to increase competitiveness is to continue internationalization. Geographical markets become increasingly diversified, and product development needs to be increasingly customer-oriented, which includes wood products becoming more value-added (e.g. Lähtinen 2010, Viitanen and Hänninen 2010). This, again, reflects the need for developing products and their quality.

Furthermore, as customers vary in their needs and wants, producers seek to identify specific segments among potential customers, whose preferences are close to or equal within the segment but distinct from others. Segmentation helps in developing products and services with the optimal level of quality that satisfies the needs of certain segments better than the "average" product. Thus being able to recognize different segments, and to be able to follow their assessment of product quality and benchmark quality between competitors is important for firms in becoming and remaining competitive in the marketplace. This calls for a relevant and generalizable construct and its efficient measurement for product quality, and continuous follow-up of customer perceptions since the relative importance of various dimensions to customers may change over time (Crosby et al. 2003).

However, it is hard to find a universally accepted definition for product quality (e.g. Sebastianelli and Tamimi 2002). There are several approaches to determining quality. The approaches can be divided into at least five categories (Kozak and Maness 2001, Sebastianelli and Tamimi 2002): transcendent, product-based, customer-based, manufacturing-based and value-based. These multiple approaches have been developed in different contexts and for different purposes.

In any event, it is the customers' perception of product quality that is crucial to company success, not the company's perception (e.g. Shetty 1987, Snöj et al. 2004). The well-known total quality management (TQM) philosophy also underlines the view that it is the customer's view of and satisfaction with product quality that is critical. However, this research does not attempt to analyze company management philosophy from all the various aspects that TQM comprises but focuses on quality perception from the customer standpoint.

Thus, quality should be measured from the customer perspective, when the aim is to enhance sales or gain higher product price (Garvin 1984,1987, Qualls and Rosa 1995, Stone-Romero and Stone 1997, Brucks et al. 2000, Matzler et al. 2004). It is clear that a common and easily applicable model for perceived quality and its measurement would be beneficial in helping producers to identify which quality issues are the most important for their customers or for certain customer segments.

Quality of product intangibles matter

Research has indicated that it is useful to measure quality in several dimensions, which may also include intangible issues (e.g. Garvin 1984, 1987, Stone-Romero and Stone 1997, Snoj et al. 2004). Product intangibles comprise such issues as service (for example related to the procurement, use or repair of the tangible product), logistics and sales personnel behaviour (e.g. Garvin 1984, 1987, Hansen and Bush 1996, 1999). Supplier reputation or image may be important, too (e.g. Thakor and Lavack 2003, Warlop et al. 2005, Tokarzyck and Hansen 2006).

The challenging market situation clearly suggests that the wood products industry in the Nordic countries faces a situation where all possible components of the product are worth analyzing in order to create more customer value, not just the product tangibles. In other words, attention also needs to be laid on services, brand and image, as well as on other potential features that make wood products interesting from a customer viewpoint. Thus the wood products industry needs to recognize, better than currently, the specific quality needs of its customers, and successfully incorporate this knowledge into product development.

Environmental quality and information are of interest

When consumers seek high quality products they look for information about quality, such as about technical quality but also about environmental and other ethical issues. For producers it is interesting to note that the more information consumers have about the product, the stronger the positive correlation between price and quality seems to be (Kirchler et al. 2010).

However, even today finding information about product quality may be still today time-consuming, economically disadvantageous and stressful (Valor 2008). Particularly the importance of information in assessing product quality regards attributes that are typically ethical, but also other such attributes that cannot be judged before or during consuming the product.

Generally, environmental concerns have been gaining strength in the global society since at least the early 1990s. This trend is also true for the forest industry (e.g. Kärnä 2003, Roos and Nyruud 2008, Thompson et al. 2009, Li and Toppinen 2010). Considerable attention was initially paid by society to the depletion of tropical rainforests, but this concern has since then spread to forests in general, and underlined sustainable forest management. Issues such as waste management and pollution have been addressed perhaps for even longer: at least since the 1970s.

Most recently social issues have been added to the list of critical issues that have attracted rising public awareness, which is also the case for the forest industry (e.g. Valor 2008, Vidal and Kozak 2008, Li and Toppinen 2010). Environmental product attributes may emphasize the product's significance in reflecting personal ethical values important to consumers, such as choosing an ecological (or healthy/simple) way of life.

It is not only the concerns of individual consumers or other customers but regulation by society that is driving the forest industry towards emphasizing the environmental impacts of their business. The increasing interest in environmental issues is reflected in the proliferation of various eco-labelling schemes intended to support environmentally aware consumers in their buying decisions. However, environmental issues are also increasingly observable in public organizations' decision-making policies; such as public procurement

policies, and general environmental and climate-related policies and related legally binding regulations.

Overall, environmental issues are increasingly relevant for wood products, but also for other building materials. Thus environmental issues can be assumed to clearly contribute to customers' perceptions on product quality. However, the existence of these attributes are not easy to assess from the tangible product, as has been pointed out, and would require augmenting the product with the relevant information (e.g. Kirchler et al. 2008, Valor 2008).

Information technology (IT) has had a revolutionary impact on all stages of business; production management, products, marketing and on consumption during the last two to three decades. Already during the 1980s, Porter and Millar (1985) for example emphasized the role of information and information technology in the total product. Today, information technology provides even much more potential to build up information and information-related services as part of the total product than what was probably even envisaged during the 1980s. Therefore information and information technology are of interest; these provide the potential to augment the total product and its quality in the wood products industry in multiple ways.

Overall, product quality in the case of wood products has been addressed in several studies during the 1990s and 2000s (e.g. Sinclair et al. 1993, Vickery et al. 1997, Handfield et al. 1997, Pakarinen 1998, Hansen and Bush 1996, 1999, Hultink et al. 1999, Weinfurther and Hansen 1999, Pakarinen and Asikainen 2001, Järvinen et al. 2001, 2002, Lautamäki 2000, Hansmann et al. 2004, Johansson 2004, Wagner and Hansen 2004, Brandt and Shook 2005, Nyrud et al. 2008, Roos and Hugosson 2008, Roos and Nyrud 2008, Thompson et al. 2009).

The quality dimensions and attributes identified have been found to relate to the supplier firm and its characteristics, the behaviour of the sales personnel, the ability to customise products, the availability of the service, and self-evidently to the physical good, including its technical performance and durability, appearance, packaging, and product and producer reputation and image, and environmental issues to some degree. An all-embracing analysis of suitable attributes measuring perceived quality is lacking at least for forest products.

Overall, abundant research on product quality exists, but a clear and commonly generalizable construct for perceived quality is still difficult to detect. The potential existence of a universally applicable measure for perceived product quality has however been indicated by for example Hansen and Bush (1999) in the case of wood products.

In particular, the contribution particularly of environmental issues, but also information, may deserve more thorough attention, with regard to the strong interest in society toward environmental and ethical issues. Empirical research does not yet provide a precise set of attributes to operationalize the environmental quality of wood products or an understanding of the relationship between these and other product attributes contributing to the total product quality from a customer perspective.

Perceived quality in the context of marketing planning

The marketing planning context for this research is presented in Figure 1. The performance of a supplier in providing product quality from a customer viewpoint is an important factor in determining competitiveness and overall business results. These are dictated by customer

assessment of the quality and value of the products in relation to those provided by the competitors of the company concerned (“The markets” side in Figure 1).

Delivering a product with a superior or specific quality provides a source of differentiation and customization. Therefore determining appropriate levels of total product quality is an essential decision that every company must make, and these assessments need to be repeated continuously. Quality is produced throughout marketing planning and actions, including product development and marketing communication, as well as in the production process. This process must be influenced by a good understanding of customer needs and competitor offerings. Here, efficient employment of IT and efficient marketing information systems are important, as well, as is delivering service and information to customers (“The producer firm” side in Figure 1).

Numerous approaches for determining the marketing/business strategy exist (e.g. Juslin 1994, Kotler and Keller 2005), and all these emphasize the importance of the product decision. The marketing planning model applied in the background of this paper is described in Juslin (1994) and Juslin and Hansen (2002). Marketing planning is conceptualized as a hierarchical process, where strategic decisions regarding products, customers, market-area and core competencies set guide-lines for marketing functions and structures. The formulation of marketing strategy, including decisions regarding customers, products, market area and core competencies, dictate the product offering developed by a company (see “The Producer Firm” side in Figure 1). In particular, the product strategy determines not only the tangible product but also product intangibles and their quality.

A resource-based approach to marketing/business strategies in the context of the forest industry is presented, for example by Lähäinen et al. (2009). This also works well as a background for this work, where we emphasize the customer perception of product quality and are interested about the capabilities of a company to provide improved tangible and intangible benefits via their total products to their existing and potential customers.

In particular, including core competencies in strategic decisions underlines such issues as improving product quality through developing intangible resource-based capabilities, such as services and including environmental issues and the use of information, and tailoring IT-based services to support the core products. This may actually provide a more sustainable source for competitiveness than improving technical product quality or raw materials, since intangible issues are more difficult to imitate by competitors. However, even recent research still indicates that the Finnish wood industry may not yet fully employ this potential (Lähäinen 2010).

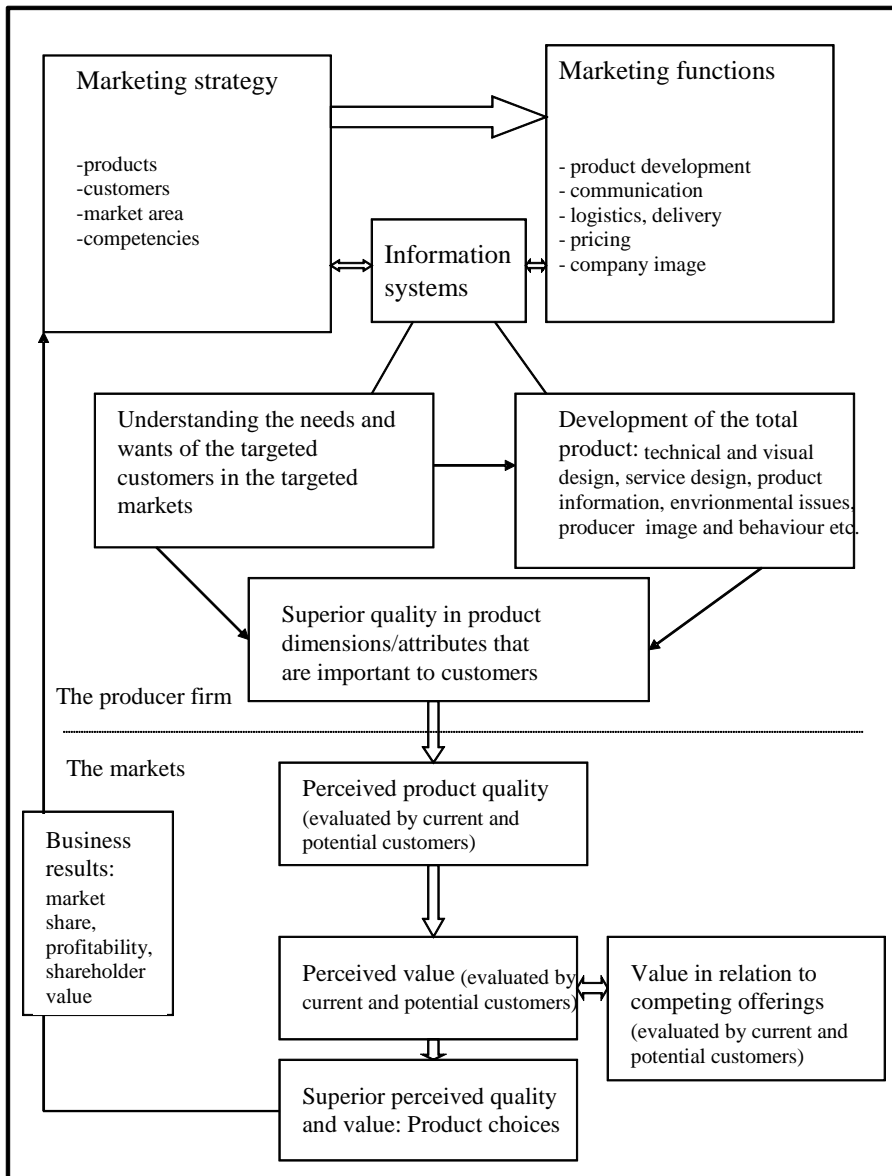


Figure 1. Linkages between marketing strategy and marketing planning with regard to perceived product quality.

2. THE PURPOSE AND STRUCTURE OF THE STUDY

Theoretical research objectives

This research investigates product quality from a customer perspective. The main theoretical interest is in revealing whether perceived product quality may be presented as a common, multi-dimensional construct over different products and markets. The following propositions guide the research, the grounds for which are provided in the “Theoretical framework” section:

The product, from a customer perspective, can be understood as a bundle of characteristics, which are tangible and intangible (a total product, Figure 3).

Perceived product quality is an attitude-like phenomenon, and it is thus a common construct generalizable over different products/markets.

Perceived quality is a multi-dimensional construct: The construct is structured into tangible and intangible dimensions on the most abstract level (Figure 5). These dimensions consist of more specific and concrete sub-dimensions, and finally specific/concrete attributes.

Perceived product value is also a multi-dimensional construct and is logically related to perceived product quality (Figure 4).

In particular, environmental and information-related characteristics contribute to the total product (Figure 3) and its quality (Figure 5) as perceived by customers in the case of wood products industry.

Empirical research objectives

The main objective of the empirical research is to explore and analyze the structure and consistency of the hypothesized general construct of perceived product quality and value in the case of wood products. The aim is to investigate whether a multi-dimensional construct for product quality can be detected, and whether this construct is common (consistent), and thus generalizable, over different products and markets.

The empirical research is visualized in Figure 2, and covers the value-chain from the manufacturing industry to intermediary marketing channel members (organizational customers trading in wood products), and individual consumers, and is based on survey data on several markets. In particular, wood material and products are studied using several data sets. The results of the sub-studies are compared qualitatively.

The practical interest is also in analyzing the importance of various quality dimensions, and whether different consumer segments exist based on quality demands. One specific intention is to determine if environmental issues and product-related information form specific quality dimensions from a customer viewpoint, and how important environmental quality is in relation to other quality dimensions. A practical objective is also to assess the

quality-based competitive position of wood product suppliers from Finland and from various other regions in the important German markets.

The specific research questions are set out as below:

1. Is the structure of the perceived quality dimensions consistent over
 - a) different construction materials? (Germany, organizational customers)
 - b) different wood product categories? (Finland, consumers)
 - c) wood products in the case of different customers/geographical markets? (statistical analyses and their qualitative comparison : The German and UK markets (organizational customers) and the Finnish market (consumers))
2. How is perceived product value linked with perceived product quality? (Finland, consumers, wooden furniture)
3. Do intangible quality dimensions in particular differ in their importance to customers, and do different customers emphasise intangible quality dimensions differently? (Germany and the UK, organizational customers). How do Finnish wood products producers perform in terms of intangible quality in comparison with their competitors? (Germany, organizational customers)
4. Which issues contribute to the environmental quality of wood products from the perspective of customers? (the UK, organizational customers) How important is environmental quality for customers? (Finland (consumers), Germany, the UK (organizational customers)) Can environmental quality be used to segment markets for wood products? (the UK and Germany (organizational customers))
5. Does the forest industry employ information and information technology in improving marketing and customer service? (Finland (forest industry companies/business units))

This research consists of six parts: five sub-studies reported separately (see Figure 2) and this Summary thesis. The sub-study reports and contributors to these studies are listed in the beginning of this Summary. Each sub-study analyzes empirically some of the specific research questions listed above. The findings of the sub-studies are briefly presented in Chapters 5.1. – 5.5. in chronological order. This Summary thesis presents the introduction and common theoretical framework that provides the basis for the empirical research for the combined research work (Chapter 1. to Chapter 4.), a synthesis of findings (Chapter 6.), and a discussion and conclusions (Chapter 7.).

In particular, the presence of a general construct for perceived product quality is evaluated, and the contribution of environmental issues and information to perceived product quality in the case of wood products is discussed throughout this Summary due to the argued importance of environmental issues, and the importance of information in communicating this quality to customers (e.g. Juslin and Hansen 2002, Kärnä 2003, Roos and Nyrud 2008, Li and Toppinen 2010).

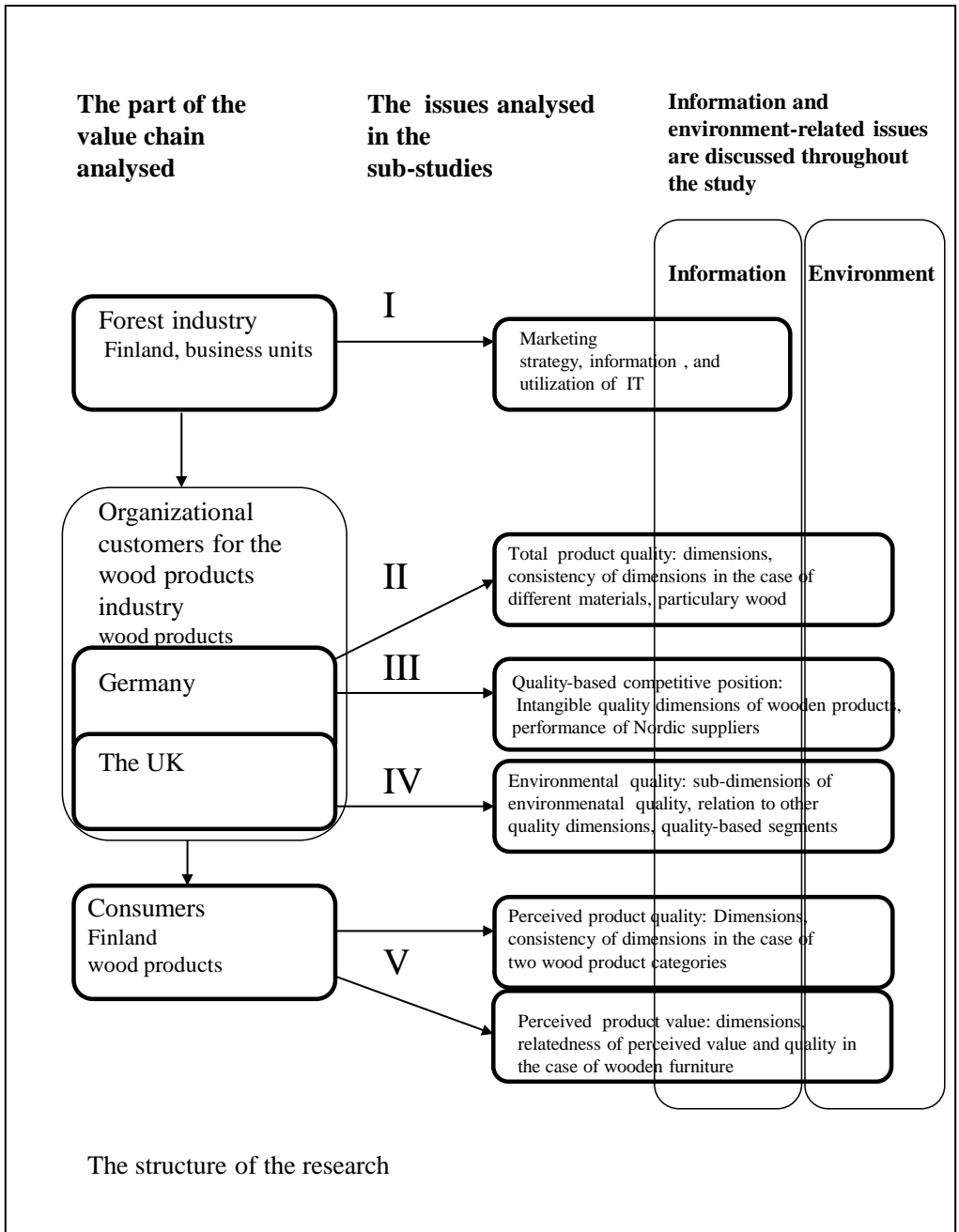


Figure 2. The structure of the research (I TO V refer to respective sub-studies).

3. THEORETICAL FRAMEWORK

The total product from a customer perspective

Product quality relates to how we understand the product itself. The measurement of total product quality requires, as a first step, a holistic definition of a product, that is, the total product. A product is anything that can be offered to a market to satisfy a customer's want or need (Kotler and Keller 2005). A product has been traditionally described as a bundle of attributes providing benefits to a customer and satisfying his/her needs and wants, and visualized as a molecular construct. The core (or generic) product is augmented by additional tangible and intangible attributes, thus developing through various stages towards a potential product, which includes even the latent needs and wants of customers (Levitt 1980, 1981, Kotler and Keller 2005).

As the definition implies, the two fundamental types of product attributes are tangible and intangible (e.g. Levitt 1980, 1981, Nyrud et al. 2008, Brandt and Shook 2005). Physical products as perceived by customers are almost always complemented with service of some kind and also with other intangible product attributes. On the other hand, services as "intangible products" also almost always incorporate some tangible physical components (e.g. Garvin 1984, 1987, Berry et al. 1985, Shetty 1987, Brucks et al. 2000, Grönroos 1998, 2001). Thus, the "total product" from a customer perspective can be determined as comprising two components or dimensions at the broadest level: tangible (the physical good) and intangible. Both components consist of more specific sub-dimensions, which are reflected in even more specific and concrete attributes (Levitt 1980, 1981, Snöj et al. 2004).

The tangible product component comprises the physical (core/basic) product, and typically such characteristics as packaging and other physical augmentations. In the case of many physical products, including wood products, aesthetics (appearance) may be very significant (e.g. Pakarinen 1998, Pakarinen and Asikainen 2001, Nyrud et al. 2008). Accordingly, the tangible product component in the case of wood products is understood to include at least two broad dimensions: Firstly, the technical characteristics of the product form the core product. Secondly, appearance, including design, is a major dimension of many physical products such as wooden flooring material or furniture (e.g. Pakarinen 1998, Jonsson 2004, Brandt and Shook 2005, Nyrud et al. 2008).

Regarding product intangibles, the attributes providing benefits to the buyer are related not only to the immaterial characteristics of the object, or good, itself, or related service, but also to the meaning the customer associates with the producer/supplier (Saren and Tzokas 1998). Therefore, supplier attributes, such as credibility and reliability, service capability and the behaviour of sales personnel, the reputation and image of the supplier, and environmental issues contribute to the intangible part of the total product from the customer perspective (e.g. Kalafatis et al. 1996, Saren and Tzokas 1998, Bou-Lljuster et al. 2001, Brandt and Shook 2005). These may be considered as the immaterial resources of a company, which are more difficult to imitate than tangible resources. Therefore intangible quality, which relies on the company's capabilities, is particularly relevant to companies operating on industrial and mature markets such as the wood product markets (e.g. Korhonen and Niemelä 2003, Tokarczyk and Hansen 2006, Lähtinen et al. 2009, Lähtinen 2010).

Overall, the total product from a customer perspective comprises tangible and intangible elements, on the most abstract level (e.g. Levitt 1981, Snoj et al. 2004, Brandt and Shook 2005). The total product from a customer viewpoint, as determined in this research, is presented in Figure 3. Tangible and intangible product components and their quality are interconnected from a customer perspective. Furthermore, this research presumes that information itself is an element of almost any product, for example instructions about use, care, repair and recycling, or about environmental and ethical issues. For example, using environmentally sound raw materials may augment the tangible physical product itself, but this procedure also reflects respect for the environment among a company's management, and should result in the relevant information being provided to the customer.

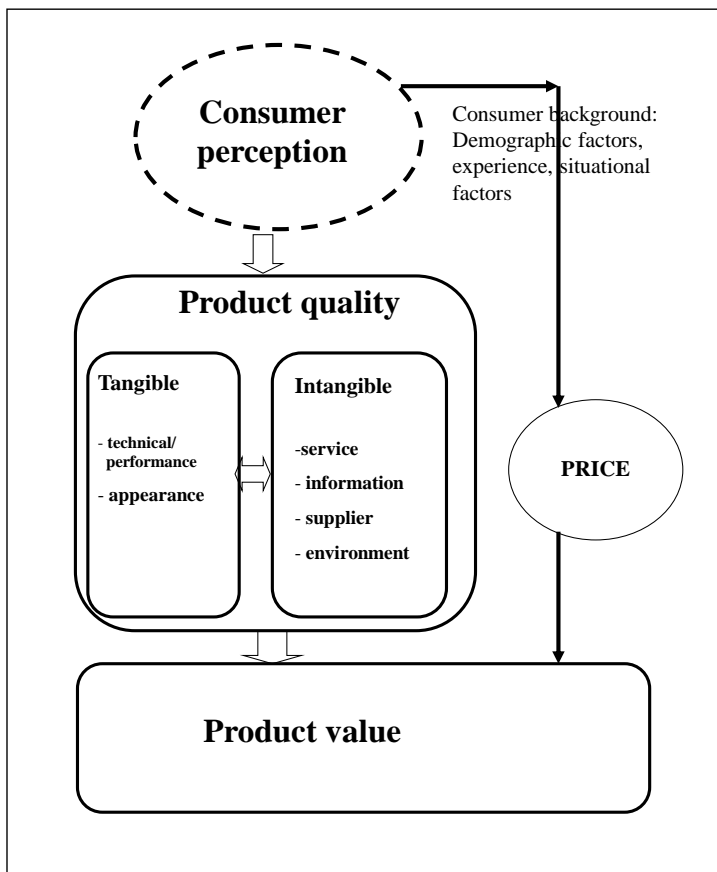


Figure 3. Customer perception of total product quality and value.

Perceived product quality

Understanding quality in terms of product dimensions may enhance the success of development of high-quality products in firms (e.g. Sebastianelli and Tamimi 2002). Therefore this approach is chosen in this research. Furthermore, a fruitful approach to quality is the customer's subjective perception, that is, a customer-based approach, which is also followed in this research. Customer judgement may be a subjective evaluation of the degree of the overall excellence of the total product (Zeithaml 1988). Despite this, the approach of determining the quality of the total product through the importance of individual product attributes, or dimensions, is common. This approach is practical and helps firms by providing them with information about which product attributes are the critical ones for their customers.

Behavioural theories of consumer choices commonly suggest that consumers demand a bundle of certain product characteristics rather than certain products. Therefore the perception of a product is based on the perceptions of the attributes that characterize the product, which can be detected and evaluated by the customer. Customers' perceptions are thus based on an affective element and information, as is the case regarding attitudes. Theoretically, attitudes are described as being composed of three components: affection toward and information about a certain product characteristic, which together build up the intention to buy (or not buy) the product (e.g. Oskamp 1991).

Thus perceived quality may also be understood as an attitude-like phenomenon, where behaviour, that is, a consumer's plan and decision to choose a certain product, is based on an evaluation of a set of product attributes (e.g. Ajzen and Fishbein 1980, Oskamp 2001, Nyrud et al. 2008). The attitude-like perception of product quality predicts consumer preferences and ultimately choices. Attitudes are fairly consistent mental constructs ("state of mind toward a certain object"). Therefore understanding perceived quality as an attitude-like phenomenon gives grounds to assume that perceived product quality can be described using a general and consistent construct (e.g. Zeithaml 1988).

In summary, this research approaches perceived product quality as an attitude-like phenomenon, and it is expected to be a fairly common construct, which is generalizable over different products and markets. This approach has been applied in a number of earlier pieces of research on the quality of wooden products and forestry services (e.g. Hansen and Bush 1996, 1999, Rämö and Toivonen 2007, Nyrud et al. 2008). Furthermore, this research understands perceived total product quality as reflecting dimensions of the total product, and as multidimensional (e.g. Garvin 1984, 1987, Madu et al. 1996, Bou-Llusar et al. 2001, Brucks et al. 2000, Curkovic et al. 2000).

From a customer perspective, product quality is determined as a multidimensional construct in a rich body of research (see examples in Table 1). A well-known dimensional construct describing product quality has been outlined by Garvin (1984, 1987). In his model, product quality comprises eight dimensions: (1) durability, (2) performance, (3) aesthetics, (4) features, (5) serviceability (repair service), (6) conformance, (7) reliability and (8) perceived quality. Not all the dimensions are necessarily important for all products or customers or in all contexts. Each dimension is related to customer perception, which means that assessing the level of quality always involves some subjectivity (e.g. Sebastianelli and Tamimi 2002).

While a well-known theoretical multidimensional construct for the quality of tangible products includes the Garvin's (1984, 1987) work, widely applied constructs for service

quality have been presented, for example, by Berry et al. (1985), and by Grönroos (e.g. 1998, 2001). The first originally consisted of over ten dimensions, but was later developed as a five-dimensional construct (Parasuraman et al. 1988, 1991, 1994). Interestingly, a six-dimensional model was developed for consumer durables by Brucks et al. (2000).

The model construct developed by Grönroos for service quality originally had two dimensions: technical (the outcome of service) and functional (how the outcome is produced). It was later developed into a three-dimensional model that also included image of the service provider. The perceived supplier image is partly created by the functional and technical quality of the service provided and therefore this dimension also may be understood as the most abstract dimension. All the above mentioned models have served as a basis for subsequent research.

Empirical research has supported the idea of the multidimensionality of perceived total product quality (e.g. Stone-Romero et al. 1997, Curkovic et al. 2000, Sebastianelli and Tamimi 2002), including the case of wood products (e.g. Sinclair et al. 1993, Hansen and Bush 1996, 1999, Kozak and Maness 2001, Pakarinen and Asikainen 2001). The existence of perfectly consistent dimensions of total product quality is not, however, crystal clear from empirical research, which may be due to varying measurement instruments. However, it seems that the dimensions can be broadly classified as reflecting the quality of either product tangibles or intangibles (Table 1).

In summary, in this research total product quality, as perceived by customers, is hypothesized as a hierarchical and multi-dimensional construct (Figure 5), which consists of tangible and intangible dimensions on the most abstract level, and more specific and concrete sub-dimensions. These, again, are reflected on the level of more concrete product attributes (e.g. Curkovic et al. 2000, Bou-Llusar et al. 2001, Lin 2003, Menon et al. 2005). The dimensions are assumed to reflect perceptions of the quality of the product's components. The customer assesses the value obtained from quality by estimating the benefits derived from quality versus price and other sacrifices (Figures 4 and 5).

Perceived quality in research on wood products

A number of quality dimensions and attributes of wood products have been identified by empirical research, such as supplier characteristics and sales personnel's behaviour, services, delivery, a supplier's willingness to tailor or customize products, product performance/characteristics such as durability and fire resistance, packaging, appearance including design, even the intrinsic value of the material, safety, warranty, and also environmental and social issues (e.g. Hansen and Bush 1996, 1999, Pakarinen 1998, Anderson et al. 2002, Jonsson 2004, Brandt and Shook 2005, Nyrud et al. 2008, Roos and Hugosson 2008, Roos and Nyrud 2008). These are present in research regarding other industrial markets as well (e.g. Hultink et al. 1999, Bou-Llusar et al. 2001, Sebastianelli and Tamimi 2002).

The quality dimensions or product attributes that are important for customers, as identified in empirical research related to wood products, have clear similarities but also diverge somewhat (e.g. Sinclair et al. 1993, Handfield et al. 1997, Vickery et al. 1997, Pakarinen 1998, Hansen and Bush 1996, 1999, Hultink et al. 1999, Weinfurther and Hansen 1999, Järvinen et al. 2001, 2002, Lautamäki 2000, Pakarinen and Asikainen 2001, Hansmann et al. 2004, Johanssen 2004, Wagner and Hansen 2004, Brandt and Shook 2005, Nyrud et al. 2008, Roos and Hugosson 2008, Roos and Nyrud 2008, Thompson et al. 2009). At least partly this is probably due to somewhat different measurement instruments.

On the broadest level the dimensions of the perceived total product quality can also be classified as either tangible or intangible in the case of wood products.

On a more detailed level, empirical research has been able to observe fewer dimensions than originally suggested for example by Garvin (1984, 1987), which might be due to the notion that not necessarily all perceived quality dimensions are important (or maybe even detectable) in the case of all products. Supplier characteristics and services are frequently observed dimensions (either as two separate dimensions or joined as one dimension); appearance/aesthetics is also often observed as an important dimension as such or in combination with other quality attributes reflecting the tangible product. For example, Hansen and Bush (1999) conclude that in the case of wooden products, the perceived quality of product tangibles seems to include only one or two dimensions.

Perceived environmental quality in the case of wood products

Regarding the forestry sector as a whole, environmental issues have been much emphasized in public discussion, and increasingly so in the context of the corporate social responsibility of firms (e.g. Valor 2008, Vidal and Kozak 2008, Li and Toppinen 2010,). Research has been widened to include environmental characteristics, or “green” issues, also in the context of wood products (e.g. Kärnä 2003, Roos and Nyrud 2008), including certification of the quality of forest management (forest certification) (e.g. Thompson et al. 2009, Chen et al. 2010).

Information’s role as part of the total product and its quality is underlined along with the increasing importance of social, environmental, health related, or other ethical attributes invisible in the tangible product (e.g. Roos and Nyrud 2008, Valor 2008, Thompson et al. 2009, Kirchler et al. 2010). These also constitute part of the total product and its quality from the customer perspective.

Overall, the literature indicates that environmental quality may be understood to incorporate ecological attributes and even health and social attributes. Many of these are intangible, even though at least some of the environmental quality characteristics may actually be created through raw material acquisition and production processes closely connected to the physical product. In this research, we assume that environmental quality is a sub-dimension of intangible product quality in combination with information, service, supplier characteristics and behaviour.

While environmental awareness has generally increased in society, certain consumer segments are believed to be particularly concerned about the environment (Samdahl and Robertson 1989, Uusitalo 1990, Bhate and Lawler 1997, Huhtanen and Autio 2010). This also applies to the consumer market and organizational customers (intermediary markets) for forest products (Ozanne and Smith 1998, Grönroos and Bowyer 1999, Bigsby and Ozanne 2002, Pakarinen and Asikainen 2001, Anderson and Hansen 2004, Thompson et al. 2008).

Not only consumers but also organizational customers trading in wood products can be assumed to differ with regard to their concern over quality demands, including environmental quality. Environmentally-oriented organizations may seek to fulfil the needs and preferences of their own targeted customers. Secondly, organizational customers may themselves pursue values that are reflected in an emphasis on environmental quality in their buying decisions (Bhate and Lawler 1997, Humphries et al. 2001). These companies may even choose to trade in environmentally high quality products and possibly pay a price premium, even if no respective premium is available on end-user markets (Humphries et al.

2001). Thirdly, companies may also choose to emphasize environmental quality due to pressure from environmental groups (Auger et al. 2003).

The benefits that environmental, ethical or aesthetic/visual product attributes provide are at least partly subjective. Their importance to buyers may be difficult or impossible to judge from those buyer background characteristics that are traditionally used in segmenting markets. This difficulty has been noted in a number of empirical studies, and is also true for wood products (e.g. Rao and Wang 1995, Valor 2008, Roos and Hugosson 2008, Roos and Nyrd 2008, Thompson et al. 2009). The same may apply to information and information related services, and potentially any product intangibles with a subjective value such as health issues, and even design.

Table 1. Examples of dimensions of perceived product quality in earlier research.

A general situation					
Garvin 1984, 1987	Stone-Romero et al. 2004	Parasuraman et al. 1985, 1988, 1991, 1994	Brucks et al. 2000	Grönroos 1998, 2001 (with reference to original work e.g. in 1984)	Madu et al. 1996
Tangible products	Tangible products	Services	Durables	Services	
Durability Performance Appearance Features Services Conformance Reliability Perceived quality (reflecting image and reputation)	Flawlessness (similar to conformance) Durability Appearance Distinctiveness (similar to status, prestige, image)	Reliability Responsiveness Assurance Empathy Tangibles	Versatility Durability Performance Ease of use Serviceability Prestige	Functional Technical Supplier image	Service Employee satisfaction Customer satisfaction (includes satisfaction with the physical product, company culture, etc.)
Wood products / Other					
Sinclair et al. 1993	Hansen and Bush 1996, 1999	Pakarinen 1998	Pakarinen and Asikainen 2001		Curkovic et al. 2000
Wooden office furniture	Softwood lumber	Furniture	Wooden furniture		Durables
Performance/features Reliability Conformance Durability Service/perceived quality Aesthetics Economic	Supplier/salesperson characteristics Lumber performance Lumber characteristics Services (Supplier facilities)	Trendy Reliable Environmentally friendly High-value Archaic	Environment Price Advertising Style Total quality In case of some products also: Domestic Design		Initial Reliability Durability Conformance Design Pre-sale service Product support Responsiveness to customers Condensed Product quality including design (physical) Service quality (intangible)

Perceived product quality alone may not explain consumers buying behaviour satisfactorily (see, for example, Sweeney and Soutar 2001). A value-based approach to product quality emphasises that in the purchasing situation customers judge not only quality but also relate quality to price and other costs (Figure 4). This includes an estimation as to the trade-off between having the desired consequences (a product of certain quality) and the sacrifices needed to acquire it (e.g. Zeithaml 1988, Parasuraman 1997, Woodruff 1997, Parasuraman and Grewald 2000, Huber et al. 2001, Snöj et al. 2004).

It is generally expected that consumers are rational and choose the product providing the highest value with regard to the utilities that the total product provides them, depending on limitations such as available financial resources and information (Gale 1994, Valor 2008, Kirchler et al. 2010). These relationships are shown in Figure 5. Therefore it is important first to understand which quality dimensions are the most important to consumers and then to assess whether these dimensions provide the highest value for them.

Market price is seen as an outcome, or cue, of perceived product quality rather than an element of product quality. A high price may inform about high quality, and a higher price may be accepted when high quality is valued. Accordingly, the connection between objective (measurable) quality and price has been noted to be normally positive, even though often at best modest (e.g. Kirchler et al. 2010).

A positive connection between price and quality has been observed to be stronger in the case of more expensive and rarely bought products than in the case of often-bought products such as food items: quality tests are usually limited to attributes and dimensions that can be objectively assessed and measured (Kirchler et al. 2010). Thus intangible quality may actually be quite clearly connected with market price, but this is difficult to detect in the tests currently applied. Thus price may be a more suitable cue for quality in the case of wood products than in the case of, for example, food items.

It needs to be noted that perceived product value is considered even more comprehensive, abstract and individualistic than perceived product quality (Tiilikainen 1998, Zeithaml 1988, Sánchez-Fernández and Iniesta-Bonillo 2007). Perceived product value is often conceptualized and measured simply as the customer judgment of product quality and price, and the relationship between them (Berry et al. 1985, Shetty 1987, Fornell et al. 1996, Chapman and Wahlers 1999, Huber et al. 2001, Sweeney and Soutar 2001, Woodall 2003). In practice consumers' evaluation of the value of a product is much more complicated, and as pointed out, market price may explain only a fraction of the buying decision. In principle, quality is evaluated first, and then compared with price. This indicates that perceived quality is an antecedent for perceived value, that is, quality perception precedes and explains value perception (Menon et al. 2005).

Customer perceptions of product quality, and of the value derived from quality, may be dynamic over time (Reeves and Bednar 1994, Huber et al. 2001, Woodall 2003). In addition, there is also a linkage from perceived value via satisfaction to perception of product quality (Figure 4); after purchase and use, perceived value is likely to change somewhat. This affects decision making in subsequent purchase situations (Woodall 2003). Value and satisfaction are here understood as distinct concepts. Satisfaction refers to a judgement of a product after it has been bought and used, whereas value is assessed both before and after a product has been bought and used.

It may be expected that perceived product value is also a multidimensional construct (Anderson and Narus 1998, Seth et al. 2000, Huber et al. 2001, Sweeney and Soutar 2001, Snöj et al. 2004). This is logical if perceived product quality is understood as a multidimensional construct, and if it is assumed that there is a linkage between perceived

quality and value. By contrast, satisfaction has been argued to be uni-dimensional since it varies on a continuum from unfavourable to favourable (Sweeney and Soutar 2001). However, in this research we do not aim to extend our analysis to value perception after purchase or to satisfaction.

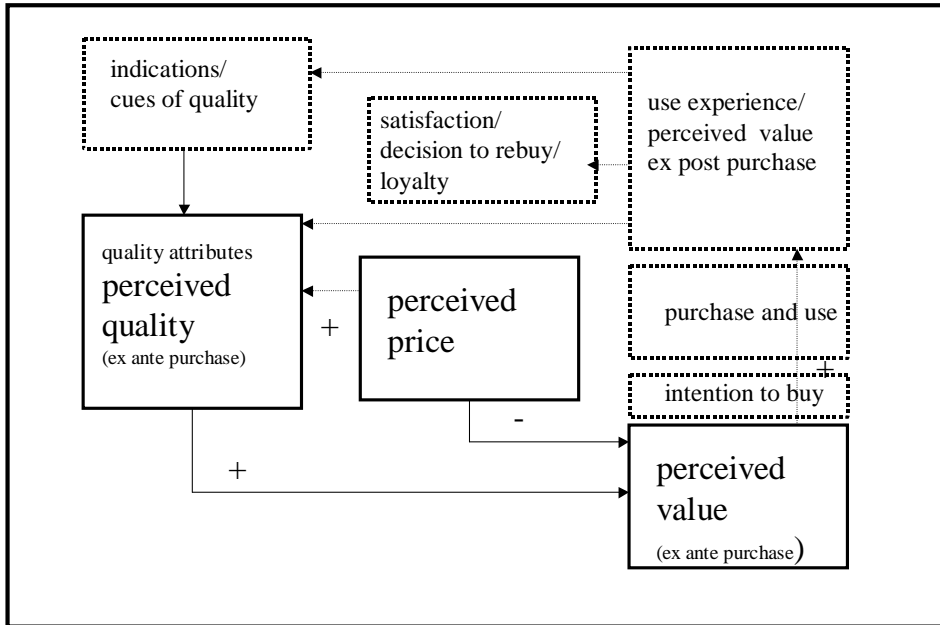


Figure 4. Linkages between perceived product quality, price and value. Only the ex ante purchase perceptions are focused on in this research, and the dotted line concepts are excluded.

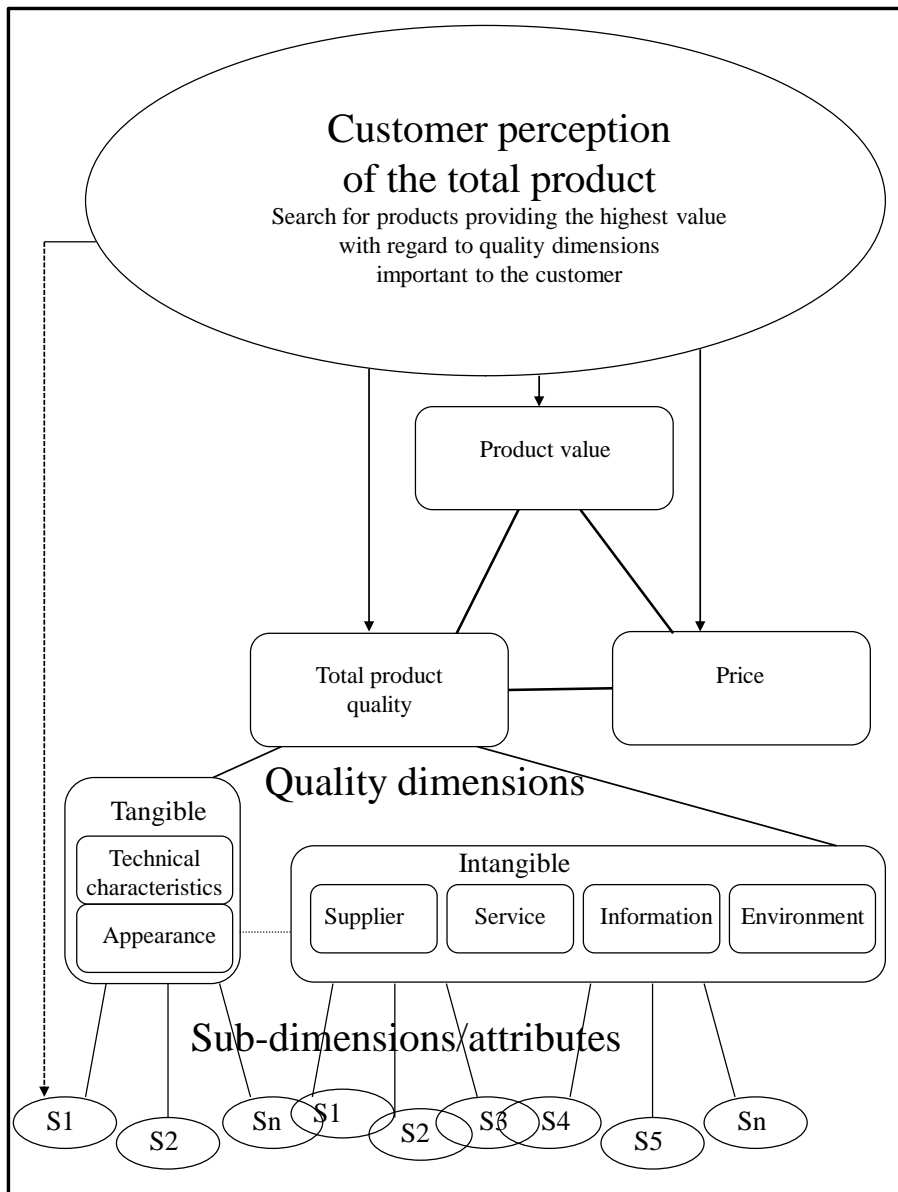


Figure 5. A hierarchical model of product quality and value as perceived by customers. S1...Sn indicate product attributes that reflect the more abstract quality dimensions.

4. MATERIALS AND METHODS

Literature about firm-level marketing strategies and the role of information and information systems in providing better customer service as part of the total product forms the basis for sub-study I. Special emphasis is on information and information technology, and how to use these in order to create added value for customers. This serves as a basis for a further analysis of literature focusing on product concept as consisting of tangible and intangible components, and the importance of focusing on product quality from a customer perspective (particularly in sub-studies II, III and IV).

The applied literature on perceived product quality is mainly based on original research from late 1980s and early 1990s, and together with its later enhancements, it forms the ground for sub-studies II-V, together with the understanding of perceived product quality as multidimensional and as an attitude-like construct. Research applying arguments on the dimensionality of perceived quality in empirical analysis, particularly on tangible products, and especially on wood products, forms the main basis for sub-studies II, III and V. This literature is enhanced by research on the quality of product intangibles (sub-studies III, IV,V) such as information and service. The analysis is deepened with special regard to environmental quality in sub-study IV but also in sub-study V, and by an analysis of how quality-based perceived value is constructed, and of linkages between perceived product quality and value in sub-study V. Literature about the potential of perceived quality to segment markets is analysed particularly in sub-studies IV and V.

The empirical research is based on four completely distinct data sets. These cover the value chain from industrial production through intermediary marketing channel members to organizational customers and final consumers: There are three firm-level data sets (one producer level data set: sub-study I), two data sets on organizational customers (intermediary marketing channel members) (sub-studies II-IV), and one consumer-level data set (sub-study V). The data was collected either via personal interviews or via mail, with the use of a structured questionnaire specifically tailored for the respective study in each sub-study. In sub-studies II and III, the same data set (observations) is applied, but different variables are used as dictated by the objectives of the two sub-studies.

The development of each questionnaire was based on an analysis of the relevant literature and on discussions with industry specialists, and each questionnaire was pre-tested via personal interviews before the actual data collection (Table 2). Non-response bias was not specifically statistically analysed due to the following reasons: A total population was targeted and rather successfully reached (sub-study I), the sample was a purposive sample but represented rather well the target market with regard to turnover (sub-studies II, III), the study was a pilot-study (sub-study IV), the sample of consumers was purposive, but was fairly successfully reached (sub-study V). The four data sets, the respective populations and the data collection procedures are described in more detail in the respective sub-studies.

The firm-level data was gathered by on-site visits to Finnish forest industry business units (sub-study I), and by on-site visits and complimentary mail interviews to German and UK firms trading in wooden products. In the targeted firms, directors or managers responsible for purchasing were targeted for interviews (sub-studies I-IV). The respondents in Finland, Germany and the UK were independent companies or the kind of business units (BUs) of a larger company which may make their buying and marketing decisions quite

independently. These firm/business-unit respondents were classified into three groups: DIY chains (including home centres), construction material retailers, and wood product wholesalers. Consumer-level data was gathered by on-site visits to home centres and to a home fair in Finland where consumers were interviewed (exit study) (sub-study V).

Statistical methods of analysis were applied to all data sets throughout the research process. Univariate and multivariate analyses are employed in each sub-study (e.g. Hair et al. 1995, Rao and Wang 1995). Exploratory factor analysis was used to examine the dimensions of marketing strategy, marketing information systems strategy, and perceived quality and perceived value (Principal Axis factoring sub-studies I and II, Maximum likelihood method in sub-studies II-V). In all factor analyses, Varimax rotation was applied in order to receive as non-correlating dimensions as possible. Cluster analysis was applied for recognizing quality-based market segments in general and environmentally sensitive segments in particular (sub-study IV).

Scale consistency testing with coefficient alpha was used in studying the reliability and consistency of quality dimensions (resulting factors, sub-studies II-V), which was also used as an indication about the existence of a hypothetical factor structure. In addition, regression analysis was employed when analyzing the explanatory relationship between perceived product quality and perceived product value (sub-study V).

Correlation analysis was used to analyze the dimensionality of perceived quality (sub-study IV), linkages between various quality dimensions (sub-study IV, V), and linkages between perceived quality and perceived value (sub-study V). Cross-tabulations and analysis of variance were used for studying potential linkages between phenomena, and in describing the profiles of quality market segments, or of other groups of interest. The importance of perceived quality dimensions was studied using mean values (sub-studies II-VI), as was the performance of (firms from) certain supplier countries with regard to quality dimensions (sub-study III). Importance was judged subjectively by each respondent using a scale from one to five. The competitive position of countries with regard to perceived quality was studied within an importance-performance grid (the idea originally from Martilla and James, 1977).

Table 2. Data and data collection methods in the sub-studies.

Sub Study No	Population and targeted sample Target country	Observations in the final data	Pre-testing the data collection instruments	Methods of data collection, year	Software for statistical analysis
I	Forest industry business units (BU) 89. A total population was targeted Finland	80 BU (90%)	A few personal interviews Non-response: telephone survey	Personal interviews using structured questionnaire 1992	SURVO
II	Wholesale/retail companies trading in wood and other construction materials, identified population > 2,600 companies. A comfort sample: a census of the 36 largest companies, and a comfort selection of smaller companies, totally (95/142 companies/business units were identified in the sample Germany	Comfort sample: 75 companies, covering 75% of the value in euros of German construction material markets (estimated at the time of data collection)	A few personal interviews in Finland and in Germany	Personal interviews/mail survey using structured questionnaire (some of the questionnaires were returned via mail after the interview or the process was a complete mail survey), two interviewers 2000-2001	SPSS
III	As in II	As in II but 76 companies	As in II	As in II	As in II
IV *	Wholesale/retail companies trading in both wood and other construction materials, 195 identified the UK	40 companies/business units (21%)	12 personal interviews, conducted in 2003 (excluded from the data)	Personal interviews using structured questionnaire 2004-2005	SPSS
V	Consumers 18-75 years of age. Comfort sample, exit sampling in home centres: 210 consumers contacted, 150 questionnaires received, 147 valid Finland	Comfort sample: 147 consumers (70%)	15 personal interviews (excluded from the data)	Personal interviews using structured questionnaire 2004	SPSS

*) A more detailed description of population definition and data collection regarding sub-study IV is in Toivonen et al. (2008).

5. RESULTS OF THE EMPIRICAL SUB-STUDIES

5.1. Marketing strategy and utilizing information in improving the service quality of the total product in the forest industry

I Toivonen, R. 1999. Planning The Use of Information Technology in Marketing: The Case of Finnish Forest Industries. *Forest Products Journal* Vol. 49(10):25-30.

A market driven organization has a strong commitment to the philosophy that the customer comes first. A market-driven company will be superior if it better understands and fulfils the needs of its customers than its competitors do. The fundamental task of marketing in a firm is to link the company to its customers, and the task of a marketing information system is to bring about this connection which will include customer service and communication. Marketing information systems are based on utilizing information technology (IT), and thus are an important structure facilitating marketing planning and the conduct of marketing activities from planning to follow-up. These systems should support the marketing strategy chosen, that is, reaching and serving the targeted customers and augmenting products as efficiently as possible.

The forest industry has traditionally been an example of an industry with commodity type products (e.g. Juslin and Hansen 2002). Specialization to further-processed and more customer-tailored products has been suggested as an overall strategy for the Finnish forest industry. This also requires developing product specific and improved customer service, communication and information availability.

An explorative analysis of 80 large or medium-sized Finnish forest industry companies or business units of larger companies (later referred to as BUs), in early 1990s revealed that BUs were already at that time well aware of the importance of providing improved services for their customers. In other words, it was realized that enhancing the tangible core product with an intangible service was potentially an important tool for becoming and remaining successful in the market place. The BUs also realized that the more the BU emphasized specialization in their product and customer choices, the more important this was, and they perceived the potential that IT-based solutions provided in developing information-based services and other structures. However, no clear connections between marketing strategy and information service systems were detected in empirical analyses. It seemed that only some companies had really established a clear IT-based (or some other) system to improve their customer service, or product-related information handling and delivery at that time. It was qualitatively concluded that further integration between marketing strategies and related IT-based services and other customer-service elements was clearly needed.

The limitations of this sub-study included the fact that the company groups in the data (sawmills, papermills, boardmills) included each fairly few observations. This did not make it possible to compare the groups. However, since almost the total intended population was reached in the survey, it would not have been possible to gather much more data. For making suggestions for today's forest industry, the data is out-dated regarding some of its contents and conclusions. However, the general conclusions regarding the potential of supporting marketing by developing relevant IT-based information services, and the need for improved and even tailored customer contacting and service systems, which would

efficiently support marketing strategies with commodity or specialty/custom-specific types of product and customer choices do not seem out-dated.

5.2. The dimensionality of perceived quality – perceptions of intermediary marketing channel members/organizational customers for the wood products industry

II Toivonen, R. & Hansen, E. 2003. Quality dimensions of wood products – perceptions of German organisational customers. In Helles et al. 2003. *Recent Accomplishments in Applied Forest Economics Research*. Kluwer Academic Publishers, Forestry Sciences. Vol. 74. p. 219-226.

High product quality is increasingly a prerequisite for entering the global market place and even local markets. Despite this, product quality remains a significant means for differentiation, and even for competitive advantage. This is especially true for wood products industry, given the variability of wood as material, and the traditional image of the industry as producing mainly commodity products.

It is generally agreed that a product can only be of high quality if the customer feels that it is. Thus recognizing that product quality needs to be assessed from a customer perspective is a major step in defining product quality. Still, quality is a difficult concept to describe simply. In a multitude of research quality is described as an attitude-like, multi-dimensional and thus fairly consistent concept (e.g. Garvin 1984, 1987, Parasuraman et al. 1985, 1988, 1994). This means that quality should be described using a generalizable model. However, clear definitions for this purpose especially from empirical research on perceived product quality in the case of the forest industry are still fairly few, and this applies perhaps even more clearly to European than North American markets.

Defining product quality requires specifying first what is intended by the term “product”. Product is often understood as a bundle of attributes or characteristics that provide benefits to a customer, satisfying his/her recognized and even latent needs. These attributes are both tangible and intangible. Almost always services also comprise some tangible elements, and hardly ever is there a tangible physical good that is not offered with some service or some other intangibles. Regarding forest industry products, the total product concept comprises an array of both tangible and intangible elements. Thus the quality of the total product stretches far beyond the mere physical good and its properties. Tangible and intangible product properties are inter-related.

Tangible product properties, or elements/components, include attributes such as technical, aesthetic and environmental properties, and intangible elements include service, information and supplier characteristics, which comprise even such features as the sales personnel behaviour and the delivery service (logistic service). Perceived product quality is assumed to be an integrity of perceptions of quality of the various elements (dimensions) of the multi-dimensional total product.

Empirical results from 75 German companies trading in wood and other construction materials indicate that these companies do perceive product quality as multi-dimensional, and consisting of both tangible and intangible dimensions. A description of the construction of a measurement instrument, and about the data-collection procedure, is presented in Järvinen et al. 2001, which report also includes some more detailed analysis and comparisons between various wood product categories, and between wood and other materials.

The results indicate that the structure of perceived quality (quality dimensions) is fairly similar from material to material (wood, steel, plastic and concrete). The dimensions

detected also reflect the main theoretical assumptions from earlier research. However, the resulting dimensions are not completely uniform, and therefore specific products are likely to need tailored measurement instruments at least for some specific attributes. Even though not for all the very specific quality attributes, it was concluded that it was possible to detect a general structure (quality dimensions) for different construction materials. Specifically for wood, five dimensions were detected reflecting how customers assess quality: Tangible (technical quality, aesthetics), and intangible (product information including environmental aspects, overall perceived quality reflected in image and use value, supplier service and economic aspects). Environmental quality did not form a specifically separate quality dimension but it was clearly important for German customers.

The limitations of the study include the fact that the data is a purposive sample and thus a non-response bias is impossible to assess. On the other hand, interestingly, the respondent companies cover a very significant share of the total construction material markets. In addition, the data is small for multivariate statistical analyses, particularly with regard to the measurement instruments developed for perceived quality, which originally consisted of over thirty single variables representing quality attributes. Anyhow, the results provide an interesting basis, and insights, for further research.

5.3. Intangible dimensions of perceived quality – perceptions of intermediary marketing channel members/organizational customers for the wood products industry

III Toivonen, R., Hansen, E., Järvinen, E., & Enroth, R-R. 2005. The Competitive Position of the Nordic Wood Industry in Germany – Intangible Quality Dimensions. *Silva Fennica* Vol. 39(2):277-285.

During the first decade of the 2000s, the European wood industry faced continuously tightening competition due to the faster growth of European supply over consumption, and due to the strong supply of substitute materials. At the end of the decade, the general economic downturn and weakening euro against US dollar tightened competition.

For an industry producing tangible products, the physical/tangible core product is a key element in the total product perceived by customers, which is clearly the case in the wood products industry. But even though the features and quality of the physical product fulfil the basic needs of customers, related services and other intangible product features and their quality, and price, together form the total offering judged by customers. Given that the quality of the physical (tangible) product features is important and may continuously be improved, the quality of service and other product intangibles may become increasingly important as a potential source of sustainable competitive advantage.

Determining the appropriate level of total product quality from the customer perspective is an essential decision that every company needs to make. Furthermore, the importance of quality dimensions is likely to differ between customers, and therefore quality from a customer perspective forms a relevant basis for differentiation. For the Finnish wood industry, Germany is one of its most important export markets. Therefore it is essential to know the quality requirements and perceptions of German customers. In addition, it is important to know how German customers rank Finnish suppliers with regard to product quality, and in comparison to the quality that domestic suppliers and suppliers from other countries provide.

An empirical analysis of 76 German firms trading in wood and other construction materials shows that German firms do perceive product quality as multi-dimensional, and the dimensions detected correspond fairly well with the dimensions suggested by earlier research. In particular, factor analysis revealed three intangible dimensions of perceived quality: “supplier reliability” (incorporating factors such as timely delivery and product-related service), “serviceability and environment” and “behaviour and image”, of which “supplier reliability” was the most important. The analyses also indicated that different customer groups emphasize these quality dimensions somewhat differently. In any event, the differences were rather modest.

The empirical study revealed that Finnish and other Nordic suppliers rank quite equally with their Central European competitors in supplying high technical quality. However, Nordic suppliers are left behind regarding the intangible quality of their products. Reliability and service quality in particular were clearly deemed to be important by customers, but Finnish and other Nordic suppliers did not reach the level of quality offered by their German and Austrian competitors.

The limitations of the study include the fact that the sample is a purposive sample. Thus a non-response bias is impossible to assess, but, on the other hand, the respondent firms’

total turnover covers a large share of the total construction material market in Germany. The results provide new information about the importance of intangible quality dimensions, and particularly about the quality-based competitive situation in the German wood products markets. In future research analysing performance of suppliers for actual marketing purposes, it would be an interesting approach to get the firms trading in wood products to evaluate individual companies and specific products rather than aggregate level estimations of supplier performance from a certain country, as was the case in this study. However, for the purpose of this study this kind of country-wide generalization was the only option.

5.4. Environmental quality – perceptions of intermediary marketing channel members/organizational customers for the wood products industry

IV Toivonen, R. 2007. Perceived Environmental Quality of Wood Products: The UK Markets. *Journal of Forest Industry Business Research* Vol(4)2:27 p. On-line journal. www.forestprod.org/jbfr-online.html

Environmental considerations and concerns have been of interest to society for decades. With regard to forestry, considerable attention was initially paid to the depletion of tropical rainforests, but concern has spread to forests in general and has underlined the importance of sustainable forest management. Not only consumer concern but increasingly also regulation by society has driven the forest industry to emphasize the high quality environmental performance in its processes and products.

Earlier research has pointed out the importance of environmental features in the forest industry's products, and suggested that environmental features contribute to the product quality perceived by consumers/organizational customers. Thus, a high environmental quality may be a strong benefit for wood products in the market place. In addition, it is generally accepted that an emphasis on the environment segments consumer markets and organizational customers. However, a clear understanding about the attributes that most contribute to perceived environmental quality, or how these attributes are related to other quality attributes, or dimensions, of perceived product quality, are lacking. Furthermore, clear profiles for environmentally sensitive segments are hard to find despite increasing research on the subject.

A pilot survey on the UK market, one of the most environmentally sensitive markets in Europe, was conducted in order to explore the quality perceptions of wood products. The study comprises the quality perceptions of 40 firms trading in wood and other construction materials. The empirical results indicate that the UK's organizational customers perceive environmental product quality to be a two-dimensional issue, one dimension comprising sustainable forest management and another, the social and health impacts. In summary, health (impacts on human health from product processes and the product itself) is considered a very important feature of the overall environmental quality of wood products.

When analyzed with multiple quality attributes, environmental attributes were more strongly related with product information and communication between supplier and customer than forming a clearly separate dimension itself. This, it was assumed was because environmental quality is difficult to assess without having information about the product. This emphasizes the importance of endowing wooden products with detailed enough environmental information, especially when environmental quality is intended to differentiate the product at the market place. One example would be various eco-labels, but it seems that also more detailed and informative information may be useful.

The UK companies did not expect their own customers to emphasize environmental product quality strongly, particularly when this would require a price premium. This situation was reflected in the modest importance of environmental quality on average as ranked by the respondent companies. However, it was possible to detect segments with higher (larger companies and companies mainly serving consumers, DIY companies in general) and lower (companies mainly serving organizational customers and smaller companies) emphasis on environmental product quality, as had been assumed. As also

assumed, it was possible to differentiate companies based on how they emphasized product quality in general.

The limitations of this pilot study include the small amount of data and a large non-response element, which makes it difficult to generalize from the results. Thus gathering more comprehensive data to verify the results is one avenue for further research. However, another interesting avenue would be to investigate the end-customers of the firms studied in this study, as well as the supplier companies producing wood products. With this data, it would be possible to compare perceptions of environmental quality over the whole value chain; the producers, intermediary organizational customers and finally their customers, that is organizational end-customers and consumers, and to analyse the differences between the quality perceptions of each group.

5.5. The consistency of quality dimensions and inter-dependency between perceived product quality and value – perceptions of consumers of wood products

V Toivonen, R. 2010. Product Quality and Value from Consumer Perspective – An Application to Wooden Products. Manuscript.

The Finnish wood industry has traditionally focused on its organizational customers when developing products and marketing. However, residential construction is shifting from new housing to renovations. Building an individual home instead of living in a flat is increasingly popular at least in Finland. These trends mean that the end-consumer has a stronger and more direct role in determining which products are ultimately successful in the market place. For Finnish wood products industry, the most important single market is the domestic market. During the last few years over 40 % of the production of sawnwood has been sold within Finland. The high quality of the total product is considered to be a key element for improving the sustainable competitiveness of the wood products industry (Lähtinen et al. 2009). So it is of the utmost importance for the industry to understand the quality-related perceptions of domestic consumers.

An empirical survey of consumers was conducted among people visiting home centres and a home building fair in Finland in order to explore consumers perceptions of wood product quality. An exit technique was applied. Totally 147 acceptable responses of the delivered 210 questionnaires were received, meaning a response-rate of seventy per cent. The survey investigated quality perceptions of wooden furniture and wooden flooring and panelling products, using exactly the same measurement instrument for all the products. In addition, the study investigated particularly how the respondent consumers valued the quality of the wooden furniture (trade-off between price and quality).

The results of factor analysis indicate that the structure (dimensions) of the perceived quality of wooden products was, broadly speaking, consistent over the two product categories. Overall, the results indicate that perceived quality may be understood as a hierarchical construct where the most abstract level includes tangible and intangible dimensions, which may be further specified in sub-dimensions. In the case of wooden products, Finnish consumers seem to rank the quality of product tangibles more important than the quality of product intangibles. The perceived quality dimensions are interrelated, a phenomenon that is also apparent in other empirical research on quality using similar approach in measurement and analysis. This may partly explain why the dimensions of perceived quality vary somewhat when the analysis moves from an abstract to a more detailed level of dimensions and attributes.

The perceived value of wooden furniture was assessed in terms of a customer judgement of the trade-off between quality and price. This was analysed by quality dimensions. The perceived product value from the consumer perspective also seemed to be a two-dimensional construct, consisting of intangible and tangible values. As assumed, quality perceptions were logically linked, and helped to explain value perceptions, which was revealed in pairwise regression analyses of the perceived quality and value dimensions.

The limitations of the study include a fairly small data set that was not a completely representative sample of Finnish consumers as it was a purposive sample. Therefore a generalization of the results even for Finnish markets is difficult. However, the validity of the data should be high. In the future, it would be important to collect more data, which

would make it possible to investigate further the consistency of perceived quality by comparing consumers from different parts of Finland. More data would also make it possible to recognize potential quality-based consumer segments, and their profiles better. Future research could also be extended by collecting data from consumers before buying a product and after using it in order to receive estimations of the quality and satisfaction actually experienced. This would require a more experimental research approach.

6. SYNTHESIS OF THE RESULTS

6.1. The multi-dimensionality of perceived product quality and value: a common construct for perceived product quality

A subjective comparison of the empirical results of the sub-studies on wood product markets suggests that perceived product quality is indeed a multi-dimensional and consistent construct over different markets and products (see Tables 3 and 4). In more detail, the interpretation of the observed quality dimensions in the sub-studies is fairly consistent, even though somewhat different variable sets were utilized. The sub-studies indicate that perceived quality may be condensed to a few main dimensions, as assumed.

The results are in accordance with the proposition of that perceived quality is a hierarchical construct with dimensions reflecting perceptions of product tangibles and intangibles on the most abstract level. It seems that it would be possible to condense the quality of product tangibles to one dimension at its most abstract level. Quality of the intangibles of the total product may be condensed to one continuum, but in any event it seems to comprise at least two abstract dimensions: supplier-related (behaviour and service) issues, and product-related intangible issues (information, environmental characteristics, origin etc.).

For physical products such as wood products, the main quality dimensions may be described as follows, based on the combined evidence from this research:

Quality of the tangible/physical core product (two main sub-dimensions):

- technical quality, which comprises such issues as durability, performance, usability/use value, and various other features such as packaging
- appearance/visual characteristics, which also may be connected to (visual) style and image, the design of the product and other similar characteristics of wood material

Quality of the supplier and services (may comprise several sub-dimensions):

- supplier-related characteristics such as reliability, reputation, and image
- supplier personnel's behaviour, such as friendliness and willingness to serve
- services: the availability and quality of various services, such as delivery and logistics, tailoring products, payment conditions, warranties

Quality of product-related intangibles (may include several sub-dimensions)

- product-related (and producer/supplier-related) information
- environmental characteristics and related information (may be augmented by corporate social responsibility (CSR) issues)
- other, such as product/material origin

Even though not exactly uniform with any earlier study, the above outlined dimensions confirm fairly well the typology presented by Garvin (1984, 1987), as well as that presented by Sinclair et al. (1993) and Hansen and Bush (1999). Also the dimensional construct for

perceived quality in case of services suggested, for example, by Grönroos (1998, 2001) fits fairly well with the intangible dimensions observed (the dimensions detected by Grönroos: functional quality, technical quality and supplier image).

The results from sub-study V indicate that the importance of customers' judgements about quality and perceived value are logically related. This indicates that quality perception is an antecedent of value perception. Overall, the assumed theoretical model of the relationship between perceived product quality and value is in accordance with the empirical observations.

Table 3. The main theoretical propositions, related research questions, and a synthesis of the observations made in the empirical sub-studies II – V (perceived quality).

Sub-Study	II Several materials, wood in particular Germany	III Wood products Germany	IV Environment, wood products the UK	V Wood products Finland	Observations and comments
Perceived quality is multi-dimensional	Yes	Yes	Yes	Yes	Based on explorative analysis, the proposition is shown to hold in each empirical sub-study (factor analysis and/or correlation analysis)
Dimensions in the case of wood products are consistent over different markets	<p>I Perceived quality (image and use value)</p> <p>II Product information (includes environmental issues)</p> <p>III Technical quality of the tangible product</p> <p>IV Aesthetics (visual appearance and style)</p> <p>V Supplier service and economics</p>	<p>I (Supplier) Behaviour and image</p> <p>II (Supplier) Serviceability and (respect for) the environment</p> <p>III (Supplier) Reliability</p>	<p>I (Product) Tangibles and appearance</p> <p>II (Supplier and product) Information (& communication) and environment (respect for environment, “green” product characteristics)</p> <p>III Supplier characteristics and services</p>	<p>I Supplier characteristics, information and service</p> <p>II Product tangibles (physical features and appearance)</p> <p>III Product related intangibles: environmental issues and domesticity</p>	<p>The resulting structures from factor analyses/correlation analysis applied to different geographical areas/customers are, broadly speaking, similar.</p> <p>The interpretation of the observed dimensions are fairly similar in the different sub-studies despite somewhat different sets of original attributes.</p>

<p>The dimensions of perceived quality is consistent over different products and markets</p>	<p>Yes</p> <p>Fairly similar in the case of four different materials: wood, plastic, steel and concrete.</p>	<p>Na</p>	<p>Na</p>	<p>Yes</p> <p>Almost exactly similar for wooden flooring and panelling material and wooden furniture, when compared with each other.</p>	<p>The interpretation of the resulting dimensions is fairly similar for different materials and products.</p> <p>The observed dimensions are also, broadly speaking, in accordance with dimensions suggested by Garvin (1984 and 1987), and Hansen and Bush (1999), and Sinclair et al. (1993).</p>
<p>The dimensions of perceived quality form a hierarchical structure</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>Sequential factor analyses suggest a hierarchical structure in each sub-study, where more concrete dimensions, or attributes, reflect more latent dimensions of perceived quality</p> <p>The combined evidence from the sub-studies suggest that there is a common hierarchical structure for perceived quality at least in the case of wood products.</p>

Na = not analyzed

Table 4. The main theoretical propositions, related research questions, and a synthesis of the observations made in the empirical sub-studies II – V (perceived quality).

Sub-Study Propositions and research questions	II Several materials, wood in particular Germany	III Wood products Germany	IV Environment, wood products the UK	V Wood products Finland	Observations and comments
Tangible and intangible dimensions form the basic structure of perceived quality	(Yes) For four materials, solutions of 4 to 8 factors were obtained. These represented tangible and intangible dimensions quite clearly, but the result of a two- dimensional solution only (tangible/in-tangible) is not reported.	(Yes) The analysis concentrated on intangible quality only. The dimensions identified as reflecting the quality of product tangibles are not reported.	Yes On the highest level: one dimension for product tangibles (including appearance), two dimensions for intangibles: (a) supplier characteristics and behaviour, and (b) information and environmental issues.	Yes On the highest level: one dimension for product tangibles (including appearance), two dimensions for intangibles: (a) supplier characteristics behaviour, and information, and (b) domestic origin and environmental issues.	The observations suggest that perceived product quality may be possible to describe with a few major dimensions, tangible (1-2) and intangible (2-3): I. product tangibles, which consists of (a) product performance, durability, use properties and features, and (b) aesthetics and possibly other related characteristics such as style II. product intangibles, which consists of (a) supplier related characteristics and behaviour such as image, reputation and reliability, and (b) product related intangibles: product information and its availability and usability, environmental characteristics, and other similar characteristics such as domestic origin.

					The tangible and intangible quality dimensions consist of the sub-dimensions above and potentially still more specific dimensions and attributes.
Perceived value and perceived quality are logically related	Na	Na	Na	Yes Perceived value is a multi-dimensional structure, quality perception is antecedent to perceived value.	<p>The propositions hold based on factor analyses and regression analyses of the respective quality and value dimensions.</p> <p>It is concluded that the more important a quality dimension is, the more value (high) quality on this dimension creates for the customer.</p> <p>Accordingly, willingness to pay for higher quality may increase when importance of quality (dimension) increases, presuming the product performs well and provides the expected level of quality.</p>

Na = not analyzed

6.2. Information and environmental quality

Of specific interest to this research was detecting whether environmental issues and information are specific quality dimensions from a customer perspective, and determining how important these are particularly in the case of wood products. Our results clearly suggest that information about products and production, as well as about the producer/supplier are important quality issues for customers. The same applies to environmental issues (see Tables 5 and 6).

Augmenting the total product by information and information-related service, as well as the general importance of information in marketing, has been well understood by the Finnish forest industry at least since the early 1990s. However, in the early 1990s the sawmill industry in particular had not utilized the opportunities available to their full potential, and even in the 2000s, German organizational customers felt that Nordic producers underperformed regarding service and supplier reliability when compared to their Central-European competitors.

It seems that product-related information and environmental issues may form stand-alone quality sub-dimensions. On a more abstract level, these issues are perceived as being tied together particularly in the case of wood material/wood products. Both environmental product characteristics and product information are perceived as intangible issues despite the fact that environmental quality is at least partly connected to the tangible product via technological and environmental choices concerning materials and processes.

Environmental awareness in western societies started to rise rapidly during the 1990s. The results of this research suggest that in the 2000s, environmental quality was perceived as being fairly to reasonably important both by the organizational customers and consumers of the wood products industry. However, it seems that consumers perceive environmental issues generally as less important than some other quality dimensions in the case of wooden products. On the other hand, organizational customers trading in wood products perceive environmental issues as being more important than consumers do, and it is even ranked among the most important quality characteristics among the UK companies analyzed. This holds even though the companies believed that few of their own customers are interested/ready to pay more for high environmental quality.

The results suggest that environmental quality splits up markets, even though this issue was particularly studied only in one sub-study about the UK market. However, in practice identifying these segments is difficult, something that earlier research has also observed. This difficulty is argued to regard recognizing market segments based on subjective and ethical issues in general.

Organizational customers and final consumers may emphasize environmental quality to different degrees based on somewhat different motivations. Thus analyzing consumer markets or organizational customers on their own is not conclusive: it does not necessarily help to understand how environmental quality actually splits up markets. Nevertheless, combining an analysis of both markets helps to detect and profile the most environmentally sensitive organizational customer segments efficiently.

It is notable that environmental quality itself comprises a variety of issues from various social aspects to the safety of processes, wood treatment methods, and the impacts on human health and ecology. In the case of wood products industry, forest management and the origin of the product are also considered to be important. However, even though

environmental quality is considered to be important, organizational customers do not see much potential for achieving significant price premiums among their own customers.

Table 5. Environmental and information related product quality in sub-studies I-V.

Proposition or research question	I IT in marketing Finland	II Several materials particularly wood Germany	III Wood products Germany	IV Environment, wood products the UK	V Wood products Finland	Observations and conclusions
Specific environmental quality dimension(s) exist	Na	7-8 dimensional models: A specific environmental quality dimension is detectable for three materials out of four. Only wood was analyzed, a 5-dimensional model: Environment is related to product information and these form one dimension.	Only product intangibles were analyzed: One out of three quality dimensions consisted of environmental issues together with information-based service/communication and wide product range: Serviceability and environment	Environmental quality: I. Social and health impacts II. Sustainability (of forest management) and (environmental) information Environmental quality itself is perceived to be multi-dimensional. Total product quality: Information (availability & services) and environment (+ 2 other dimensions)	Environmental friendliness & domestic origin (& brand).	May form a specific quality dimension in the case of wooden products and for selected construction materials. However, a stand-alone environmental dimension is not one of the main and most abstract level quality dimensions. Environmental issues and information tend to be tied together.
Environmental quality is perceived to be connected to product	Na	Yes Individual dimension in 7-8 dimensional solutions.	Yes* * Obs. Only intangible quality attributes were included in the analysis.	Yes Relates to information and information-based service.	Yes Relates to other intangible product quality attributes,	Environmental quality is related to intangible product quality. It is strongly linked with product and producer

intangibles rather than tangibles.		Wood, A 5-dimensional factor solution: Environmental quality is related to intangibles (information).			particularly domestic origin and brand.	information, but also with other intangible characteristics attributable to the physical product, such as origin.
Importance of environmental issues	Na	Na	Not studied independently. The quality dimension including the environment is important but not the most important of the three intangible quality dimensions observed.	Is among the most important quality issues to organizational customers trading in wood products. However, the organizations do not believe that environmental quality matters strongly to the majority of their own clients.	Is of average importance to consumers, and less important than many other issues such as product appearance and technical performance.	Consumers perceive environmental quality generally as less important than some other quality dimensions in the case of wood products. Intermediary customers perceive environment as more important than consumers.
Importance of information and information-related services and systems	Using and providing product and customer-related information are important in product development and in improving service, as assessed by Finnish companies.	Information is ranked as being moderately important.	German organizational customers feel that Nordic producers underperform regarding supplier reliability, service and information-related issues when compared to their Central-European competitors.	Information is ranked as being moderately important.	Information is ranked as being moderately important.	The importance of information is well understood by the forest industry and by its organizational customers and consumers.

Na = not analyzed

Table 6. Environmental and information related product quality in sub-studies I-V.

Proposition or research question	I IT in marketing Finland	II Several materials particularly wood Germany	III Wood products Germany	IV Environment, wood products the UK	V Wood products Finland	Observations and conclusions
Segments based on environmental quality	Na	Na	<p>Different customers were observed to find quality in general and quality of service and environmental issues in particular of importance to different degrees</p> <p>However, quality-based segments were not profiled in the study.</p> <p>Organizational customers perceive clear differences in how wood product suppliers from various countries perform in producing quality.</p>	<p>Yes</p> <p>More and less environment-oriented segments were identified.</p> <p>Segments based on overall quality perceptions were identified.</p> <p>Profiling the segments based on the traditional attributes that describe companies provides only a very broad description of the segments.</p>	Na	<p>The results provide indications that environmental quality segments, and quality segments in general, exist among organizational customers.</p> <p>However, identifying and profiling these segments based on traditional consumer/company attributes is challenging.</p>

Specific information related dimension(s) exist.	Na	Yes For each of four materials (wood, steel, plastic, concrete), a specific information dimension (quality of product and producer-related information, and its availability) was detected in the case of the 7 to 8 dimensional factor solutions.	Yes – but not a stand-alone Information is related to environmental issues in the 3-dimensional factor solution.	Yes – but not a stand-alone Information is related to environmental issues in the 3-dimensional factor solution.	Yes – but not a stand-alone Information is related to supplier characteristics and service in the 3-dimensional factor solution.	An information-related stand-alone quality dimension is detected as a lower-level quality dimension. On a more abstract level, information is related with environmental issues and potentially service quality.
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Na = not analyzed

6.3. The importance of quality dimensions

The evaluation of the combined results of the sub-studies clearly indicates that different quality dimensions, and also specific quality attributes, are of different importance to both organizational customers and consumers, as expected (see Table 7). According to the indications observed, this importance varies somewhat between products, and between customers. Thus, product quality forms a basis for segmenting markets and differentiating products.

The quality of the tangible product is very important to both organizational customers and consumers in the case of wooden products. This applies to both technical quality (performance of the product/material) and appearance. However, it seems that the technical quality of the tangible product is even more important and decisive for consumers than it is for organizational customers, who, in this research, were limited to firms (intermediary marketing channel members) trading in wood products. Instead, organizational customers trading in wood products and other construction materials strongly emphasize supplier-related characteristics, particularly reliability but also service.

In other words, technical quality and appearance are critical, but intangible quality issues are also clearly important in the case of wooden products. In organizational markets, tangible and intangible quality is even equally decisive from a customer viewpoint, particularly when it comes to supplier reliability. However, ethical, efficient and friendly behaviour, and the availability of appropriate services also matter. It is important that there is sufficient information available about these issues and the physical product itself.

Environmental quality contributes to total product quality in the case of wooden products, but also generally, at least in the case of the construction materials studied in this research. Our results indicate that environmental quality is not, generally speaking, among the most decisive quality issues for organizational customers trading in wood products, or for consumers. Environmental quality may even matter more for organizational customers than for consumers. Intangible product quality provides an important way for differentiating wooden products.

Table 7. The importance of perceived quality dimensions (wood, wood products) in sub-studies II-V.

Sub-Study Propositions and research questions	II Several materials, particularly wood Germany	III Wood products (*) Germany	IV Environment, wood products the UK	V Wood products Finland	Observations and comments
The importance of quality dimensions vary between customers (basis for segmentation)	<p>Wood material:</p> <p>I. Perceived quality (image and use value)</p> <p>II. Product information (includes environmental issues)</p> <p>III. Technical quality of the tangible product</p> <p>IV. Aesthetics (visual appearance and style)</p> <p>V. Supplier service and economics</p> <p>Importance was not reported.</p>	<p>I. Behaviour and image (2.2)</p> <p>II. Serviceability and environment (2.1)</p> <p>III. Reliability (1.5)</p> <p>1= very important, 5= not important at all</p> <p>*Importance of tangibles was not analyzed in this sub-study but it was ranked as being very important (measured by one variable only: mean importance 1.3, see Järvinen et al. 2002, Table 8)</p>	<p>I. Tangibles and appearance (1.9)</p> <p>II. Information and environment (2.4)</p> <p>III. Supplier characteristics and services (2.1)</p> <p>1= very important, 5= not important at all, means calculated from the original paper</p>	<p>I. Supplier characteristics, information and service (3.7)</p> <p>II. Product tangibles (physical features and appearance) (4.4)</p> <p>III. Product related intangibles (environmental issues and domesticity) (3.65)</p> <p>1= not important at all 5= very important, means calculated as an average of the two original structures reported.</p>	<p>The quality dimensions are of different importance to both organizational customers and consumers, as assumed. Customers also vary in how they emphasize quality, but the analysis of the issue was limited in this research.</p> <p>For consumers in Finland, the quality of the tangible product is clearly the most critical. This includes product appearance as a very important matter (similar indications about German markets are reported in Järvinen et al. 2001, and from other markets e.g. by Jonsson 2004, and Nyruud et al. 2008). However, other quality dimensions are also of relevance; environmental quality being on average as important as service.</p>

	<p>Importance of quality dimensions for German organizational customers trading wood products and other construction materials was studied in the case of several different products in detail in Järvinen et al. (2001, Tables 15 & 16). The most important quality dimensions for wood products are technical quality and aesthetics, followed by supplier characteristics and service, and finally by environmental characteristics.</p>			<p>For organizational customers, quality of product tangibles, particularly technical performance, is important. Appearance/aesthetics is also very important in the case of wooden products, but the importance varies somewhat from product to product, which is logical (details reported in Järvinen et al. 2001)</p> <p>Supplier-related characteristics are very decisive for organizational customers (more important than for consumers), supplier reliability in particular.</p> <p>In the UK, organizational customers place strong emphasis on environmental quality even though they did not assume the same regarding their own customers.</p>
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7. SUMMARY, DISCUSSION AND CONCLUSIONS

Background, motivation and research objectives

The business environment of the wood products industry changed significantly during the 1990s to the early 2010s. Society has developed toward a proliferation of heterogeneous consumer segments with specific needs regarding product quality. The revolution of information technology since the 1990s has made it possible to provide tailor-made products in a completely new way. Increasing environmental awareness has had a major impact on production processes in the forestry sector.

Remaining competitive means that the wood products industry must be able to adapt rapidly to changes in the economic activity in their operation environment and to changes in their customers' subjective needs and wants. Providing high quality products and augmenting tangible products with service and other intangibles is often suggested as a potential tool in the search for competitiveness. The motivation for this research was the fact that a definition and practical measurement of product quality, which would allow forest products companies to systematically benchmark, and develop the quality of their products from a customer perspective is still lacking.

This research analyses, theoretically and empirically, product quality from a customer perspective in the case of wood products industry, with the main objective of recognizing a common and generalizable construct for perceived quality. One theoretical proposition is that the total product, from a customer viewpoint, is a bundle of both tangible and intangible characteristics, which are hierarchically structured, and may be inter-related. In particular, it is assumed that environmental characteristics and information are important characteristics of wood products. Secondly, another proposition is that perceived product quality is an attitude-like, and hierarchical construct, which is generalizable over various products and markets. Thirdly, it is proposed that perceived product value is a function of quality and price perceptions, and is also a multi-dimensional and generalizable construct.

Empirically, this research analyzes the applicability of the theoretical propositions above to the wood product markets and seeks to recognize the most important quality dimensions from a customer perspective. Of specific interest is environmental and information-related quality, and the contribution of these to overall quality perception in the case of wood products.

Main empirical observations

The combined empirical results of this research suggest that perceived quality can be described using a common multi-dimensional construct generalizable to wood products, but also to selected construction materials. Intangible and tangible quality dimensions are the most abstract dimensions in the construct. The tangible quality dimension consists of two main sub-dimensions: technical quality and appearance. For the intangible quality dimension, a few main sub-dimensions are detectable: the intangibles related to the physical core product, such as environmental quality and information, and supplier-related issues such as reliability and service, and the behaviour of sales personnel. Perceived product

value was observed to be a multi-dimensional construct, and, as assumed, quality perception explains value perception. However, the explanatory power was only modest.

In the case of wood products, the quality of the tangible product is the most important both for organizational customers and consumers. Product appearance is very important, particularly for consumers. However, a few supplier-related intangible quality issues are also clearly critical, particularly reliability. It seems that the Nordic wood products industry is not performing strongly on the latter quality-issues compared to their Central-European competitors on the important German markets.

Environmental quality is perceived to comprise a wide variety of issues from sustainable forest management and ecological processes to health and social issues. For the most part, consumers mainly consider environmental quality to be modestly important in the case of the Finnish market. In the German and UK markets on the other hand, organizational customers seem to consider environmental quality from modestly to clearly critical. However, organizational customers trading in wood and other construction materials also assumed that environmental quality is not very important to the majority of their customers. Indications from the UK organizational customer data suggest that environmental quality is a way to segment markets, as expected.

Environmental quality is perceived as an intangible and information-related issue in the case of wood products. The results also suggest that environmental quality and product information may be stand-alone dimensions, but this holds true only when analyzing dimensions of perceived quality at a detailed level. For the most part, environmental quality and information tend to be combined together as one dimension.

The results show that already in the early 1990s, the Finnish forest industry was well aware of the importance of augmenting their products with improved service and information, including the potential that IT already provided at that time. However, this was hardly visible in how the companies actually utilized information and information technology in their marketing. Unfortunately, it seems that utilizing this potential to its full extent still seems to be a challenge today in the case of the Finnish wood products industry.

Methodological issues and limitations

Qualitative approaches have been increasingly applied in marketing research during the 1990s and 2000s. However, this study applies quantitative analyses, and provides results with several empirical data sets. Thus the results can be verified statistically, and developed in future research.

The measurement instruments used in this research were built based on the special literature as well as on discussions with industry experts, and, after initial development, the instruments have also undergone empirical tests. The final measurement instruments have been condensed step-by-step throughout the chain of empirical studies, in order to capture the common quality dimensions. However, in each sub-study there remained some degree of unexplained variation. Therefore it is still possible that important quality attributes, or dimensions, exist that have not yet been included in the variables used in this research.

The empirical research in this study is based on four different data sets, and each of the five sub-studies employ a somewhat different set of variables. The variable sets used in measuring perceived quality have a temporal and geographic divergence, which augments the coverage of the research. The approach in each sub-study is explorative, which makes it possible to recognize the actual construct (dimensions) of perceived product quality.

The data of each sub-study is fairly limited. This makes it difficult to test differences between respondent groups statistically. Owing to relatively small samples, or the sampling system, the empirical results cannot be generalized, and need to be treated with caution and as indicative only. Some of the data-sets were collected quite some time ago, which limits the practical applicability of some of the results. Another limitation is that a comparison of the results remains subjective since a statistical testing of the similarity of the results between the sub-studies is not possible.

Discussion

The results of this research are in accordance with earlier research that understands perceived product quality as an attitude-like phenomenon (e.g. Zeithaml 1988, Hansen and Bush 1999, Brucks et al. 2000, Johanssen 2004, Nyrud et al. 2008). This research also provides further understanding of the quality dimensions important to customers particularly in the case of wood material and wood products, and indicates that perceived product quality is a multi-dimensional construct. At the top of the hierarchy are intangible and tangible dimensions, which are reflected in more specific sub-dimensions and indeed in more concrete attributes.

The empirically observed quality dimensions of wooden products are in accordance, even though not necessarily strictly uniform with, several earlier studies (e.g. Garvin 1984, 1987, Hansen and Bush 1996, 1999, Brucks et al. 2000, Pakarinen and Asikainen 2001). This finding also supports the proposition that a common construct exists for perceived product quality. This research suggests that the dimensions of perceived product quality in the case of tangible products may be presented in a more condensed way than that of earlier research, such as Garvin's (1984, 1987) eight-dimensional construct. A similar suggestion has been presented in some other empirical research on wood products. However, the empirical results of this research also indicated that some relevant quality attributes or dimensions may not have been picked up by the measurement instrument used. A possibility might be that perceived product quality comprises dimensions common to a large number of products and markets, as assumed and revealed in this research, but that some other attributes and dimensions exist that are rather product specific.

The technical quality (performance) of the physical product, its appearance (visual and aesthetical characteristics and design), and various characteristics of the supplier and the sales personnel, and services, are important quality dimensions in the case of wood products, which also has been observed in earlier research. Information and environmental characteristics also clearly matter for customers, but are not the most decisive. Regarding environmental quality, this has also been indicated in a few other studies (e.g. Pakarinen and Asikainen 2001, Jonsson 2004, Nyrud et al. 2008, Roos and Hugosson 2008, Roos and Nyrud 2008). Information as a product quality attribute has not been extensively studied, except as a method to communicate environmental and ethical quality to customers. This research indeed reveals that environmental quality and information are often joined as a specific dimension of perceived product quality in the case of wood products.

There is increasing interest in social issues, and in responsible consuming in general in society (e.g. Auger et al. 2003, Arli and Lasmono 2010), and this also applies to forest industry (e.g. Panwar and Hansen 2008, Vidal and Kozak 2008, Li and Toppinen 2010). Accordingly, this research indicates that for organizational customers of the wood products industry environmental quality represents much more than simply the environmental

impacts of production processes or the sustainability of forest management, even though these are considered critical.

As pointed out, ethical and other subjective quality issues, such as environmental quality, need to be communicated to the market in order to facilitate environmentally sensitive customers in choosing the product that attracts them (e.g. Valor 2008, Thompson et al. 2009, Kirchler et al. 2010). The sustainable management of forests, the impacts of production processes and the availability of related credible information, such as well-demonstrated certification and related chain-of-custody and accounting systems, are of relevance (e.g. Vidal and Kozak 2008). The observations of this research are in accordance with these arguments.

However, as much as environmental issues are underlined in public discussion and in research, for most companies or consumers environmental quality is not among the most important quality dimensions in the case of wood products, and it is difficult to obtain a price premium (e.g. Aquilar and Vlosky 2007). This is observed in this research, too, and may apply to corporate social responsibility (CSR) issues also more generally (e.g. Arli and Lasmono 2010).

The rationale for any company to invest in improved quality is that customers perceive that they are receiving more value from the product; only if this is the case then the company may gain a higher price or market share. The theoretical and empirical analysis of perceived product value was limited in this research. A statistically significant and positive relationship was observed between perceived product quality and value, which was expected. Understanding perceived product value as a multi-dimensional construct that may help practical product development has also been noted by other authors (e.g. Sanchez-Fernandez and Iniesta-Bonillo 2010).

Environmental quality is believed to attract specific customer segments, and this is also the case when it comes to wood products (see, for example, Roos and Nyrud 2008 about Nordic markets and Thompson et al. 2009 about North-American markets). The results of this research indicate the existence of quality-based segments, and to some degree also environmental quality based segments, among the UK's organizational customers of the wood products industry.

However, traditional variables used in profiling organizations or even consumers do not always provide clear profiles for quality-based segments when intangible and subjective quality dimensions are of interest, such as environmental quality. This also applies to the findings of this research, despite that those UK companies which are most closely linked to consumers are the most environmentally sensitive.

The road ahead for further research

Several interesting kinds of data, measurement and methodology-related avenues exist for future research on perceived product quality issues in the case of wood products.

- The development of measurement instruments to construct as complete an entity of perceived product quality dimensions as possible, including additional qualitative research to recognize important but still unidentified quality attributes or dimensions.
- The development of more detailed measurement instruments for those dimensions that are particularly critical in the case of wood products: namely, appearance

(aesthetic and design issues), technical quality, supplier reliability, service and environmental quality.

- Gathering larger data-sets, which allow more sophisticated statistical analyses and generalizations or comparisons across customer segments and products.
- Comparing the performance of different construction materials in terms of the common quality dimensions.
- Applying experimental research including both ex ante and ex post evaluation of perceived quality, value and satisfaction.
- Applying methods for measuring subjective preferences, such as environmental and visual preferences, against willingness to pay. In the case of well-specified products, these preferences may be detected using choice methods, which have been fairly scarcely applied in academic research on wood products so far. Measuring the relationship between aesthetic and visual characteristics, as well as environmental and other intangible product quality issues, and actual market price in the case of wooden products would also be interesting. However, this has rarely been done for any products so far (Kirchler et al. 2010).

A larger theme for future research includes deepening the analysis of profiles of various quality-based consumer segments, even though consumer market research has become more active in the wood products markets during the last few years. There are still open questions regarding environmental quality. It is considered at least modestly important in the case of wood products, but willingness to pay for environmental quality is estimated to be at most moderate.

The “free-rider” phenomenon may be a reason for the low interest in paying a price premium, but another reason may be the complexity of the concept. Existing research about environmentally sensitive consumer segments with regard to forest products is scarce, except that females and younger people tend to be the most environmentally sensitive (e.g. Jonsson 2004, Roos and Nyrud 2008, Huttunen and Autio 2009). Another avenue is to broaden the analysis of environmental quality to include climate change issues. In addition, recognizing segments with specific environmental, product appearance or service-related preferences would also benefit the wood products industry.

Conclusions

The Finnish forest industry has been criticized for being production oriented despite its well-stated aim to be customer-oriented. During the latter part of the 2000s and early 2010s, arguments have also been presented about its modest if not inadequate investments in new product development.

This research challenges the claim that perceived product quality is such an individual or undivided entity, or a continuously changing concept, that it would not be possible to determine it using a general and multi-dimensional construct, at least for a specific industry such as the wood products industry. This research provides a commonly applicable multi-dimensional construct as a basic tool for determining perceived product quality regarding tangible and intangible quality. This construct might help wood product firms when assessing the performance of their products on various markets.

The results of this research indicate that the quality of the tangible product is the most important for any type of customer of the wood industry. Thus, for the wood products industry, it is necessary continuously to maintain the high technical performance of their

products, which luckily is considered a strength of the Nordic wood products industry at least on the German market. The high technical quality of the tangible product may be a “licence to operate” on the markets. By contrast, appearance was considered very important by customers. It probably still provides clear potential for quality improvements from the customer perspective, and thus for market segmentation. Therefore one of the key issues for the future competitiveness of the wood products industry is to recognize successfully the various visual/aesthetic and design-related needs of consumers.

Improving intangible product quality, including service, also provides a way to improve product development. Interestingly, this may not require major manufacturing or material-related investments or innovations (e.g. Molina-Castillo and Munuera-Aleman 2009). In addition, intangible product characteristics and their quality are often more difficult to be imitated by competitors.

Sadly, delivering high quality service, and building up a very reliable image still seem to be challenging for Nordic exporters, at least when they are compared with their Central-European competitors by German organizational customers. Understanding better the service-related needs of their customers is therefore necessary for Nordic wood products firms.

Today, information technology provides a number of ways to tailor individual products, but also to bundle physical products and service more innovatively and more cost-efficiently than ever before. The Nordic wood products industry could take advantage of this. This could also help in focusing more the final consumers in product development and marketing. Consumers may be attracted by complete products that include full service from delivery and warranties to assembly and even interior or building design. This would require strong co-operation or partnerships between different companies: wood product producers, delivery and assembly service providers, and design service providers.

Environmental quality is often regarded as a specific strength of wood material. But based on this research, environmental quality is not among the most prioritized quality issues for customers. Some appropriate level of environmental quality may today be more a necessity required from wood products than a new issue bringing competitive advantage.

Still, one may argue that environmental quality is not yet used to its full potential in the wood products industry. It is important to note that for customers, environmental quality comprises a wide array of issues, not simply forest management or the issue of waste from production processes. This fact provides a way to augment product quality by revealing, or by adding, new environmental characteristics important to customers.

The problem is that environmental quality issues cannot be directly observed, or otherwise judged from the product. The only way of assessing environmental quality is information. This information should be credible, easily available and comprehensive. More attention needs to be paid to communicating environmental quality in the value chain. This calls for further development of eco-labelling, and providing more detailed, easily accessible and low-cost relevant information. Modern information technology and chain-of-custody standards provide tools for this. In addition, product branding may be an efficient way to inform customers about product quality, including environmental or service quality. Interest in product branding in industrial markets has been growing recently, including forest industry (e.g. Tokarczyk and Hansen 2006, Aspara and Tikkanen 2008).

If a price premium is expected, then environmental quality may need to be bundled with other characteristics providing more individual, hedonic and concrete benefits in addition to producing “good for the planet” benefits (e.g. Tiilikainen 1998, Molina-Castello et al. 2009). Examples include such as product characteristics that deliver positive impacts for

personal health, a feeling of well-being, or communicate a certain life-style, or lighter product weight that makes transportation and assembly easier or cheaper, less energy-consuming products, or easy recycling.

More generally, climate change has triggered interest in renewable energy and energy-efficiency, and induced overall interest in the use of renewable materials, and in materials and products with low carbon-footprint. Recycling remains a major trend in society. At the same time, individual and personal life-styles are emphasized by many consumers. These trends are promising for the wood products industry: Wood material provides good potential for developing products that are attractive but individual by appearance, perform well in environmental terms, are also technically advanced and well-performing, and meet criteria for improving energy efficiency, and renewability of materials.

One example of a positive trend is the growth of ready-to-assemble wooden homes, and the popularity of wooden flooring and interior decorating materials. In Sweden and in the U.S., for example, innovative utilization of wood in building multi-storey buildings has successfully attracted both consumers and public and business organizations. This trend seems to be growing also in Finland. The key issue for the wood products industry is to recognize the different customers' quality needs and wants, and successfully combine this with the technical, aesthetic and environmental potentials of wood material, and with supplier reliability and good service.

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