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**ENVIRONMENTAL QUALITY OF WOOD PRODUCTS –  
PRELIMINARY STUDY ABOUT THE UK MARKET**

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**ABSTRACT:** Environmental questions have long been linked to forestry and forest industry products. These cover a wide variety of aspects from sustainable forest management and environmental impacts of industrial processes to health issues and even social responsibility. Environmental quality contributes to the total product quality perceived by customers of the forest industry. This paper explores whether environmental product attributes create one or several dimensions in the case of wood products, how important these are, and how environmental quality relates to other product quality dimensions from the customer perspective. The empirical data reflect the perceptions of 40 UK-based companies trading wood and other building materials. The results show that in addition to the sustainability of forestry and other ecological issues, the companies find health impacts clearly important. Environmental quality is considered as multidimensional itself, and as a closely information-related matter. For wood product manufacturers, the results emphasise the importance of facilitating the products with detailed environmental information, particularly if environmental product quality is intended to differentiate the product in the market place.

**Key words:** total product quality, health impacts, sustainable forestry, product information

**RITVA TOIVONEN – ERNO JÄRVINEN – RAIJA-RIITTA ENROTH – ANNA-KAISA RÄMÖ. 2008. PUUTUOTTEIDEN YMPÄRISTÖYSTÄVÄLLISYYS ISO-BRITANNIAN MARKKINOILLA.** Pellervon taloudellisen tutkimuslaitoksen työpapereita nro. 111, 35 s. ISBN 978-952-224-003-3 (PAP), ISBN 978-952-224-004,0 (PDF), ISSN 1455-4623 (PAP), ISSN 1796-4784 (PDF)

**TIIVISTELMÄ:** Ympäristöasiat ovat jo pitkään olleet kiinteästi yhteydessä metsätalouteen ja metsäteollisuustuotemarkkinoihin. Näihin sisältyy lukuisia asioita kestävästä metsätaloudesta ja teollisten tuotantoprosessien ympäristövaikutuksista terveysvaikutuksiin ja jopa sosiaaliseen vastuuseen. Metsäteollisuustuotteita ostavat asiakkaat liittävät tuotteen ympäristölaadun yhdeksi osaksi tuotteen kokonaislaatua. Tässä tutkimuksessa selvitetään puutuotteita ostavien asiakkaiden näkökulmasta onko puutuotteen ympäristöominaisuuksilla yksi vai useampia ulottuvuuksia, kuinka tärkeitä nämä ovat ja mikä on ympäristöominaisuuksien asema muihin tuoteominaisuuksiin verrattuna. Tutkimusaineisto muodostuu 40 brittiläisen puu- ja rakennusmateriaaleja myyvän yrityksen haastattelusta. Tulokset osoittavat, että kestävä metsätalous ja muiden ympäristöasioiden lisäksi tuotteiden terveysvaikutuksilla on myös suuri merkitys. Ympäristölaatu on moniulotteinen asia ja on voimakkaasti sidoksissa asiasta saatavaan informaatioon. Puutuotteita valmistavien yritysten onkin tärkeää lisätä tuotteisiinsa ympäristöasioista kertovaa yksityiskohtaista informaatiota. Tämä on erityisen tärkeää mikäli puutuotteita valmistava yritys haluaa erottautua kilpailijoistaan tuotteensa ympäristöystävällisyydellä.

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## **EXECUTIVE SUMMARY**

Environmental questions have long been linked to forestry and forest industry products. United Kingdom may be considered as one of the most environmentally sensitive areas in Europe. The UK is also a major net importer of wood products, and therefore provides an interesting market for studying the importance of environmental issues related to the quality of wood products.

The closest markets for forest industries exporting their products to the UK are the intermediary channel members. Consequently, this study focuses on the marketing channel members trading wood products.

This paper explores whether environmental product attributes create one or several dimensions in the case of wood products. The importance of these dimensions and how environmental quality relates to other product quality dimensions from customer perspective are also studied. The empirical data was collected by face-to-face interviews in 2004 and they reflect the perceptions of forty UK-based companies trading wood and other building materials.

According to the study, environmental quality contributes to the total product quality perceived by customers of the forest industry. Perceived environmental quality comprises traditional ecological issues, such as sustainability of forestry and recycling, but also health and social responsibility concern. Wood product traders assume that sustainability of forestry is the most important environmental characteristics of wood products to their own customers. This may explain the large emphasis placed on forest certification in the UK lately.

The study suggests also that environmental quality is multi-dimensional, and an information-related matter from the customer perspective. It is perceived as being related more clearly to supplier and product information than to the physical good. This may result from the fact that environmental quality is difficult to evaluate without information. Customers may also have little experience in evaluating environmental quality and they need training for it.

Environmental labels are considered efficient in communicating environmental quality to markets. For wood product manufacturers, the results emphasize the importance of facilitating the products with detailed environmental information complementing the labels. This is particularly important, if environmental product quality is intended to differentiate the product in the market place.

## TIIVISTELMÄ

Ympäristöasiat on liitetty jo pitkään metsätalouteen ja metsäteollisuustuotteiden markkinoihin. Iso-Britannia on puutuotteiden merkittävä nettotuoja ja myös yksi ympäristöasioihin herkimmin reagoivista alueista Euroopassa. Siten se on mielenkiintoinen markkina-alue, kun ympäristöominaisuuksien tärkeyttä puutuotteiden laadun osana halutaan selvittää.

Toimitusketjun välijäsenet muodostavat ne markkinat, jotka ovat lähimpänä puutuotteita Iso-Britanniaan vieviä metsäteollisuusyrityksiä. Tässä selvityksessä keskitytäänkin puutuotteita myyviin toimitusketjun jäseniin.

Tutkimuksessa selvitetään, onko puutuotteen ympäristöominaisuuksilla yksi vai useampia ulottuvuuksia ja kuinka tärkeitä nämä ulottuvuudet ovat. Lisäksi tutkimuksessa selvitetään asiakkaan näkökulmasta, mikä merkitys tuotteen ympäristöominaisuuksilla on tuotteen kokonaislaadussa. Empiirinen aineisto kerättiin henkilökohtaisin haastatteluin Iso-Britanniassa vuonna 2004. Aineistossa on edustettuna kaikkiaan 40 puuta ja muita rakennusmateriaaleja myyvää yritystä.

Tulosten mukaan metsäteollisuustuotteita ostavat asiakasyritykset liittävät ympäristökijät osaksi tuotteen kokonaislaatua. Tuotteen ympäristölaatu muodostuu perinteisistä ympäristöominaisuuksista kuten kestävästi tuotetusta raaka-aineesta ja kierrätettävyydestä. Tämän lisäksi tuotteiden terveysvaikutuksilla ja sosiaalisella vastuulla on suuri merkitys ympäristölaadun osana. Puutuotteiden myyjät arvelevat, että heidän asiakkaansa pitävät metsätalouden kestävyttä kaikkein tärkeimpänä puutuotteiden ympäristöystävällisyyteen liittyvänä ominaisuutena. Tämä saattaa selittää sen, miksi Iso-Britanniassa on viime vuosina vaadittu voimakkaasti metsien sertifiointia.

Tulokset viittaavat myös siihen, että ympäristölaatu on moniulotteinen ja vahvasti sidoksissa siitä saatavaan informaatioon. Ympäristölaadun katsotaan liittyvän ensisijaisesti tavaran toimittajaan sekä tuoteinformaatioon ja vähemmän itse tuotteeseen. Tausalla saattaa vaikuttaa se, että ympäristölaadua on vaikea arvioida ilman informaatiota. Asiakkailta saattaa lisäksi olla hyvin vähän kokemusta ympäristölaadun arvioinnista. Tämän vuoksi heillä on mahdollisesti myös tarvetta saada koulutusta tällaiseen arviointiin.

Ympäristömerkkejä pidetään tehokkaana tapana kertoa ympäristölaadusta markkinoilla. Lisäksi puutuotteita valmistavien yritysten on tärkeää toimittaa tuotteidensa mukana niiden ympäristöominaisuuksista kertovaa yksityiskohtaista informaatiota. Tämä on erityisen tärkeää silloin, kun puutuotteita valmistava yritys haluaa erottautua kilpailijoistaan ympäristöystävällisyydellä.

# **1. INTRODUCTION**

## **1.1. Background and Purpose**

Concern over the environment increased among consumers particularly during the 1990s, even though environmental considerations have been of interest to society for decades or even longer (Bhate & Lawler 1997). With regard to forestry, substantial attention was initially paid to the depletion of tropical rainforests, but the concern has since spread to forests in general (Kärnä 2003). Issues such as recycling and waste management have been addressed, as well as pollution and the chemical load from forest industry processes on the environment (Handfield et al. 1997, Lambert 1996). In addition to consumer demands, regulation by society has also driven forest industry towards emphasizing environment in business development (Handfield et al. 1996).

Wood products are physical goods. Even though the features of physical goods are usually the ones fulfilling the basic needs of customers in case of tangible products, the related services and their quality, as well as price, together form the holistic offering (or the total product), which fulfils the manifold needs and wants of customers (Kotler & Keller 2005 p. 372-373). Therefore, product quality is also judged with reference to all aspects of the total offering. However, price is seen being rather a cue or result of total quality than a part of quality itself. Environmental performance can be considered as being among the aspects contributing to total product quality (Anderson et al. 2002, Toivonen & Hansen 2003, Vlosky et al. 1999).

Product quality may be defined from several viewpoints. It can be seen as objective quality, based on standardised measurements, or as perceived quality, based for example on customer judgement. A number of authors argue that quality should be assessed particularly from the customer or stakeholder perspective if the aim is to improve market success, since customer judgement of quality is critical in buying decisions (Curkovic et al. 2000, Garwin 1987, Kotler & Keller 2005, Shetty 1987, Zairi 2002). This approach is also adopted in this study.

Environmental awareness has been assumed to be strong in Europe, particularly regarding forest certification, and the United Kingdom may be considered as one of the most environmentally sensitive areas in Europe in this respect (Anderson et al. 2002). The UK is a major net importer of wood products, and therefore provides an interesting market for studying the importance of environmental issues related to the quality of wood products. The closest markets for forest industries exporting their products to the UK are the intermediary marketing channel members, i.e. organisational customers trading in wood products, and this market is the focus here. In other words, the marketing

channel members trading in wood products are determined as customers for wood industry in this paper, and their perceptions about quality of wood products are studied.

*The purpose of this study is to explore which characteristics environmental quality comprises in the case of wood products, and how important environmental quality is from the customer viewpoint.* The empirical analysis focuses on companies trading wood and other building materials on the British markets (the UK markets). The analysis addresses three specific research questions:

- 1) *Which attributes the environmental quality of wood products comprises from the perspective of retailer/wholesale companies?*
- 2) *How is the environmental quality related to other quality aspects of wood products from the customer perspective?*
- 3) *Do British retailer/wholesale companies differ with regard to how they emphasise the importance of environmental quality, and is there a connection with the demands of their own customers?*
- 4) *Which means are considered as the most efficient in informing the UK end-users about environmental product quality?*

## **1.2. Literature review**

### **1.2.1. Product concept**

Applying Kotler's well-known definition (Kotler and Keller 2005, p. 372), a product is anything that can be offered to a market to satisfy a customer's want or need. The customer will judge the product based on the tangible good and its quality, but also based on services and service equality, and price. Traditionally, a product has been visualized as a molecular offering, which includes the core (or generic) product. This is augmented by tangible and intangible attributes and described accordingly as developing through various stages towards a potential product, which includes even the potential and latent wants of customers (also: Levitt 1980).

Saren and Tzokas (1998) argue that the "total product" is an outcome of a signification process between the producer, the buyer and the physical or immaterial product. The benefits and characteristics of the product to the buyer are at least partly related to the relationship the buyer has both with the "object or good" and with the supplier company, i.e. what meaning or signification the customer associates with the product and producer. The supplier characteristics, such as credibility and service capability, and supplier image become a part of the total offering.

The view of a product providing benefits and advantages to the user can be classified as closer to utilitarian. Another view would be to emphasise products as having symbolic values to customers (Lautamäki 2000), an approach that is also visible in the discussion by Saren and Tzokas. This view puts the product's meaning in expressing abstract subjective and personal values of customers in focus, and thus emphasises even more strongly the need to analyse the product from the customer perspective. Utilitarian and symbolic product definitions do not need to be understood as distinct alternatives, but rather a continuum (Lautamäki 2000, p. 43).

Were the product definition more utilitarian or symbolic, from the customer perspective the "total" product could be defined as including the material and intangible characteristics of the "object" or product, services and information related to it, and all other characteristics related to the supplier, production and delivery processes. Saren and Tzokas (1998) argue that on consumer markets, the functional use of the product may become even less important than the symbolic or cultural meaning the product represents to customers. On industrial markets, supplier characteristics may be equally or even more important than product performance.

In this study, the product concept from customer perspective is understood to include the physical good, producer characteristics and behaviour and services, including the intangible meanings that the buyer relates to the product. This view of a product may be understood as being between utilitarian and symbolic, but closer to utilitarian, because we analyse organisational markets and relatively concrete products with a clearly utilitarian "nature", such as sawn wood and flooring materials. Therefore, we also use rather sensorial attributes in operationalizing product quality. However, environmental and ethical product characteristics may emphasise the product's meaning in carrying values important to customers, such as choosing an ecological and ethical way of life. Overall, symbolic meanings may also be increasingly important on building materials, furniture and other similar product markets.

### ***1.2.2. Product quality***

Total quality management is an approach to continuously improve the quality of all of an organisation's processes, products and services (e.g. Curkovic et al. 2000). Product quality is related to the product concept. However, there are several approaches to determine quality, which do not necessarily depend on how the product is defined. The transcendent view claims that quality is absolute, and can be only identified through holistic experience and evaluation. An opposite approach assumes that product quality can be measured as a weighted sum of the amounts of the desired attributes.

The engineering or manufacturing based definition equates quality with conformance with pre-set specifications. This is the basis for most certification schemes, including

also at least some of the forest certification systems. Standards for checking manufacturing quality in factories are based on this approach. An opposing approach is the user/customer based view, where quality is defined based on how it meets customer needs. A value-based approach can be either customer- or manufacturing-oriented, but it combines the product performance and price or production costs. For example, Kotler and Keller (2005, p. 147) emphasise that total quality is a key to value creation and customer satisfaction.

Perceived product quality is often defined as multidimensional (Garwin 1984 and 1987, Madu et al. 1996, Curkovic et al. 2000, Vickery et al. 1997). According to the approach originally outlined by Garwin (1984, 1987), product quality comprises such aspects as the durability and performance of the physical product, its appearance and features, services, conformance, reliability and finally the perceived quality (also: Brucks et al. 2000). These descriptions have served as basis for abundant later research. Madu et al. (1996) have suggested a different classification of three quality dimensions comprising customer and employee satisfaction and service quality.

Empirical research has confirmed the multidimensionality of quality to some degree, including the case of wood products (e.g. Curkovic et al. 2000, Hansen and Bush 1999, Pakarinen 1998, Toivonen and Hansen 2003). The quality dimensions or attributes of wood products resulting from empirical research have included such issues as supplier characteristics and behaviour, services, delivery, tailoring or customizing products, product performance/characteristics, packaging, appearance and safety (e.g. Anderson et al. 2002, Hansen & Bush 1996 and 1999, Pakarinen 1988, Toivonen & Hansen 2003, Vickery et al. 1994).

In this study the approach to product quality is the customer's perception. It is assumed that product quality is manifested in various attributes commonly applied in earlier research, which may reflect broader and more abstract quality dimensions. Overall, the approach to total quality in this study has its roots in early work of Garwin, and its later traditional applications augmented with environmental quality and emphasising information. Customer satisfaction is seen as a result of quality rather than part of quality (Madu et al. 1996). Employer satisfaction is excluded totally from the definition of quality in this study.

### ***1.2.3. Environmental product quality***

Samdahl and Robertson (1989) argue that environmental concern itself is a multidimensional matter. Some studies have investigated whether, in case of wood products, environmental quality is uni- or multidimensional from the customer perspective. Anderson et al. (2002) defined a five-dimension model for wood product quality, where they determined one dimension as being environmental quality. However, they did not test the

dimensionality or how environmental attributes were related to other product quality attributes. Anyhow, the empirical result was that environmental dimension was less important than other dimensions of quality.

Pakarinen (1998) analysed end-consumers' perceptions related to wooden furniture. He observed an environmental dimension but without a clear correlation with other product attributes. Pakarinen and Asikainen (2001) used later the same data but different variables and they performed the analysis separately in the case of solid wood furniture and upholstery furniture. They observed some linkages between environmental attributes and other product attributes, particularly finishing. In the case of solid wood furniture, environmental attributes and social issues were also related.

Environmental attributes and other product quality attributes have also been analyzed in various ways several other studies focusing wood material or wood products (e.g. Bigsby & Ozanne 2002, Toivonen & Hansen 2003; Toivonen et al. 2005, Wagner & Hansen 2004b and b). Empirical studies have not, however, provided a uniform and clear indication of the existence of a particular environmental quality dimension in the case of wood products, or how this is related to other quality issues. It also still remains unclear whether environmental quality is a uni- or multidimensional construct.

#### ***1.2.4. Operationalizing the concept of environmental quality***

Traditionally, environmental issues have been understood as referring to ecological aspects in forestry and forest industry and the related research: In the case of wood products, attributes have been addressed such as sustainability (of forestry), the origin and type of wood material (e.g. whether tropical or not tropical, from plantations or rain forests, domestic or imported), harvesting practices, emissions, waste management, and recycling (Bigsby & Ozanne 2002, Grönroos & Bowyer 1999, Kozak et al. 2004).

The concept of sustainability has gained significant attention. The issue of forest/environmental certification manifesting the sustainability of forest management has particularly been addressed in a large number of studies in various ways (e.g., Bigsby & Ozanne 2002, Hansmann et al. 2004, Humphries et al. 2001, Hubbard & Bowe 2005, Kozak et al. 2004, Kärnä et al. 2003, Ozanne & Smith 1998, Ozanne & Vlosky 2003, Ruddell & Stevens 1998, Vlosky & Ozanne 1997, Vlosky et al. 1999).

The practical contents of environmental quality may also be approached through the aspects pointed out in advertising. Wagner and Hansen (2002) analysed the contents of environmental advertising in relation to wood products in the US between 1995-2000 (see also Kärnä et al. 2001). They revealed that major issues addressed in the ads often included the raw material (wood), fairly often the production processes, and sometimes consumption/disposal (recycling) issues. Packaging was also mentioned, but more

rarely. The authors concluded that the ultimate driving forces in the background of the advertisements were commonly planet preservation, i.e., ecological concerns, and sometimes animal and personal health.

It has been argued that health issues or more generally impacts on personal physical well-being are becoming increasingly important for consumers, and thus in the marketing of products (e.g. Lambert 1996). Safety in general or safety to health have been used in operationalizing the quality of wood products and furniture in some studies (Järvinen et al. 2001, Pakarinen 1998, Toivonen & Hansen 2003). Such matters as outdoor and indoor air quality, which are related to volatile compound effects and surface treatments of wood, are interesting both from health and ecological/environmental points of view (Lambert 1996). These, among others, have also become issues in the wood and building industry (Grönroos & Bowyer 1999; Handfield et al. 1997).

A need to broaden the concept of environmental quality and its operationalization has also risen due to the growing interest towards social issues in addition to ecological matters (Lambert, 1996). For example, O'Brien and Teisl (2004) included worker's rights in the set of attributes describing environmental labelling related to forest industry products, and noticed this as being more important to U.S. consumers than many of the ecological attributes they had listed, including no clear-cutting.

In summary, empirical research does not yet provide a precise set of attributes to operationalize the environmental quality of wood products. However, it seems that traditional issues, such as sustainability, emissions and impacts from processes and recycling need to be complemented with health and social concerns.

### ***1.2.5. Incorporating environmental quality in marketing planning***

Even though environmental awareness has increased in society in general, certain consumer segments are particularly concerned about the environment. This also concerns the end-consumer and intermediary customer markets for forest products (Bhate & Lawler 1997; Bigsby & Ozanne 2002; Grönroos & Bowyer 1999; Ozanne & Smith 1998; Pakarinen & Asikainen 2001; Samdahl & Robertson 1989).

A positive association has been observed between consumers' ecological orientation and their intentions of buying environmentally labelled products (Hansmann et al. 2004; Ozanne & Smith 1998). Not only end-consumers but also intermediary customers trading wood products can be assumed to differ with regard to their concern over environmental product quality. The environmentally oriented customers may seek to fulfil the needs and preferences of their own customers. Intermediary customers may also themselves pursue values that are reflected in emphasis over environmental product characteristics (Bhate & Lawler 1997; Humphries et al. 2001). Therefore, these companies

may choose to trade environmentally high quality products and even pay a price premium for these, even if a respective premium is not available on end-user markets (Humphries et al. 2001). Companies may also choose to emphasise environmental labelling under the pressure of environmental groups (Anderson and Hansen 2004).

The most common assumption in the literature seems to be that consumers are interested in environmentally friendly products merely or mainly because of their concern about the environment in ecological or societal terms. However, consumer motives and behaviour related to the environment and product choices may not yet be fully understood (e.g. Anderson and Hansen 2004). In other words, consumers may buy “green” products in order to improve their personal lives in terms of health and personal well-being instead of wanting primarily to preserve nature (Lambert 1996). Generally speaking, one motive to pay a higher price for a product might be an attempt to ensure overall high product quality (Rao & Bergen 1992: discussion); price could then be used as an indicator of total product quality. An interesting idea to test would be to analyze whether environmental quality and/or a related higher price are used as a cue of overall product quality. However, this is outside the scope of this study.

Environmental product quality and the related behaviour of a producer company nevertheless provides a basis for customer segmentation, and may thus create marketing opportunities and even competitive advantage to suppliers performing strongly on the issue (Bigsby & Ozanne 2002, Zairi 2002, Porter & van der Linde 1995). Kotler and Keller (2005, pp. 16-22) call for a “societal marketing concept” to incorporate societal and ethical considerations in marketing planning and practices. This includes environmental considerations. Pursuing societal marketing may be finally manifested in the purchasing decisions of socially and environmentally oriented consumer segments. Environmental motivations should also be reflected in the willingness to pay for environmental quality, at least among the most interested consumer segments (Vlosky et al. 1999).

In the case of the forest industry, Handfield et al. (1996 p. 269) describes the evolution in business strategies incorporating environmental issues as a change from resistant adaptation to proactive assessment of market/customer needs. Proactive companies consider environmental issues to be a part of their total quality management, and aim at meeting customer needs as well as possible with regard to environmental quality.

Despite the potential for competitive advantage and economic benefits that environmental quality is argued to have, scepticism also exists (Irland 2002, Anderson et al. 2002). A true proactive strategy was uncommon in the U.S. forest industry in the mid-1990s (Handfield et al. 1996). In Europe, the forest industry may see social and environmental concerns and responsibilities more as a necessity for survival than as a source of competitive advantage (e.g. Kärnä 2003).

Behind the cautiousness in the forest industry may be the fact that the environment is not usually the most critical criterion for wood products from buyer or designer perspective (Anderson et al. 2005, Anderson et al. 2002, Kozak et al. 2004, Pakarinen & Asikainen 2001, Wagner & Hansen 2004a and b). For most buyers, other quality issues, such as performance of the physical product and supplier reliability, are more important. This regards both the forest industry's intermediary customers and consumers (Anderson et al. 2002, Kärnä 2003; Lambert 1996; Järvinen et al. 2001, Pakarinen & Asikainen 1998).

Another reason supporting the scepticism may be that research does not provide a uniform but instead a rather confusing picture of the potential size of markets for environmentally highly qualified products, or what kind of price premium if any would be available (Anderson & Hansen 2004, Bhate & Lawler 1997, Grönroos & Bowyer 1999). In the light of past research, developing substantial markets for certified forest products is not easy (see Kärnä 2003 p. 5), at least if these should be based on a clear price premium (e.g. Humphreys et al. 2002, Anderson et al. 2005, Anderson and Hansen 2004).

In contrast, a number of studies indicate that in the U.S. there would be a fairly high willingness to pay a premium for environmentally certified forest products, although the observed share of interested consumers has varied considerably between studies (Anderson and Hansen 2004; O'Brien & Teisl 2004; Ozanne & Smith 1998; Ozanne & Vlosky 1998 and 2003). However, research has not verified the true willingness to pay in real buying situations except in a few studies, and these examples do not indicate a high actual willingness to pay a premium for certified wood products in real choice situations among end-consumers (Anderson and Hansen 2004, Anderson et al. 2005). Thus, the link between environmental concern and willingness to pay for environmental quality may not be straightforward (Humphries et al. 2001), and it may be even fairly vague (Anderson et al. 2005, Grönroos & Bowyer 1997). One reason may be missing or too narrow information about the environmental characteristics of the product (Ehrich & Irwin 2005; O'Brien & Teisl 2004), or simply the inverse relation between price and willingness-to-buy (Anderson et al. 2005).

In any case, environmental quality may provide other benefits than price premiums. Handfield et al. (1997) actually argued that gaining market shares among environmentally concerned consumers is the only long-term advantage of environmental orientation: "Green" price premiums disappear if environmental performance becomes a commonly followed strategy in the forest industry. Porter and van der Linde (1995) instead emphasise the potential efficiency gains through integrating sustainability into company operations, and increased innovativeness forced by society regulations.

### ***1.2.6. Communicating environmental quality at the marketplace***

If environmental quality is a cornerstone of marketing planning, and it is aimed to contribute to improved company performance and competitive advantage, then customers need to be aware of the environmental performance of products (Ehrich & Irwin 2005). However, environmental quality or other ethical attributes cannot be easily observed from the physical product (Ehrich & Irwin 2005, Vlosky et al. 1999). Therefore, the availability and credibility of information are key issues if environmental aspects are to create a competitive advantage (Barney and Hansen 1994; Hansmann et al. 2004; O'Brien & Teisl 2004). In other words, information is a necessary tool in realising the profits from investments in environmental quality (Ehrich & Irwin 2005; Lambert 1996, Wagner & Hansen 2004a).

A sufficient availability of information may activate the buying decisions of at least the most environmentally concerned consumers (Ehrich & Irwin 2005). Hansmann et al. (2004) showed that increased availability of information about environmental attributes increased the willingness to buy the products. Availability of information may be also connected to the degree of consumers' willingness to pay for environmental product quality (O'Brien & Teisl 2004, Teisl 2003).

Eco-labels are commonly argued as being a simple and thus efficient way of manifesting the environmental quality of products. A background assumption has been that consumers are confused if they are offered a large set of information. However, the literature provides somewhat contradicting conclusions on these arguments. Hansmann et al. (2004) emphasise that a precondition for reasonable preference for environmentally labelled wood products is that consumers know about the label's criteria. If consumers do not understand the meaning of these, then a simple label may be even misleading (Teisl 2003).

Many individuals are probably not truly familiar with the criteria and attributes on which various eco-labels are based (Anderson et al. 2005). Therefore, simple labels may not be effective or sufficient in informing consumers about environmental quality. The communication of the label's standards and underlying values is thus necessary for its effectiveness at the market place. Availability of information also reduces the potential bias that may result if consumers know one label better than another (Teisl 2003).

If information about environmental quality is not available, this may confuse customers and arouse suspicion (Bhate & Lawler 1997) or stress (Ehrich & Irwin 2005) among consumers. The more detailed the available information is, the more credible is the environmental quality it manifests from the customer perspective (Teisl 2003). Therefore, easy availability and objectivity of information play a role in how consumers rank the environmental performance of a product (O'Brien & Teisl 2004), or how they use envi-

ronmental performance as buying criterion (Ehrich & Irwin 2005). Availability of detailed environmental information is important also for business-to-business customers, since they need to be able to deliver the information to their own clients, including end-consumers.

In summary, the ample availability of research related to environmental issues and forest products does not yet provide a deep and uniform understanding of what environmental quality of forest products is from the customer standpoint, and how it actually contributes to forest industry competitiveness or market success. This requires understanding of what environmental quality actually refers to from the customer viewpoint, properly identifying the different customer segments with regard to environmental orientation, and finding out how to communicate efficiently the relatively abstract environmental quality to customers.

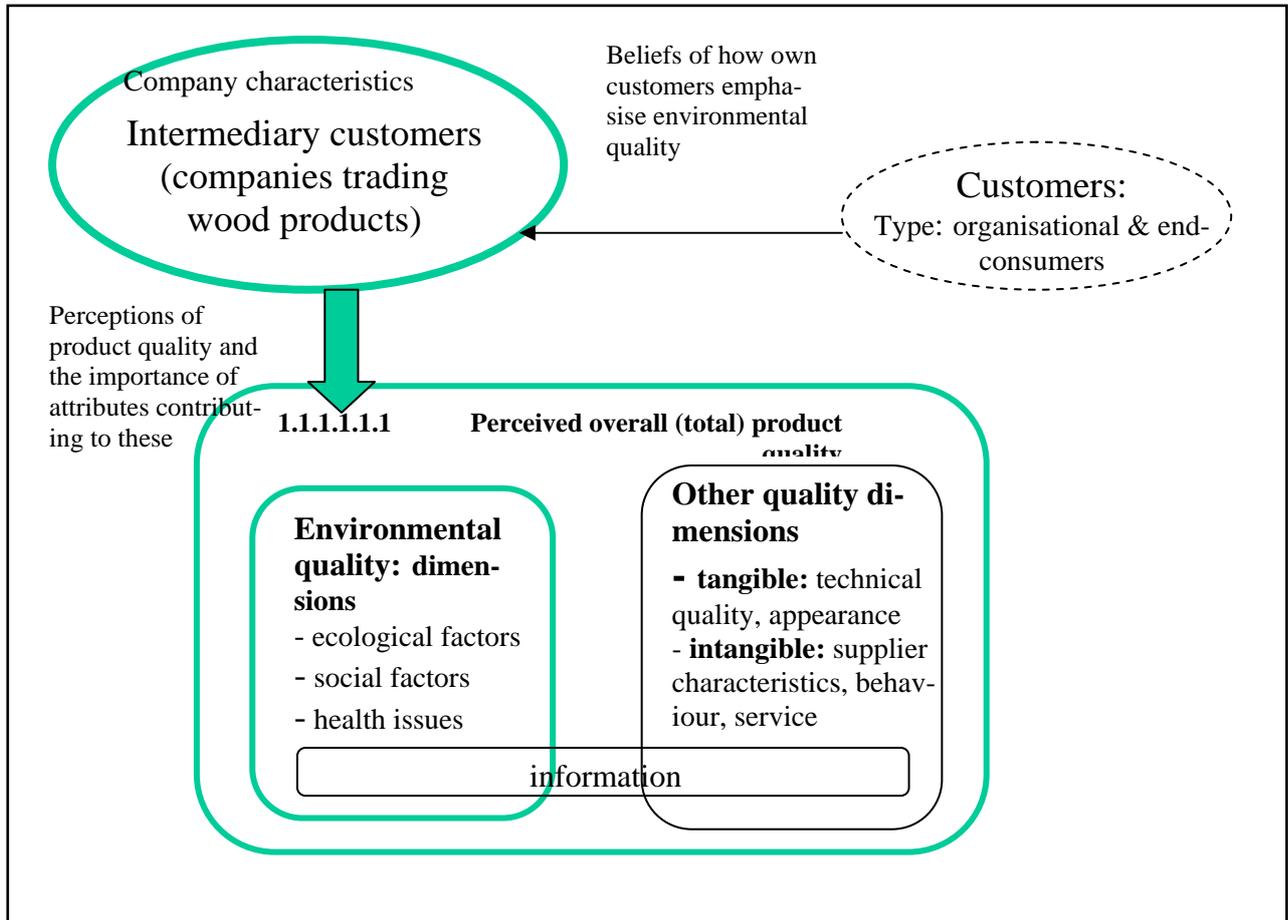
### ***1.2.7. A priori assumptions based on the literature***

Even though this study is explorative by nature, a few a-priori assumptions were drawn from the existing literature, and these were analysed in the empirical study. However, the assumptions were not such that these could be tested statistically with a precise hypothesis and its counter-hypothesis ( $H_0$ - $H_1$ ). Instead, the following broader assumptions were used to guide the explorative data analysis:

- 1. Environmental quality of wood products, as perceived by customer companies, is a multidimensional concept*
- 2. Different segments exist among the UK wood trading companies with regard to their emphasis on environmental product quality*
- 3. Emphasis on environmental product quality among the wood product trading companies is related to the degree of environmental interest among the customers of these companies (as assessed by the companies themselves)*
- 4. Environmental quality is related to (environmental) product information*
- 5. Environmental quality is positively related to overall product quality*

The a priori assumptions are visually characterized in the framework guiding the empirical part of the study (Figure 1). The main assumptions are that the organisational customers trading wood products differ based on their perceptions about the importance of environmental product quality, which creates possibilities to market segmentation. The differences between the UK companies are assumed originating from the background of these companies, such as the type of business and how the companies assume their own customers to appreciate environmental product quality. In addition, it is hypothesized that environmental product quality is a broad concept comprising social and health concerns in addition to pure ecological impacts. Furthermore, environmental quality is manifested, from customer perspective, in product information. Product information (availability, coverage etc.) is determined being one element contributing or

total product quality. The more detailed operationalization of the framework is presented in Table 13 (Appendix).



**Figure 1.** *The framework guiding the conduct of the empirical part of the study.*

## 2. MATERIALS AND METHODS

The targeted population of the study consists of all building material traders and DIY-chains in the UK (Britain). Comprehensive statistics on the number of these companies or about the value of the market were not available. Thus, the target companies for this study were selected from two lists of companies, i.e., from the contact lists of Finpro, which is a Finnish sales promotion organisation owned by Finnish industry, and from the member list of BMF (Builders Merchant Federation in the UK). Finpro's list included 55 companies, and that of BMF 325 companies. After investigating the www-pages of all these companies, only those trading wood products were selected as the final population, which was then 195 companies.

The empirical data for the study was collected through personal interviews and using a structured questionnaire during 2004. These companies were approached by sending a letter explaining the objective of the study, and asking for a possibility to interview the person in charge of purchasing products. After sending the letter, the companies were contacted by telephone or e-mail. Forty companies agreed to be interviewed (21%). Refusals were based on too busy a schedule. Test interviews were made among 12 companies in 2003, which resulted in some minor modifications to the questionnaire. Test cases are not included in the results of this paper. The large non-response proportion of the sample is marked as a potential source of bias. However, this was not analysed due to the reluctance of the companies to invest time in the study.

### 2.1.1. Operationalizations

The product quality attributes were operationalized to measurable questions so that these allowed comparisons with similar data collected earlier from Germany (Järvinen et al. 2001). The operationalizations are presented in detail in Table 13 (Appendix). Environmental quality was operationalized based on attributes used or mentioned in earlier studies (previous chapter). Perceptions were measured both about the companies assumed that their own customers emphasise environmental product attributes, and how the companies themselves emphasise environmental quality when choosing wood products to their product assortment. All the quality-related attributes were measured using a 5-step semantic scale (Likert-type of scale), and assuming equal distances between alternatives, which was explained to the interviewed persons.

The company background was described through company turnover, the share of wood products and the type of products traded. The perceptions of the respondent companies about their own customers' interest in the environmental quality of wood products was clarified by asking about how large proportion of customers showed interest in environmental issues when making purchasing decisions, and how large proportion of cus-

tomers would be (assumably) willing to pay a green price premium of various sizes (0%, 1-5%, 6-10%, 11-20%, 21-30%, over 30%).

### **2.1.2. Methods**

Using statistical analyses provides better possibilities to analyse the data collected with structured questionnaires than qualitative analysis. Hence, statistical methods of analysis were applied, but the results need to be treated with caution due to small number of observations (Hair et al. 1995), and should be seen as indicative. The study was preliminary in nature, and further research is in any case needed to validate the findings.

Factor analysis was used to examine the dimensionality of product quality attributes. Varimax rotation was performed in each analysis, since the objective was to identify dimensions as different (non-correlating) as possible. Variables with a communality of at least 0.2 were included in the analyses. The rule of thumb used in interpreting the factors was that variables were removed from the solution if these did not load on any factor by at least 0.4. In some cases, however, variables with a loading a little below 0.4 were included if these were logical for interpretation and in accordance with background assumptions.

The suitability of factor analysis for the data set was analysed with Bartlett's test for sphericity, testing whether the variables included in the analysis were correlated enough to make the use of factor analysis feasible. The internal reliability of the resulting dimensions was studied using Cronbach's alpha coefficient for internal consistency of scale. Values of 0.6 or higher were considered as indicating sufficient scale consistency (e.g. Desphande 1982, reported in Hair et al. 1995).

The factor-score variables representing each respondent's relationship to various quality dimensions were calculated with a regression method. All variables with their loadings on the particular dimension were used in producing the factor scores, even though variables with low loading were excluded from the interpretation.

Perceptions of product quality among different respondent groups were explored using clustering analysis (k-means clustering). Differences between company groups (profile of different groups) were tested using ANOVA (F-test) for continuous variables. Cross-tabulations and Pearson's chi-squared tests were performed for dichotomous variables. For all statistical tests, except Cronbach's alpha, an untraditionally high p-value of 0.10 was considered as the criterion for significance due to the small data. In a pilot study this was regarded as justifiable, since an important aim was to reveal new information rather than test hypotheses based on observations in previous research.

### 3. RESULTS

#### 3.1. The respondent companies

Wood played an important role in the business of the studied companies: 61% of the companies/business units analyzed received over 50% of their total turnover from wood products. Two companies did not provide information about the share of wood products in their total turnover. On average, the annual turnover of interviewed companies was 242 million pounds (£), the range between the smallest and largest being from 3.4 million to about 1,600 million pounds (£). The average wood product sales value was 72.8 million pounds (range 3.4-400). The share of wood in the total value of sales varied from 4 per cent to 100 per cent, the average being 67 per cent.

The 40 respondent companies were classified into three groups based on their type of business (average turnover/average wood product turnover/average share of wood in the total turnover %):

1	Wood product traders	(17)	(53.9£/52.8£/99%)
2	Construction material retailers	(13)	(203.2£/87.4£/48%)
3	Do-It-Yourself (DIY) companies	(10)	(601.9£/90.7£/32%)

Wood products are, logically, the most important product group for companies classified as “wood product traders”. With an average share of little less than half of the turnover, wood products also constitute an important product group for companies classified as “construction material retailers”. “DIY companies” receive about one third of their sales value from wood products. From here onwards, all the respondent companies/business units will be referred as “companies”.

**Table 1.** *Relationship between the type of company and importance of wood products in business*

	The share of wood products in the total annual turnover		
	≤50%	>50%	Total % (no)
Wood product traders	0	<b>100</b>	100 (17)
Construction material retailers	<b>64</b>	36	100 (13)
DIY companies	<b>80</b>	20	100 (10)
Total % (no)	40	60	100 ( <b>38</b> )

$X^2=0.000$ , 2 cells count less than 5 observations

DIY companies and construction material retailers were about equally large traders of wood products based on the average value of wood product sales per company. An average company in both groups sold annually almost double the average value of wood product sales of wood product traders.

**Table 2.** *Turnover in different types of companies.*

Company groups	Turnover Groups of Respondent Companies/BUs			Total % (no)
	< 50 mill. £ Small (%)	50-100 mill. £ Average (%)	>100 mill £ Large (%)	
Wood product traders	<b>53</b>	35	12	100 (17)
Construction material retailers	<b>54</b>	8	38	100 (13)
DIY companies	20	20	<b>60</b>	100 (10)
Total % (no)	45 (18)	23 (9)	32 (13)	100 (40)

$X^2=0.059$ , 6 cells count less than five observations

Construction material retailers can be described as being in between wood product traders and DIY companies. Construction material retailers are, on average, larger companies than wood product traders but smaller than DIY companies. Construction material retailers concentrate relatively more on wood products than DIY companies but less than wood product traders. Overall, the classification of construction material retailers and DIY chains must be regarded as somewhat artificial. In some aspects wood product traders and construction material retailers are fairly close to each other and differ from the DIY group in a similar way.

The product range differed between the different types of companies: For wood product traders and construction material retailers, at least half of all wood product sales were based on sawn timber. For DIY companies, sawn timber made up less than one third of the wood product sales value, and further processed wood products were clearly more important trading articles.

The three company groups also differed with regard to their most important customer groups. Generally, wood product traders concentrate on serving industries that processes wood further and merchants. Of the 17 wood product traders, 15 (88%) defined further processing companies and merchants as their most important customer group. Construction material retailers defined building and construction companies as their most important customer group (11 out of 13 companies), while DIY companies defined private consumers and the building sector as their most important customer groups. For most of the companies, the most important customer groups were other organisations. Few companies named private consumers as their most important customer group.

The differences between company types and most important customer groups were statistically significant in cross-tabulations. The wood product share and turnover are significantly related to the company type. Therefore, these variables were also linked to the most important customer groups (cross-tabulations not reported).

### 3.2. Interest in environmental issues

The companies estimated that interest in environmental issues was small or modest among their own customers: Approximately one fifth of the customers (21%) were assumed to be at all interested in environmental issues when buying products. The median value was even clearly smaller: half of companies assumed that the proportion of environmentally-interested customers was at most 10%. Two thirds of the companies (68%) assumed that the proportion of interested customers is below 20%, and only 15% (6 companies) expected that the proportion would be over 40%. DIY companies estimated that their customers were most often interested in environmental issues (Table 3).

**Table 3.** *Interest towards environmental quality among the customers of the companies trading wood products*

Company type	Customers interested in the environment, % of all companies		
	At most 10%	Over 10%	Total, % (no)
Wood product traders & Construction material retailers	<b>60%</b>	40%	100% (30)
DIY companies	30 %	<b>70%</b>	100% (10)
Total % (no)	<b>53%</b> (21)	47% (12)	100% (40)

X<sup>2</sup>=0.100, 1 cell count less than 5 observations

The companies assumed that the proportion of customers who would pay a price premium for “green” products was clearly smaller than the proportion of environmentally interested customers. A typical (mode-value 40% /16 companies) respondent company estimated that 1-5% of customers would be ready to pay a green price premium for environmental quality. Every fourth company (25%) assumed that none of their customers would be willing to pay any premium. DIY companies expected that their customers would more often pay a green price premium for environmentally friendly products than the other companies (Table 4).

The companies were also asked to describe hypothetically what kind of products would, according to their expectations and experiences, receive a green price premium. The named products were possible to be classified into two broad categories: 1) Tropical wood and products made out of tropical wood, and 2) joinery products including (garden) furniture. A few companies also thought that there is no wood product for which their customers would be willing to pay a green price premium. In sum, it seems that environmental quality is believed to matter most with regard to products made of tropical wood, or products that are purchased or at least often chosen by end-consumers. This result indicates that among the wood trading companies, perceptions about environmental issues may still be related to tropical wood. Thus non-tropical timber products may also be evaluated with criteria related to tropical forestry.

**Table 4.** *Expected customer willingness to pay a green price premium for wood products.*

Company type	Expected percentage of customers willing to pay a premium, share of companies (%)		
	0-5% of customers	> 5% of customers	Total, % (no of companies)
Wood product traders & Construction material retailers	73	27	100% (30)
DIY companies	40	60	100% (10)
	65% (26)	35% (14)	100% (40)

X<sup>2</sup>=0.056, 1 cell count less than 5 observations

### 3.3. Environmental quality and its importance

#### 3.3.1. Importance of environmental attributes

The environmental product quality was analysed using eight attributes. These measured how important the respondents assumed environmental issues being for their own customers (the attributes: respect to social aspects, safety of surface treatment, safety to health, environmental impacts of production processes, recyclable product, recyclable packaging materials, wood originates from sustainable managed forests, availability of information about environmental impacts and factors: a five-point interval scale from “very important” to “not important at all” (each alternative was assumed to be of an equal distance from each other). The companies ranked sustainability of forestry and health impacts on average as “important” for their own customers. Social responsibility of suppliers, impacts of production process on the environment, the availability of information about environmental factors and impacts, and recycling issues were regarded as moderately important (Table 5).

Factor analysis was applied to analyse how the attributes were related to each other, and whether these reflect any potential latent dimensions of environmental product quality. No a priori assumption determining the number of factors (dimensions) was applied. Alternative solutions of one, two and three factors were tried, and based on the eigenvalues of factors in different solutions, the two-factor solution was chosen as technically the best<sup>1</sup>.

The first dimension (factor) is characterised by social and health aspects, and environmental impacts including recycling. This factor is named “*Social and health impacts*”. The other dimension is dominated by the sustainability of forestry, but the availability of environmental information also becomes loaded fairly strongly on this dimension. The factor is named as “*Sustainability and environmental information*”. It is notable

<sup>1</sup> Recyclability of packages was closely and positively related to recyclability of the product. Therefore, the first of these two attributes was dropped from the final factor analysis in order to reduce the number of variables to be more suitable for the small data set. The interpretation of the results remained the same in both alternatives.

that environmental impacts from production are fragmented between the two factors. The regression method was applied to produce factor scores representing both dimensions for each observation.

**Table 5.** *Environmental quality dimensions resulting from factor analysis (Maximum Likelihood method with Varimax rotation)*

Variables	Average importance 1=very important, 5=not at all important, mean value (st.deviation)	Factor I “Social and health impacts”	Factor II “Sustainabil- ity and Infor- mation”	h <sup>2</sup>
Social aspects are respected	2.5 (0.8)	0.791	*	0.501
Safe surface treatment	2.3 (0.9)	0.759	*	0.479
Safe (for health)	2.3 (1.1)	0.660	*	0.380
Environmental impacts of production processes	2.7 (0.9)	0.475	0.410	0.449
The product is recyclable	2.8 (0.8)	0.412	*	0.233
Wood originates from forests man- aged in a sustainable way	1.7 (0.9)	*	0.999	0.532
Availability of information about environmental factors and impacts	2.7 (0.9)	*	0.594	0.423
Eigenvalue		2.047	1.581	
% of total variance		29.24%	22.58%	51.82%
Cronbach's alpha		0.764	0.744	
Bartlett's test p=0.000				
Loadings between +/-0.2 are marked with “**”				

The analysis shows that health and social issues are perceived as being related to traditional environmental issues. The results also suggest that environmental quality is a multi-dimensional construction. However, the factor solution had some weaknesses. The two factors capture 52% of the variance of the attributes, which indicates that some attributes related to environmental quality may be missing from the pre-defined variable set. A technical problem might also be the strong loading of the sustainability of forestry.

### 3.3.2. *Differences in perceptions about environmental quality*

Cluster analysis was used to investigate whether the companies can be allocated into several segments based on how environmental product quality is emphasised (k-means clustering). The analysis resulted in a two-cluster solution (Table 6). Companies in cluster one find both environmental quality dimensions less important for their own customers than companies in cluster two. Thus, the groups were named as “Less environmentally oriented - LESS” and “More environmentally oriented - MORE”. In practice, the clusters are interpreted to represent two customer company segments, of which an-

other perceives higher emphasis on environmental product quality on the markets than the other one.

**Table 6.** *Company clusters based on environmental quality dimensions (factor score variables)*

Factor score variables representing latent dimensions of environmental quality	Factor score centres for two company clusters		
	LESS environmentally oriented companies	MORE environmentally oriented companies	ANOVA (F-test) p value
Social and Health Impacts	0.3275	-0.2421	0.048
Sustainability and Environmental Information	0.8777	-0.6487	0.000
Number of companies (total 40)	17	23	

The background characteristics of the two segments were studied in order to produce information that would help to recognize more and less environmentally sensitive companies. However, no clear characterization was possible to produce: Cross-tabulations with company background characteristics did not result in any other statistically significant difference between the two clusters except company type: the DIY companies are more likely to belong to the more environmentally oriented segment than to the less environmentally oriented segment, whereas other companies belong equally often to both groups (Table 7). The DIY companies expect their own customers to emphasise environmental issues in buying decisions more often than other companies (Tables 3 and 4), which is logically reflected in these results.

**Table 7.** *Relationship between company type and the assumed emphasis on environmental product quality dimensions among the customers of the UK wood trading companies*

	Group: LESS environmentally oriented	Group: MORE environmentally oriented	Total, % (no)
Wood & Construction material traders, %	50	50	100 (30)
DIY companies, %	20	80	100 (10)
Total % (no)	43 (17)	57 (23)	100 (40)

$\chi^2$  p=0.097, one cell has less than 5 observations

### 3.4. Total product quality and environmental quality

Perceptions of the total product quality in the case of wood products (importance of attributes when choosing suppliers for wood products) were analysed using a pre-defined set of 19 variables measured with a five-step scale from very important to not important at all. This variable set was different from the one used to operationalize the contents and dimensionality of environmental quality. In this variable set environmental quality was referred to by only two variables.

Regarding general product quality, the reliability of the supplier was perceived to be the most important single attribute: it was ranked as very important. The technical quality

of physical products, easiness of contacting and fast deliveries as well as willingness to supply various sizes and quantities were also perceived as important. Environmental issues were also ranked as clearly important and being among the most important product characteristics, even though not quite as important as the previously mentioned attributes.

Importance of attributes contributing to total product quality (mean value, standard deviation):

- reliability of the supplier (1.3, 0.5)
- technical quality of physical products (1.6, 0.7)
- ease of contacting the supplier (1.7, 0.6)
- fast delivery schedules (1.8, 0.7)
- general customer orientation (described by willingness to supply various sizes and quantities) (1.8, 0.7)
- respect to environment in operations (2.0, 0.8)
- environmentally friendly (products) (2.1, 0.8)
- product appearance (2.1, 0.7)
- e-mail connection with the supplier (2.2, 0.8)
- the sales persons respect customers (2.3, 0.9)
- payment arrangements (2.3, 0.9)
- image and reputation of the supplier (2.4, 0.9)
- friendliness of the sales personnel (2.5, 0.9)
- wide product range (2.6, 1.0)
- possibility to order via e-mail (2.6, 0.9)
- product information (2.9, 0.9)
- well-known supplier (2.9, 0.8)
- country of origin (2.9, 0.9)
- supplier information (3.0, 0.8)

The structure and dimensionality of product attributes were studied using factor analysis. The aim was to reveal broader and more abstract quality dimensions. Initially, a three-factor solution was technically acceptable. However, the number of attributes included in the analysis needed to be reduced due to the small number of observations. Therefore the variables with lower than 0.5 loading on any of the resulting factors were dropped out. Thus, during the process several attributes were excluded due to their low communality or low loadings on any factor (country of origin, payment arrangements, customer orientation, fast deliveries, wide product range, easy to get in contact, well-known). Finally also the two variables related to electronic communication were dropped out even though these constantly received fairly high loadings (on the same factor with product and producer related information and environmental attributes). Finally, another of the environmental attributes were also dropped out (general environmental soundness of company operations), since there was still a need to reduce the number of variables in the analysis. The general interpretation of the factor (information/communication, environment) did not change due to the exclusion of these vari-

ables. The final solution was well-interpretable and captured 63% of the variation of the nine variables included.

**Table 8.** *Product quality dimensions produced by factor analysis (Principal Axis solution with Varimax rotation)*

Product Quality attributes	Average importance 1=very important, 5=not important at all, mean value	Factor I Supplier charac- teristics	Factor II Information and envi- ronment	Factor III Tangible product	h <sup>2</sup>
Product information	2.9	*	0.848	*	0.765
Environmental friendliness of products	2.1	*	0.699	*	0.621
Supplier information	3.0		0.705	*	0.637
The sales persons respect customers	2.2	0.815	*	*	0.693
Friendliness of sales personnel	2.5	0.838	*	*	0.715
Image and reputation of the supplier	2.4	0.738	*	*	0.609
Reliability of the supplier	1.3	0.438	*	*	0.402
Product appearance	2.1	*	*	0.750	0.573
Technical product quality	1.6	*	*	0.705	0.614
Eigenvalue		2.229	1.978	1.423	
% of total variation		25%	22%	16%	63%
Cronbach's alpha		0.810	0.785	0.695	
Bartlett's test p=0.000					

Loadings within the range of +/- 0.2 are marked with \*\*\*\*

Factor 1 has the highest loadings on behaviour of personnel in customer relationships, and on image and reputation as well as reliability of the supplier company. All the characteristics are clearly related to the supplier, and thus the factor (quality dimension) is named “*Supplier characteristics*”. Factor II (quality dimension) has high loadings on the (product and supplier related) information, and the environmental quality. The factor is named “*Information and environment*”. Factor III (quality dimension) has high loadings on the visual appearance and technical quality of products. Both are related to the tangible physical product, and thus the factor is named “*Tangible product*”. Factor scores were produced using the regression method, and the new variables were used to represent the three latent product quality dimensions in further analyses. The resulting three-factor solution follows fairly well the product concept based on the core or tangible product, and the augmented product with service, supplier characteristics, and information and environmental factors.

Cluster analysis (k-means clustering, Table 9) was applied to investigate whether different segments can be detected among the UK companies based on how product quality is emphasised. The analysis revealed two groups that differed based on how important they perceived the “Supplier characteristics” and “Information and environment” dimensions of the total product quality. Companies in the first group emphasised informa-

tion and environmental quality more than companies included in the second group and, likewise, companies in the second group emphasised supplier characteristics more than companies in the first group. Group one was named as “Environment oriented” and group two was named as “Supplier oriented”. Group one could have also been named as “Information oriented”, or “Information and environment oriented”, but the name was chosen since the environment is the focus in this paper.

**Table 9.** *Clusters (k-means clustering) based on product quality dimensions.*

Factor score variables	Factor score variable centres within the clusters		
	Group: Environmen- tally oriented	Group: Supplier ori- ented	ANOVA p value (F)
Supplier characteristics	0.2689	-0.7084	0.002
Information and environment	-0.3354	0.8842	0.000
Tangible product	-0.0759	0.2002	0.380
No of cases (40)	29	11	

Background characteristics of the companies in the two groups were compared in order to create a profile of the Environment oriented and the Supplier oriented company segments. The observed statistically significant differences between the segments were related to company size and type: The average size of business (both wood product sales value and overall company turnover) was different in the two segments (t-test:  $p=0.038$  and  $p=0.087$ , respectively): Companies in the Environment oriented group were on average larger both regarding the total turnover and wood product sales value than companies in the Supplier oriented group. Hence, smaller average company size and total wood product sales volume characterise Supplier oriented group. These companies are also more often wood product traders than in the DIY business or construction material retailers. The companies in Environment oriented group are more typically in the DIY or construction material retail business than wood product traders (Table 10).

The results are logical from earlier analyses indicating that DIY companies emphasise environmental issues more than other companies; particularly their own customers are assumed to do so. Despite this, the outcome should be interpreted with some caution, and as indication about typical characteristics for a company putting over average emphasis on environment. The difference between clusters might be also connected to general emphasis on information availability and quality, which was tied into the same dimension with environment.

**Table 10.** *Relationships between the company type and the emphasis on quality dimensions*

Clusters	Wood product traders	DIY and construction material traders	Total % (n)
Environment oriented	35	<b>66</b>	101% (29)
Supplier oriented	<b>64</b>	36	100% (11)
Total % (n)	42 (17)	58 (23)	100% (40)
$X^2$ , $p=0.096$			

The two segments, i.e., the Supplier oriented and the Environment oriented groups, were compared regarding how the companies emphasised the two dimensions of environmental product quality (as measured based on how the companies assumed that their own customers emphasise environmental product quality, Table 5). The results show that the Supplier oriented companies emphasise the social and health dimension more than the Environment oriented ones. The Environment oriented group emphasises more the sustainability of forestry and environmental information (Table 11).

**Table 11.** *The quality-based segments and emphasis on environmental quality dimensions*

Factor score variables representing latent dimensions of environmental quality	Mean values of the factor score variables describing environmental quality dimensions within two company clusters		
	Environmentally oriented	Supplier oriented	p value (t-test)
Social and Health Impacts	0.2005	-0.5287	0.021
Sustainability and Information	-0.1647	0.43411	0.091

### 3.5. Summary of the results: perceived general and environmental quality

The empirical results indicate that the perceived general or total product quality is multidimensional, and comprises three dimensions: the tangible product and its performance, the supplier behaviour and services, and product and supplier related information and environmental quality. These results are in accordance with the a priori assumption that a product and product quality comprise the quality of the physical good, more abstract supplier characteristics, behaviour and service, and information. The result is in line with findings of earlier research about customer perceptions about quality of wood products.

The perceived environmental product quality seems to be multidimensional itself. It is related more closely to the abstract than the tangible part of the total product. Importance of product and supplier related information and environmental quality seem to be positively linked but the results did not provide other clear indications about connections between environmental quality and other quality issues. This question needs thus further research.

At least two clusters seem to exist among the UK wood product trading companies with regard to both overall (total) product quality and environmental quality. These groups overlap at least partly. Thus environmental quality can be used to segment the markets: One group places greater emphasis on supplier characteristics and social/health issues and environmental impacts from production processes. These companies are smaller (based on turnover), and more often pure wood product traders than DIY companies. The other segment appreciates more good availability of product and supplier information, and the environmental quality of products. Companies in this group emphasise particularly environmental issues manifested in the sustainability of forestry and avail-

ability of information about environmental matters. Companies in this group are larger and more often DIY companies than pure wood product retailers.

These characterizations of the UK wood product trading companies must be regarded as preliminary due to the limitations of the data, and would need deeper investigation with a larger data set. It should be noted that the two segments are based on different locations on a continuum of environmental and other product quality importance: Companies classified as supplier-oriented also emphasise environmental and information issues but relatively less than companies classified into the environmental group, and vice versa. Moreover, all companies emphasised the importance of tangible product quality, but so similarly that this did not segment the markets.

### **3.6. Communication of environmental quality to customers on the UK markets**

Finally, the channels and means were investigated, which the UK wood trading companies find most efficient when communicating environmental quality to their customers. The two best methods were considered to be eco-labels attached to the products and product information tags with environmental information. Overall, it seems that environmental information that is concretely attached to the tangible products is seen as the most effective.

The perceived efficiency of communication media for informing customers about environmental product quality (mean values, scale 1=very efficient - 5=not efficient at all, st. deviation):

- eco-labels attached to the products (2.1, 1.2)
- product information tags with environmental information (2.2, 0.9)
- press campaigns (2.3, 1.0)
- television campaigns (2.4, 1.0)
- a certificate of origin (mean rank 2.5, 1.1)
- environmental information leaflets separate from the physical products (2.6, 0.7)

The effectiveness of the media was further studied using principal component analysis (Varimax rotation). The analysis suggests that the media can be classified into three categories: mass-media, simple labels, and text-form product-related information. The solution explained 74% of the total variation, and the result was not analysed further.

**Table 12.** *Principal component analysis of efficiency of media communicating environmental product quality (Varimax rotation)*

	<b>Component I</b>	<b>Component II</b>	<b>Component III</b>	<b>h<sup>2</sup></b>
<b>Communication media</b>	<b>Mass-media</b>	<b>Labels</b>	<b>Product information</b>	
Press campaigns	0.841	0.353	*	0.840
Tv campaigns	0.831	*	0.332	0.815
Eco-label	*	0.881	0.345	0.795
Certificate of origin	0.246	0.674	*	0.528
Environmental product information in product information tags	*	0.456	0.753	0.780
Information leaflets	*	-0.217	0.797	0.693
Eigenvalue	1.478	1.630	1.344	4.452
% of total variation	25%	27	23%	74.19%
Bartlett's test p=0.000				
Loadings between +/- 0.2 are marked with '**'				

## 4. DISCUSSION

This paper explores the contents and importance of the environmental quality of wood products among companies trading building materials in the UK markets. The survey data includes face-to-face interviews of forty companies. This limited number of companies also limits the generalisation of the results, which should be treated as indicative before testing in further research. Nevertheless, the findings provide interesting insights into the contents and importance of environmental quality from customer perspective in the case of wood industry.

This study suggests that environmental quality is multi-dimensional, and an information-related matter from the customer perspective: environmental quality is perceived as being related more clearly to supplier and product information than to the physical good. An explanation may be the fact that environmental quality is difficult to evaluate from the product without information. Customers may also still have little experience in evaluating environmental quality, which emphasizes the need for educating them if environmental quality is aimed as means of differentiation.

Perceived environmental quality comprises traditional ecological issues, such as the sustainability of forestry and recycling, but also health and social responsibility concern. The latter are considered more important than, for example, recycling. Anyhow, the wood product traders assume that sustainability of forestry is the most important environmental characteristics of wood products to their own customers. This may explain the large emphasis, which has been placed on forest certification in the UK lately. Earlier results from German markets (Järvinen et al. 2001) confirm that health impacts and the sustainability of forests are most important for intermediary customers trading wood products, but on German markets safety to health is first. The managerial implication is nevertheless that sustainability of forestry deserves clear attention, but the forest industry should also place emphasis on health and social aspects.

Environmental labels, such as certificates of sustainable forestry, are considered efficient in communicating environmental quality to markets. However, both literature and this study indicate that wood product suppliers might benefit from complementing simple eco-labels with detailed environmental information. This may increase the credibility of the labels, and helps consumers to make unbiased rankings between products based on their personal preferences. The information should be physically very close to the products. Overall, providing information to customers plays an important role in supporting business strategies based on high environmental quality.

This study reinforces the assumption of the UK markets as being environmentally sensitive. However, the results are also in accordance with earlier findings indicating that environmental quality is not the most critical issue when organizational customers choose wood products. Particularly this regards companies operating mainly on business-to-business markets, who do not see a very large overall interest in environmental issues among their own customers or the potential for a marked “green” price premium. Do-It-Yourself business may be an exception.

However, it was possible to identify environmentally more and less oriented company segments. The more environmentally oriented companies were those estimating more often that their own customers pay attention to environmental issues than the other companies assumed. This emphasises the need for analysing the whole value-chain including end-consumers when forest industry is making plans how to incorporate environmental issues into business strategy.

Despite substantial research in the field of environmental issues in marketing, there still seems to exist room for deeper analyses of both intermediary customers and end-consumers in order to recognize and determine the environmentally sensitive market segments. The small data of this study also necessitate testing of the robustness of the findings, and the measurement instruments may still need development. For example, considering the recent price increase and discussion of the limited resources of fossil energy, energy issues are likely to be included in environmental product quality attributes in the future. It would be worthwhile studying the relationship between environmental quality and other product quality dimensions more deeply. A particularly interesting question is whether environmental quality is used as a cue for the overall quality of products or vice versa, and which are the most important cues for environmental product quality used by end-consumers.

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## APPENDIX

**Table 13.** *Operationalizations of the framework guiding the empirical research*

Phenomenon/object	Operationalization=original variables measured	Constructed variables from the original variables
Companies trading wood products and other building materials in the UK	Background: turnover (in £), turnover based on wood products (in £), customer structure (most important customer groups), wood product assortment on sale	Categories based on original variables Cluster (segment) variable based on how environmental quality dimensions are emphasised Cluster (segment) variable based on how total product quality dimensions are emphasised
	Type of business/company (wood product wholesale, construction material retail, Do-It-Yourself)	
	Own customers: most important customer types (building/construction companies, merchants, end-consumers, others)	
Environmental awareness of the customers of the target companies	Proportion of customers considering environmental impacts when purchasing products: % of all customers, proportion of customers willing to pay a green price premium of various sizes as per cent of the "normal" market price of an otherwise totally similar product, categorized: 0%, 1-5%, 6-10%, 11-20%, 21-30%, >30%	Classified variables from the original variables
Environmentally sensitive products on the markets	Open question, respondents named the products freely	Qualitative classification into broader groups
Contents, importance and structure of perceived environmental quality of wood products: importance of various attributes to the customers of the respondent companies (as assessed by the respondent companies)	8 original variables: respect for social aspects (needs of local people considered, no child labour etc.), safe (for health) surface treatment, (generally) safe for health, environmental impacts from production processes, recyclable, recyclable packaging materials, wood originates from sustainable managed forests, availability of information about environmental factors and impacts: assumed importance to own customers, a scale from very important to not important at all, uniform distances between alternatives assumed	Dimensionality/structure of environmental quality: factor score variables from the original variables

		Table 13 continues on the next page
Table 13 continues...		
Contents, importance and structure of total product quality, including supplier characteristics and product tangibles and intangibles, asked through how the respondent emphasise various attributes when choosing suppliers of wood products	19 original variables: payment arrangements, fast deliveries, well-known supplier, country of origin, high technical product quality, appearance, environmental friendliness of the product, product information, supplier information, wide product range, customer orientation, image and reputation of the supplier, reliability of the supplier, easiness of contacting, friendliness of sales personnel, respect for customers by the sales personnel, e-mail connection, e-mail ordering possible, respect to environment in supplier operations, a scale from very important to not important at all, uniform distances between alternatives assumed	Dimensionality/structure of total quality: factor score variables from original variables
Media for communicating environmental quality of wood products on the UK markets	6 original variables: Efficiency of eco-labels, product information tags, separate information leaflets, certificates of origin, press and tv-campaigns, measured using a five-step scale from very efficient to not efficient at all, equal distances between alternatives assumed	Structure: principal component score variables from original variables



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