Charlotta Harju

The perceived sustainable quality of wooden products in the context of housing

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Tiivistelmä

Viimeaikaiset tutkimukset osoittavat, että kuluttajat arvostavat vastuullisia tuotteita, mutta siitä huolimatta niiden markkinaosuus on edelleen pieni. Väitöskirjan kolmen artikkelin kautta tutkitaan, miten kuluttajat arvioivat tuotteiden koettua laatua ja kestävyysnäkökulmia, jotta ymmärtäisimme paremmin kuluttajien vastuullisiin tuotteisiin liittyviä valintoja. Väitöskirjassa tarkastelun kohteena ovat puutuotteet, joita käytetään asumisen kontekstissa.

Ensimmäisessä artikkelissa tehtiin systemaattinen kirjallisuuskatsaus puisten rakennusmateriaalien koetusta laadusta ja tulokset osoittivat, että erilaiset laatuindikaattorit, kuten laatuvihjeet ja -attribuutit, kuluttajien ominaisuudet ja kulutustilanteeseen liittyvät tekijät vaikuttivat kuluttajien näkemyksiin puusta. Toisessa ja kolmannessa artikkelissa tutkittiin empiirisesti puutuotteiden koetun laadun ulottuvuuksia ja sitä, miten kuluttajien ominaisuudet olivat yhteydessä niiden arviointiin. Tulosten mukaan puisten rakennus- ja sisustustuotteiden koetun laadun ulottuvuudet koostuivat erilaisista teknisistä, ekologisista, sosiaalisista ja taloudellisista näkökulmista. Kuluttajien kestävään kuluttamiseen liittyvä ostokäyttäytyminen ja sosiodemografiset tekijät olivat myös yhteydessä siihen, miten he arvioivat puutuotteiden laatu-ulottuvuuksia.

Väitöskirjan artikkelien kautta saatiin myös tietoa tuotteen koetun laadun ja kestävyysattribuuttien välisistä yhteyksistä. Tulosten pohjalta väitöskirjassa ehdotetaan uutta käsitettä "koettu kestävä laatu", jolle rakennetaan käsitemallit puisten rakennustuotteiden ja sisustustuotteiden kontekstissa. Koetun kestävän laadun käsite tuo yhteen tuotteen ekologiset, sosiaaliset ja taloudelliset kestävyysattribuutit, jotka muodostavat osan koettua laatua. Väitöskirjan tulokset edistävät markkinoinnin ja kuluttajakäyttäytymisen tutkimusta käsitteellistämällä tuotteen koetun laadun ja kestävyysattribuuttien väliset yhteydet. Lisäksi väitöskirja tuo uutuusarvoa metsätieteiden ja kestävyystieteen aloille. Tulokset tarjoavat myös merkittävää tietoa puuteollisuusyrityksille ja muille sidosryhmille liittyen siihen, kuinka ne voivat hyödyntää koettua kestävää laatua liiketoimintamalleissaan ja markkinointistrategioissaan.

Asiasanat: koettu laatu, laatuindikaattorit, kestävyysattribuutit, kestävyys, kestävä kuluttaminen

Abstract

Recent research shows that although consumers appreciate sustainable products, their market share still remains low. Through three interlinked articles, this thesis examines how consumers evaluate product sustainability in relation to perceived quality to gain a better understanding of consumers' choice of sustainable products. This issue is scrutinized in the case of wooden products in the context of housing.

In the first article, a systematic literature review was carried out to examine the perceived quality of wooden building materials and the results showed that consumers' perceptions of wood were influenced by quality indicators (i.e., quality cues and attributes) and personal and situational variables. The second and third articles empirically explored the quality dimensions of wooden products and the connections between consumer characteristics and their perceptions of these dimensions. According to the results, the perceived quality of wooden building and interior products consisted of quality dimensions that included various technical, economic, social, and environmental aspects. Also, consumers' consciousness for sustainable consumption and their sociodemographic background related to their evaluations of these quality dimensions.

Furthermore, the articles provided empirical evidence on the connections between the perceived quality and sustainability attributes of wooden products. As a result, a novel construct called "perceived sustainable quality" is proposed and conceptual models of the perceived sustainable quality of wooden building and interior products are constructed. The construct of perceived sustainable quality brings together environmental, social, and economic sustainability attributes of wooden products that form a part of perceived quality. The main theoretical contribution to marketing and consumer behavior research is the conceptualization of the connections between perceived quality and sustainability attributes. In this way, the thesis also brings novel insights to the fields of forest sciences and sustainability science. The results also provide significant managerial implications for wood industry companies and other stakeholders in terms of how they can utilize perceived sustainable quality in their business models and marketing strategies.

Keywords: perceived quality, quality indicators, sustainability attributes, sustainability, sustainable consumption

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My PhD journey, which at times has felt like a never-ending project, is actually coming to an end. It feels like just yesterday when pondering about possible doctoral studies during a lunch at the University Consortium of Seinäjoki. I had just graduated and was unsure whether I could ever actually write a dissertation. To my surprise, I did, and five years later, I have a finished thesis in my hands.

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Kauhava, November 2022

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Abbreviations

CSC	Consciousness for sustainable consumption
CSR	Corporate social responsibility
SDG	Sustainable development goal

Articles

Harju, C. (2022). The perceived quality of wooden materials – A systematic literature review and future research agenda [published]. *International Journal of Consumer Studies*, 46, 29–55. https://doi.org/10.1111/ijcs.12764. This article is licensed by CC BY-NC-ND 4.0: https://creativecommons.org/licenses/by-nc-nd/4.0/.

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1 INTRODUCTION

Perceived quality is a central construct in marketing research, and it has been examined extensively for decades in different product categories and contexts. Based on the existing literature, it has a significant effect on consumer behavior in terms of, for instance, willingness to pay (van Doorn & Verhoef 2011; Da Cunha et al. 2019; Tong et al. 2020), purchase intentions (Jung & Seock 2016; Yeh & Liao 2016; Xu, Prybutok & Blankson 2019), and choice (Aschemann-Witzel 2018; Thøgersen, Pedersen & Aschemann-Witzel 2019).

Perceived quality is defined as "*the consumer's judgment about a product's overall excellence or superiority*" (Zeithaml 1988) and is evaluated by using different product-related quality indicators, such as quality cues and quality attributes (e.g., Olson & Jacoby 1972; Steenkamp 1989; Oude Ophuis & Van Trjip 1995). For example, consumers use quality cues (i.e., price, environmental labels) to predict and evaluate those quality attributes (i.e., durability, environmental friendliness) that cannot be assessed in the purchase situation or during or after consumption (Steenkamp 1989). Furthermore, perceived quality is conceptualized as a multidimensional construct consisting of abstract dimensions (e.g., Zeithaml 1988; Brucks, Zeithaml & Naylor 2000), and identifying and analyzing its dimensions yields a deeper understanding of consumer judgment and choice (Brucks, Zeithaml & Naylor 2000).

Even though there are established models and definitions for perceived quality (e.g., Zeithaml 1988; Steenkamp 1989; Oude Ophuis & Van Trjip 1995; Brucks, Zeithaml & Naylor 2000), the studies conducted in the 2000s have used the perceived quality construct in various manners. The use of the perceived quality construct has been inconsistent and ambiguous: the construct has been defined in multiple ways, and the meaning and nature of the perceived quality construct has varied. For example, perceived quality has been considered either as an abstract outcome of consumers' evaluations influenced by different quality indicators and/or consisting of multiple dimensions (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Magnier, Schoormans & Mugge 2016; de Medeiros, Ribeiro & Cortimiglia 2016; Lee & Hwang 2016; Marakanon & Panjakajornsak 2017; van Giesen & de Hooge 2019) or as a lower-level attribute determined by consumer's assessment on a scale from bad to good (e.g., Loureiro 2003; Marell et al. 2004; van Doorn & Verhoef 2011). Also, some scholars have either developed their own definition for perceived quality (e.g., Cheung, Lam & Lau 2015; Yeh & Liao 2016; Xu, Prybutok & Blankson 2019) or have not defined the construct at all in their studies (e.g., Grolleau, Mzoughi & Sutan 2019; Testa et al. 2020; Davis & Dabas

2021; Donato, Barone & Romani 2021; Margariti et al. 2021). Therefore, conceptual clarity is needed when examining the perceived quality construct in future studies.

Another topical construct in recent marketing and consumer behavior research is the product sustainability (e.g., Trudel 2019). According to the existing academic literature, product sustainability consists of sustainability attributes that are product properties related to environmental, social, and economic sustainability aspects (e.g., Bangsa & Schlegelmilch 2020). *Environmental* aspects comprise issues such as waste, pollution, resource usage, ecosystems, and preserving natural resources and the environment (OECD 2008; Bangsa & Schlegelmilch 2020), while *social* aspects address the well-being of people and communities (Choi & Ng 2011), health, welfare, and social justice (Elkington 1997; OECD 2008). *Economic* aspects relate to issues such as the economic interests of external stakeholders (Sheth, Sethia & Srinivas 2011), and protecting and preserving favorable economic environments (Choi & Ng 2011).

Most of the existing research addressing sustainability attributes has investigated environmental issues (Bangsa & Schlegelmilch 2020), while largely neglecting social and economic sustainability attributes. Furthermore, their importance in consumers' purchase decisions has varied. In certain contexts, consumers have considered sustainability attributes as significant factors influencing their purchase decisions (e.g., Torjusen et al. 2001; Sáenz-Navajas et al. 2014; Migliore et al. 2017). For example, according to a study by Sáenz-Navajas et al. (2014), the country and region-of-origin of wine were significant factors for most consumer clusters. However, some studies have had contradictory findings (e.g., de Medeiros, Ribeiro & Cortimiglia 2016; Sogari, Mora & Menozzi 2016). For example, environmental sustainability attributes were considered less relevant during a typical purchase decision process regarding green products (de Medeiros, Ribeiro & Cortimiglia 2016). Therefore, the significance of sustainability attributes in consumers' purchase decisions seems context-dependent and more information is needed in different product categories regarding how different sustainability attributes, addressing environmental, social, and economic aspects, are evaluated by consumers.

Investigating the connections between these two constructs, perceived quality and sustainability attributes, produces significant information regarding consumers' choice of sustainable products. The existing literature on investigating both sustainability attributes and perceived quality has been limited and mostly conducted in the context of food products with a focus on environmental sustainability (e.g., Grolleau & Caswell 2006; Migliore et al. 2017; Wang 2017;

Wang & Gao 2017). Furthermore, the studies have had conflicting results regarding the importance and role of sustainability attributes in relation to perceived quality. For example, sustainability attributes have been treated as determinants influencing perceived quality in either a positive or negative way (e.g., Lee & Hwang 2016; Magnier, Schoormans & Mugge 2016; Lidón et al. 2018; Aakko & Niinimäki 2021), or as a quality dimension (Toivonen 2012; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017). In contrast, some studies have considered sustainability attributes and perceived quality to be separate variables (van Doorn & Verhoef 2011; Monnot, Parguel & Reniou 2015; Jung & Seock 2016; Wang, Hazen & Mollenkopf 2018). It still remains unclear how the various sustainability attributes of products, reflecting environmental, social, and economic aspects, are perceived by consumers in relation to quality.

The issue is also important to investigate from the point of view of sustainable development. Consumption and production patterns significantly affect the possibilities to achieve the global sustainable development objectives (e.g., United Nations 2002), and consumers play an increasingly important role in sustainability change (e.g., Schrader 2007). The United Nations General Assembly set 17 Sustainable Development Goals (SDGs) seven years ago to tackle the global challenges (United Nations 2022a). These goals were targeted at governments, businesses, and other stakeholders, and are intended to be achieved by 2030. Since then, the world has faced serious crises including conflicts and wars, global pandemic, hunger, and climate change (World Vision 2022) that have put reaching the SDGs by 2030 at great risk (United Nations 2022b). In particular, global consumption keeps growing and contributing to environmental degradation (Thøgersen 2014). The most recent SDG Progress Report (2022) calls for "an urgent rescue effort" to change course and get the SDGs back on track (United Nations 2022b).

According to the United Nations Conference on Trade and Development (UNCTAD) (2017), the SDGs require the participation of "responsible" and "empowered" consumers so that the sustainability targets can be reached. For example, Goal 12 – "*Ensure sustainable consumption and production patterns*" – is one of the SDGs focusing on aspects related to consumers and the choices they make in their daily lives (UNCTAD 2017). Recent studies show that there are still challenges in adopting sustainable consumption habits and the market share of sustainable products remains low (van Doorn, Verhoef & Risselada 2020). There are indications that the Covid-19 pandemic may have nudged consumer behavior toward sustainable consumption: Consumers are more willing to pay for sustainable products, showing increasing attention to environmental issues, and behaving in a more sustainable way (Dangelico, Schiaroli & Fraccascia 2022).

However, a recent study suggests that while Finnish consumers are interested in the sustainability and origin of products, those aspects have conflicting effects on their purchase decisions (Fairtrade Finland 2022). Furthermore, another study reveals that consumers are confused by environmental marketing claims; for instance, they find it difficult to recognize what kinds of products and services are sustainable in terms of the environment (Kuluttajaliitto 2022).

The results of Fairtrade Finland (2022) reflect the issue of the "attitude-behavior gap," "intention-behavior gap," or "value-action gap," which has been researched extensively for decades (e.g., Auger & Devinney 2007; Carrington, Neville & Whitwell 2010; Gruber & Schlegelmilch 2014; Wiederhold & Martinez 2018). This gap describes the inconsistency between the consumers' intentions and actual behavior (e.g., Auger & Devinney 2007) and is still evident (Wiederhold & Martinez 2018; Skard, Jørgensen & Pedersen 2021). This gap puts pressure on marketers and other practitioners to develop strategies for sustainable products that capture consumers' attention and result in actual purchasing decisions.

Perceived quality provides means for researchers and marketers to specify the role of sustainability attributes in consumers' product evaluations and to investigate consumers' choice of sustainable products. Therefore, in this dissertation, perceived quality is adopted as the theoretical lens when examining how consumers evaluate various environmental, social, and economic sustainability attributes. For example, by examining if consumers consider sustainability attributes to be dimension(s) of perceived quality helps to explain consumers' choice of sustainable products. Do consumers include the sustainability attributes in their product evaluations, and if so, do they perceive them as part of quality?

1.1 Empirical context of the thesis

To tackle the issue regarding consumers' choice of sustainable products, this study scrutinizes the connections between the perceived quality and sustainability attributes of wooden products in the context of housing. According to the Oxford English Dictionary (1989), housing refers to both building of houses and dwelling or lodging in a house, for example. Based on that definition, housing as the empirical context of this thesis refers to building of and dwelling in houses. The choice of the empirical context is motivated by three reasons. First, housing is a relevant sector when discussing sustainable consumption (e.g., Gram-Hanssen 2014). Second, wooden products have several sustainable characteristics, and they play an important role in sustainability change through the choices made in housing (i.e., building of and dwelling in houses) (e.g., Kuittinen 2019; Himes &

Busby 2020). Third, the academic research in the wood industry has been limited in terms of consumer behavior; there has been a particular lack of research on the perceived quality of wooden products used in the context of housing. These themes are discussed next.

Household consumption (i.e., housing, travel, food, goods, and services) is a major factor when evaluating greenhouse gas emissions, both in Finland and at a global level (Salo & Nissinen 2017), and thus these different sectors provide several opportunities for consumers to reduce their carbon footprint and adopt sustainable lifestyles. Housing is one of the relevant sectors where changes toward sustainability could be made. One-third of global carbon dioxide emissions is caused by manufacturing of building materials (all types of buildings) and the use of residential buildings (United Nations Environment Programme 2021). Furthermore, the choices made in the residential construction sector are connected to the Sustainable Development Goals (SDGs), which bring forth consideration of environmental, social, and economic life-cycle sustainability in buildings (Ogunmakinde, Egbelakin & Sher 2022). Population growth sets pressure to provide more dwellings, and sustainable building solutions are playing a key role in adapting to climate change and offering comfortable living conditions (He 2019).

Wooden products used in the context of housing provide significant possibilities to investigate how consumers evaluate sustainability aspects. In this thesis, wooden products are addressed from the perspective of material choices made in building (e.g., load-bearing structures and facades), in building and dwelling (e.g., floorings and panels), and in dwelling (e.g., furniture and home decoration). Wooden building products are considered to have significant potential to support sustainable development and transitioning toward biobased economies (e.g., Ollikainen 2014; Bugge, Hansen & Klitkou 2016; Luo et al. 2018). Wood is considered to be an environmentally friendly material due to its carbon storage properties (Lippke et al. 2011), and the utilization of wood in construction has strong potential to decrease the environmental impacts of the building processes and use of houses (e.g., carbon dioxide emissions and use of energy) compared to non-renewable materials, such as concrete and steel (e.g., Jönsson, Tillman & Svensson 1997; Gustavsson, Pingoud & Sathre 2006; Lippke et al. 2011; Ximenes & Grant 2013; Cabeza et al. 2014; Tettey, Dodoo & Gustavsson 2019; D'Amico, Pomponi & Hart 2021).

In addition to environmental benefits, wooden building products have technical properties, such as longevity in use, which could yield economic advantages (e.g., off-site prefabrication of modules for building and repairability of materials in

housing) (e.g., Brandner et al. 2016; Pelli & Lähtinen 2020). Furthermore, wooden building products have social benefits, such as positive effects on the aesthetics of living environments and well-being in housing (e.g., Rhee 2018; Lähtinen et al. 2021). In addition to wooden building products, wooden interior products also share similar sustainability benefits: They are perceived as durable (Andac Guzel 2020; Hakala, Autio & Toppinen 2015) and environmentally friendly (Hakala, Autio & Toppinen 2015), and have positive effects on well-being (e.g., Rice et al. 2006), for instance. Therefore, by choosing to live in an apartment made of wood or to use wood in their homes, consumers can contribute to the development of a low-carbon society and gain various social and economic benefits.

In Finland, wood construction has been promoted in several national strategies and programmes: the Wood Building Programme, Government Programme, the National Energy and Climate Strategy, National Forest Programme and Finnish Bioeconomy Strategy (Ministry of Agriculture and Forestry 2022). However, large-scale industrial multi-story construction (MSC) with wooden structures is still a relatively new phenomenon (Lähtinen et al. 2022): The proportion of new wooden MSC apartments in Finland was about 5% in 2021 (Kiiskinen 2021). The barriers to wooden multistory construction have been recognized in the context of the themes of system development, innovation, institutional changes, business collaboration, stakeholder awareness, urban planning, and market demand (Jussila et al. 2022). Dwellers have been found to have a significant role in sustainability change in the context of residential building (Martek et al. 2019) and therefore, it is also important to take the demand in the housing markets into consideration.

The recognition of the significance of general choices made in consumption (United Nations 2002; Schrader 2007; UNCTAD 2017) and choices made in the context of housing (i.e., building and dwelling) (e.g., Gram-Hanssen 2014; Kuittinen 2019; Ogunmakinde, Egbelakin & Sher 2022) to enhance sustainable development have created new needs to add to the body of knowledge on consumers' perceptions of wooden products. In the existing wood product literature, there are several studies that investigate how consumers feel about wooden products in terms of various product properties and what type of wood they prefer. For example, visual appearance (Jonsson 2005; Roos & Nyrud 2008; Valtonen 2008; Gold & Rubik 2009; Costa, Garcia & Ibanez 2011), design (Pakarinen & Asikainen 2001), price (e.g., Strobel, Nyrud & Bysheim 2017; Bernard et al. 2018) and durability (Høibø, Hansen & Nybakk 2015) are considered to be important factors in a choice situation. In terms of sensory aspects, consumers prefer smooth wooden surfaces (de Morais & Pereira 2015; Bhatta et al. 2017; Ramanakoto et al. 2019), a homogeneous visual appearance and

moderate color intensity (Nyrud, Roos & Rødbotten 2008), and wood with fewer knots over wood with many knots (Nyrud & Bringslimark 2010). Consumers also consider wood to be a soft, warm, and fragrant material (Strobel, Nyrud & Bysheim 2017; Viholainen et al. 2020). Furthermore, wood as a material has a positive influence on the acoustics of the room (Strobel, Nyrud & Bysheim 2017), and a wooden multi-framed building is experienced to have a pleasant soundscape with no echoes (Viholainen et al. 2020).

Regarding its social benefits, wood is seen as an aesthetic and beautiful material (e.g., Hu et al. 2016; Viholainen et al. 2020) and consumers have a positive opinion about the physical and mental health effects of wood (Jiménez et al. 2015; Jiménez et al. 2016; Andac Guzel 2020; Häyrinen, Toppinen & Toivonen 2020; Viholainen et al. 2020). However, consumers have prejudices regarding the fire safety of wooden materials (Gold & Rubik 2009; Costa, Garcia & Ibanez 2011; Hu et al. 2016; Moresová et al. 2019) as well as the durability of wood as a building material (Gold & Rubik 2009; Hu et al. 2016).

Furthermore, the sustainability of wooden products has been a central topic in the existing research with a focus on consumers' perceptions of environmental issues. Based on several studies, consumers consider wood to be an environmentally friendly material (Valtonen 2008; Strobel, Nyrud & Bysheim 2017; Moresová et al. 2019; Kylkilahti et al. 2020; Viholainen et al. 2020) and they appreciate environmental friendliness and certification (Roos & Hugosson 2008; Roos & Nyrud 2008; Costa, Garcia & Ibanez 2011; Cai & Aguilar 2014; Paulin, Nadeau & Dech 2018; Andac Guzel 2020). However, information regarding issues such as whether environmental friendliness is a decisive factor in a choice situation is scarce.

In conclusion, the interest in consumer behavior research in terms of wooden products has increased among scholars in recent years (e.g., Luo, Kanzaki & Matsushita 2017; Luo et al. 2018; Kylkilahti et al. 2020; Loučanová & Olšiaková 2020; Oblak et al. 2020; Viholainen et al. 2020; Viholainen et al. 2021). However, knowledge on perceived quality of wooden products is still very limited. In the previous studies on wooden products, quality has been investigated mostly by addressing only technical or supplier-related properties and ignoring the role of the consumer as a decision-maker (Sinclair, Hansen & Fern 1993; Sinclair & Hansen 1993; Hansen, Bush & Fern 1996; Hansen & Bush 1996; Hansen & Bush 1999; Weinfurter & Hansen 1999), while more research is needed especially from the consumer's point of view. For example, Hansen and Bush (1996, 1999) developed a condensed measurement model for softwood lumber quality that was also used in further research (Weinfurter & Hansen 1999). In this model, the

quality dimensions consisted of salesperson and supplier characteristics, supplier facilities, lumber performance, lumber characteristics, and supplier services. These dimensions included mainly technical product properties (e.g., lumber appearance, straightness, durability) and variables related to supplier (e.g., on-schedule delivery, product availability, supplier's salespeople). These models were also developed for industrial consumers (professional softwood lumber buyers), so their suitability for analyzing e.g., the end-consumers' perceptions of quality of wooden products can be questioned.

Only a few studies (Costa, Garcia & Ibanez 2011; Toivonen 2012) have investigated the perceived quality of wooden products. These studies also had different approaches to explore perceived quality. While Costa, Garcia, and Ibanez (2011) investigated consumers' perceptions of individual quality indicators, Toivonen (2012) examined the quality dimensions of wooden products. Toivonen (2012) assumed that the perceived product quality was a hierarchical structure consisting of tangible and intangible dimensions, while Costa, Garcia, and Ibanez (2011) used the term "quality perception" to refer to the quality level estimated by consumers on the basis of product attributes. The measurement scales developed in both studies also differed in terms of included items.

Furthermore, even though the consumers' perceptions of sustainability of wood have been addressed in recent studies (e.g., Kylkilahti et al 2020; Viholainen et al. 2020), direct investigations of sustainability attributes in relation to perceived quality have been lacking in the wood industry context. As an exception, Costa, Garcia, and Ibanez (2011) and Toivonen (2012) included certain sustainability attributes (i.e., environmental friendliness, product origin, and safety) in their measurement scales to explore perceived quality. However, in their studies, the examination of sustainability attributes was quite limited, and they were not addressed through environmental, social, and economic sustainability. This dissertation aims to fill that gap in the literature by examining environmental, social, and economic sustainability attributes of wooden products in relation to perceived quality.

The value-action gap is evident also in terms of wooden products. For example, even though consumers in general appreciate the use of wood in housing because of its multiple sustainability benefits (e.g., Häyrinen, Toppinen & Toivonen 2020; Kylkilahti et al. 2020; Viholainen et al. 2020), this is not straightforwardly reflected in, for example, their preferences for the materials used in their own homes (Høibø, Hansen & Nybakk 2015; Lähtinen, Harju & Toppinen 2019; Lähtinen et al. 2022). Therefore, it can be questioned whether environmental sustainability or other sustainability aspects primarily affect consumers' actual

purchasing choices in the context of housing. In addition, even though there are also other challenges related to adopting wood in sectors such as construction (e.g., Jussila et al. 2022), consumers' role cannot be overlooked. In order to enhance consumer acceptance of wooden products and sustainability change in the housing sector, a better understanding of consumer behavior is required. For this purpose, this thesis examines consumers' wood product evaluation with perceived quality as the theoretical lens to reveal on what basis consumers choose wooden products. Furthermore, the present study explores the connections between "perceived quality" and "sustainability attributes" to gain information on how consumers evaluate different sustainability aspects of wooden products in the context of housing.

1.2 Purpose of the thesis and research objectives

The purpose of this thesis is *to conceptualize how the sustainability of wooden products, explored from environmental, social, and economic viewpoints, is connected to perceived quality in consumers' product evaluations in the context of housing*. The dissertation adopts perceived quality as the focal concept and examines the perceived quality of wooden products in the context of housing (i.e., wooden products used in, e.g., load-bearing structures, facades of houses, interiors, and furniture). In order to achieve this purpose, the research has three specific objectives.

The first objective is *to identify the constituents of the perceived quality of wooden products in the context of housing*. Since perceived quality research has its roots in marketing and consumer behavior research, and the empirical context of the thesis connects with forest sciences, and especially forest products marketing, a comprehensive understanding of the variables influencing and constructing perceived quality is pursued by investigating the issue from the perspectives of consumer behavior and forest sciences in order to achieve a synthesis of the current knowledge. To achieve the first objective, the dissertation first clarifies the perceived quality construct based on the existing literature (Chapter 2) and determines the constituents of perceived quality (i.e., quality indicators and dimensions, personal and situational variables). Then, the dissertation examines the existing wood product literature and aims to identify the constituents of perceived quality in terms of wooden building products (Articles I-II) and wooden interior products (Article III). Article I adopts a systematic literature review methodology when identifying the constituents of perceived quality in terms of wooden building materials, while further examinations of perceived quality constituents are also carried out in the following empirical studies in the

investigation of wooden building products (Article II) and interior products (Article III). Furthermore, the connections between certain constituents (i.e., consumer characteristics and quality dimensions) are examined in Articles II and III.

The second objective is *to specify the linkages between the perceived quality and sustainability attributes of wooden products in the context of housing*. The second objective is addressed both in Chapter 2 and in the empirical studies of the dissertation in terms of wooden building products (Article II) and wooden interior products (Article III). First, the dissertation structures the connections between perceived quality and sustainability attributes based on the existing literature (Chapter 2). Then, in two empirical studies (Articles II-III), the quality dimensions of perceived quality are examined in terms of wooden building products and interior products to analyze the role of sustainability attributes, addressed from environmental, social, and economic viewpoints, in consumers' evaluations.

The third objective is *to develop a conceptualization of the perceived sustainable quality of wooden products in the context of housing*. Derived from the results of the empirical studies of the thesis, a novel construct called "perceived sustainable quality" is proposed and defined. With perceived sustainable quality, the dissertation refers to the sustainability attributes of wooden products that consumers perceive as part of quality based on the results of Articles II and III. In Chapter 5, the conceptual models of perceived sustainable quality are constructed for both wooden building products and wooden interior products.

The findings from the three articles, presented in Chapter 4, are analyzed in terms of the purpose and the objectives of the dissertation in Chapter 5. In Chapter 5, the contributions of the dissertation to the study objectives and purpose are discussed. Figure 1 presents an overview of the objectives of the dissertation and how the articles seek to meet them.

Furthermore, in the dissertation, each research objective has a related research question. The research questions are presented in Table 1. The main research question, "*How consumers evaluate the sustainability of wooden products in relation to perceived quality*?" guides the dissertation and Article III, where the connections between environmental, social, and economic sustainability of forestry-wood value chains and perceived quality of wooden interior products are investigated.

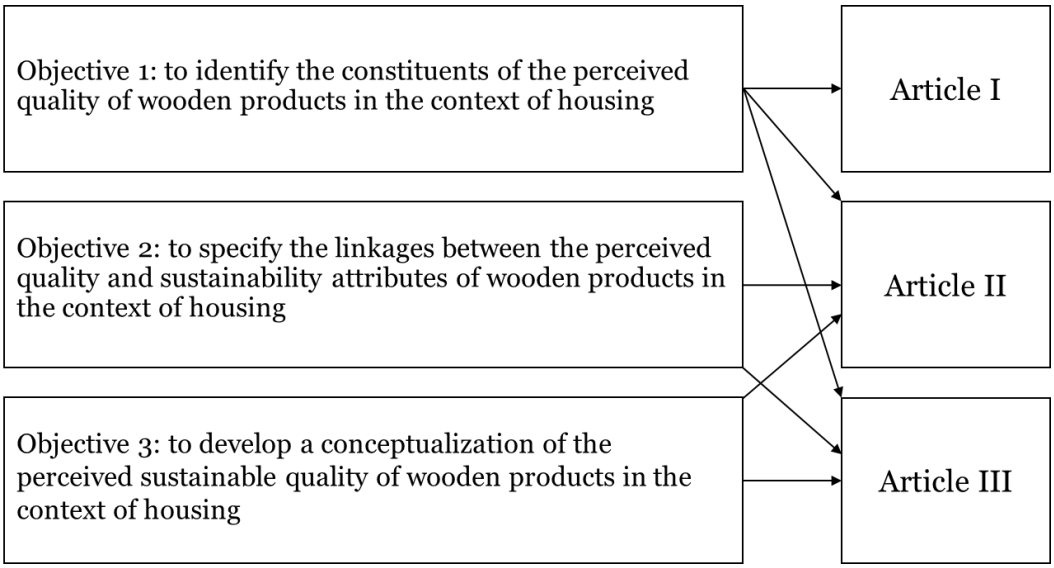

Figure 1. The overview of the research objectives of the dissertation

In addition, the dissertation has six specific research questions. The first research question, "*What are the key variables when investigating perceived quality of wooden products?*" guides both the articles and the thesis. First, it guides Chapter 2 when identifying the constituents of perceived quality based on the existing literature. Second, it guides Article I, where the constituents of perceived quality in the case of wooden building materials are identified and analyzed, and also the empirical studies (Articles II-III) when examining the quality indicators and dimensions of wooden building and interior products.

Furthermore, the second research question, "*How are consumer characteristics connected with perceived quality of wooden products?*", guides mainly the empirical studies (Articles II-III) when exploring the linkages between consumers' characteristics (i.e., consciousness for sustainable consumption, sociodemographic background) and the perceived quality of wooden building and interior products. In addition, this question guides Article I when examining how personal variables relate to consumers' perceptions of wooden building materials.

The third research question, "*How are the connections between perceived quality and sustainability attributes investigated in the existing studies?",* guides Chapter 2 when specifying the linkages between perceived quality and sustainability attributes in the existing literature. The fourth and fifth research question, "*What are the quality dimensions of wooden products?*" and "*Are sustainability attributes included in the quality dimensions of wooden products*?", guide the empirical studies of the dissertation (Articles II-III) when exploring the quality dimensions of wooden products and the role of sustainability attributes in those

dimensions. The sixth research question, "*How can the connections between perceived quality and sustainability attributes of wooden products be conceptualized?*" guides Chapter 5 of the dissertation when analyzing the results of the empirical studies and constructing conceptual models for perceived sustainable quality of wooden products.

Table 1. The research questions related to the research objectives

Research objectives	**Research questions**
Purpose: to conceptualize how the sustainability of wooden products, explored from environmental, social, and economic viewpoints, is connected to perceived quality in consumers' product evaluations in the context of housing	**Main research question:** How consumers evaluate the sustainability of wooden products in relation to perceived quality?
1. objective: to identify the constituents of the perceived quality of wooden products in the context of housing	**RQ1:** What are the key variables when investigating perceived quality of wooden products?
	RQ2: How are consumer characteristics connected with perceived quality of wooden products?
2. objective: to specify the linkages between the perceived quality and sustainability attributes of wooden products in the context of housing	**RQ3:** How are the connections between perceived quality and sustainability attributes investigated in the existing studies?
	RQ4: What are the quality dimensions of wooden products?
	RQ5: Are sustainability attributes included in the quality dimensions of wooden products?
3. objective: to develop a conceptualization of the perceived sustainable quality of wooden products in the context of housing	**RQ6:** How can the connections between perceived quality and sustainability attributes of wooden products be conceptualized?

1.3 Positioning and intended contributions of the dissertation

The dissertation is positioned at the intersection of three research fields: consumer behavior, forest sciences, and sustainability science (Figure 2). The dissertation makes academic contributions to the field of marketing by scrutinizing the connections between the perceived quality and sustainability attributes of wooden products in the context of housing through the lenses of consumer behavior, forest

sciences, and sustainability science. Simultaneously, the thesis brings novel insights to forest sciences and sustainability science. The pivotal role of marketing is highlighted in Figure 2 by positioning it in the middle.

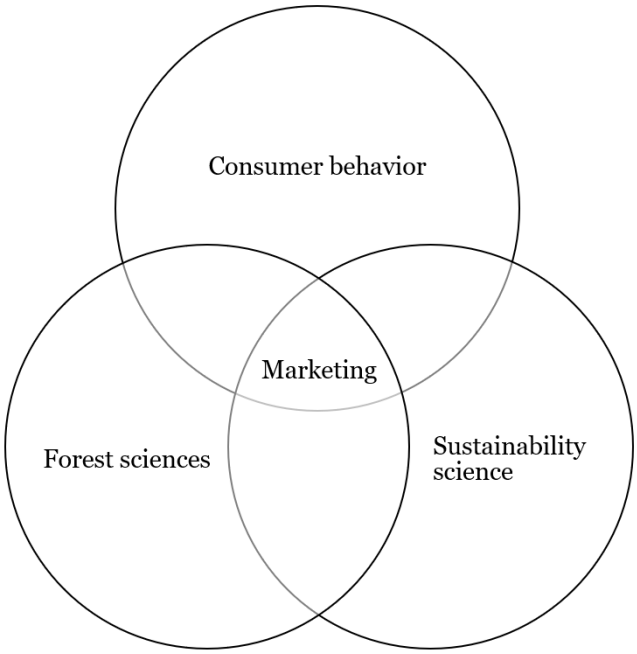

Figure 2. Positioning of the thesis at the intersection of three research fields

The thesis has its conceptual and theoretical basis in marketing, in the consumer behavior paradigm. The consumer behavior paradigm is largely based on cognitive psychology, and it has traditionally borrowed from the behavioral sciences when developing models of consumers' decision-making processes (Aslin & Rothschild 1987). Perceived quality, the theoretical lens of this thesis, was extensively researched during the 1980-1990s when many consumer studies remained within the tradition of the Three Rs: rationality, rigor, and relevance (e.g., Malter et al. 2020). According to the Three Rs, scholars viewed consumers as information-processing decision-oriented buyers (rationality), conducted studies with neo-positivistic experimental designs and quantitative techniques (rigor), and aimed to provide useful and relevant insights to marketing managers (relevance) (Malter et al. 2020).

Under these premises, several models were developed with the aim of explaining the consumer's quality perception process, such as the Perceived Quality Component by Zeithaml (1988), the Model of the Quality Perception Process by Steenkamp (1989), and Quality Quadrant by Oude Ophuis and Van Trijp (1995). Since then, these models have been widely adopted by researchers who have explored perceived quality in different product categories and contexts. However,

the examinations of sustainability attributes in relation to perceived quality have been vague with inconsistent results. Furthermore, the focus has been on environmental sustainability attributes and for example, the construct of green perceived quality has been developed by Chen and Chang (2013). Green perceived quality refers to consumers' evaluation of the product's environmental excellence, while it does not address e.g., the social and economic aspects of product sustainability. This dissertation forwards the research on perceived quality and builds upon these discussions by investigating the connections between perceived quality and environmental, social, and economic sustainability attributes instead of focusing only on product's environmental performance.

This dissertation also draws from the field of sustainability marketing that integrates environmental, social, and economic sustainability and evolved from ecological marketing and social and societal marketing (e.g., Kumar et al. 2013). Sustainability marketing is explicitly related to the sustainable development agenda (Kumar et al. 2012) and has been defined as "*the building and maintaining sustainable relationships with customers, the social environment and the natural environment*" (Belz & Peattie 2009: 31 in Kumar et al. 2012). However, most of the existing research in terms of sustainability marketing has focused on environmental issues (Kumar et al. 2013). This dissertation contributes to the fields of consumer behavior research and sustainability marketing by conceptualizing the connections between perceived quality and sustainability attributes and by developing a novel construct of "perceived sustainable quality" that can be tested and developed further in future studies.

Furthermore, by building a theoretical foundation for how to examine the perceived quality of wooden products in the context of housing, this thesis extends the current wood product literature. This dissertation draws from the field of forest sciences, especially from the subfields of business administration and forest products marketing within forest economics. For example, green consumerism in terms of end-consumers has been considered as one research area from the business administration point of view in the context of forest sector (e.g., Kleinschmit et al. 2014). In this research area, the studies have investigated e.g., consumer perceptions, preferences, or willingness to pay for certified forest products (e.g., Hansmann et al. 2006; Cai & Aguilar 2013, 2014; Strobel et al. 2017; Andac Guzel 2020; Brusselaers et al. 2020). This dissertation builds upon the discussions of green consumerism in the forest sector by examining how consumers' consciousness for sustainable consumption (CSC), that integrates the environmental, social, and economic aspects of consumption, is related to the evaluations of wooden products and their sustainability.

In addition, wood product quality has been of interest in the existing research in the subfield of forest products marketing (e.g., Hansen & Juslin 2011). So far, investigations of wood product quality have been conducted from a manufacturing point of view and with a focus on only technical or supplier-related properties of wooden products (e.g., Sinclair, Hansen & Fern 1993; Sinclair & Hansen 1993; Hansen, Bush & Fern 1996; Hansen & Bush 1996; Hansen & Bush 1999; Weinfurter & Hansen 1999). Only a few studies (e.g., Costa, Garcia & Ibanez 2011; Toivonen 2012) have explored consumers' perceptions of wood product quality, and there is limited information available regarding sustainability attributes in relation to the perceived quality of wooden products. By identifying and analyzing the constituents of perceived quality, and by specifying the role of environmental, social, and economic sustainability attributes in consumers' perceptions of quality in terms of wooden products, the thesis advances the field of forest sciences, and especially forest products marketing.

The results of this dissertation also bring novel insights also to the field of sustainability science, which is generally defined as a discipline that "*points the way toward a sustainable society*" and has its origins in the concept of sustainable development (Komiyama & Takeuchi 2006: 1–2). Sustainable development is defined by the World Commission on Environment and Development (1987) (WCED) as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED 1987: 41). Sustainability science has been characterized as an interdisciplinary and a transdisciplinary field, providing problem-driven and solutions-oriented research on human-environmental interaction (Mino & Kudo 2020). This thesis adopts a social science perspective to sustainability science, in which previous research has focused on e.g., (un)sustainable consumption and understanding the motives and actions of consumers, while there is still a research gap in understanding "*the processes that lead to shifts in everyday consumption patterns, especially with regard to social influences on individuals' habits and practices*" (Fahy & Rau 2013: 17). This thesis yields novel theoretical insights to sustainability sciences on the role of consumers in sustainable development by examining the connections between their consciousness for sustainable consumption and wood product evaluations that also affects the demand in the housing markets and further sustainability change in the housing sector. Furthermore, the current research on product sustainability and consumer decision-making mainly addresses environmental sustainability attributes (Bangsa & Schlegelmilch 2020) and neglects sustainability as a multi-dimensional construct. This thesis advances the field of sustainability science by investigating product sustainability as an entity composed of environmental, social, and economic aspects in the wood products context.

Along with academic contributions, several managerial implications for companies, manufacturers, and other actors operating in the housing markets are derived from the results of this thesis. To increase the consumer acceptance of wooden products, especially in the context of housing, it is critically important to understand how consumers evaluate and choose wooden products. It is crucial that consumers accept solutions related to aspects such as materials and technologies that are developed for sustainability change in the residential building sector (Zhao et al. 2015). Furthermore, producers have to understand consumer preferences to provide economically viable options in the housing market (Gibler & Tyvimaa 2014). The managerial implications of the thesis are related to issues such as marketing communication and new product development: How can the perceived sustainable quality of wooden products serve as an asset for companies in their business models and marketing strategies?

1.4 Structure of the dissertation

The dissertation consists of five chapters (Figure 3). In Chapter 1, the background of the study and the research context are introduced, followed by the purpose of the thesis and study objectives. Furthermore, the positioning of the thesis and the intended contributions are discussed. In Chapter 2, the theoretical foundation of the thesis is constructed by scrutinizing the existing literature on perceived quality and sustainability attributes, followed by an analysis of the connections between those constructs. As a result, a theoretical framework to conceptualize the connections between perceived quality and sustainability attributes is formulated.

Chapter 3 discusses the philosophical underpinnings of the dissertation, empirical data collection and analysis in the articles, and the reliability and validity of the research. Chapter 4 examines the three articles of the thesis in terms of background and objectives, key results, and contributions, while Chapter 5 scrutinizes the findings from the three articles further in reflection to the theoretical framework and research objectives. Additionally, Chapter 5 conceptualizes the connections between the perceived quality and sustainability attributes of wooden products in the context of housing and proposes a novel construct: “perceived sustainable quality.” Furthermore, conceptual models for the perceived sustainable quality of wooden building and interior products are developed. Chapter 5 also discusses the theoretical and managerial implications of the dissertation along with limitations and future research suggestions.

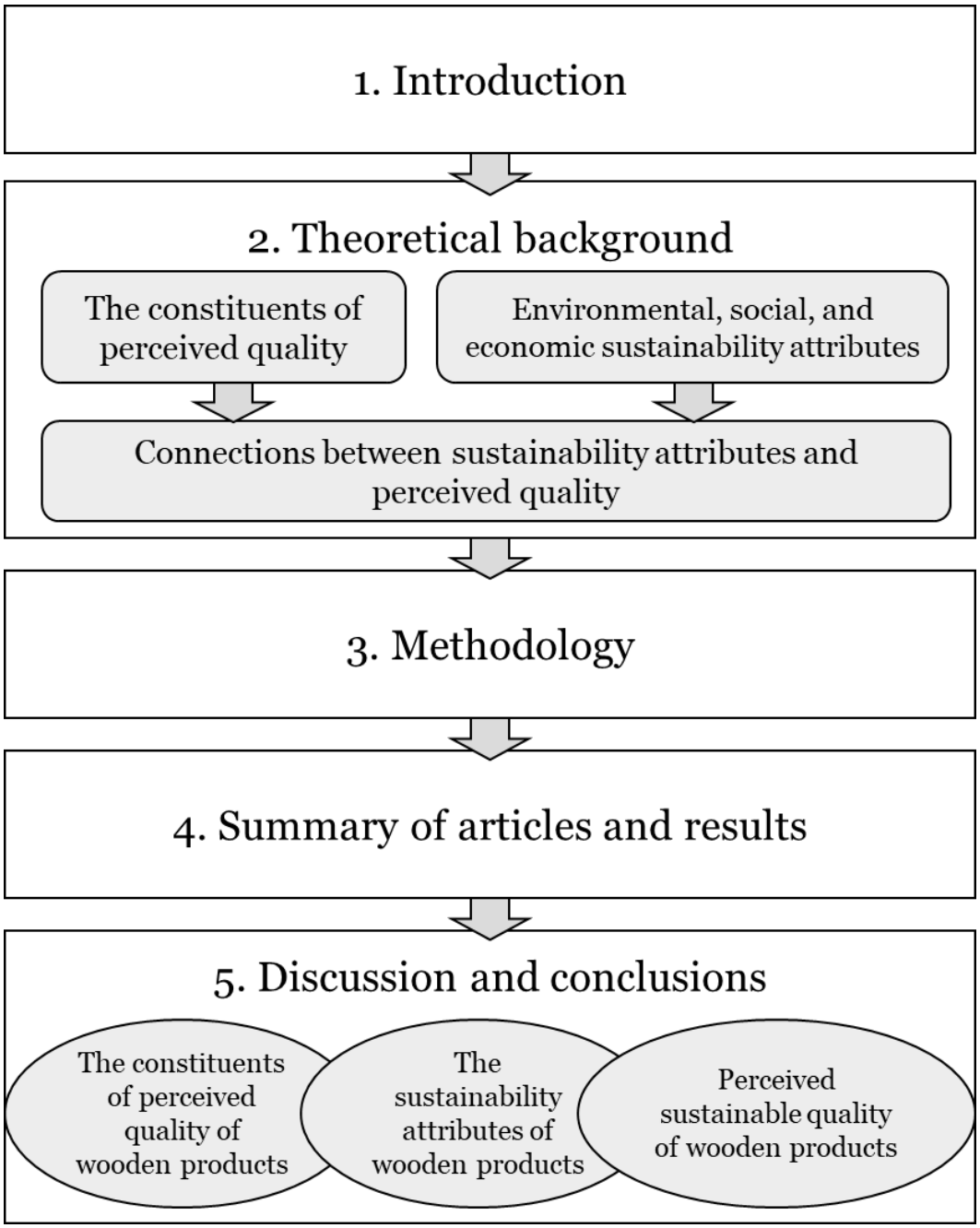

Figure 3. The structure of the dissertation

2 CONNECTIONS BETWEEN PERCEIVED QUALITY AND SUSTAINABILITY ATTRIBUTES

This chapter analyzes the key literature on perceived quality in relation to sustainability attributes that serves as the theoretical foundation for this dissertation. First, perceived quality is defined, and the existing conceptualizations of the consumer's quality perception process are discussed. Then, the constituents of perceived quality are identified and analyzed followed by the examination of the use of the perceived quality construct in empirical studies investigating both perceived quality and sustainability attributes. After that, the environmental, social, and economic sustainability attributes are specified and the connections between perceived quality and sustainability attributes are examined. As a result, the various roles of sustainability attributes in perceived quality studies are revealed. At the end of the chapter, wood product quality studies are explored in terms of conceptualizations and constituents of perceived quality and with a focus on sustainability attributes. Finally, a theoretical framework for conceptualizing the connections between perceived quality and sustainability attributes is formulated.

2.1 The conceptualizations of perceived quality

Over time, there have been different approaches to product quality. Steenkamp (1989: 7–57) defined and discussed the four major approaches: the metaphysical approach of philosophy, the production management approach, the economic approach, and the behavioral or perceived quality approach of marketing and consumer behavior. The metaphysical approach concentrates on the nature of quality that is seen as a feature that cannot be analyzed and which can be recognized only through experience. In that approach, quality is different for everyone because people are different in terms of experience. In the production management approach, quality is seen as a concept that is objectively measurable and explained in technical descriptions, while the economic approach investigates quality from an economic perspective and considers quality as a competitive weapon of the firm.

The perceived quality approach, which is the theoretical lens of this dissertation, focuses on the consumer's quality perception process, which means "*the way consumers form judgments about the quality of a product on the basis of incomplete information*" (Steenkamp 1989: 7). In the perceived quality approach, the effects of personal and situational variables on quality perceptions are also

taken into consideration. Perceived quality research derives from the "quality perception gap," which refers to the gap between manufacturers and consumers, presented by Morgan (1985). The quality perception gap refers to a situation where consumers are not satisfied with the quality they receive from companies. This gap emphasizes the need to investigate quality from a consumer's perspective because a consumer is the one who decides which product to buy (Steenkamp 1989: 58). This approach is also described as a "marketing approach" or "marketing-oriented interpretation" of perceived quality (Stylidis, Wickman & Söderberg 2020). As this dissertation examines wooden products in the context of housing, the discussion will be limited to the perceived quality of tangible products.

Table 2 lists the various definitions and descriptions of perceived quality in the existing literature. As early as in 1950, Oxenfeldt (1950) defined quality from a consumer's perspective and stated that the consumer acts as the judge of quality and quality consists of product attributes which yield consumer satisfaction. Subsequently, perceived quality was considered as fitness for use or goals (Kuehn & Day 1962; Kawlath 1969; Wimmer 1975; Genth 1981; Trenkle 1984) especially in those definitions that were written in German and translated by Steenkamp (1989) (e.g., Kawlath 1969; Genth 1981; Trenkle 1984). However, Zeithaml (1988) considered perceived quality to be "*the consumer's judgment about a product's overall excellence or superiority"* and this definition is the most cited among scholars and adopted in numerous studies, as will be discussed in Chapter 2.3. Also, other researchers regarded perceived quality as a consumer's judgment (Trenkle 1984; Steenkamp & Van Trijp 1989; Steenkamp 1989; Oude Ophuis & Van Trjip 1995).

Since the 1970s, scholars have made attempts to develop models to capture the nature of the perceived quality construct and identify the variables affecting consumers' perceptions of quality (e.g., Wimmer 1975; Olson & Jacoby 1972; Kupsch et al. 1978; Zeithaml 1988; Steenkamp 1989; Steenkamp & Van Trijp 1989; Oude Ophuis & Van Trijp 1995). Next, the chapter reviews and discusses the models that have significantly contributed to the field and have been applied in numerous empirical studies.

Table 2. The definitions of perceived quality

Author(s)	**Definition or description of perceived quality**
Oxenfeldt (1950)	quality consists of all attributes of a product which yield consumer satisfaction; the ultimate judge of quality is the consumer
Kuehn & Day (1962)	depends on how well it fits in with patterns of consumer preferences
Kawlath (1969) in Steenkamp (1989)	the fitness for certain goals
Wimmer (1975) in Steenkamp (1989)	fitness for use
Kupsch et al. (1978) in Steenkamp (1989)	a bundle of need-satisfying attributes
Genth (1981) in Steenkamp (1989)	fitness for use
Böckenhoff & Hamm (1983) in Steenkamp (1989)	the composite of all product attributes irrespective of whether these attributes are in reality existent in the product and objectively measurable, and whether consumers are correct in their evaluations
Trenkle (1983) in Steenkamp (1989)	three manifestations: 1) neutral concept: the nature of a product, given by the whole of all the attributes which discriminates the product from the other products in the same category; 2) evaluative concept: the fitness for use of a product, given by the whole of all the attributes that are relevant to the evaluation of the product; 3) positive judgment: superior or excellent with respect to all attributes
Kotler (1984)	the rated ability of the brand to perform its functions as perceived by consumers
Zeithaml (1988)	the consumer's judgment about a product's overall excellence or superiority
Steenkamp (1989)	an idiosyncratic value judgment with respect to the fitness for consumption of the product which is based upon the conscious and/or unconscious processing of appropriate and available intrinsic and extrinsic quality cues in relation to relevant experience and credence quality attributes, and formed within the context of prior experience, perceived quality risk, quality-consciousness, usage goals, and other personal and situational variables
Steenkamp & Van Trijp (1989)	an overall evaluative judgment, existing on a continuum from very poor to very good; perceived quality judgements are formed

Author(s)	**Definition or description of perceived quality**
	at two different points in time: when purchasing a product (quality expectation), and upon consumption (quality performance)
Steenkamp (1990)	fitness for consumption
Aaker (1991)	customer's perception of the overall quality or superiority of a product or service with respect to its intended purpose, relative to alternative
Oude Ophuis & Van Trijp (1995)	dependent on the consumer's judgment; an overall, global concept like an attitude
Mitra & Golder (2006)	perception of the customer, opposite to the objective quality
Keller & Swaminathan (2019)	customers' perceptions of the overall quality or superiority of a product or service compared with alternatives and with respect to its intended purpose
Stylidis, Wickman & Söderberg (2020)	a multi-dimensional entity, an outcome of designer/customer convention, and can be seen differently by the different research schools of thought; a place where the product meaning, form, sensorial properties, and their execution intersect with human experience; such an experience is driven by the interplay between product quality and its context
Aakko & Niinimäki (2021)	the elements of perceived quality include the process of assessment, levels involved in the assessment and multidimensional cues of assessment; for a consumer, assessing quality is a process that is shaped first by the expectations of the product, and further by the experience of using it

Zeithaml (1988) defined the concepts of price, perceived quality, and perceived value from the consumer's perspective and examined their relations in a conceptual model (The Perceived Quality Component, Figure 4). She adopted the distinction between intrinsic and extrinsic cues, first presented by Olson and Jacoby in 1972 and used by several scholars subsequently. An intrinsic cue is "*a product attribute which cannot be changed or experimentally manipulated without also changing the physical characteristics of the product itself,"* while extrinsic cues are "*product-related attributes which are not a part of the physical product"* (Olson & Jacoby 1972). According to Olson and Jacoby (1972), consumers perceive intrinsic cues to be the most accurate quality indicators. Based on Zeithaml's model, intrinsic attributes influence consumers' perceptions of abstract quality dimensions, which further affect perceived quality along with perceived monetary price and reputation. In her model, brand name and level of advertising

are considered to be extrinsic cues influencing reputation. She conceptualized the intrinsic product attributes as product-specific, while the abstract quality dimensions, which capture various specific attributes, are considered to be generalizable to product categories.

Additionally, Zeithaml described perceived quality through four properties. First, perceived quality is *different from objective or actual quality*. Zeithaml defined objective quality as measurable and verifiable superiority based on certain predetermined standards. However, Zeithaml emphasized the fact that all quality is perceived by someone, and thus objective quality may not exist (Maynes 1976). Second, perceived quality is *a higher-level abstraction rather than an attribute*. With this, Zeithaml referred to the means-end chain approach where consumers organize information at different levels of abstraction varying from simple product attributes to more complex personal values. Zeithaml defined perceived quality as a second-order phenomenon: an abstract attribute. Third, perceived quality can be seen as *a global assessment that sometimes resembles attitude*. Fourth, she also defined perceived quality as *a judgment usually made within a consumer's evoked set,* which means that consumers' quality evaluations usually occur in a comparison context. This thesis adopts Zeithaml's view of perceived quality as a rather subjective, second-order phenomenon consisting of abstract dimensions and influenced by intrinsic and extrinsic cues.

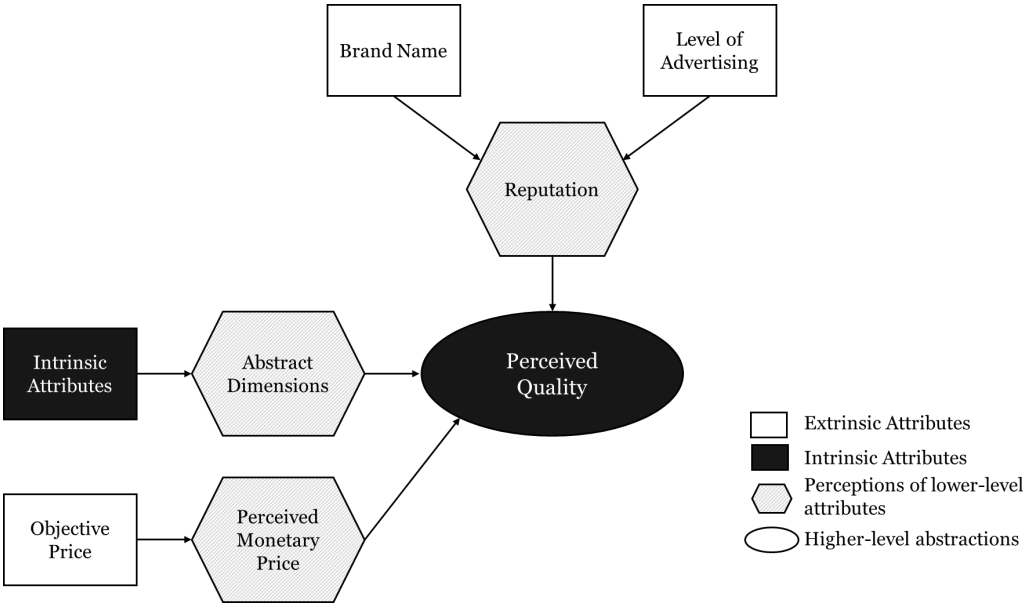

Figure 4. The Perceived Quality Component (Zeithaml 1988)

Steenkamp (1989) also investigated the perceived quality construct and developed the Model of the Quality Perception Process (Figure 5). He defined perceived

quality as "*an idiosyncratic value judgment with respect to the fitness for consumption of the product*" (p. 107) and this judgment is based on the evaluation of intrinsic and extrinsic quality cues in connection with experience and quality attributes and formed within the context of personal and situational variables. Steenkamp stated that perceived quality differs from other product quality approaches because it refers to quality neither as absolute nor as objective. In his model, three phases exist in the process of quality perceptions: cue acquisition and categorization, quality attribute belief formation, and integration of quality attribute beliefs.

Compared to the model by Zeithaml (1988), Steenkamp also included quality attributes in his model. The quality cues in the environment, such as intrinsic and extrinsic cues, are used to predict the quality attributes that cannot be observed before consumption. The quality attributes are defined as credence and experience attributes. Experience attributes can be determined based on the actual experience with the product, while credence attributes cannot be verified by the consumer even after normal use for a long time or without consulting a professional. Steenkamp stated that the distinction between quality attributes and cues enhances the understanding of the way quality perceptions are formed. He also suggested that the quality perception process is affected by personal and situational variables in addition to quality cues and attributes. In the model, prior experience, level of education, quality-consciousness, and perceived quality risk are examples of personal variables related to consumers' characteristics, while physical surroundings, social surroundings, and time pressure are examples of situational variables.

In contrast to Zeithaml's (1988) work, Steenkamp described perceived quality as an overall unidimensional evaluative judgment and suggested that consumers' perceived quality can range from "poor" to "good." He also considered that quality attribute perceptions are central in quality judgments: Perceived quality is based on consumers' perceptions of quality attributes. However, in two empirical studies included in his book, he also tested the relationships between quality cues, quality dimensions, and overall perceived quality. He revealed the underlying quality dimensions of food products through principal component analysis; he tested the effects of quality cues on those dimensions, and the results showed strong support for the fact that perceived quality judgments are predominantly based on consumers' perceptions of quality dimensions. In a somewhat contradictory fashion, he stated that perceived quality is a unidimensional construct, but still used quality dimensions, composed of quality attributes, in the empirical studies. Furthermore, his model does not include quality dimensions, while the central concepts are the quality cues and attributes. Similarly, this thesis adopts the

distinction between quality cues and attributes when identifying the variables influencing perceived quality, and also investigates the quality dimensions on which consumers' perceived quality judgments are based in terms of wooden products. Furthermore, the dissertation adopts Steenkamp's view of the quality perception process, and perceived quality is also seen to be influenced by personal and situational variables.

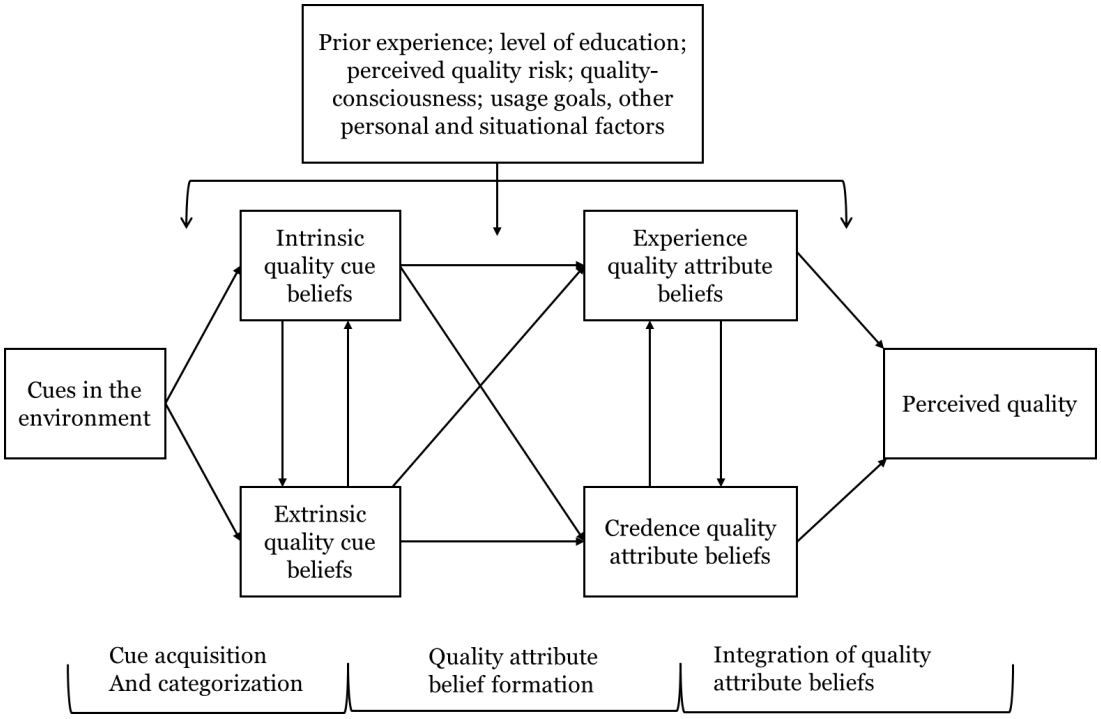

Figure 5. The Conceptual Model of the Quality Perception Process (Steenkamp 1989)

Subsequently, Oude Ophuis and Van Trijp (1995) defined quality as "*a multifaceted concept which is based on several dimensions that cannot be all evaluated by a consumer*" (p. 178) and thus consumers evaluate "surrogate" or "indirect" quality indicators to form a judgment of perceived product quality. They emphasized the significance of the concept of quality indicators (i.e., quality cues and attributes) and considered it to be a crucial element in discussing perceived quality. Oude Ophuis and Van Trijp introduced the Quality Quadrant (Figure 6), which comprises four Ps: Perception, Product, Person, and Place. They suggested that the concept of perceived quality is useful to determine and examine in accordance with these four modalities. In that model, perceived quality is considered to be the outcome of a *Perception* process, in which the quality judgment is formed based on product properties that are either visible or invisible and may have been experienced or are considered to be connected with the assessed product.

The other three modalities, Product, Person and Place, represent aspects related to the relativity and specificity of the perceived quality. The components of perceived quality can be different from each other depending on the examined *Product* or product category. For example, certain quality attributes can be relevant for some products only. Furthermore, perceived quality is grounded on the consumer's judgments, which refers to the *Person* modality. Perceived quality can vary accordingly based on the different perceptual abilities, personal preferences, and experience levels of consumers. *Place* refers to the context and situational factors, such as the intended purpose of usage, which can affect the perceived quality. The Quality Quadrant has the same elements as Steenkamp's (1989) Model of the Quality Perception Process. However, the Quality Quadrant does not aim to investigate the causal relationship between the components, but simply recognizes that they exist and are the main elements of perceived quality.

These four components are also relevant to examine in the context of this thesis. The thesis adopts the view that perceived quality is the result of consumers' perception process influenced by various quality indicators. Furthermore, the examination of the perceived quality construct happens in two product categories: wooden building and interior products. It is significant to explore the phenomenon in both categories because the components of perceived quality can be different depending on the examined product category (Oude Ophuis & Van Trijp 1995). This dissertation also investigates the Person component: consumer characteristics in terms of sociodemographic background and their consciousness for sustainable consumption (defined and discussed in Chapter 2.2.3) that may relate to their perceptions of quality. Furthermore, Place refers to the empirical context of the study, which is housing (i.e., building of and dwelling in houses).

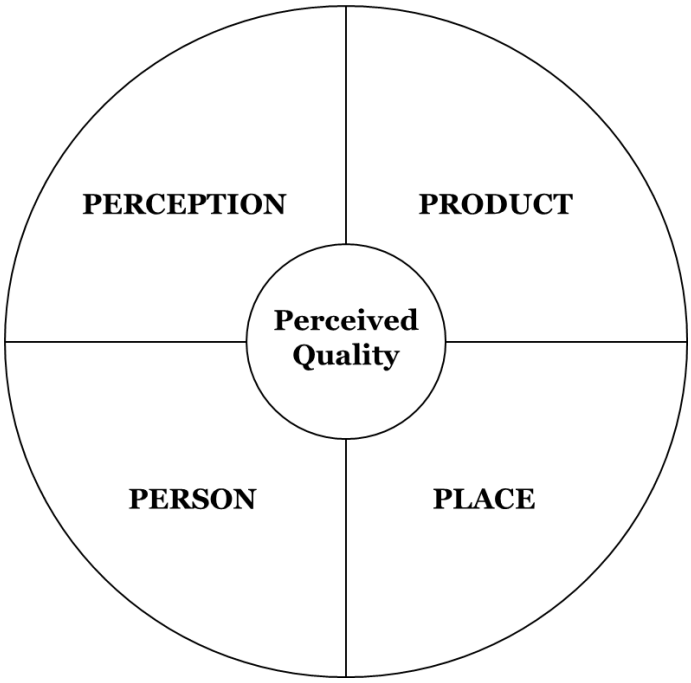

Figure 6. The Quality Quadrant (Oude Ophuis & Van Trijp 1995)

Brucks, Zeithaml, and Naylor (2000) extended the model of Zeithaml (1988) and developed the Conceptual Model of Perceived Quality (Figure 7). Distinct from work by Steenkamp (1989) and Oude Ophuis and Van Trijp (1995), they focused on abstract quality dimensions and considered that these dimensions would be influenced by consumers' perceptions of product-related attributes and cues, such as price, brand name, and reputation. They did not use the distinction between intrinsic and extrinsic quality cues directly, but in their model, product properties can be seen to reflect intrinsic cues, and brand name, price, and reputation extrinsic cues. Furthermore, they did not consider perceived quality to be influenced by aspects such as consumer-related or situational variables; instead, the final choice was affected by additional information and situational factors. They addressed the need to investigate the relevant quality dimensions and cues for a product category in order to deliver quality products. They also suggested that consumers see quality as composed of multiple abstract dimensions instead of an overall global assessment, which is in contrast with Steenkamp's (1989) view. This view is adopted in this thesis: To gain a comprehensive understanding of the nature of the perceived quality construct, this thesis scrutinizes the quality dimensions of wooden products.

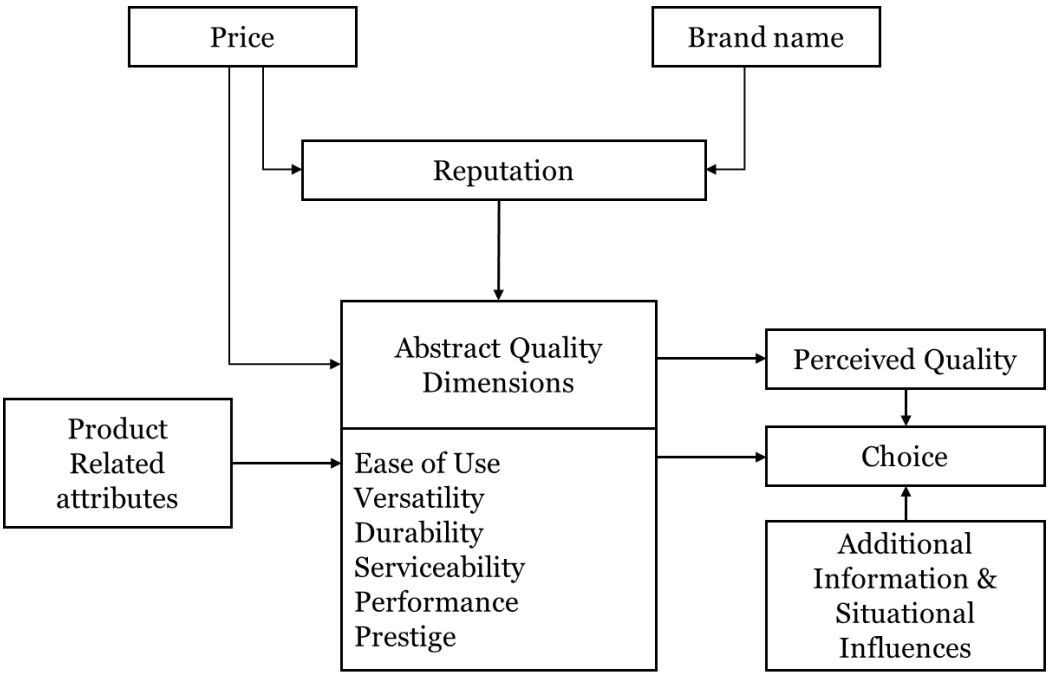

Figure 7. Conceptual Model of Perceived Quality (Brucks, Zeithaml & Naylor 2000)

Based on the existing models, certain conclusions can be drawn regarding the characteristics of the perceived quality construct. First, perceived quality can be considered to be different from objective quality (Zeithaml 1988) and a rather subjective construct formed within the context of personal variables (e.g., Steenkamp 1989). This means that every consumer forms their own perceptions of quality, depending on their perceptual abilities, personal preferences, and experience levels (Oude Ophuis & Van Trijp 1995). Second, perceived quality is a judgment made within a consumer's evoked set (Zeithaml 1988) and the constituents of perceived quality can differ from each other depending on the investigated product category (Oude Ophuis & Van Trijp 1995). Third, perceived quality is a relativistic and context-dependent construct, influenced by situational variables, such as intended purpose of usage and usage goals (Steenkamp 1989; Oude Ophuis & Van Trijp 1995). Fourth, perceived quality is formed in consumers' quality perception process, where intrinsic and extrinsic quality cues influence consumers' perceptions of experience and credence quality attributes (e.g., Steenkamp 1989). Fifth, perceived quality is also a multidimensional construct, consisting of abstract dimensions (Zeithaml 1988; Brucks, Zeithaml & Naylor 2000). Even though Steenkamp (1989) suggested that perceived quality is

unidimensional, he still formulated quality dimensions for the construct and gained empirical evidence for those dimensions which support the idea of the multidimensional nature of perceived quality. In the next chapter, these constituents of perceived quality (i.e., quality indicators and dimensions, personal and situational variables) are identified from the models and discussed further.

2.2 The constituents of perceived quality

As can be seen from the existing models of perceived quality, perceived quality is affected by different variables regarding product properties, consumer characteristics, and contextual factors (Table 3). These variables, including quality indicators and quality dimensions, and personal and situational variables, can be considered to be the constituents of perceived quality.

Table 3. The constituents of perceived quality related to the product, consumer, and context in the existing models

	Zeithaml (1988)	**Steenkamp (1989)**	**Oude Ophuis & Van Trijp (1995)**	**Brucks, Zeithaml & Naylor (2000)**
Product *Quality indicators and quality dimensions*	Intrinsic attributes Objective price Brand name Level of advertising Reputation Perceived monetary price Abstract dimensions	Cues in the environment (intrinsic, extrinsic quality cues), experience and credence attributes	Product	Price Brand name Reputation Product-related attributes Abstract quality dimensions
Consumer *Personal variables*	-	Personal factors (prior experience; level of education; perceived quality risk; quality consciousness)	Person	-
Context *Situational variables*	-	Situational factors (usage goals)	Place	-

2.2.1 Quality indicators

Quality cues (i.e., intrinsic and extrinsic cues) and quality attributes (i.e., experience and credence attributes), which are referred to as quality indicators (Oude Ophuis & Van Trijp 1995), are the central concepts when discussing product properties' influence on perceived quality. Steenkamp (1989: 100) defined quality cues as "*informational stimuli that are, according to the consumer, related to the quality of the product, and can be ascertained by the consumer through the senses prior to consumption.*" Intrinsic cues are physically part of the product, while extrinsic cues are only related to the product (Olson & Jacoby 1972). Quality attributes can be defined as product characteristics that deliver functional and psychosocial benefits to the consumer (Steenkamp 1990). According to Steenkamp (1989), quality attributes can be divided into experience and credence attributes. Experience attributes are those that consumers can determine after consumption, while credence attributes cannot be verified even after a long time or without consulting an expert. Steenkamp (1989) considered quality cues to be concrete properties and quality attributes to be abstract properties.

Several scholars have also investigated the relationship between various quality indicators, for example the importance of different cues in the quality perception process (Olson & Jacoby 1972; Rao & Monroe 1988; Purohit & Srivastava 2001). Olson and Jacoby (1972) emphasized the role of intrinsic cues: They were seen as more accurate indicators of product quality in comparison with extrinsic cues. Rao and Monroe (1998) and Purohit and Srivastava (2001) also came to the same conclusion and considered intrinsic cue information more useful for formulating evaluations. However, the role of extrinsic cues is emphasized when intrinsic information is scarce and consumers are more likely to use extrinsic cues to evaluate product quality (Monroe 2003; Suri & Monroe 2003; Miyazaki, Grewal & Goodstein 2005). Furthermore, the existing studies have also examined the relationship between the quality cues and attributes. Northern (2000) stated that both intrinsic and extrinsic cues are able to communicate experience attributes, while only extrinsic cues can communicate credence attributes. This means that consumers cannot use, for example, inherent product qualities to predict the credence properties of products, such as attributes regarding production processes.

To exemplify quality cues and quality attributes, the thesis utilizes food product studies that have extensively investigated perceived quality. This choice is supported by the fact that the wood products industry, like the food products industry, is a nature-dependent branch of business affected by factors such as rising consumer expectations on CSR (Ranängen & Zobel 2014) and societal

expectations for contributing to the development of the bioeconomy (Ekman et al. 2013). Both systems are directly linked to the flow of renewable natural resources and, additionally, the agricultural and food sector along with the forest sector can be seen as relevant actors when discussing sustainable development (Korhonen & Niutanen 2003).

Oude Ophuis and Van Trijp (1995) categorized the product-related quality indicators into quality cues and attributes in the context of food products (Table 4). These quality indicators have been investigated broadly in the context of food products. For example, intrinsic cues of food products include sensory properties, such as color, appearance, and size, while extrinsic cues can be price, brand name, and product information. Experience quality attributes consist of taste, freshness, and convenience, which are evaluated by the consumer during and after consumption, while credence attributes include, for instance, animal friendliness, environmental friendliness, and healthfulness, which are difficult to verify by consumers.

Table 4. Quality cues and quality attributes of food products (Oude Ophuis & Van Trijp 1995)

Intrinsic quality cues	**Extrinsic quality cues**
appearance color shape size structure	price brand name country of origin store production information nutritional information
Experience quality attributes	**Credence quality attributes**
taste freshness convenience	healthfulness naturalness animal friendliness environmental friendliness wholesomeness exclusiveness way of production

As can be seen from Table 4, certain attributes regarding sustainability issues in terms of country of origin, production information, healthfulness, animal friendliness, way of production, and environmental friendliness have already been included in the assessments since 1995. In the existing food product literature, these indicators have been researched extensively. For example, *country of origin* (Krystallis, Chryssochoidis & Scholderer 2007; Sáenz-Navajas et al. 2014; Ortega et al. 2016; Thøgersen, Pedersen & Aschemann-Witzel 2019; Sigurdsson et al. 2020), *production information* (Andersen 2011; Bejaei, Wiseman & Cheng 2011; Gracia, Barreiro-Hurlé & Galán 2014; Samant & Seo 2016; Baba, Kallas & Realini 2017; Katiyo et al. 2020), *healthiness* (Torjusen et al. 2001; Krystallis,

Chryssochoidis & Scholderer 2007; van Doorn & Verhoef 2011; Koistinen et al. 2013; Henchion et al. 2014; Hidalgo-Baz, Martos-Partal & González-Benito 2017; Tong et al. 2020), *animal friendliness* (Torjusen et al. 2001; Koistinen et al. 2013; Ortega et al. 2016; Gao et al. 2020) and *environmental friendliness* (Loureiro 2003; Lee & Hwang 2016; Samant & Seo 2016; Gao et al. 2020) have been investigated. In Chapter 2.4, the sustainability attributes investigated in perceived quality studies are analyzed in depth.

2.2.2 Quality dimensions

Alongside quality indicators, quality dimensions are also seen as relevant when discussing perceived quality. Zeithaml (1988: 7) referred to these dimensions as "*abstract dimensions that capture diverse specific attributes*." These abstract dimensions were already included in Zeithaml's (1988) model of the Perceived Quality Component in which these dimensions were influenced by intrinsic product attributes. Furthermore, Steenkamp (1989) combined the quality attributes into quality dimensions with principal component analysis in his empirical studies. Also, Oude Ophuis and Van Trijp (1995) considered perceived quality to be based on several dimensions.

Later, the role of quality dimensions was examined by Brucks, Zeithaml, and Naylor (2000). They developed the quality dimensions for consumer durables, such as automobiles, cameras, lawn mowers, furniture, hair dryers, camcorders, microwave ovens, power tools, blenders, and computers. They suggested that instead of overall quality, the quality dimensions form a better basis for understanding the significant connections involved in consumers' judgment and choice. Their results showed that the quality dimensions of these products consisted of ease of use, versatility, durability, serviceability, performance, and prestige (Table 5). Table 5 presents these quality dimensions with examples of the included quality attributes.

Similarly to Steenkamp (1989), in the study by Brucks, Zeithaml, and Naylor (2000), the quality dimensions included several quality attributes. This indicates that the quality dimensions are rather abstract constructs, consisting of various lower-level attributes. Brucks, Zeithaml, and Naylor provided examples of these lower-level attributes for each quality dimension in the context of automobiles. For example, versatility included attributes that referred to the product characteristics that differentiate the product from others, such as the cruise control or audio system, while durability included attributes that were related to the product lifetime, such as electrical systems, engine cooling system, and structural integrity.

Prestige included both inherent product attributes, such as appearance, and less tangible social components related to aspects such as the brand's image. Performance referred to the product's ability to do what it is supposed to do and consisted of attributes such as engine size and horsepower. Ease of use included attributes that facilitate the use of the product, such as adjustable seat position and cruise control, while serviceability included attributes of the service warranty and length of wait for service appointment, among other aspects.

Table 5. The quality dimensions of consumer durables by Brucks, Zeithaml, and Naylor (2000)

Quality dimensions by Brucks, Zeithaml & Naylor (2000: 361)	**Definition**	**Examples of quality attributes**
Versatility	*"Versatility involves the number and complexity of the characteristics that distinguish the model or brand from a stripped-down model"*	Cruise control Air-conditioning (A/C) Audio system Power windows Warning lights and indicators
Durability	*"Durability involves the length of time the product lasts; the length of time the product works properly (i.e., whether it needs frequent servicing); and how well the product holds up under adverse conditions, such as weather, heavy use, or misuse"*	Electrical systems Engine cooling system Service warranty length Parts warranty length Structural integrity Type of engine
Prestige	*"Prestige involves how well the product communicates superiority to the purchaser and relevant social groups of the purchaser. Prestige involves some visible inherent characteristics of the product, such as appearance, but also includes a less tangible social component that is reflected in the product or brand's image"*	Car's shape Vinyl/hard top Colors Sunroof Convertible
Performance	*"Performance refers to how well the product does what it is supposed to do"*	Miles per gallon (MPG), city/highway Automatic or manual Horsepower Engine size Fuel capacity Gas or diesel
Ease of use	*"Ease of use involves the consumer's ability to start and operate the product as well as clarity of instrumentation and instructions"*	Control of side mirror Right side mirror Seat position adjustable Automatic or manual Cruise control
Serviceability	*"Serviceability involves the consumer's ease of obtaining repair service (i.e., access to service centers and/or ease of self-service), the responsiveness of service personnel (i.e., ease of getting an appointment, willingness of repair personnel to listen to the customer), and the reliability of service (i.e., whether the service is performed right the first time)"*	Service warranty Parts warranty Distance to service parts center-dealer Length of wait for service appointment Employees listen to customers

2.2.3 Personal and situational variables

Also, it is evident that consumer-related variables influence perceived quality (e.g., Steenkamp 1989; Oude Ophuis & Van Trijp 1995). For example, Oude Ophuis and Van Trijp (1995) stated that perceived quality will vary according to the different perceptual abilities, personal preferences, and experience levels of consumers, and Steenkamp (1989) suggested that personal variables, such as prior experience, level of education, quality-consciousness, and perceived quality risk, influence consumers' quality perception process. Furthermore, the roles of situational variables (Steenkamp 1989) and place (Oude Ophuis & Van Trijp 1995) have been emphasized as contextual factors.

Consumers' sociodemographic background and consciousness for sustainable consumption (CSC) are examples of personal variables affecting perceived quality. To examine how personal variables relate to the perceived quality of wooden products, the dissertation examines the role of consumers' consciousness for sustainable consumption (CSC) along with sociodemographic background. Balderjahn et al. (2013) defined consumers' CSC as "*an intention to consume in a way that enhances the environmental, social, and economic aspects of the quality of life*" (p. 182) and suggested that CSC consisted of three interrelated but distinct dimensions: environmental, social, and economic sustainability. They also developed a measurement scale for CSC by operationalizing consciousness by weighting consumers' personal beliefs on the importance of aspects linked with the three sustainability dimensions. Table 6 presents the key factors for the conceptual model for CSC.

The CSC scale has been adopted by several scholars (Seegebarth et al. 2016; Ziesemer et al. 2016; Balderjahn et al. 2018; Hüttel et al. 2018; Pena-Cerezo, Artaraz-Minon & Tejedor-Nunez 2019; Balderjahn et al. 2020; Suárez et al. 2020; Haines & Lee 2021; Ziesemer, Hüttel & Balderjahn 2021). In recent years, some scholars have presented criticism toward the CSC scale (Gupta & Agrawal 2018; Pena-Cerezo, Artaraz-Minon & Tejedor-Nunez 2019; Quoquab, Mohammad & Sukari 2019) because it does not consider, for example, the behavioral aspect of the consumer (Quoquab, Mohammad & Sukari 2019). However, the validity of the scale has not been criticized (Pena-Cerezo, Artaraz-Minon & Tejedor-Nunez 2019). The original structure of the CSC scale was confirmed by Pena-Cerezo, Artaraz-Minon, and Tejedor-Nunez (2019) in their measurement of the degrees of CSC among university students. Furthermore, Suárez et al. (2020) examined the influence of CSC alongside materialism and a consideration of the future consequences of frugal behaviors. According to their results, the dimensions of CSC had a significant effect on frugal behavior.

Table 6. The conceptual model of Consciousness for Sustainable Consumption (Balderjahn et al. 2013)

	Consciousness for environmental consumption	**Consciousness for social consumption**	**Consciousness for economic consumption**
Key factors	*Recycling and disposing* *Packaging* *Use of resources and energy* *Local/regional production* *Climate impact*	*Human rights* *Social minimum standards* *Child labor/forced labor* *Discrimination* *Disciplinary sanctions/mistreatment* *Fair compensation*	***Voluntary simplicity*** *Material simplicity* *Durability* *Frugality* ***Debt-free consumption*** *Financial budget* *Safeguarding for future* *Price performance* ***Collaborative consumption*** *Renting* *Leasing* *Borrowing*

Previously, the CSC scale has been used in the context of anticonsumption (Seegebarth et al. 2016; Balderjahn et al. 2020; Ziesemer, Hüttel & Balderjahn 2021), fast-moving consumer goods (Balderjahn et al. 2018), university students (Pena-Cerezo, Artaraz-Minon & Tejedor-Nunez 2019), frugal behavior (Suárez et al. 2020), and consumers of fashion (Haines & Lee 2021). However, it has not been used in the context of wooden products that are of interest in this research and its connections to perceived quality have not been investigated earlier. By applying the CSC scale in the wood industry context, the dissertation provides significant insights on how consumers' consciousness for sustainable consumption, addressed from environmental, social, and economic viewpoints, connects with their perceptions of the quality of wooden products.

Based on the existing literature, the constituents of perceived quality consist of various quality indicators (i.e., quality cues and attributes), quality dimensions, and both personal and situational variables. This dissertation identifies and analyzes these constituents with a focus on sustainability attributes in terms of wooden products used in the context of housing. Furthermore, the connections between those constituents, such as consumer characteristics and quality dimensions, are investigated in the empirical studies of the thesis. Next, the use of the perceived quality construct in empirical studies is scrutinized.

2.3 The ambiguous ways of using the perceived quality construct

Before examining how sustainability attributes are evaluated in perceived quality research, it is critical to recognize how the existing empirical studies addressing both perceived quality and sustainability attributes define and use the perceived quality construct. In the existing research conducted in the 2000s, the use of the perceived quality construct has been inconsistent and contradictory: Perceived quality has been defined in many different ways, and the meaning and nature of the perceived quality construct varies. This challenge was already present in the late 1980s, when perceived quality was included in multiattribute models and treated as a lower-level attribute, even though according to Zeithaml (1988), perceived quality is instead a second-order phenomenon, an abstract attribute. Also, Steenkamp (1989: 58) stated that even though perceived quality was widely investigated in the existing literature at that time, only few authors had actually defined the concept before investigating it. He came to the conclusion that many authors seemed to assume that there is a general agreement among researchers about the meaning of perceived quality.

This issue seems to persist in studies conducted in the 2000s, and the perceived quality research is characterized by five properties. First, it varies in terms of whether perceived quality is treated as a concept or construct. Perceived quality is considered either as an abstract outcome of consumers' evaluations influenced by different quality indicators and/or consisting of multiple dimensions, or as a lower-level attribute determined by consumer's assessment on a scale from bad to good. Second, several studies use the term "quality perceptions" as a synonym for perceived quality with a similar meaning. Third, there are studies that either develop their own definition for perceived quality, sometimes in contrast with the original definitions discussed in Chapter 2.1, or do not define the construct at all. Fourth, some studies explore only consumer preferences for various quality indicators, but the focus is not on the outcome (e.g., the influence of quality indicators on perceived quality). Fifth, an extensive body of literature is focused on investigating the influence of perceived quality on other consumer behavior constructs, such as consumer choice, purchase intentions, and willingness to pay. These themes are scrutinized next.

Perceived quality – a concept or construct?

Several studies have investigated perceived quality as an abstract attribute in accordance with the original definitions by, for instance, Zeithaml (1988) (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Henchion et al.

2014; Monnot, Parguel & Reniou 2015; Bodur, Tofighi & Grohmann 2016; Ariffin et al. 2016; Lee & Hwang 2016; Jung and Seock 2016; Magnier, Schoormans & Mugge 2016; de Medeiros, Ribeiro & Cortimiglia 2016; Grubor, Djokic & Milovanov 2017; Hazen et al. 2017; Marakanon & Panjakajornsak 2017; Aschemann-Witzel, Giménez & Ares 2018; De Toni et al. 2018; Tong & Su 2018; Dekhili, Achabou & Alharbi 2019; Ramash et al. 2019; van Giesen & de Hooge 2019; Moslehpour et al. 2019; Farías 2020; Pahlevi & Suhartanto 2020; Zhang, Xiao & Zhou 2020; Ishaq 2021). In those studies, perceived quality was seen as a multidimensional construct (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Ariffin et al. 2016; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017) and as an outcome of the consumer's evaluation affected by different attributes, such as intrinsic and extrinsic attributes (de Medeiros, Ribeiro & Cortimiglia 2016), intrinsic and extrinsic quality cues (van Giesen & de Hooge 2019), and credence attributes (Lee & Hwang 2016).

For example, Krystallis, Chryssochoidis, and Scholderer (2007) suggested that consumers use a number of intrinsic and extrinsic quality cues to formulate their opinions about meat quality. In their study, the factors of visible quality, healthiness, nutritional value, general safety, and drug residue-related safety were described as underlying dimensions of meat quality. Furthermore, Ariffin et al. (2016) measured the perceived quality of green products by using the four dimensions of Petrick (2002): dependability, reliability, superiority, and consistency. They considered these dimensions to be capable of measuring consumers' overall judgment of a product or service. Furthermore, the perceived quality of electric products was seen, for example, as a six-dimensional construct comprising performance, durability, attention, worthiness, reliability, and product safety (Marakanon & Panjakajornsak 2017), while in the context of remanufactured products, perceived quality was a four-dimensional construct consisting of lifespan, features, performance, and serviceability (Hazen et al. 2017). Hidalgo-Baz, Martos-Partal, and González-Benito (2017) suggested that consumers' quality assessments are based on specific organic product attributes, such as environmental protection, health, and hedonic aspects.

However, many studies used "perceived quality" or "quality perceptions" when referring to quality as an unambiguous, lower-level attribute determined by the consumer's evaluation on a scale from bad to good (e.g., Loureiro 2003; Marell et al. 2004; van Doorn & Verhoef 2011; Sáenz-Navajas et al. 2014; Wan, Poon & Yu 2016; Gao et al. 2020; Lim & Reed 2020). This also relates to Steenkamp's (1989) view that perceived quality can range from "poor" to "good." For example, in a study by Loureiro (2003), perceived quality referred to the experienced quality of wine on a scale from very bad to very good, and Marell et al. (2004) used the

perceived quality concept when referring to the quality of a car evaluated in a similar manner. These studies did not consider perceived quality to be a construct affected by different cues and attributes or consisting of different dimensions, but rather viewed it as one product attribute among others.

Based on the analysis, perceived quality is used both as a concept and a construct. In multidimensional constructs, the higher-level abstraction is called a construct and the lower-level abstractions are referred to as concepts (Bhattacherjee 2012). Treating quality as a lower-level attribute refers to quality as a concept while considering quality as an overall assessment, consisting of different dimensions and dependent on different cues and attributes and other factors in the consumer environment, refers to a construct. Perceived quality as a construct exists at a higher level of abstraction than the concept and consists of several dimensions.

Perceived quality versus quality perceptions

Furthermore, one issue that makes the existing perceived quality literature a bit more confusing is that many studies only use the term "quality perceptions" to refer to perceived quality *(*e.g., Grunert, Bech-Larsen & Bredahl 2000; Torjusen et al. 2001; Grolleau & Caswell 2006; Costa, Garcia & Ibanez 2011; Bodur, Tofighi & Grohmann 2016; Samant & Seo 2016; Hidalgo-Baz, Martos-Partal & González-Benito 2017; Migliore et al. 2017; Wang & Gao 2017; Gassler, Fronzeck & Spiller 2019; van Giesen & de Hooge 2019). This probably stems from the late 1980s, when, for example, Steenkamp (1989: 7) stated that the perceived quality approach focuses on the quality perception process. Thus, researchers used "quality perceptions" in many cases as a synonym for perceived quality. For example, Torjusen et al. (2001) used quality perceptions to describe consumers' perceptions of different quality attributes, including freshness, taste, use of GMOs, health-harming substances in food, shelf life, food additives, nutrients, degree of processing, environmentally sound production, animal welfare, convenient preparation, ethical and political considerations, and visible quality attributes. Additionally, van Giesen & de Hooge (2019) investigated how intrinsic quality aspects, such as authenticity positioning, highlighting the product's naturalness, and extrinsic quality aspects, such as price and sustainability positioning, highlighting environmental sustainability, affect the consumers' quality perceptions. In both studies, quality perceptions referred to an abstract phenomenon affected by several product properties.

Perceived quality with differing or lacking definitions

Furthermore, the concept of perceived quality was used in some studies with a clearly differing definition compared to the original definitions listed in Chapter

2.1. For example, Cheung, Lam, and Lau (2015) considered perceived quality as being similar to product value and defined perceived quality "*as assessment of the product value contributed by the different product factors*," but still used the measurement scale for green perceived quality by Chen and Chang (2013). Akturan (2020) also used a similar approach, using the term "perceived quality," but measured it in terms of environmental performance. In addition, Yeh and Liao (2016) defined perceived quality as a customer's assessment of product value and quality, and measured it with variables regarding the product's environmental properties. Wang, Hazen, and Mollenkopf (2018) used perceived quality to refer to Garvin's (1984) conceptualization of perceived quality, while Xu, Prybutok, and Blankson (2019) defined the perceived quality of automobiles as a consumer's evaluation of a product's overall characteristics that reflect the hedonic and instrumental values. Also, Sun, Teh, and Linton (2018) used the construct of perceived quality and defined it as the judgment and assessment of a product's excellence, but also used the term "expectations of quality." Lv, Liu, and Cheng (2021) defined perceived quality in the context of new products to refer to the new product quality level assessed by consumers according to the clues and signals provided by the remanufactured products.

There were also studies that used the perceived quality construct but did not define it at all (e.g., Altintzoglou & Heide 2016; Aschemann-Witzel 2018; Lidón et al. 2018; Da Cunha et al. 2019; Grolleau, Mzoughi & Sutan 2019; Testa et al. 2020; Davis & Dabas 2021; Donato, Barone & Romani 2021; Margariti et al. 2021). Apparently, the problem regarding not defining the concept of perceived quality before investigating it, which was brought up by Steenkamp (1989: 58), is still evident in empirical studies examining perceived quality during the 2000s.

Focus on only quality cues and attributes

Furthermore, there were some studies investigating issues such as consumer preferences for quality cues, attributes, or signals, but these studies did not directly adopt the term "quality perceptions" or "perceived quality" (e.g., Koistinen 2013; Ortega et al. 2016; Thøgersen, Pedersen & Aschemann-Witzel 2019; Sigurdsson et al. 2020; Tong et al. 2020). These studies investigated consumers' perceptions and preferences for various quality indicators, but did not focus on the outcome (i.e., the effects of quality indicators on perceived quality or quality perception).

Perceived quality in relation to other consumer behavior constructs

However, it is evident that perceived quality – whether treated as a lower-level attribute or higher abstraction in the existing studies – had a significant effect on consumer behavior in terms of different variables. Perceived quality and

consumers' quality perceptions were examined in relation to other consumer behavior constructs, such as *purchase intentions* (Lee et al. 2014; Monnot, Parguel & Reniou 2015; Ariffin et al. 2016; Lee & Hwang 2016; Jung & Seock 2016; Yeh & Liao 2016; Issock Issock, Mpinganjira & Roberts-Lombard 2018; Sun, Teh & Linton 2018; Tong & Su 2018; Xu, Prybutok & Blankson 2019; van Giesen & de Hooge 2019; Moslehpour et al. 2019; Ramash et al. 2019; Jäger & Weber 2020; Tong et al. 2020; Lv, Liu & Cheng 2021; Margariti et al. 2021), *consumer choice* (Torjusen et al. 2001; Aschemann-Witzel 2018; Thøgersen, Pedersen & Aschemann-Witzel 2019), *customer loyalty* (Mejri & Bhatli 2014; Marakanon & Panjakajornsak 2017; Pahlevi & Suhartanto 2020), *perceived value* (Lee et al. 2014; Lee & Hwang 2016, de Medeiros, Ribeiro & Cortimiglia 2016; Chen, Tsai & Hsieh 2017; Wang, Hazen & Mollenkopf 2018; De Toni et al. 2018; Bonn, Chang & Cho 2020; Pahlevi & Suhartanto 2020; Zhang, Xiao & Zhou 2020), *perceived risk* (Chen, Tsai & Hsieh 2017; Marakanon & Panjakajornsak 2017; Bonn, Chang & Cho 2020; Pahlevi & Suhartanto 2020), *customer trust* (Marakanon & Panjakajornsak 2017; Pahlevi & Suhartanto 2020), *willingness to pay* (Sogari, Mora & Menozzi 2016; van Doorn & Verhoef 2011; Da Cunha et al. 2019; Tong et al. 2020), *brand attitudes* (Jung and Seock 2016; Margariti et al. 2021), *brand preference* (Moslehpour et al. 2019), *green purchase intention* (Cheung, Lam & Lau 2015), *green brand image* (Ng et al. 2014; Delafrooz & Goli 2015), *green brand perceived value* (Ng et al. 2014), and *green brand equity* (Ng et al. 2014; Ishaq 2021).

For example, in a study by Cheung, Lam, and Lau (2015), perceived quality was considered to be a driver of green product adoption. Furthermore, according to the results of Marakanon and Panjakajornsak (2017), perceived quality had an indirect effect on customer loyalty via customer trust. In terms of perceived value, the findings by Bonn, Chang, and Cho (2020) suggested that positive perceived quality of regional wines leads to positive perceived value for purchasing regional wine. Also, Pahlevi and Suhartanto (2020) considered perceived quality to be the main driver of perceived value, satisfaction, and loyalty based on their Quality-Loyalty Model. Furthermore, some studies treated perceived quality as a mediating variable when investigating repurchase intentions (e.g., Ariffin et al. 2016), the interaction between the ethical attributes and extrinsic cues in consumers' evaluations (Bodur, Tofighi & Grohmann 2016), and the relationship between the credence attributes and perceived value (Lee & Hwang 2016). In conclusion, perceived quality was found to have a significant relationship with several consumer behavior constructs.

Figure 8 presents the practices used to examine perceived quality in the existing research. In Figure 8, the thesis reflects the reviewed studies in relation to Zeithaml's (1988) Perceived Quality Component in terms of adopting the

distinction between lower-level attributes and higher-level abstractions. In conclusion, the use of the perceived quality construct has been inconsistent and heterogenous; perceived quality is used both as a lower-level attribute and as a higher-level abstraction, with differing definitions, and therefore conceptual clarity is needed. However, it is evident that used in either way, perceived quality has a significant effect on consumer behavior in terms of different variables.

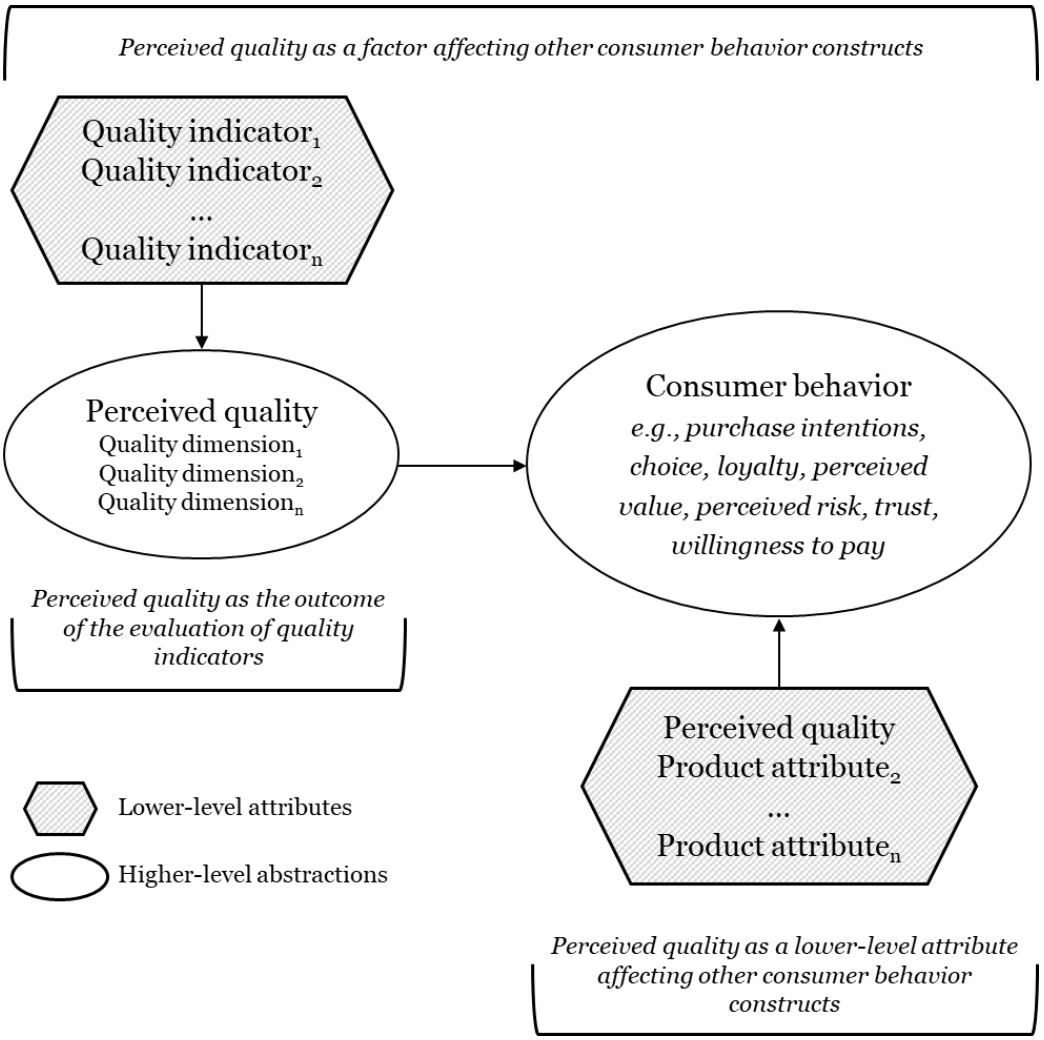

Figure 8. The practices to investigate perceived quality in the existing research: as a lower-level attribute or as a higher-level abstraction

In this dissertation, perceived quality is approached as a higher-level abstraction consisting of various quality dimensions and as the outcome of consumers' evaluation of quality indicators. In the next section, the sustainability attributes are specified and their connections with the perceived quality construct are analyzed. It is significant to note that the various practices to investigate the

perceived quality construct presented above make it challenging to compare these studies, as the conceptualizations of perceived quality have been inconsistent and the studies treating perceived quality as a multidimensional construct are limited. Therefore, to gain a comprehensive view of the connections between perceived quality and various sustainability attributes, those studies treating perceived quality as a lower-level attribute are also included in the examinations of sustainability attributes along with the studies that address perceived quality as a higher-level abstraction and a multidimensional construct.

2.4 Sustainability attributes in relation to perceived quality

In this section, the key definitions for environmental, social, and economic sustainability attributes are discussed. Then, the thesis scrutinizes perceived quality studies that investigate product sustainability and identifies and analyzes the examined sustainability attributes. Finally, the various connections between perceived quality and sustainability attributes are outlined.

2.4.1 Specifics of sustainability attributes

Before characterizing the sustainability attributes, the related key constructs (i.e., sustainable development, sustainability, and sustainable consumption) must be defined. Sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED 1987: 41), while sustainability can be defined as "*the principle of ensuring that our actions today do not limit the range of economic, social, and environmental options open to future generations*" (Elkington 1997: 20). Based on those definitions, the differences between the constructs are that sustainability is considered to be the main goal, while sustainable development is seen as a means to achieve that goal.

Sustainable consumption has a significant role in achieving sustainable development goals (United Nations 2022c). At the Oslo Symposium (1994), sustainable consumption was defined as "*the use of services and related products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations*" (UNEP 2010: 12).

Since then, sustainable consumption has been defined in many ways by academic researchers (e.g., Lim 2017). One of the most commonly used definitions sees sustainable consumption as "*consumption that simultaneously optimizes the environmental, social, and economic consequences of acquisition, use and disposition in order to meet the needs of both current and future generations*" (Phipps et al. 2013: 1277). Phipps et al. (2013) defined the concept based on the work by Lusch et al. (2011) who investigated the consumption cycle from acquisition to usage and disposition and emphasized consumers' different decision points when trying to consume sustainably. According to the definition by Phipps et al. (2013), sustainable consumption means that when choosing which products to buy, consumers are expected to consider the environmental, social, and economic impacts of their consumption from acquisition to disposal. In this definition, the dimensions of environmental, social, and economic sustainability are clearly present.

Furthermore, Lim. (2017) considered responsible consumption, anti-consumption, and mindful consumption as prominent theoretical perspectives to sustainable consumption. Mindful consumption is "*guided and underpinned by a mindful mindset that reflects a conscious sense of caring toward self, community, and nature"* (Sheth et al. 2011: 27) that is similar to CSC (consciousness for sustainable consumption) concept by Balderjahn et al. (2013), examined in Article II in this thesis. The concepts of mindful consumption and CSC are also related to the triple bottom line concept on sustainable development by Elkington (1997) where environmental quality, social justice, and economic prosperity are interlinked.

Sustainability of products has been a central topic within the research on sustainable consumption (Trudel 2019). However, this research has mostly focused on the environmental and social dimensions of sustainability (e.g., Balderjahn et al. 2018), which are considered to reflect what most consumers associate with sustainability attributes (Catlin, Luchs & Phipps 2017). For example, Lusch et al. (2010) defined sustainable products as products with positive social and/or environmental attributes. In spite of this, economic sustainability attributes can also affect consumers' perceptions (e.g., Choi & Ng 2011). A study by Choi and Ng (2011) focusing on environmental and economic sustainability showed that consumers responded to multiple dimensions of sustainability.

In general, sustainability attributes can be seen to be connected with environmental, social, and economic sustainability aspects (see, e.g., Elkington 2004). Environmental sustainability attributes involve issues such as waste,

pollution, resource usage, and ecosystems (OECD 2008), and preserving natural resources and the environment (Bangsa & Schlegelmilch 2020). Environmental sustainability can appear in many forms: For example, the production process can be environmentally sustainable, or the physical product attributes can be made of environmentally sustainable material (Skard, Jørgensen & Pedersen 2021). Social sustainability emphasizes the well-being of people and communities as a noneconomic form of wealth (Choi & Ng 2011). Social sustainability attributes can be seen to address themes related to health, welfare, and social justice (OECD 2008, Elkington 1997), and issues concerning workers and suppliers, consumers, and communities (Catlin, Luchs & Phipps 2017).

Economic sustainability attributes have various definitions and meanings. Sheth, Sethia, and Srinivas (2011: 24) identified two dimensions of economic sustainability: "*conventional financial performance (e.g., cost reductions)*" and "*economic interests of external stakeholders, such as a broad-based improvement in economic well-being and standard of living*." Based on the definitions, economic sustainability attributes can be considered from the point of view of both companies and other stakeholders, such as consumers. This dissertation adopts the view of economic sustainability attributes that are perceived by consumers. According to Choi and Ng (2011), the economic dimension of sustainability refers to protecting and preserving favorable economic environments. They considered it to be desirable in the minds of consumers: Through their purchases, consumers may want to support firms that offer employment and contribute to the economic development of local communities, which is important for them. Furthermore, according to Gerlach and Schudak (2010), product attributes that relate to issues such as longevity reflect the economic dimension of sustainability, while Hanss and Böhm (2012) considered attributes regarding economic welfare, economic viability, and economics as examples of economic sustainability. According to Balderjahn et al. (2013), the economic sustainability dimension involves consumers' careful decisions regarding whether to spend money on a product or not.

Product sustainability can be either intrinsic or extrinsic (Magnier, Schoormans & Mugge 2016). Examples of extrinsic sustainability attributes are environmental or ethical labels (e.g., FSC and PEFC labels) (Hansmann, Koellner & Scholz 2006; Shoji et al. 2014; Holopainen et al. 2017), narrative claims, such as "environmentally friendly" or "sustainable" (Andac Guzel 2020; Higgins, Hutchinson & Longo 2020), and properties regarding physical appearance, such as biodegradable packaging (Steenis et al. 2018) or a paper-based instead of plastic-based packaging (Donato, Barone & Romani 2021). These attributes can

also be seen as extrinsic cues (e.g., Olson & Jacoby 1972) that aim to communicate the sustainability performance of products (Bangsa & Schlegelmilch 2020).

In addition, product sustainability can be an intrinsic property when, for example, a product is made of environmentally friendly material. However, sustainability properties can be seen as credence quality attributes that cannot be verified even after normal use for a long time or without consulting an expert (e.g., Steenkamp 1989). Bangsa and Schlegelmilch (2020) argued that most sustainability attributes are considered to be credence attributes. Examples of credence quality attributes can be environmental friendliness or animal welfare. However, products can have extrinsic cues, such as information or labels, to inform consumers about these properties.

When considering the distinction between lower-level attributes and higher-level abstraction by Zeithaml (1988), product sustainability on the whole can be considered to be a higher-level abstraction, while individual sustainability attributes reflecting aspects such as environmental, social, or economic sustainability are lower-level attributes in their nature. Product sustainability can be considered to be a multidimensional construct, consisting of environmental, social, and economic sustainability attributes, and this can be considered to be the starting point of this thesis when investigating the sustainability attributes in relation to the perceived quality of wooden products in the context of housing. In the next section, perceived quality studies investigating product sustainability are examined and the sustainability attributes are identified and analyzed.

2.4.2 Sustainability attributes in perceived quality studies

Sustainability attributes addressed in perceived quality studies can be categorized into environmental, social, and economic attributes, as discussed in the previous section. Most of the investigated sustainability attributes reflect the environmental dimension of sustainability. *Environmental sustainability attributes* can include, for example, attributes related to environmental friendliness, such as environmental labels and information, environmental benefits, and environmental protection (e.g., Torjusen et al. 2001;Loureiro 2003; Grolleau & Caswell 2006; Costa, Garcia & Ibanez 2011; Toivonen 2012; Koistinen et al. 2013; Chen, Lin & Weng 2015; Monnot, Parguel & Reniou 2015; Lee & Hwang 2016; Samant & Seo 2016; Wan & Toppinen 2016; Hidalgo-Baz, Martos-Partal & González-Benito 2017; Migliore et al. 2017; Wang & Gao 2017; Wang, Hazen & Mollenkopf 2018; Dekhili, Achabou & Alharbi 2019; Gao et al. 2020; Jäger & Weber 2020; Lim & Reed 2020; Tong et al. 2020). In terms of wooden products,

both Costa, Garcia, and Ibanez (2011) and Toivonen (2012) considered environmental friendliness to be a quality attribute. Furthermore, several scholars adopted the concept of *green perceived quality,* which can be seen as an environmental sustainability attribute (e.g., Chen & Chang 2013; Chang & Chen 2014; Chen, Lin & Weng 2015; Wang 2017; Nekmahmud & Fekete-Farkas 2020; Pahlevi & Suhartanto 2020; Ansu-Mensah 2021; Cuesta-Valiño et al. 2021; Wasaya et al. 2021). In most of the studies, green perceived quality was defined based on Zeithaml's (1988) definition of perceived quality: Green perceived quality was "*a consumer's judgment about a product's overall environmental excellence or superiority*" (Chen & Chang 2013).

The most explored *social sustainability attributes* comprise attributes regarding healthiness and health aspects (Grunert, Bech-Larsen & Bredahl 2000; Torjusen et al. 2001; Krystallis, Chryssochoidis & Scholderer 2007; van Doorn & Verhoef 2011; Koistinen et al. 2013; Henchion et al. 2014; Hidalgo-Baz, Martos-Partal & González-Benito 2017; Lidón et al. 2018; De Toni et al. 2018; Testa et al. 2020; Tong et al. 2020; Davis & Dabas 2021; Donato, Barone & Romani 2021), safety issues (Krystallis, Chryssochoidis & Scholderer 2007; Costa, Garcia & Ibanez 2011; Koistinen et al. 2013; Lee & Hwang 2016; Ortega et al. 2016; Samant & Seo 2016; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017; Wang & Gao 2017; Gao et al. 2020; Pahlevi & Suhartanto 2020), and animal welfare (Torjusen et al. 2001; Koistinen et al. 2013; Ortega et al. 2016; Migliore et al. 2017; Gao et al. 2020). There were also studies that examined social value (Zhang, Xiao & Zhou 2020), social quality (Mejri & Bhatli 2014), social responsibility (Gao et al. 2020), and social information (Dekhili, Achabou & Alharbi 2019). In the case of wooden products, Costa, Garcia, and Ibanez (2011) included fire resistance and safety in their measurement scale.

In the existing studies, *economic sustainability attributes* were not investigated in-depth. The economic sustainability attributes were mostly explored in relation to perceived quality through the product's price and costs (Grunert, Bech-Larsen & Bredahl 2000; Costa, Garcia & Ibanez 2011; Koistinen et al. 2013; Lee & Hwang 2016; Ortega et al. 2016; Samant & Seo 2016; Wan & Toppinen 2016; Aschemann-Witzel 2018; De Toni et al. 2018; Wang, Hazen & Mollenkopf 2018; Tong & Su 2018; Da Cunha et al. 2019; van Giesen & de Hooge 2019; Moslehpour et al. 2019; Thøgersen, Pedersen & Aschemann-Witzel 2019; Testa et al. 2020; Sigurdsson et al. 2020; Zhang, Xiao & Zhou 2020). Also, the product's durability (Costa, Garcia & Ibanez 2011; Wan & Toppinen 2016; Hazen et al. 2017; Marakanon & Panjakajornsak 2017; Pahlevi & Suhartanto 2020; Aakko & Niinimäki 2021; Davis & Dabas 2021) can be seen to represent the economic dimension due to its connections with costs: A product with a low durability needs to be replaced at

some point and that leads to indirect price increases for consumers (BEUC 2015). However, these attributes were not referred to as sustainability attributes in the existing studies.

Furthermore, some attributes can be seen to reflect more than one dimension of sustainability. Organic claims and certifications (Grunert, Bech-Larsen & Bredahl 2000; van Doorn & Verhoef 2011; Ortega et al. 2016; Samant & Seo 2016; Aschemann-Witzel 2018; Gassler, Fronzeck & Spiller 2019; Tong & Su 2018; Grolleau, Mzoughi & Sutan 2019; Thøgersen, Pedersen & Aschemann-Witzel 2019; Testa et al. 2020; Margariti et al. 2021) and attributes regarding the use of pesticides (Migliore et al. 2017; Farías 2020) can be considered to be both environmental and social sustainability attributes because organic foods, which are grown without synthetic pesticides, have benefits for both the environment and people in terms of health, for instance (see, e.g., Winter & Davis 2006).

Also, the attributes of social and economic sustainability can be seen to overlap in terms of origin, for example (Loureiro 2003; Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Sáenz-Navajas et al. 2014; Ortega et al. 2016; Thøgersen, Pedersen & Aschemann-Witzel 2019; Sigurdsson et al. 2020). For instance, the benefits of local production and origin can be seen to address both economic sustainability (i.e., improvements in economic well-being and standard of living) and social sustainability (employment of local workers, well-being of local communities) (e.g., OECD 2008; Sheth, Sethia & Srinivas 2011). For example, Toivonen (2012) included domestic origin as a quality attribute in terms of wooden panel and flooring materials and wooden furniture. Furthermore, the durability of a product relates to long-term economic benefits (economic sustainability) and environmental sustainability: In addition to the connections with costs, prolonging product durability is an important way to decrease negative environmental effects (Sinclair et al. 2018).

Additionally, corporate social responsibility (CSR) can be seen to reflect environmental, social, and economic sustainability. CSR is defined as "*the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large*" (World Business Council for Sustainable Development 2000). CSR-related attributes were investigated in some studies (e.g., Jung & Seock 2016; Tong & Su 2018; Dekhili, Achabou & Alharbi 2019; Ramash et al. 2019). Furthermore, the issues of food waste, examined in a study by Aschemann-Witzel (2018), can be considered to reflect environmental (e.g., inefficient use of scarce natural resources, emissions during disposal), social (e.g., inequality in access to food across the globe, food

security), and economic (e.g., not all waste is avoidable in an economically feasible manner) sustainability issues (Aschemann-Witzel 2018).

In the studies, sustainability attributes were called extrinsic cues (Krystallis, Chryssochoidis & Scholderer 2007; Henchion et al. 2014; Sáenz-Navajas et al. 2014; van Giesen & de Hooge 2019), extrinsic attributes (de Medeiros, Ribeiro & Cortimiglia 2016), extrinsic indicators (Grolleau & Caswell 2006), extrinsic components (Mejri & Bhatli 2014), extrinsic qualities (Gao et al. 2020), credence attributes (Grunert, Bech-Larsen & Bredahl 2000; Grolleau & Caswell 2006; Krystallis, Chryssochoidis & Scholderer 2007; Henchion et al. 2014; Lee & Hwang 2016; Sogari, Mora & Menozzi 2016; Migliore et al. 2017; Aakko & Niinimäki 2021), credence characteristics (Migliore, Schifani & Cembalo 2015) and ethical attributes (Bodur, Tofighi & Grohmann 2016). Magnier, Schoormans, and Mugge (2016) investigated intrinsic product sustainability (organic products) and extrinsic product sustainability (sustainable packaging). In addition, some studies used the term "sustainability" to only describe for example the environmental friendliness of a product. For example, van Giesen and de Hooge (2019) used the concept of sustainability positioning when addressing environmental sustainability. Furthermore, Aakko and Niinimäki (2021) used the concept of sustainability cues, which included ethical and environmental quality, and Donato, Barone, and Romani (2021) used the concept of "sustainable package," which referred to a package that was either paper- or plastic-based. However, in a study by Ishaq (2021), sustainability was measured through all the three dimensions (i.e., environmental, social, and economic) of sustainability.

In the studies, consumers considered sustainability attributes to be important. Consumers were concerned about issues such as animal welfare and health aspects (Torjusen et al. 2001), and according to a study by Sáenz-Navajas et al. (2014), the country and region-of-origin of wine appeared to be an important extrinsic factor for most consumer clusters. In addition, when investigating consumers' quality perceptions of locally produced beef, Migliore et al. (2017) found that the ethical and environmentally friendly production attributes alongside food safety attributes guaranteed through certification were seen to influence consumers' choices. However, there were studies with contradictory findings: For example, the attributes regarding environmental sustainability were deemed less relevant during a typical purchase decision process regarding green products (de Medeiros, Ribeiro & Cortimiglia 2016). Furthermore, Sogari, Mora, and Menozzi (2016) suggested that using eco-labels on wine products might be useful to gain consumers' attention, but not sufficient to encourage purchase if the product is considered to be of low quality or too expensive. Next, the connections between perceived quality and the measured sustainability attributes are scrutinized.

2.4.3 Linkages between perceived quality and sustainability attributes

Based on the studies investigating the connections between perceived quality and sustainability attributes, three different relationships between the constructs can be identified: sustainability attribute as a determinant of perceived quality, sustainability attribute as a quality dimension, and sustainability attributes and perceived quality as separate variables.

Sustainability as a determinant of perceived quality

Most of the studies positioned sustainability attributes as factors affecting perceived quality, *the determinants of perceived quality* (Figure 9). For example, Aakko and Niinimäki (2021) argued that sustainability shapes the entire perception of quality in the context of fashion products, and in Lee's and Hwang's (2016) study, credence attributes significantly impacted the perceived quality of organic foods and further purchase intentions. The influence of a sustainability attribute was considered positive in many studies. For example, the results of Magnier, Schoormans, and Mugge (2016) suggested that the perceived quality of food products was more positive when the food product was packed in sustainable packaging. Similar results were also obtained in another study: A food product in a sustainable package was perceived as more satiating and this effect was explained by the higher perceived quality triggered by the presence of a sustainable package (Donato et al. 2021). In a study by Hidalgo-Baz, Martos-Partal, and González-Benito (2017), quality assessments of organic products were based on specific attributes, such as environmental protection, health, and hedonic assessment, and based on the results, these attributes positively affected quality perception. Additionally, the results of Bonn, Chang, and Cho (2020) suggested that when regional environmental conditions are perceived to be positive by consumers, it may lead them to have more positive perceptions about the overall quality of regional wines. Furthermore, in two studies, CSR had a significant impact on perceived quality (Tong & Su 2018; Ramash et al. 2019).

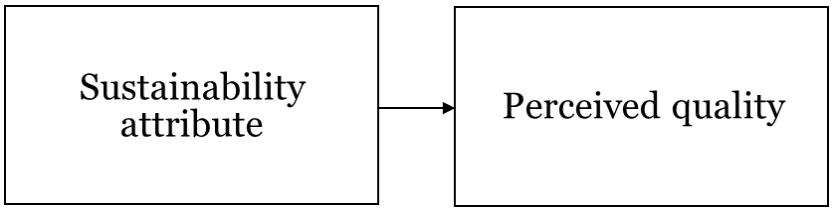

Figure 9. Sustainability attribute as a determinant of perceived quality

Sustainability was investigated with labels or product information in many studies. For example, using "pesticide-free" labels had a positive effect on perceived quality

(Farías 2020), and according to the results by Margariti et al. (2021), organic food products with organic claims led to positive attitudes toward the brand and purchase intention via enhanced perceived naturalness and perceived quality. In Mejri's and Bhatli's (2014) study, the communication of the social quality of private labels improved consumers' perceived quality. In addition, presenting suboptimal products with a sustainability positioning or with an authenticity positioning positively affected consumers' quality perceptions and purchase intentions regarding suboptimal products (van Giesen & de Hooge 2019), and in a study by Lim and Reed (2020), the perception of quality was positively correlated with the preference for ecolabels in the case of wine products. As an exception, sustainability information, regarding environmental and social information, negatively affected the perceived quality of luxury products (Dekhili, Achabou & Alharbi 2019).

Sustainability attributes as a quality dimension

Some studies considered sustainability attributes to be a part of perceived quality, and in these studies, sustainability attributes formed either a part of a quality dimension (Figure 10) or a quality dimension of their own (Figure 11). One example of the former is a study by Krystallis, Chryssochoidis, and Scholderer (2007). They found underlying dimensions of perceived meat quality that also included general safety (i.e., country of origin, safe from salmonella, dioxins, and BSE), drug residue-related safety (i.e., free from hormones, antibiotics), and healthiness (i.e., less fat, nutritional value information, production method information, weight control, fat content) in addition to visible quality (i.e., color, freshness, marbling, type of cut) and nutritional value (i.e., rich in vitamins, rich in proteins, nutritious). In their study, the quality dimensions included both sustainability attributes and other product properties. For example, the dimension of healthiness included the sustainability attribute of production information, but also other product attributes, such as fat content. Their quality dimensions can be considered to reflect social and economic sustainability: For example, safety issues and healthiness reflect social sustainability, while country of origin relates to both social and economic sustainability. In addition, Wan and Toppinen (2016) examined the quality dimensions of children's furniture. One of the revealed dimensions included basic product attributes but also the attributes of reasonable price and durability, which can be seen to reflect both economic and environmental sustainability.

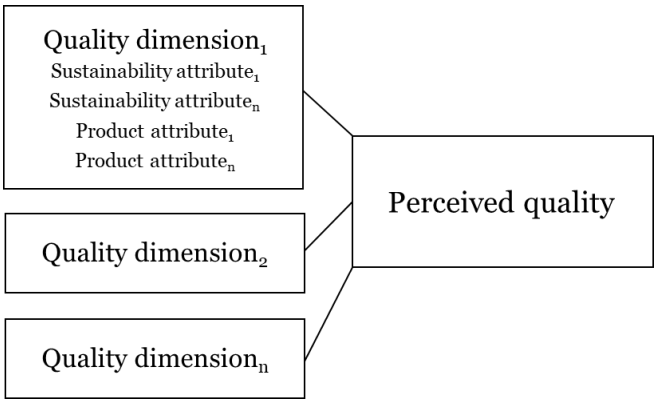

Figure 10. Sustainability attribute(s) as a part of a quality dimension

The examples of the latter – sustainability attributes as their own quality dimension – are the studies by Toivonen (2012), Wan and Toppinen (2016), and Marakanon and Panjakajornsak (2017). In Toivonen's (2012) study, domestic origin (reflecting both economic and social sustainability) and environmental friendliness constituted a quality dimension of wooden panels and flooring materials and wooden furniture. Furthermore, the results by Wan and Toppinen (2016) showed that one quality dimension of children's furniture included the naturalness of the material, safety, and environmental friendliness. This dimension mostly reflects environmental sustainability; however, safety aspects are also related to social sustainability. Marakanon and Panjakajornsak (2017) suggested perceived quality to be a six-dimensional construct that included the dimensions of product safety along with performance, durability, attention, worthiness, and reliability. In these dimensions, product safety reflects social sustainability, while durability is an example of an economic sustainability attribute that can also relate to environmental sustainability.

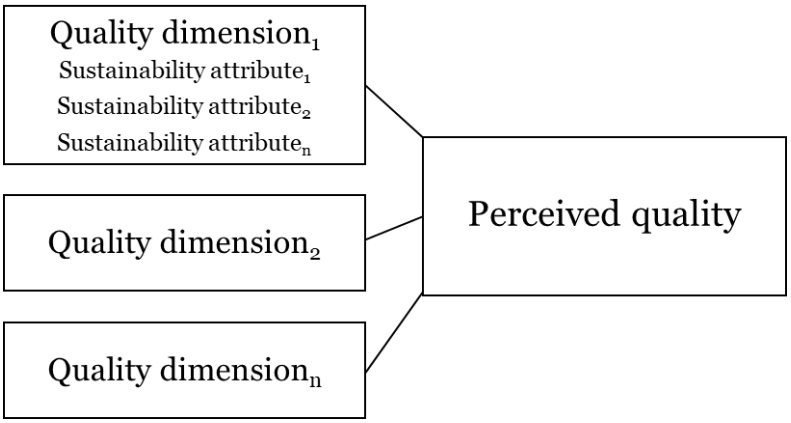

Figure 11. Sustainability attributes as a quality dimension

Perceived quality and sustainability as separate variables

Finally, some studies investigated sustainability attributes and perceived quality as separate variables affecting certain consumer behavior constructs (Figure 12), such as purchase intentions (Monnot, Parguel & Reniou 2015; Jung & Seock 2016), perceived value (Wang, Hazen & Mollenkopf 2018), and willingness to pay (van Doorn & Verhoef 2011). For example, Monnot, Parguel, and Reniou (2015) explored perceived environmental friendliness and perceived quality as separate variables affecting purchase intentions in the case of private label products. A similar approach was used by Jung and Seock (2016). They studied the effects of companies' CSR reputation alongside perceived quality on consumers' attitudes and purchase intentions. In a study by Wang, Hazen, and Mollenkopf (2018), perceived sacrifices (perceived quality and perceived risk) and perceived benefits (environmental benefits, price advantage) were seen to affect perceived value. Van Doorn and Verhoef (2011) suggested that quality in addition to healthfulness and prosocial product benefits influenced consumers' willingness to pay.

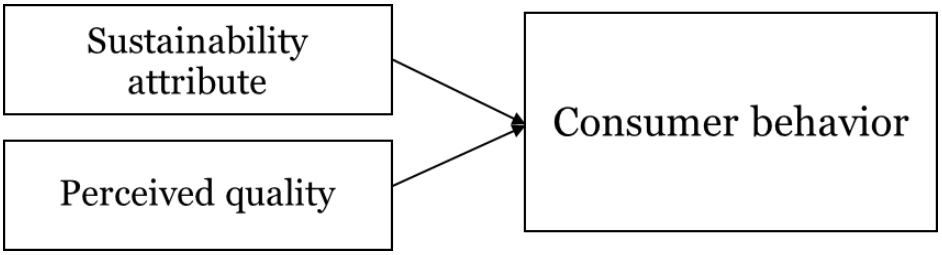

Figure 12. Sustainability attribute and perceived quality as separate variables

In conclusion, the connections between perceived quality and sustainability attributes have not been examined in-depth: The studies are conducted mostly in the context of food products and the role of sustainability attributes varies between a determinant, a part of a quality dimension, a quality dimension of their own, and a separate variable. As the dissertation approaches perceived quality as a multidimensional construct, and evidence is gained based on the existing studies in which sustainability attributes are perceived as part of quality (as a quality dimension) in some product categories, this thesis examines whether consumers consider sustainability attributes to be part of perceived quality also in the context of wooden products. Next, the existing literature on wood product quality is analyzed with a focus on perceived quality constituents, theoretical and empirical approaches, and investigated sustainability attributes.

2.5 Approaches to wood product quality

Several scholars investigating wood product quality (e.g., Sinclair, Hansen & Fern 1993; Sinclair & Hansen 1993; Hansen, Bush & Fern 1996; Hansen & Bush 1996; Hansen & Bush 1999; Weinfurter & Hansen 1999) have utilized the dimensions of product quality by Garvin (1984), who advocated a deeper understanding of the customers' perspective as a necessary first step in defining product quality. In his model, perceived quality was considered to be a quality dimension alongside performance, features, reliability, conformance, durability, serviceability, and aesthetics, and it consisted of the variables of brand name, reputation, and previous experience. For example, when assessing industrial forest product quality regarding office furniture, Sinclair, Hansen, and Fern (1993) tested Garvin's eight quality dimensions, but the results of their study failed to support the eight-dimensional structure of quality, and therefore the authors suggested combining different dimensions (performance and feature) and adding an economic dimension. Also, Sinclair and Hansen (1993) investigated the quality attribute relationship in office furniture. Similarly to Sinclair, Hansen, and Fern (1993), the choice of quality attributes in their study was guided by Garvin's eight quality dimensions. According to their results, the three most important attributes to rate quality were absence of defects, delivery on schedule, and structural integrity.

Subsequently, consumer perceptions of softwood lumber quality were examined in four studies (Hansen, Bush & Fern 1996; Hansen & Bush 1996; Hansen & Bush 1999; Weinfurter & Hansen 1999). Hansen et al. (1996) used the models by Garvin (1984) and Parasuraman, Zeithaml, and Berry (1988) and combined them in their theoretical framework. In addition to Garvin's quality dimensions, Parasuraman, Zeithaml, and Berry (1988) identified the dimensions of service quality: service reliability, responsiveness, assurances, empathy, and tangibles. However, Hansen et al. (1996) proposed several modifications to make the dimensions more applicable to softwood lumber. As a result of the study, quality characteristics were divided into five dimensions: supplier/salesperson characteristics, supplier facilities, supplier services, lumber performance, and lumber characteristics. Based on this, Hansen and Bush (1996, 1999) developed a condensed measurement model for softwood lumber quality. Weinfurter and Hansen (1999) continued investigating the perception gap that existed between suppliers and buyers regarding softwood lumber quality requirements. They also used the Condensed Measurement Model for Softwood Lumber Quality by Hansen and Bush (1996) in their study. Their results showed that the largest perception gaps exist in terms of various aspects of lumber aesthetics. In those studies, the models were developed for industrial consumers (professional softwood lumber buyers) for measuring perceptions of softwood lumber quality, so their applicability in

contexts such as analyzing the end-consumers' quality perceptions of wooden products, which are of interest in this study, can be questioned. However, all these studies considered quality to be a multidimensional construct with several dimensions.

Only a couple of studies have investigated wood product quality by using the perceived quality approach (Costa, Garcia & Ibanez 2011; Toivonen 2012). Table 7 presents the quality indicators examined in those studies. Costa, Garcia, and Ibanez (2011) constructed an econometric model that explained consumers' purchase decisions by simultaneously integrating perceived product quality and tastes. They referred to quality perception as the quality level estimated by consumers on the basis of product attributes and assumed that each consumer forms a quality perception for each attribute and might judge the quality level of attributes differently for differentiated products. They used the term "quality perceptions" instead of perceived quality and their approach emphasized that quality perception is subjective and product-dependent, similarly to Oude Ophuis and Van Trijp (1995). They also explored the effects of consumer characteristics and information on quality perceptions of different wood product attributes, such as global quality, thermal insulation, acoustic insulation, maintenance, product life, aesthetics, environment, fire resistance, safety, and price. Their results showed that socioeconomic factors affected the choice of window material. However, their study did not aim to investigate the dimensionality of the perceived quality construct or perceived quality as an outcome of consumers' evaluation of these quality indicators. Instead, they investigated consumers' perceptions of the individual quality indicators.

Furthermore, Toivonen (2012) investigated product quality in the case of wooden products (i.e., wooden panel and flooring material, wooden furniture). Based on the results, she also considered perceived quality to be a multidimensional construct, similarly to Zeithaml (1988) and Brucks, Zeithaml, and Naylor (2000), and assumed that the perceived product quality was a hierarchical structure consisting of tangible and intangible dimensions. Table 8 presents the quality dimensions of wooden panel and flooring material and wooden furniture based on the results of Toivonen (2012). The tangible quality dimension included variables, such as ease of care of the surfaces, use properties, appearance/visuality, and technical quality, while the first intangible quality dimension consisted of variables related to the supplier, service, and information. The second intangible quality dimension comprised variables regarding environmental friendliness and domestic origin. These dimensions were also related to the dimensions by Brucks, Zeithaml and Naylor (2000), especially in respect to the dimensions of serviceability, ease of use, durability, performance, and prestige. In addition, the

quality dimensions of her study were similar in both product categories, which supported the assumption by Zeithaml (1988), who suggested that the abstract quality dimensions can be generalized to product categories. However, the results were in contrast with, for instance, Oude Ophuis and Van Trijp (1995) who stated that perceived quality may vary depending on the product investigated.

Table 7. The quality indicators of the existing perceived quality studies investigating wooden products

Reference	Product category	Quality indicators
Costa, Garcia & Ibanez (2011)	Wooden windows	Global quality Thermal insulation Acoustic insulation Maintenance Product life Aesthetics Environment Fire resistance Safety Price
Toivonen (2012)	Wooden panels and flooring materials, wooden furniture	Reliability of the supplier Reputation of the producer Serviceability of the sales personnel Service (related to the product) Warranty (for the products) Payment and delivery terms Availability of product information Availability of information about the producer Environmental friendliness (of the product) Domestic origin Appearance Ease of care/maintain the surfaces Use properties Technical quality Brand name

In the studies by Costa, Garcia, and Ibanez (2011) and Toivonen (2012), certain sustainability attributes were included in the measurement scales. Both Costa, Garcia, and Ibanez (2011) and Toivonen (2012) explored environmental friendliness as a quality indicator of wooden products. In addition, Costa, Garcia, and Ibanez (2011) included product life, fire resistance, safety, and price, and Toivonen (2012) domestic origin in their measurements. Costa, Garcia, and Ibanez (2011) also investigated how important these indicators were for consumers when purchasing windows made of either wood or vinyl. All these attributes were considered to be important by consumers, with product life being deemed the most

important. In Toivonen's (2012) study, domestic origin and environmental friendliness formed a quality dimension of perceived quality both in the case of wooden panels and flooring materials and wooden furniture. However, in both studies, the investigations of sustainability attributes were quite narrow, and they were not addressed through environmental, social, and economic sustainability.

Table 8. The quality dimensions of wooden panel and flooring materials and wooden furniture by Toivonen (2012)

The quality dimensions by Toivonen (2012)	**Variables (wooden panel and flooring materials)**	**Variables (wooden furniture)**
Intangibles I: supplier, service and information	Reputation of the producer Availability of information about the producer Reliability of the supplier Availability of product information Service (related to the product) Brand name Serviceability of the sales personnel Warranty (for the product)	Reputation of the producer Availability of information about the producer Reliability of the supplier Availability of product information Service (related to the product) Brand name Payment and delivery terms Warranty
Tangibles	Ease of care of the surfaces Use properties Appearance/visuality Payment and delivery terms Technical quality	Ease of care of the surfaces Use properties Appearance/visuality Technical quality
Intangibles II: physical product related intangibles	Domestic origin Environmental friendliness (of the product)	Domestic origin Environmental friendliness (of the product)

In conclusion, the existing studies on wood product quality have examined perceived quality to some extent (Costa, Garcia & Ibanez 2011; Toivonen 2012). However, there have been inconsistencies in the definitional domains of perceived quality, and the quality indicators investigated by Costa, Garcia, and Ibanez (2011) and Toivonen (2012) were different from each other. It is also worth mentioning that the distinction and identification of quality cues and attributes have not been made previously in the case of wooden products. Furthermore, the linkages between perceived quality and product sustainability have not been scrutinized in-depth in the wood industry context. Thus, this thesis conceptualizes both perceived quality and the connections between the perceived quality and sustainability attributes of wooden products in the context of housing.

2.6 The theoretical framework of the connections between perceived quality and sustainability attributes

The previous sections have discussed the conceptualizations and constituents of perceived quality and the connections between perceived quality and sustainability attributes. Based on the dominant view of consumer behavior and marketing research (e.g., Zeithaml 1988; Steenkamp 1989; Oude Ophuis & Van Trijp 1995; Brucks, Zeithaml & Naylor 2000), perceived quality is a rather subjective construct consisting of abstract dimensions (quality dimensions) and influenced by different quality cues and attributes of a product (quality indicators), and other factors related to consumer characteristics and the consumer environment (personal and situational variables). This dissertation refers to these variables as *the constituents of perceived quality*. Perceived quality is also a relativistic construct; for example, the quality indicators and dimensions can differ from each other depending on the investigated product category. However, in the empirical studies that examine both perceived quality and sustainability, the use of the perceived quality construct has been inconsistent and heterogenous, and perceived quality is used both as a lower-level attribute and as a higher-level abstraction. Furthermore, perceived quality has been used with differing definitions.

Nevertheless, it is evident that based on the existing consumer behavior and marketing research, perceived quality is a significant factor influencing consumers' purchase intentions and choice (e.g., Jung & Seock 2016; Yeh & Liao 2016; Aschemann-Witzel 2018; Xu, Prybutok & Blankson 2019; Thøgersen, Pedersen & Aschemann-Witzel 2019). Therefore, it is surprising that in terms of wooden products, consumers' perceptions of wood product quality have been examined only to some extent and there are only few studies addressing the perceived quality of wooden products (Costa, Garcia & Ibanez 2011; Toivonen 2012). In these studies, there are inconsistencies in the definitional domains of perceived quality, and the used measurement scales also differ in terms of which quality indicators are used. Thus, additional theoretical and empirical research is needed to build a theoretical foundation for perceived quality in the case of wooden products.

Furthermore, on the basis of the existing perceived quality studies, the role of sustainability attributes in relation to perceived quality is not consistent and three different relationships between the constructs can be identified. First, there are studies that position sustainability as a determinant of perceived quality (e.g., Lee & Hwang 2016; Magnier, Schoormans & Mugge 2016; Donato et al. 2021). These studies represent the majority of the studies; a certain sustainability attribute is

considered to influence perceived quality in either a positive or negative manner. Second, some studies consider certain sustainability attributes to be a part of the quality dimension or a quality dimension of their own (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017). Third, some studies explore sustainability and perceived quality as separate variables affecting other consumer behavior constructs (van Doorn & Verhoef 2011; Monnot, Parguel & Reniou 2015; Jung & Seock 2016; Wang, Hazen & Mollenkopf 2018). In addition, sustainability attributes have been investigated mainly with a focus on environmental sustainability, while examinations of product sustainability with environmental, social, and economic sustainability attributes are rare in perceived quality studies. This issue is present also in the case of wooden products, where sustainability attributes have been explored with a focus on only environmental and/or social sustainability (e.g., Costa, Garcia & Ibanez 2011; Toivonen 2012).

Figure 13 presents the theoretical framework to conceptualize the connections between perceived quality and sustainability attributes based on the existing theoretical and empirical literature discussed in the previous sections. In this dissertation, perceived quality is considered to be an abstract construct, influenced by quality cues and attributes, consumer characteristics, and situational variables according to Steenkamp's (1989) model. Furthermore, perceived quality is viewed as a multidimensional construct, as evidence is gained from both theoretical literature (e.g., Zeithaml 1988; Oude Ophuis & Van Trijp 1995; Brucks, Zeithaml & Naylor 2000) and empirical studies (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Ariffin et al. 2016; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017).

Unlike the models developed by Zeithaml (1988), Steenkamp (1989), and Brucks, Zeithaml, and Naylor (2000), this study also explores whether quality cues can be considered to be part of the quality dimension alongside quality attributes. This has been done by researchers such as Krystallis, Chryssochoidis, and Scholderer (2007), Wan and Toppinen (2016), and Toivonen (2012) and the results of those empirical studies showed that quality cues were grouped with quality attributes in the same quality dimensions and did not form separate dimensions. In this dissertation, first the indicators of perceived quality (i.e., sustainability attributes and other product attributes) of wooden products are identified, followed by an investigation of underlying dimensions of the perceived quality of wooden building and interior products. These dimensions are further analyzed to gain an understanding of the connections between perceived quality and sustainability attributes. Furthermore, the linkages between consumer characteristics (i.e., sociodemographic background and CSC) and their perceptions of the quality

dimensions of wooden building and interior products are examined in the empirical studies.

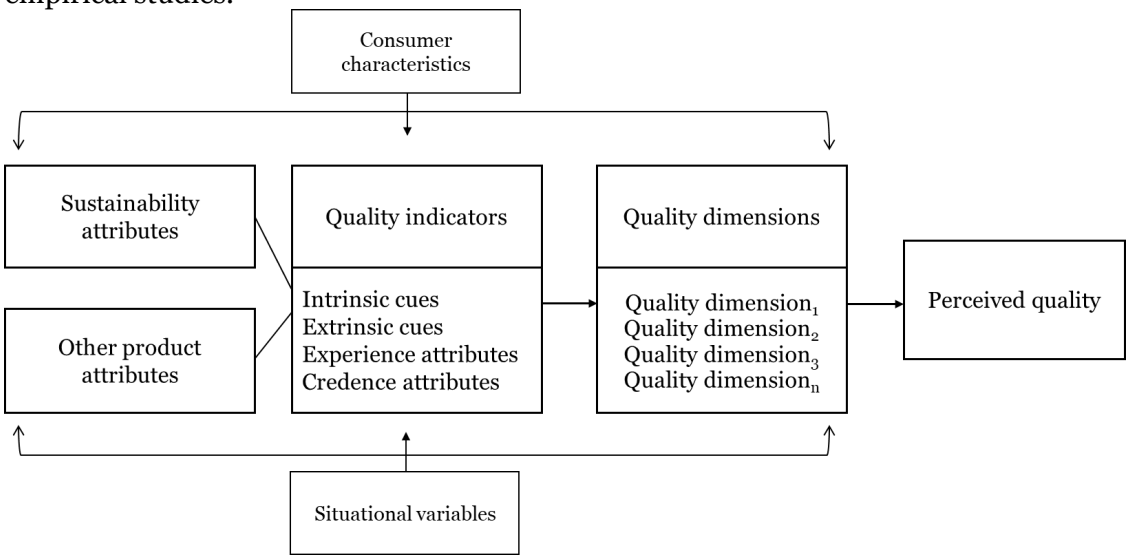

Figure 13. Theoretical framework to conceptualize the connections between perceived quality and sustainability attributes

3 METHODOLOGY

This chapter discusses the philosophical and methodological underpinnings of this dissertation. First, the key elements of the research process, including ontology, epistemology, methodology, and methods, are defined and analyzed. Then, the methodological choices of the three articles related to the methods of data collection (systematic literature review methodology, survey methodology) and data analysis (qualitative methods, statistical analysis methods) are discussed. Finally, the quality of the research is assessed by analyzing the concepts of reliability and validity in relation to the articles.

3.1 Philosophical underpinnings of the dissertation

Crotty (1998: 2-10) suggested that the research process consists of four basic elements: methods, methodology, theoretical perspective, and epistemology. He also added that ontology is a relevant concept informing the theoretical perspective with epistemology. Each theoretical perspective embodies a way of understanding *what is* (ontology) as well as understanding *what it means to know* (epistemology). Before introducing the philosophical and paradigmatic assumptions of this dissertation, it is significant to recognize how these elements (i.e., ontology, epistemology, methodology, and methods) are defined and what their relationships with each other are.

Ontology concerns "*the ideas about the existence of and relationship between people, society and the world in general*" (Eriksson & Kovalainen 2008). It refers to the study of being and addresses "what is" in terms of the nature of existence and the structure of reality as such (Crotty 1998: 10). Epistemology relates to the nature of knowledge (Hamlyn 1995: 242) and it is concerned with "*what constitutes acceptable knowledge in a field of study"* (Saunders, Lewis & Thornhill 2007: 102). According to Mulisa (2022), while ontology is focused on the essence of truth, epistemology is concerned with studying the existing reality.

According to Crotty (1998: 3), methodology refers to the strategy behind the choice and use of methods, which links the choice and use of methods to the desired outcomes. Methodology has to do with why, what, from where, when, and how data is gathered and analyzed (Scotland 2012). In comparison, methods are the techniques used to collect and analyze data related to certain research questions and hypotheses (Crotty 1998: 3). Through methodology and epistemology, methods can be traced back to an ontological position (Scotland 2012).

Paradigm is a concept that refers to a set of assumptions regarding ontology, epistemology, human nature, and methodology (Burrell & Morgan 1979). In the social sciences, the major paradigms include positivism, post-positivism, interpretivism, postmodernism, and critical theory (Guba & Lincoln 1994; Lincoln, Lynham & Guba 2018). Crotty (1998: 7) called these paradigms theoretical perspectives referring to "*the philosophical stance that lies behind our chosen methodology.*"

The research philosophy of this thesis reflects the principles of post-positivism. Even though post-positivist assumptions about the grounds of social knowledge are mostly based on the objectivist tenets guiding positivist social research (Miller 2000: 60), post-positivism differs in many ways from positivist research. A positivist study has a focus on a strictly scientific empiricist method designed to yield pure data and facts uninfluenced by human interpretation or bias (Saunders, Lewis & Thornhill 2009), and causal relationships are examined to create law-like generalizations (Gill & Johnson 2010). Furthermore, in a positivist study, observable and measurable facts and regularities are discovered, and only phenomena that would be observed and measured would lead to the production of credible and meaningful data (Crotty 1998). In comparison, unlike positivism, post-positivism assumes that the absolute truth cannot be found (Guba & Lincoln 1994) and proposes that knowledge is socially constructed and not neutral (Henderson 2011). Post-positivism suggests that researchers cannot completely apprehend reality and the driving mechanisms in the world cannot be completely understood (Miller 2000: 58). Post-positivists also aim to understand causal relationships (Creswell 2009: 7) and they hold to the assumption that "*the search for knowledge remains centered on causal explanations for regularities observed in the physical and social world*" (Miller 2000: 60). A post-positivist researcher uses methods that aim to be as unbiased as possible and attempt to recognize values that may compromise neutrality (Miller 2000: 61).

This thesis adopts a deductive approach to research when pursuing a post-positivist epistemology. It is typical of the deductive approach that a clear theoretical position is developed before data gathering, quantitative data is collected, and the concepts are operationalized to ensure clarity of definition (Saunders, Lewis & Thornhill 2007: 38, 120). The thesis starts with an analysis of the existing literature on perceived quality and sustainability attributes. The constituents of perceived quality, specifics of sustainability attributes, and the linkages between perceived quality and sustainability attributes are discussed and analyzed. Following that, a theoretical framework is developed for scrutinizing and conceptualizing the connections between those constructs. In the articles of this dissertation, quantitative techniques and procedures dominate and are applied in

the empirical studies (Articles II and III), while in the theoretical conceptualizations of perceived quality (Article I), qualitative methods, such as content and thematic analysis, are used when analyzing secondary data (i.e., peer-reviewed scientific articles). Next, the chosen methodology and methods are discussed in terms of the three articles and the objectives of the thesis.

3.2 Data collection and analysis in the articles

The dissertation consists of three articles whose research context, research aims, methodology, and methods are presented in Table 9. Article I examined the variables affecting the perceived quality of wooden building materials, which relates to the first objective of the thesis: identifying the constituents of perceived quality (i.e., quality indicators, personal and situational variables). This was investigated by means of a systematic literature review by using the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol (Paul et al. 2021). The data consisted of peer-reviewed research articles published or in the state of "in press" between January 2000 and November 2020 in international peer-reviewed journals. To structure and scrutinize the results, two organizing frameworks were adopted, and the data were analyzed with content analysis and thematic analysis.

The empirical studies, Articles II and III, relate to all the objectives of this dissertation. First, they aimed to identify the constituents of perceived quality (i.e., quality indicators and dimensions) of wooden building products (Article II) and interior products (Article III), an aim that is also connected with the first objective of the thesis, similarly to Article I. Furthermore, the articles investigated the connections between certain constituents (i.e., consumer characteristics and quality dimensions). In Article II, the relationship between consumers' consciousness for sustainable consumption and their perceptions of the quality dimensions of wooden building products were explored, while in Article III, the linkages between consumers' sociodemographic background and their perceptions of the quality dimensions of wooden interior products were investigated. Second, the results of these studies (i.e., revealed quality dimensions) are utilized in Chapter 5 when specifying the linkages between the perceived quality and sustainability attributes of wooden products in the context of housing (second objective of the dissertation) and developing a conceptualization of the perceived sustainable quality of wooden products (third objective of the dissertation). Based on the results of these studies, conceptual models for the perceived sustainable quality of wooden building and interior products are constructed.

Table 9. The articles of the dissertation in terms of research context, aims, methodology, and methods

	Research context	**Research aims**	**Methodology**	**Methods**
Article I	Wooden building materials	(1) to systematically review the existing literature on consumer behavior regarding wooden building materials, (2) to identify, analyze and summarize the variables affecting the perceived quality of wood	Systematic literature review methodology with the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol (Paul et al. 2021)	Organizing frameworks: 1) the Model of the Quality Perception Process by Steenkamp (1989), 2) TCCM framework by Paul and Rosado-Serrano (2019), content analysis, thematic analysis
Article II	Wooden building products	(1) to add knowledge concerning how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures), (2) to investigate the connections between consumers' perceptions of wooden building product quality indicators and their CSC, addressed from environmental, social, and economic viewpoints	Survey methodology	Questionnaire, statistical analysis (Exploratory factor analysis, Mann-Whitney U-test)
Article III	Wooden interior products	(1) to evaluate how the environmental, social, and economic sustainability of forestry-wood value chains contribute to the perceived quality of wooden interior products through different quality indicators, (2) to investigate the interlinkages between consumers' sociodemographic background and their perceptions of wooden interior product quality	Survey methodology	Questionnaire, statistical analysis (Exploratory factor analysis, Mann-Whitney U-test, Kruskal-Wallis test)

In Articles II and III, data were collected by means of a postal survey, and different quantitative methods, such as multivariate methods (exploratory factor analysis, Mann-Whitney U-test, Kruskal-Wallis test), were applied. Exploratory factor analysis was conducted when investigating the underlying quality dimensions of wooden building products (Article II) and wooden interior products (Article III). Then, nonparametric tests, such as the Mann-Whitney U-test and Kruskal-Wallis test, were applied when investigating the relationships between the quality dimensions and consumers' consciousness for sustainable consumption (CSC) (Article II) and consumers' sociodemographic background (Article III). Next, the methods of data collection and analysis of the three articles are discussed in detail.

3.2.1 Systematic literature review methodology

In Article I, the research aims were 1) to systematically review the existing literature on consumer behavior regarding wooden building materials and 2) to identify, analyze, and summarize the variables affecting the perceived quality of wood. These variables can be considered to be the constituents of perceived quality. To achieve these aims, a systematic literature review was implemented with the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol (Paul et al. 2021). This methodology was chosen because literature reviews contribute significantly to the conceptual, methodological, and thematic development of different domains (Palmatier, Houston & Hulland 2018; Hulland & Houston 2020). Furthermore, the review was a combination of a domain-based review (Paul & Criado 2020) and a framework-based review (Paul & Benito 2018). Two organizing frameworks were adopted to achieve the aims: the TCCM framework by Paul and Rosado-Serrano (2019) and the Model of the Quality Perception Process by Steenkamp (1989).

The SPAR-4-SLR protocol comprised three stages (i.e., assembling, arranging, and assessing) and six sub-stages (i.e., identification, acquisition, organization, purification, evaluation, and reporting), which are discussed in detail in Article I. The material of the study consisted of peer-reviewed research articles either published or in a state of "in press" between January 2000 and November 2020 in international peer-reviewed journals. Research articles were gathered in November 2020 with a systematic literature review using two electronic databases (ISI Web of Knowledge and Scopus) with the search words 1) "wood*" AND "consumer" or 2) "timber" AND "consumer" for titles, abstract, and keywords. These research terms generated 1,713 studies in the ISI Web of Knowledge and 2,060 studies in Scopus. In addition, the reference lists of the articles found through systematic searches were scrutinized to capture all the relevant material

in the background of the review. As a result of this procedure, altogether 10 additional studies were identified to be used as a material of the study. Overall, 3,783 records were screened based on their publication titles and abstracts.

The selection of the studies included three steps. Step 1 consisted of screening studies based on publication titles by checking whether all inclusion criteria, such as field, topic, study design, year, language, and publication status, were met. In step 2, the contents of the abstracts selected in step 1 were studied and studies were further excluded if the focus was not on wood as a building material. In step 3, potentially appropriate studies were selected and evaluated in detail to determine their relevance to the inclusion criteria. Some studies were excluded in this phase because the results presented were not usable for identifying the variables influencing consumer behavior regarding wooden building materials or the perceived quality of wood. Based on the inclusion criteria, 69 studies published in 31 journals in the period from January 2000 to November 2020 were eventually included in the analysis.

3.2.2 Survey methodology

Articles II and III adopted a survey methodology. Groves et al. (2009: 2-41) defined a survey as "*a systematic method for gathering information from (a sample of) entities for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are members.*" They also introduced the life cycle of a survey from a design perspective that consists of two parallel processes: the measurement of constructs and descriptions of population attributes. The measurement dimension answers the question: What is the survey about? It describes the properties of the data to be gathered about the observational units in the sample. The dimension consists of issues regarding the construct, measurement, response, and edited response. The representation dimension is related to the populations that are described by the survey and answers the question: Who is the survey about? This dimension consists of issues related to the target population, sampling frame, sample, respondents, and postsurvey adjustments. Both dimensions demand careful planning and execution. Figure 14 presents the survey methodology of this thesis reflected in relation to the "survey lifecycle from a designer perspective" by Groves et al. (2009). Next, the survey methodology of this thesis is discussed in terms of the elements of the measurement and representation dimensions.

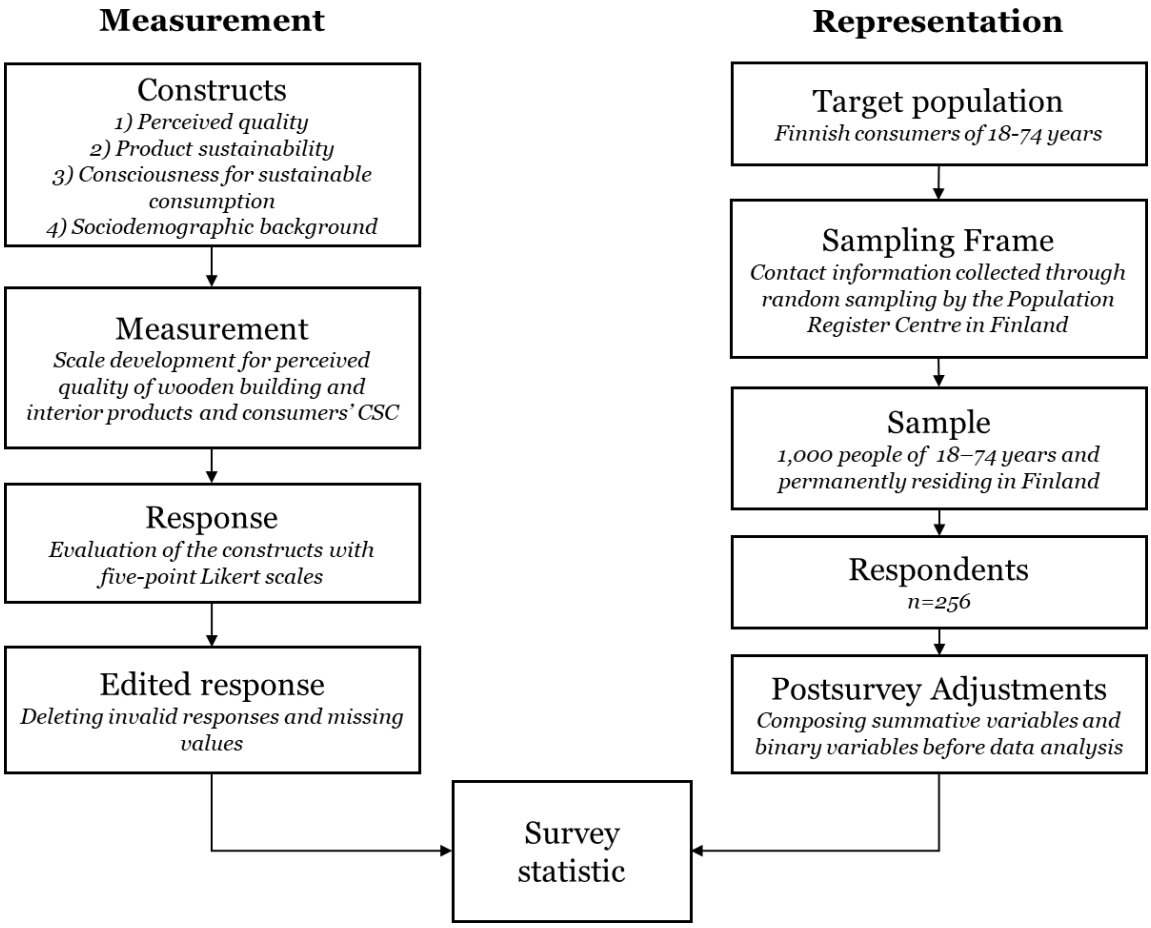

Figure 14. The survey methodology of this thesis reflected in relation to the "survey lifecycle from a designer perspective" by Groves et al. (2009)

In survey development, constructs are those elements of information that are sought by the researcher (Groves et al. 2009: 41). In Articles II and III, the main construct was perceived quality. Other key constructs included product sustainability, consciousness for sustainable consumption, and sociodemographic background. In the questionnaire, three measurement scales were developed: 1) for the perceived quality of wooden building products, 2) for the perceived quality of wooden interior products, and 3) for consumers' consciousness for sustainable consumption (CSC). The construct of product sustainability was measured with various sustainability attributes that were included in the measurement scales of perceived quality among other quality indicators. Furthermore, sociodemographic information (i.e., gender, age, education, municipality of residence, forest sector involvement, forest ownership) was gathered from the respondents.

In the questionnaire, consumers' consciousness for sustainable consumption (CSC) was measured through the dimensions of environmental, social, and

economic sustainability. The constructed measurement scale for CSC is presented in Article II (p. 161 Table 3.—Statements used in the questionnaire to measure views of respondents on consciousness for sustainable consumption (CSC), FOREST PRODUCTS JOURNAL). However, compared to the original scale of CSC, some modifications were made to add relevant sustainability issues regarding the forestry-wood industry value chains to the questionnaire and to enhance the balance of information between the statements addressing environmental, social, and economic sustainability. Furthermore, consumers' CSC was assessed with a five-point Likert scale. As the variables describing consumers' CSC were mostly derived from the Scale of Consciousness for Sustainable Consumption (Balderjahn et al. 2013) and perceived quality is the main construct of the thesis, the chapter scrutinizes in detail only the scale development for the perceived quality construct in the case of wooden building and interior products.

Table 10 presents the phases of scale development based on the work by Boateng et al. (2018) and considered in relation to the scale development process of this dissertation. Boateng et al. (2018) state that the scale development process includes three phases (item development, scale development, and scale evaluation) that consist of several steps. The process starts with the identification of domain and item generation. This thesis used a deductive method to identify the appropriate items for the scale of perceived quality and conducted a systematic literature review on peer-reviewed journal articles connected to consumer behavior regarding wooden products. This was done to identify and evaluate the existing indicators and scales of the perceived quality of wooden products in the context of housing. All items included in the scale were carefully designed to ensure fit between the theoretical and empirical aspects of the two product categories (wooden building products and wooden interior products). As a result of the operationalization, the items were connected to different quality indicators of wooden products, which comprised both sustainability attributes (e.g., product certificates, origin, environmental aspects) and general properties of wood (e.g., technical and visual properties). In the questionnaire, respondents' perceptions of these quality indicators were assessed with five-point Likert scales to measure quantitatively the degree of importance of each attribute.

Table 10. The three phases and nine steps of scale development and validation (Boateng et al. 2018) in relation to this thesis

Phase	Step	Step included in the scale development of the thesis	Activity to achieve the step in the thesis
1. Item development	1. Identification of domain and item generation	x	Systematic literature review
	2. Content validity	x	Evaluation of the questionnaire items by experts
2. Scale development	3. Pre-testing of questions	x	Interviews with experts
	4. Sampling and survey administration	x	Survey administration, establishing the sample size, determining the type of data to use
	5. Item reduction	x	Including only relevant and functional items, Deleting or imputing missing cases
	6. Extraction of factors	x	Exploratory factor analysis
3. Scale evaluation	7. Tests of dimensionality	-	-
	8. Tests of reliability	x	Cronbach's alpha
	9. Tests of validity	x	Pearson's correlation coefficient

After that, the content validity of the scales was tested. Experts from interest organizations (i.e., the Central Union of Agricultural Producers and Forest Owners (MTK), the Finnish Sawmills Association and the Federation of the Finnish Woodworking Industries) were interviewed. These experts assessed whether the items adequately measured the quality indicators of wooden building and interior products and pretested the developed scales. Furthermore, based on the interviews with experts, the items were reduced to ensure that only relevant items were included.

The constructed measurement scales for the perceived quality of wooden building and interior products are presented in the empirical studies, in Article II (p. 160 Table 2.—Peer-reviewed studies used to operationalize the quality indicators of

wooden building products in the survey, FOREST PRODUCTS JOURNAL) and Article III (p. 7 Table 2. —Peer-reviewed journal articles used to operationalize the quality indicators of wooden interior products in the questionnaire, SILVA FENNICA). The existing measurement scales investigating the perceived quality of wooden products by Costa, Garcia, and Ibanez (2011) and Toivonen (2012) were inconsistent and limited regarding various sustainability attributes, and as a difference to these scales, the measurement scales developed in this dissertation contained quality indicators that addressed also social sustainability attributes (e.g., coziness, health effects) abreast with environmental and economic sustainability attributes. Furthermore, the scales included several experience attributes (e.g., personal values, multifunctionality, innovativeness) and extrinsic cues, such as certificates, which were not addressed in previous studies.

In the second phase of scale development, decisions were made regarding the administration of the survey and sample size, for example. The target population of this survey was Finnish consumers, and the postal survey was sent to 1,000 permanent residents of Finland aged 18–74 years. The participants of the study were selected by simple random sampling from the Population Information System, an official database governed by the Population Register Centre in Finland. The data gathering consisted of two rounds. In the first round of material gathering, the questionnaire could only be returned by postal mail to facilitate tracking of those who had already participated in the survey. The second round of data gathering and the reminder letter were targeted at non-respondents, who were given an opportunity to choose between a paper or electronic version of the questionnaire. As a result of the two-round material gathering, altogether 256 respondents filled out the questionnaire (response rate 25.6%). According to Kaplowitz, Hadlock, and Levine (2004), the response rate can be considered to be typical of mail and online surveys.

Table 11 presents the sociodemographic background of the respondents (n=256). The sociodemographic background by subcategories of the respondents was, except for age classes, very similar to the Finnish population in 2018 (Statistics Finland 2021). This indicated that the data were applicable for use in assessing general consumer views in the country. However, comparable statistics on education, forest ownership (respondent or family member is a forest owner), and forest sector involvement (respondent has an education or job in forest industries or in a business branch connected to forest industries, e.g., transportation or building) were not available.

Table 11. The sociodemographic background of the respondents in comparison with the population in Finland aged 18–74 years in 2018 (in total 3,947,859) (StatiFin)

	% respondents	% of people living in Finland
Gender		
Female	51.6	49.8
Male	48.4	50.2
Age		
18-34 years	19.9	29.0
35-59 years	38.3	44.2
60 years or older	41.8	26.7
Education		
Basic education	6.1	N/A
General upper secondary education	6.1	N/A
Vocational upper secondary education	35.9	N/A
Higher education at university of applied sciences	24.1	N/A
Higher education at university, other academic education	25.3	N/A
Other	2.5	N/A
Municipality of residence*		
Urban municipality	72.5	72.7
Semi-urban municipality	15.3	14.9
Rural municipality	12.2	12.4
Forest ownership (oneself or family member)		
Yes	33.7	N/A
No	66.3	N/A
Forest sector involvement		
Yes	15.1	N/A
No	84.9	N/A

*Classification based on Statistics Finland (https://www.stat.fi/meta/kas/til_kuntaryhmit_en.html).

Before data analysis, answers that did not contain valid information were removed and the answers were checked in terms of missing values. Furthermore, other post-survey adjustments were made (i.e., composing summative variables and binary variables). According to Boateng et al. (2018), the last steps of scale development include the extraction of factors to determine the optimal number of factors that fit a set of items, and the tests of dimensionality, reliability, and validity. These steps are discussed in detail in the next section. However, different from the suggested scale development process by Boateng et al. (2018), the thesis did not test the dimensionality of the scales at a different time point or on a new sample (as suggested in Step 7 in Phase 3). This issue is discussed further at the end of this thesis in terms of future research suggestions.

3.2.3 Data analysis methods

Next, the data analysis methods of the three articles are discussed with a focus on content analysis and thematic analysis applied in Article I, and statistical analysis methods, such as exploratory factor analysis and non-parametric tests (Mann-Whitney U-test and Kruskal-Wallis test) utilized in Articles II and III.

Qualitative methods in Article I

In Article I, qualitative analysis methods were used, and secondary data (i.e., peer-reviewed scientific articles) were analyzed with content analysis and thematic analysis. Content analysis refers to a research method that uses different procedures to make valid inferences from text (Weber 1990). The purpose of content analysis is "*to describe the characteristics of the content by examining who says what, to whom, and with what effect*" (Bloor & Wood 2006: 58). Thematic analysis is a method that systematically identifies, organizes, and offers insights into patterns of meaning, *themes*, across a dataset (Braun & Clarke 2012). Content analysis was employed to address the dimensions of the TCCM framework (theory development, context, characteristics, and methodology), while thematic analysis was utilized to identify the variables affecting consumers' perceptions of wooden building materials in the reviewed literature. First, the theoretical underpinnings of the studies (T in TCCM framework) were identified and analyzed followed by the research contexts (C in TCCM framework). After that, the characteristics of the reviewed literature (C in TCCM framework) were reported. In this section, the variables affecting the perceived quality of wooden building materials (constituents of perceived quality) were identified, analyzed, and further combined into different dimensions (themes) with thematic analysis. Steenkamp's (1989) Model of the Quality Perception Process was used to guide the identification

of the relevant variables. Finally, the used methodologies (M in TCCM framework) of the reviewed studies were introduced and analyzed.

Statistical analysis in Articles II and III

In both Articles II and III, statistical methods were used. The data were analyzed in two stages by employing multivariate research methods to identify the underlying dimensions of the perceived quality of wooden building products (Article II) and wooden interior products (Article III), and to determine whether consumers' perceptions of these quality dimensions were connected with their consciousness for sustainable consumption (CSC) (Article II) or sociodemographic background (Article III). As methods of analysis, exploratory factor analysis (Kim & Mueller 1978; Costello & Osborne 2005), nonparametric tests (e.g., Gibbons 1993), such as the Mann-Whitney U-test (Berenson et al. 2002) and Kruskal-Wallis test (Nahm 2016) executed with IBM SPSS Statistics 25.0 software were utilized. In the statistical analysis, as evidence of the statistical significance of the analysis results, the threshold values were $0.05 \leq p\text{-value} < 0.1$ = suggestive evidence on statistical significance, $0.01 \leq p\text{-value} < 0.05$ = moderate evidence on statistical significance, and < 0.01 p-value = very strong evidence on statistical significance.

The first stage of analysis was similar in both studies. In this stage, exploratory factor analysis (EFA) with Kaiser normalization, Maximum Likelihood Estimation, and Varimax rotation was applied when examining the different dimensions of perceived quality in both studies. EFA was executed employing data on respondents' perceptions of the quality indicators of wooden building products (Article II) and interior products (Article III). The aim of factor analysis is to reveal latent variables causing the manifest variables to covary (Costello & Osborne 2005): The assumption of the exploratory factor analysis is that a particular phenomenon may be examined by identifying latent factors that are causing the covariation in the data of original variables, and which are smaller in number than the original variables (Kim & Mueller 1978; Henson & Roberts 2006). Implementation of the exploratory factor analysis is driven by both subjective considerations (e.g., in reference to the existing theoretical and empirical literature) and statistical measures to find the final solution (Kim & Mueller 1978; Henson & Roberts 2006; Beavers et al. 2013). As an outcome of the exploratory factor analysis, quality dimensions for wooden building products (Article II) and wooden interior products (Articles III) were revealed.

In the second stage of analysis in Article II, a nonparametric Mann-Whitney U-test was executed to test the relationships between the respondents' consciousness for sustainable consumption (CSC) and their perceptions of the quality dimensions of

wooden building products derived from exploratory factor analysis. The non-parametric Mann-Whitney U-test is applicable to data that are measured on an ordinal or interval scale in comparison with tests that assume the data are normally distributed (e.g., Student's t-test, analysis of variance ANOVA) (e.g., Gibbons 1993). Nonparametric tests do not assume a normal distribution (Harpe 2015). The data in this study did not follow a normal distribution and thus nonparametric tests were conducted. By analyzing the differences in the median values (Nahm 2016), the Mann-Whitney U-test is the non-parametric equivalent to Student's t-test to compare two independent samples (Berenson et al. 2002). The Mann-Whitney U-test was employed in group comparisons for CSC regarding environmental, social, and economic sustainability.

In the second stage of analysis in Article III, a Mann-Whitney U-test and Kruskal-Wallis test were executed to investigate the relationships between the respondents' sociodemographic background and their perceptions of the quality dimensions of wooden interior products derived from exploratory factor analysis. The Kruskal-Wallis test is the non-parametric equivalent to an ANOVA with three or more independent samples (Berenson et al. 2002; Bergmann, Ludbrook & Spooren 2000). The sociodemographic variables used were gender, age, education, municipality of residence (urban, semi-urban, rural), forest ownership (respondent or family member a forest owner), and forest sector involvement (respondent has an education or profession in forest industries or in a business branch connected to forest industries, e.g., transportation or building). A Mann-Whitney U-test was employed in group comparisons for gender, forest ownership, and forest sector involvement, and a Kruskal-Wallis test was executed for group comparisons for age, education, and municipality of residence.

In conclusion, the methodological choices of the thesis regarding data collection and analysis are in line with the theoretical framework presented in Chapter 2 and follow deductive reasoning that is typical for post-positivist epistemology. First, qualitative methods, such as content analysis and thematic analysis, were used when analyzing the secondary data (i.e., peer-reviewed scientific articles) to identify the constituents of the perceived quality of wooden products in the context of housing. Then, quantitative methods (i.e., exploratory factor analysis, Mann-Whitney U-test, Kruskal-Wallis Test) were applied when exploring the quality dimensions of wooden building and interior products and investigating the connections between those dimensions and consumer characteristics. In Chapter 5 and based on the results of these three articles, the quality dimensions are further analyzed in terms of various sustainability attributes and the connections between the perceived quality and sustainability attributes of wooden products are conceptualized.

3.3 Reliability and validity of the research

The concepts of reliability and validity are essential in evaluating the credibility of research findings (Saunders, Lewis & Thornhill 2007: 149). When reliability refers to *"the extent to which your data collection techniques or analysis procedures will yield consistent findings"* (Saunders, Lewis & Thornhill 2007: 149), validity means *"a way to ensure quality in measurement, attest expected causalities and allow generalization"* (Baumgarten 2012: 4). Next, the three articles are discussed concerning the issues related to reliability and validity.

To enhance the reliability of the studies of the thesis, the studies were designed and conducted carefully and transparently to enable repetition. For example, in Article I, through the employment of two organizing frameworks (i.e., TCCM framework and Model of the Quality Perception Process) in the evaluation and analysis of the contents of the literature, the reliability of the results was enhanced. Additionally, the reviewed studies were limited to those that had been published in peer-reviewed English-language journals, which also enabled the repetition of the study.

The issue of reliability was also addressed in the empirical studies in the context of evaluating non-response bias by comparing the sociodemographic profiles of the first and second round respondents. Those tests did not show any indications of statistically significant differences between early and late respondents and therefore it was assumed that non-response bias would not cause significant risks concerning the reliability of the results. In addition, reliability was evaluated through investigating, for example, Cronbach's alpha for internal reliability. In Articles II and III, values were calculated for Cronbach's alpha in terms of each factor and CSC dimension. As the values of Cronbach's alpha were acceptable (for interpretation of Cronbach's alpha values, see DeVellis 2012: 95–96), the results supported the reliability of the scales.

In terms of validity, it is critical to evaluate whether the results are really about what they seem to be about (Saunders, Lewis & Thornhill 2007: 150). In Article I, the issues regarding validity were related to the chosen framework, and included articles, for example. Article I was a single-author review, which prevented the cross-checking of the analysis or interpretation of the results. To avoid the issues caused by this, organizing frameworks were adopted to identify the variables affecting the perceived quality of wooden building materials and to report the results transparently. It is worth considering whether the chosen framework could have resulted in different results. However, Steenkamp's (1989) Model of the Quality Perception Process is based on the definitions of quality cues and quality

attributes and this distinction is broadly accepted and adopted among scholars (as discussed in Chapter 2). In terms of included scientific articles, several measures were taken to ensure the source quality. For instance, the Web of Science journal quality list, journal impact factors, and article citations were used to evaluate the source quality and identification of journals.

In Articles II and III, important issues in terms of validity concerned the questionnaire and measurement design and the applicability of data for the analysis. In the questionnaire, the study did not use previously developed scales when measuring consumers' perceptions of the quality indicators of wooden products, but rather modified the existing scales. For example, there were only two existing scales – one by Costa, Garcia, and Ibanez (2011) and one by Toivonen (2012) – for evaluating perceived quality in the case of wooden products and these scales were inconsistent in terms of the quality indicators. Thus, new measurement scales for wooden building and interior products were developed and the process followed the phases of scale development (see, e.g., Boateng et al. 2018) to ensure the conceptual validity of the operationalized quality indicators. The items of the final scales of both wooden building and interior products were chosen after careful consideration based on the results of a systematic literature review and suggestions made by the experts of different interest organizations. Furthermore, validity tests (i.e., Pearson's correlation coefficient) were conducted to ensure the validity of the developed scales.

In terms of the applicability of data for exploratory factor analysis, the sample size was relatively small. However, there are no strict rules regarding sample size for exploratory factor analysis (Costello & Osborne 2005). The strength of the data has an influence on the outcome and thus a smaller, but more robust dataset can be used for an accurate analysis. Furthermore, the results of exploratory factor analysis were carefully evaluated in accordance with the principles of EFA and in terms of values of communalities, loadings, and cross loadings, for example. The study also used nonparametric tests instead of parametric tests because the data did not follow a normal distribution. The choice of a statistical test is context-specific and must be justifiable, and sometimes nonparametric tests can be required (Harpe 2015).

Another issue in evaluating the results is generalizability, which is sometimes referred to as external validity (Saunders, Lewis & Thornhill 2007: 151). Articles II and III only investigated the perceptions of Finnish consumers, and thus the results cannot be generalized in an international context. However, based on the results, the phenomenon is worth investigating in follow-up studies in different contexts. Furthermore, it is worth noting that the purpose of this dissertation is

not to produce results that are generalizable to all populations. Instead, the interest of this thesis is on structuring the constituents of perceived quality and conceptualizing the connections between perceived quality and sustainability attributes, which can be seen as a starting point for theory development.

The studies of this thesis were conducted in accordance with responsible conduct of research. Ethical principles were carefully considered at each stage of research from study planning to data reporting. These ethical principles include e.g., integrity, fairness and open-mindness of the researchers, respect for others, avoidance of harm, privacy of those taking part, ensuring confidentiality of data and maintenance of anonymity of those taking part, responsibility in the analysis of data and reporting of findings, compliance in the management of data, and ensuring the safety of the researcher (Saunders, Lewis & Thornhill 2020).

For example, when conducting a systematic literature review (Article I) and collecting and analyzing secondary data, the search strategy (SPAR-4-SLR) was recorded to enable repeatability of the study, the journals and articles were carefully chosen based on predefined criteria (e.g., field and topic, study design, year of publication, language, publication status) and in the analysis, two organizing frameworks were adopted to report the results transparently and other researchers' work were correctly cited. Furthermore, the questionnaire used in Articles II and III contained a cover letter that included information regarding the study (e.g., purpose, description of the topic, research project, project funding) and a statement regarding confidentiality and anonymity in all phases of the research. The participants were given explicitly the contact information of the researchers (e.g., for gaining additional information about the study, participation, and storage and use of data). To ensure the strict anonymity of the survey recipients and respondents, all personal information was removed from the data.

4 SUMMARY OF PUBLICATIONS AND RESULTS

This chapter analyzes the main findings of the articles by summarizing the objectives, key results, and theoretical and managerial implications of each individual article. Table 12 presents the research gaps addressed in the articles. The theoretical and managerial implications of the results, limitations, and future research suggestions of the articles are discussed in-depth in Chapter 5.

Table 12. Addressed research gaps in individual articles

Article	**Addressed research gap**
Article I: The perceived quality of wooden building materials – A systematic literature review and future research agenda	1) lack of research investigating consumers' perceptions of the quality of wooden products 2) non-existence of systematic literature reviews in the domain
Article II: Consumers' consciousness for sustainable consumption and their perceptions of wooden building product quality	1) lack of research addressing the three dimensions of sustainability when investigating sustainable consumption 2) limited knowledge of the quality indicators of wooden building products 3) lack of information on the relationship between consumer characteristics (consciousness for sustainable consumption) and wooden building product quality
Article III: Perceptions of wooden interior product quality – insights on sustainability views among Finnish consumers	1) lack of research addressing the three dimensions of sustainability when investigating sustainability attributes 2) limited knowledge of the quality indicators of wooden interior products 3) lack of information on the relationship between consumer characteristics (sociodemographic background) and wooden interior product quality

4.1 Article I: The perceived quality of wooden building materials – A systematic literature review and future research agenda

Article I aimed to systematically review the existing literature on consumer behavior regarding wooden building materials and to identify, analyze, and summarize the variables affecting the perceived quality of wood. The paper aimed to fill the void in the existing knowledge regarding the perceived quality of wooden building materials. The existing research investigating consumers' perceptions of the quality of wooden products was limited and the studies lacked theoretical understanding in terms of perceived quality. The previous wood product quality studies focused only on technical or supplier-related aspects of wood as quality indicators and consumers' perceptions of quality were not examined in-depth (Hansen, Bush & Fern 1996; Hansen & Bush 1996; Hansen & Bush 1999; Weinfurter & Hansen 1999). Additionally, no systematic literature reviews on the topic existed. Systematic literature reviews are encouraged if they have not been conducted in the domain in recent years (Paul et al. 2021).

The theoretical foundation of Article I was based on perceived quality literature and specifically on the Model of the Quality Perception Process (Steenkamp, 1989), which was adopted to guide the identification of the variables influencing the perceived quality of wood (constituents of perceived quality). Furthermore, the TCCM framework by Paul and Rosado-Serrano (2019) was applied to present the domain in terms of theory development, context, characteristics, and methodologies. The context of Article I was wooden building materials, such as wood used in the load-bearing structures and facades of houses, and interiors such as floors, walls, and roofs. Wooden interior products were not included in the analysis, because, for example, wooden furniture does not have similar technical requirements as wooden products used in load-bearing structures (e.g., strength grading) and including those studies might have influenced the interpretations of the results.

The results showed that consumer behavior regarding wooden building materials was affected by several factors connected with product properties, consumer characteristics, and consumption context. According to the results, the quality indicators of wooden building materials were grouped into five main themes: sensory, social, economic, technical, and sustainability dimensions. Each variable was also categorized as an intrinsic or extrinsic cue, or experience or credence attribute. Based on the reviewed literature, some of these variables positively influenced consumer perceptions, such as certain intrinsic cues (i.e., visual, tactile, auditory, and olfactory cues), extrinsic cues (i.e., environmental labels), and

experience and credence attributes (i.e., health effects, the naturalness and environmental friendliness of wood). However, some variables had a negative influence, and these were related to certain experience and credence attributes, such as durability and fire safety of wood, and sustainability of logging. Consumer behavior regarding wooden building materials was also affected by certain personal variables, such as consumers' sociodemographic and psychographic characteristics, and situational variables related to the consumer environment. In terms of consumers' sociodemographic background, the consumers who favored wood were educated and young. Also, situational variables, such as usage context, influenced consumer behavior regarding wooden building materials.

The theoretical contributions of the study for consumer behavior research relate to building a theoretical foundation for investigating perceived quality in the case of wooden products and identifying the constituents of perceived quality, such as quality indicators (i.e., quality cues and attributes) and personal and situational variables. The article also advances the forest sciences by providing a theoretical foundation for the perceived quality of wooden building materials. Thus, the results of the study can be considered to be the starting point for the conceptualization of perceived quality in the case of wooden building materials, operationalization of the construct, and development of a measurement scale. Furthermore, the article provides several future research suggestions in terms of theory development, context, characteristics, and methodology, and sets guidelines on how to approach the perceived quality of wooden building materials in future studies. For example, based on the reviewed literature, studies investigating the sustainability of wooden building materials were mostly focused on environmental issues. Therefore, future research should address the sustainability of wood from social and economic viewpoints in addition to environmental aspects.

The study identified the variables affecting consumer behavior and perceived quality regarding wooden building materials and these findings have significant managerial implications for different actors, such as wood industry companies, governmental agencies, and interest organizations. For example, companies need to consider all the different variables affecting the perceived quality of wood and to understand how consumer characteristics and other factors in the consumer environment influence wood-related consumer behavior. This understanding is required to develop successful marketing strategies and sustainable product-service concepts that meet the needs of different consumer segments with various values and expectations. Furthermore, to enhance wood consumption in society, different actors can use the findings of this study to promote the strengths of the material, such as its environmental friendliness, naturalness, health impacts, and

symbolic properties, via integrated marketing communication while aiming to dispel the existing prejudices against wood with respect to issues such as fire resistance and durability.

4.2 Article II: Consumers' consciousness for sustainable consumption and their perceptions of wooden building product quality

Article II aimed to add knowledge concerning how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures), and to investigate the connections between consumers' perceptions of wooden building product quality indicators and their consciousness for sustainable consumption (CSC), addressed from environmental, social, and economic viewpoints. The existing research addressing wooden building products was dominated by the views of production, while scientific knowledge of consumption remained very limited. Furthermore, information about how consumers with differing views of sustainable consumption evaluate the quality of wooden building materials was scarce.

When investigating wooden building product quality, this study adopted a perceived quality approach similarly to Article I. In addition to perceived quality and wood product literature, the theoretical basis of Article II was in the existing studies addressing consumers' sustainable consumption behavior. In those studies, sustainable consumption behavior was mostly explored from environmental and/or social viewpoints (e.g., Balderjahn et al. 2018), while investigations of sustainable consumption as an environmental, social, and economic phenomenon were rare. To investigate the connections between consumers' perceptions of wooden building product quality and sustainable consumption behavior, the study used a multidimensional scale of consciousness for sustainable consumption (CSC), developed by Balderjahn et al. (2013), that took the three dimensions of sustainability into account. The consumers' consciousness for sustainable consumption was defined as "*an intention to consume in a way that enhances the environmental, social and economic aspects of quality of life*" (Balderjahn et al. 2013: 182).

Based on the results, the most important quality indicators of wooden building products were related to the material's health effects, coziness, and longevity, while the least important quality indicators were information, product certificates, and personal values (e.g., wood as a medium to express one's identity and personal status). Furthermore, the quality dimensions of wooden building products were

revealed through exploratory factor analysis and they consisted of "technical reliability," "versatility of materials," and "certificates and environmental sustainability." These dimensions included various quality indicators of wooden building products, addressing both general product properties (e.g., acoustics, innovativeness, multifunctionality) and sustainability attributes (e.g., safety, longevity, origin, certificates, environmental aspects). The sustainability attributes are analyzed further in Chapter 5.

In addition, evidence was also gained on the interlinkages between consumers' consciousness for sustainable consumption and their perceptions of wooden building product quality. The strength of CSC was found to relate to the evaluation of different wooden building product quality dimensions. For example, the dimensions of "technical reliability" and "versatility of materials" of wooden building products were more valued by consumers with strong environmental, social, and economic CSC than those with weak CSC in these aspects. However, the quality dimension of "certificates and environmental sustainability" was found to be appreciated more by consumers with strong environmental or social CSC than those with weak environmental or social CSC, while no evidence of such behavior was found for economic CSC.

The article contributes to consumer behavior research by providing empirical evidence on the connections between perceived quality and sustainability attributes. Furthermore, the study brings novelty to forest sciences by addressing wooden building products from a viewpoint of consumption instead of production, and by adopting a perceived quality approach when examining wooden building product quality. The study operationalizes the construct and develops a measurement scale for perceived quality in the case of wooden building products. Furthermore, the study provides novel insights to sustainability science by adopting a CSC scale to investigate consumers' sustainable consumption behavior. Thus, instead of addressing only the environmental or social aspects of consumption, the study emphasizes all three dimensions of sustainability.

The results provide significant information for companies in the wood and construction industries about how consumers with strong CSC appreciate different properties of wooden building materials. These results can be used in product development and marketing. Understanding how consumers' personal values regarding sustainability aspects relate to their perceptions of wooden building products can help to better meet consumer expectations for different aspects of sustainability and to enhance the acceptability and desirability of materials in the building markets. It is notable that consumers with different values can appreciate different properties of wooden products and thus the marketing strategies should

be designed accordingly. For example, consumers with strong economic CSC do not have strong preferences for environmental aspects of wooden building products, and therefore promoting the environmental friendliness of wood, which is usually considered to be a strength of wooden materials, might not be the main key to achieving success in marketing efforts. In comparison, consumers with environmental and social CSC also appreciate environmental friendliness in addition to technical and social benefits. Therefore, it is important for practitioners to recognize what types of wood building product quality indicators are appreciated by different consumer segments, and how these properties can be promoted successfully to them.

4.3 Article III: Perceptions of wooden interior product quality – insights on sustainability views among Finnish consumers

Article III aimed to provide knowledge on how sustainability issues connect to consumer perceptions of quality indicators in the case of wooden interior products. The study aimed to evaluate how the environmental, social, and economic sustainability of forestry-wood value chains contribute to the perceived quality of wooden interior products through different quality indicators, and to investigate the interlinkages between consumers' sociodemographic background and their perceptions of wooden interior product quality.

Similarly to Articles I and II, the study adopted a perceived quality approach when examining wood product quality and also used wood product literature when operationalizing the construct of perceived quality in terms of wooden interior products. In addition to perceived quality and wood product literature, the theoretical grounds of this study were in the existing sustainable consumption research addressing sustainability attributes. Previously, sustainability of products was mostly investigated by focusing on environmental and/or social product attributes (e.g., Bangsa & Schlegelmilch 2020), and this issue was also evident in wood product studies. The existing wood product literature includes limited information on sustainability, addressed from environmental, social, and economic viewpoints, in relation to perceived quality. Furthermore, the understanding of the connections between consumer characteristics (e.g., sociodemographic background) and perceived quality of wooden interior products was scarce.

According to the results, the most important quality indicators of wooden interior products were related to the material's coziness, longevity, and technical

properties while the least important quality indicators were information, product certificates, and personal values (e.g., wood as a medium to express one's identity and personal status). The evaluations were quite similar to those of the wooden building products investigated in Article II. In addition, the quality dimensions of wooden interior products were revealed through exploratory factor analysis and they comprised "technical solidity," "fit with lifestyle and home design," "environmental friendliness," and "visual and tactile attractiveness." These dimensions were also analyzed in terms of their connections with the environmental, social, and economic sustainability of forestry-wood value chains. Based on the results, the quality dimensions were in multiple ways connected with either environmental, social, or economic sustainability, which is discussed in detail in Chapter 5.

In addition, the quality dimensions were connected with consumers' sociodemographic background in terms of gender, age, education, forest ownership, and forest sector involvement. For example, the quality dimension of the "environmental friendliness" of wooden interior products was rated higher by older respondents (60 years old or older) than younger consumers (18–34 years old), and the quality dimension of "fit with lifestyle and home design" was mostly valued by females, consumers with a vocational upper secondary education, forest owners (respondent or family member), and consumers with forest sector involvement (education or profession) in comparison with other groups. The quality dimension of "visual and tactile attractiveness" was more appreciated by females than males, and the quality dimension of "technical solidity" was especially valued by consumers with a vocational or general upper secondary education and those with forest sector involvement compared to consumers with higher education (universities or other academic education) or those without forest sector involvement.

The article contributes to consumer behavior research by providing empirical evidence on the connections between perceived quality and sustainability attributes similarly to Article II. Additionally, the study provides novel insights to forest sciences by examining the perceived quality of wooden interior products, operationalizing the construct, and developing a measurement scale. In addition, the study explores the role of consumer characteristics (sociodemographic background) in evaluating perceived quality. Furthermore, the study investigates product sustainability through environmental, social, and economic viewpoints, instead of addressing only the environmental or social sustainability of wooden interior products, and therefore the article brings novel insights to the field of sustainability science.

Similarly to Articles I and II, the study provides important information for wood industry companies and other stakeholders to use in their business models and marketing strategies. It is notable that different types of purchasing preferences may all result in sustainable consumption choices. For example, consumers can value technical durability that connects with longevity, which may support environmental and economic sustainability and result in sustainable consumption by choosing wooden products. Therefore, providing consumers with comprehensive information about the products is of major importance. Furthermore, the results provide evidence that consumers with different backgrounds value different properties of wooden interior products. Actors in the wood industry should take these aspects into account when designing marketing strategies and consumer communication.

5 DISCUSSION AND CONCLUSIONS

The results of the three articles provide several theoretical contributions that are discussed in this chapter. First, the constituents of the perceived quality of wooden products are identified and scrutinized, followed by an analysis of the sustainability attributes of wooden products. After that, the connections between perceived quality and sustainability attributes are conceptualized and the construct of perceived sustainable quality is specified and discussed. In addition to academic contributions, the findings provide managerial implications for marketing, which are presented and evaluated after the theoretical contributions. At the end of the chapter, limitations and future research suggestions are discussed.

The purpose of this thesis was *to conceptualize how the sustainability of wooden products, explored from environmental, social, and economic viewpoints, is connected to perceived quality in consumers' product evaluations in the context of housing*. To achieve this purpose, the dissertation had three objectives. The first objective was *to identify the constituents of the perceived quality of wooden products in the context of housing*. This objective was achieved through first clarifying the perceived quality construct and mapping its constituents (i.e., quality indicators and dimensions, personal and situational variables) based on the existing literature (Chapter 2). Then, the articles of the dissertation conceptualized the perceived quality construct and its constituents in the case of wooden building and interior products. In Article I, the quality indicators (i.e., quality cues and attributes) of wooden building materials were identified, and the role of personal and situational variables was analyzed. In the empirical studies (Articles II and III), the quality dimensions of wooden building and interior products were revealed through exploratory factor analysis, and their connections with personal variables, consumers' consciousness for sustainable consumption and sociodemographic background were examined.

The second objective was *to specify the linkages between the perceived quality and sustainability attributes of wooden products in the context of housing*. This objective was achieved through identifying the sustainability attributes investigated in the existing perceived quality studies and specifying their role in relation to perceived quality. As a result, a theoretical framework for conceptualizing the connections between sustainability attributes and perceived quality was developed (Chapter 2). Later in the current chapter, the sustainability attributes of wooden products are identified and analyzed based on the results of the articles. Furthermore, these sustainability attributes are analyzed in relation to

the quality dimensions of wooden building and interior products to reveal the linkages between the constructs.

The third objective was *to develop a conceptualization of the perceived sustainable quality of wooden products in the context of housing*. At the end of this chapter, the connections between perceived quality and sustainability attributes are conceptualized in the case of wooden products used in housing and a novel construct called "perceived sustainable quality" is proposed and defined based on the results of Articles II and III. Furthermore, conceptual models for the perceived sustainable quality of wooden building and interior products are constructed.

The thesis contributes to consumer behavior research by clarifying the perceived quality construct and mapping its constituents, conceptualizing the connections between perceived quality and sustainability attributes, and proposing a novel construct called "perceived sustainable quality." In this way, the results of the thesis build on the existing literature on perceived quality and sustainability attributes. The thesis also brings novel insights to the fields of forest sciences and sustainability science. The dissertation develops a theoretical foundation for the perceived quality of wooden building and interior products, and in this way advances the field of forest sciences. By scrutinizing both consumers' consciousness for sustainable consumption and the sustainability attributes of wooden products through environmental, social, and economic sustainability, the dissertation provides novel insights to the field of sustainability science. Next, the theoretical contributions of the thesis are discussed in detail.

5.1 The constituents of the perceived quality of wooden products

In Chapter 2, the conceptualizations and constituents of perceived quality were discussed. Based on the dominant view of consumer behavior and marketing research on perceived quality, it is defined as a subjective, multidimensional construct (Zeithaml 1988; Oude Ophuis & Van Trijp 1995; Brucks, Zeithaml & Naylor 2000) that refers to consumers' product evaluation, influenced by different quality cues and attributes related to the product, personal variables regarding consumer characteristics, and situational variables related to the consumption context (e.g., Steenkamp 1989). However, the existing empirical studies, mostly conducted in the context of food products, use the term in ambiguous ways. Even though most of the studies use it in accordance with the original definitions of researchers such as Zeithaml (1988), there are studies that use it with different

meanings or without defining the construct at all. There are also studies that use it as a lower-level attribute, in contrast to the original meaning of the construct. Thus, the use of the perceived quality construct in the existing research is extremely heterogeneous, even though clear definitions have been provided in the literature.

Based on the existing literature, this dissertation considered perceived quality to be a multidimensional construct, consisting of different abstract dimensions and affected by various quality indicators (i.e., quality cues and attributes), and personal and situational variables. These constituents were identified and analyzed in the articles of this dissertation in the case of wooden products used in the context of housing and are discussed next.

5.1.1 The quality indicators of wooden products

Article I aimed to identify the variables influencing the perceived quality of wooden building products and systematically reviewed the consumer behavior literature related to wooden building materials. In Article I, the various quality cues and attributes of wooden building materials, and personal and situational variables were identified in accordance with Steenkamp's (1989) Model of the Quality Perception Process. The quality cues and attributes were categorized into five dimensions: the sensory, social, economic, technical, and sustainability dimensions (Figure 15).

In this categorization, the sensory dimension included intrinsic cues of wooden building materials: visual properties (e.g., color, grain, character marks), tactile properties (e.g., smoothness, roughness, hardness), auditory properties (e.g., wooden sounds, acoustics), and olfactory properties (e.g., scent, fragrance). The social dimension consisted of safety aspects (e.g., health aspects, fire safety) that were considered to be credence attributes, in addition to symbolic properties (e.g., coziness, effects on identity) and esthetic properties (e.g., esthetics, visual appearance, trendiness) that were examples of experience attributes. The economic dimension included extrinsic cues of price and costs related to wooden building materials, while the technical dimension comprised both material properties (i.e., type of material, chemical composition, structure) as intrinsic cues and functional properties (i.e., performance, durability, use properties) as experience attributes. Finally, the sustainability dimension included environmental labels and product information, which were considered to be extrinsic cues, and environmental friendliness, corporate social responsibility, and origin, which were considered to be credence attributes.

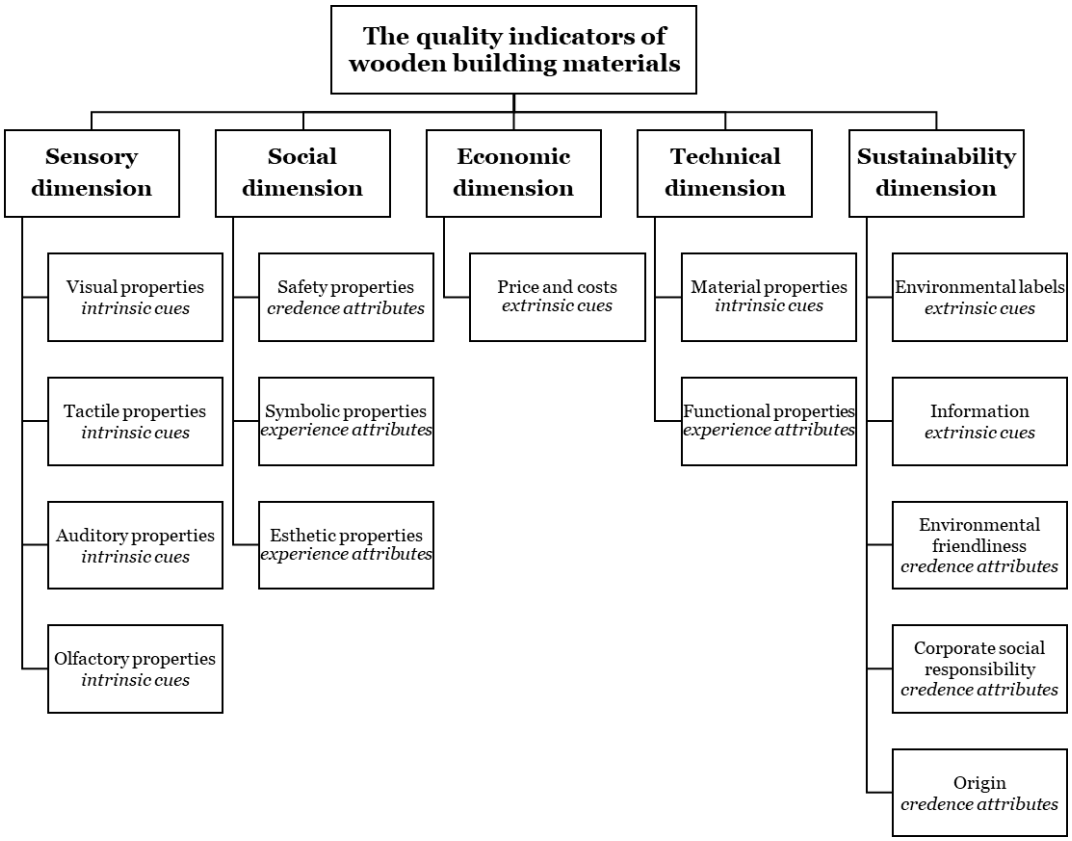

Figure 15. Identified quality indicators of wooden building materials in Article I

Furthermore, even though Article I was conducted only in the case of wooden building products, similar quality indicators can be found in the case of wooden interior products, such as wooden furniture (Article III). Based on the results of Article I and empirical and theoretical literature addressing wooden products, measurement scales for the perceived quality of wooden building and interior products were developed (see Table 2 in Article II and Table 2 in Article III). The quality indicators were also designed to fit between the theoretical and empirical aspects of the two product categories (wooden building products and wooden interior products). In those studies, the measurement scales included quality indicators addressing the general product properties (e.g., technical properties, visual and tactile properties, multifunctionality) and several sustainability attributes (e.g., longevity, information, product certificates, price, coziness, origin, environmental aspects, health effects, and safety). These sustainability attributes are discussed in detail in Chapter 5.2.

5.1.2 The quality dimensions of wooden building and interior products

In Articles II and III, the quality dimensions of wooden building and interior products were revealed through exploratory factor analysis and they consisted of several quality indicators. The quality dimensions of wooden building products were "technical reliability," "versatility of materials," and "certificates and environmental sustainability" (Figure 16). The first quality dimension – "technical reliability" – included quality indicators related to the technical properties of wood, such as acoustics, safety, and longevity. The second quality dimension – "versatility of materials" – reflected social benefits of wooden building products and consisted of quality indicators related to the consumption and usage phase: the innovativeness and multifunctionality of wood, and personal values related to using wood as a medium to express one's identity and personal status. Also, origin was included in this dimension. The third quality dimension – "certificates and environmental sustainability" – comprised product certificates, information, and environmental aspects. In Article II, the connections between consumers' consciousness for sustainable consumption and their perceptions of these quality dimensions were also investigated; these are discussed in detail in the next section.

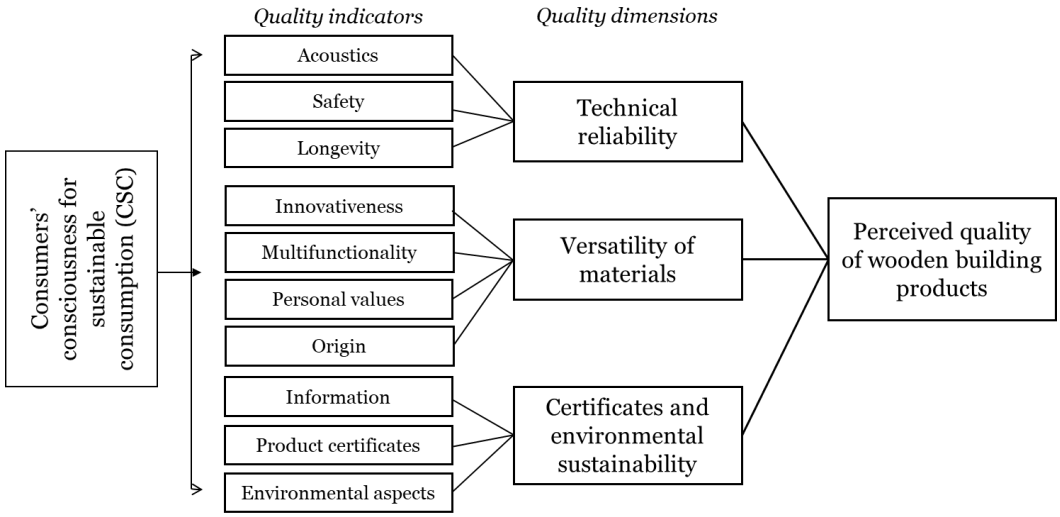

Figure 16. The quality dimensions of wooden building products

In Article III, four quality dimensions of wooden interior products were revealed through exploratory factor analysis: "technical solidity," "fit with lifestyle and home design," "environmental friendliness," and "visual and tactile attractiveness" (Figure 17). The first quality dimension – "technical solidity" – included variables of technical properties, longevity, and retailer, while the second quality dimension – "fit with lifestyle and home design" – comprised innovativeness,

multifunctionality, personal values (e.g., wood as a medium to express one's identity and personal status), and coziness. The third quality dimension – "environmental friendliness" – consisted of information, product certificates, environmental aspects, and origin, while the fourth dimension – "visual and tactile attractiveness" – included visual and tactile properties of wooden interior products. Additionally, in Article III, the linkages between consumers' sociodemographic background and their perceptions of these quality dimensions were explored. These are discussed in the next section.

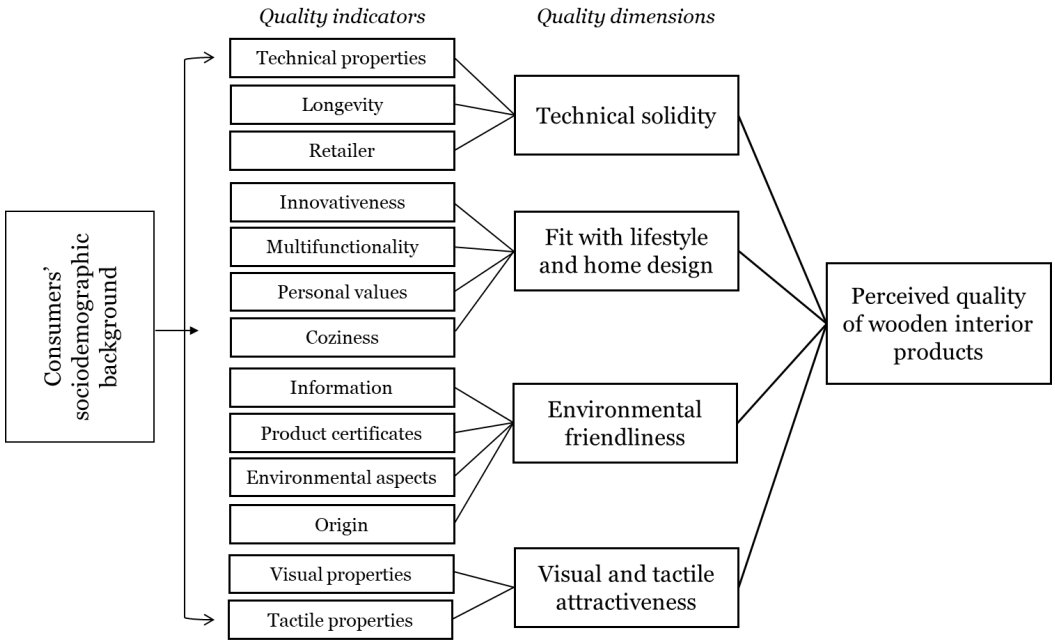

Figure 17. The quality dimensions of wooden interior products

The quality dimensions of wooden building and interior products, revealed in Articles II and III, were quite similar. For example, the quality indicators in the dimension of "certificates and environmental sustainability" (Article II) and in the dimension of "environmental friendliness" (Article III) were the same. Furthermore, the quality dimensions of "versatility of materials" and "fit with lifestyle and home design" consisted partly of the same quality indicators: multifunctionality, innovativeness, and personal values. In terms of wooden interior products, there was also coziness, while in wooden building products, origin was included in this dimension. In addition, the quality dimensions of "technical reliability" (Article II) and "technical solidity" (Article III) both included the quality indicator of longevity. In the case of wooden building products, the dimension also included the acoustic properties and safety aspects of wooden materials, while in terms of wooden interior products, there were quality indicators related to technical properties and the retailer's role in the purchase

situation. The similarity between the quality dimensions in both articles is in line with Zeithaml (1988) who argued that the intrinsic product attributes are product-specific while the abstract quality dimensions can be generalized to product categories. Furthermore, this is supported by the results by Toivonen (2012): Her research on wooden flooring and paneling materials and wooden furniture showed that consumers' quality perceptions were consistent for these two product categories.

Compared to the quality dimensions by Brucks, Zeithaml, and Naylor (2000) and Toivonen (2012), presented in Chapter 2, the quality dimensions revealed in Articles II and III are similar to some extent. These dimensions are presented in Table 13 alongside and contrasted in relation to the quality dimensions revealed in the empirical studies of the thesis. According to Brucks, Zeithaml, and Naylor (2000), the quality dimensions for consumer durables included versatility, durability, prestige, performance, ease of use, and serviceability. Their dimension of versatility can be seen to be related to the quality dimension of the "versatility of materials" of wooden building products and the "fit with lifestyle and home design" of wooden interior products, especially in respect of the variables of innovativeness and multifunctionality. Furthermore, the dimensions of "technical reliability" of wooden building products and "technical solidity" of wooden interior products include the variable of longevity that relates to the dimension of durability.

The prestige dimension is connected to the dimensions of the "versatility of materials" of wooden building products and "fit with lifestyle and home design" of wooden interior products in respect of the variable of personal values (e.g., wood as a medium to express one's identity and personal status) that reflects the tangible social component, as discussed by Brucks, Zeithaml, and Naylor (2000). The prestige dimension is also related to the dimension of the "visual and tactile attractiveness" of wooden interior products. In addition, the performance dimension can be seen to be related to the "technical reliability" of wooden building products in respect of safety aspects. One difference is that the dimensions by Brucks, Zeithaml, and Naylor (2000) did not include any environmental aspects or variables related to product origin that would have been related to the dimensions of the "certificates and environmental sustainability" or "environmental friendliness" of wooden products.

Table 13. Comparing the quality dimensions revealed in the empirical studies of the thesis to the quality dimensions by Brucks, Zeithaml and Naylor (2000) and Toivonen (2012)

The quality dimension of wooden building products (Article II)	**The quality dimension(s) of consumer durables by Brucks, Zeithaml & Naylor (2000)**	**The quality dimension(s) by Toivonen (2012)**
Technical reliability	Durability; Performance	Tangibles
Versatility of materials	Versatility; Prestige	Tangibles; Intangibles II: physical product related intangibles
Certificates and environmental sustainability	-	Intangibles I: supplier, service and information; Intangibles II: physical product related intangibles
The quality dimension of wooden interior products (Article III)		
Technical solidity	Durability	Intangibles I: supplier, service and information; Tangibles
Fit with lifestyle and home design	Versatility; Prestige	Tangibles
Environmental friendliness	-	Intangibles I: supplier, service and information; Intangibles II: physical product related intangibles
Visual and tactile attractiveness	Prestige	Tangibles

However, in Toivonen's (2012) study, environmental friendliness and origin formed a quality dimension of their own. The results showed that the quality dimensions revealed for wooden panels and flooring materials and wooden furniture were similar in both product categories. When comparing the quality dimensions by Toivonen to the quality dimensions of this thesis, the quality dimension of "intangibles I: supplier, service and information" can be seen to be related to "certificates and environmental sustainability" in the case of wooden building products and the "environmental friendliness" and "technical solidity" of wooden interior products in respect of the variables of information and retailer. Also, the quality dimension of "tangibles" is connected with the "technical reliability" and "versatility of materials" of wooden building products and "technical solidity," "fit with lifestyle and home design," and "visual and tactile attractiveness" of wooden interior products in respect of the variables of technical aspects, longevity, multifunctionality, coziness, and visual properties.

Furthermore, the quality dimension of "intangibles II: physical product-related tangibles" included the variables of domestic origin and environmental friendliness. A similar dimension was also revealed in this thesis in the case of wooden interior products, and it consisted of the variables of environmental aspects, information, product certificates, and origin. As a difference, a similar dimension in the case of wooden building products consisted only of product certificates, information, and environmental aspects, while the variable of origin belonged to the dimension of "versatility of materials." Furthermore, as a difference between Toivonen's measurement scale and the measurement scales of this thesis, Toivonen investigated extensively producer-, supplier-, and service-related issues, which formed the first quality dimension (Intangibles I). These issues were not included in the measurement scales of Articles II and III because these variables were not considered to constitute relevant quality indicators in the existing consumer behavior literature addressing wooden products. In addition, Toivonen (2012) did not include issues such as the safety aspects or symbolic properties of wooden products in the measurement scale. Compared to the quality dimensions by Brucks, Zeithaml, and Naylor (2000) and Toivonen (2012), the quality dimensions revealed in this dissertation provide more information on product sustainability aspects, addressed from environmental, social, and economic viewpoints.

5.1.3 Personal and situational variables connected to the perceived quality of wooden products

Furthermore, along with quality indicators and dimensions, personal and situational variables are considered to be constituents of perceived quality. In this dissertation, Article I identified personal and situational variables that influenced consumers' perceptions of wooden building materials in the existing literature. Based on the results, personal variables, such as consumers' sociodemographic and psychographic characteristics, and situational variables, such as usage context, influenced consumers' perceptions of wooden building materials. Sociodemographic characteristics consisted of, for example, age, gender, income, and education, while psychographic characteristics were connected with consumers' experience, knowledge, and personal values. These variables are discussed in detail in Article I.

In Articles II and III, certain personal variables (i.e., consumers' consciousness for sustainable consumption and sociodemographic background) were empirically investigated in the case of wooden building products and interior products to test for the existence of relationships between quality dimensions and personal

variables. Based on the results, the quality dimensions of wooden building products were connected with consumers' CSC, while the quality dimensions of wooden interior products were connected with consumers' sociodemographic background in terms of gender, age, education, forest ownership, and forest sector involvement.

In Article II, the connections between consumers' CSC and their perceptions of different quality dimensions of wooden building products were measured. The results showed that those consumers that paid attention to environmental and social sustainability in their daily consumption choices (consumers with strong environmental and social CSC) had a greater appreciation for the quality dimensions of wooden building products than the consumers with weak environmental and social CSC. In particular, strong environmental and social CSC was connected with appreciating the quality dimensions of "technical reliability," "versatility of materials," and "certificates and environmental sustainability." In contrast, the quality dimension of "certificates and environmental sustainability" was found to be appreciated more by those consumers with strong environmental and social CSC than those with weak environmental and social CSC, while no evidence of such behavior was found for economic CSC. Overall, according to the results, consumers who were conscious about sustainable consumption and interested in environmental, social, or economic sustainability had a greater appreciation for the various characteristics of wooden products than those consumers who ignored sustainability issues in their daily purchasing choices. This indicates that one target group for wooden building products might be those consumers who are not only environmentally oriented but also share an interest in social and economic issues in society.

In Article III, the connections between consumers' sociodemographic background and their perceptions of the quality dimensions of wooden interior products were examined. The results showed that the quality dimension of "visual and tactile attractiveness" was more appreciated by women than men. Furthermore, the quality dimension of "environmental friendliness" was appreciated more by older consumers (60 years old or older) than younger consumers (18-34 years old). Those results suggest that valuing the environmental sustainability of wooden interior products might not be directly linked with younger age, which is in contrast with many previous studies in the wood product literature (e.g., Thompson et al. 2010; Høibø, Hansen & Nybakk 2015). The quality dimension of "fit with lifestyle and home design" was mostly valued by females, consumers with vocational upper secondary education, forest owners (respondent or family member), and consumers with forest sector involvement (education or profession) in comparison with other groups. "Technical solidity" was more appreciated by

consumers with a vocational or general upper secondary education and those with forest sector involvement than by consumers with higher education (universities or other academic education) or those without forest sector involvement.

An interesting result is that consumers with connections with the forest sector value both the social benefits and technical benefits of wooden interior products more than those without any connections. This may be explained by the fact that these consumers have more knowledge of the technical properties of wooden products, and they are more aware of the possibilities afforded by wooden products in terms of the social effects on well-being, for instance. Also, consumers with vocational upper secondary education had a greater appreciation for social and technical benefits than consumers with higher education. This is somewhat in contrast with previous results; usually higher education has been connected with choosing wood (e.g., Luo, Kanzaki & Matsushita 2017; Loučanová & Olšiaková 2020). The results indicate that appreciating the economic and social sustainability of wood in particular does not relate to higher education, but rather to consumers' own experiences and professional background.

In conclusion, the constituents of the perceived quality of wooden products in the context of housing include various quality indicators (i.e., quality cues and attributes), quality dimensions, and personal and situational variables. Based on the results of Article I, quality cues and attributes can be categorized into sensory, social, economic, technical, and sustainability dimensions and either as an intrinsic or extrinsic cue, or as an experience or credence attribute. Furthermore, according to the results of Articles II and III, the quality dimensions of wooden building products comprised the dimensions of "technical reliability," "versatility of materials," and "certificates and environmental sustainability," while the quality dimensions of wooden interior products consisted of "technical solidity," "fit with lifestyle and home design," "environmental friendliness," and "visual and tactile attractiveness." These dimensions were also linked with consumer characteristics (i.e., CSC and sociodemographic background). Next, the sustainability attributes of wooden products investigated in the empirical studies are identified and discussed.

5.2 The sustainability attributes of wooden products

As discussed in Chapter 2.4.1, product sustainability is a multidimensional construct consisting of various sustainability attributes reflecting environmental, social, and economic sustainability. In Articles II and III, the measurement scales developed for the perceived quality of wooden building and interior products

consisted of various quality indicators, some of which can be considered to be environmental, social, and economic sustainability attributes (Table 14). Table 14 presents the measured sustainability attributes and the sustainability dimension that they reflect. The sustainability attributes influencing consumers' perceptions of wooden products in the existing literature were included in the final measurement scales. The sustainability attributes comprised longevity, information, product certificates, price, coziness, origin, environmental aspects, health effects, and safety. The last two sustainability attributes (health effects and safety) were measured only in the case of wooden building products.

Out of these sustainability attributes, the attribute of environmental aspects reflects environmental sustainability, while price is an example of an economic sustainability attribute. Coziness, health effects, and safety relate to social sustainability due to their effects on both mental and physical well-being. Some of the attributes represent several sustainability dimensions. For example, the attribute of product certificates measured in Articles II and III reflects both environmental and social sustainability, while information relates to environmental, social, and economic aspects through the given examples. Longevity can address both environmental and economic sustainability, while origin reflects social and economic sustainability. Figure 18 presents the sustainability attributes from environmental, social, and economic viewpoints.

The measured sustainability attributes can be categorized as intrinsic and extrinsic cues, and experience and credence attributes, in accordance with Steenkamp (1989). Environmental friendliness is an intrinsic property of wooden materials (e.g., Lippke et al. 2011); however, it can also be considered to be a credence attribute because consumers cannot verify it during or after consumption. Other credence attributes can include country of origin, for example, if consumers are not informed regarding that aspect, and safety attributes. Extrinsic cues comprise product certificates, information, and price. Coziness and longevity are examples of experience attributes that consumers can determine during or after consumption.

Table 14. The sustainability attributes measured in Articles II and III

Sustainability attribute	**Reference**	**Sustainability dimension**
Longevity, e.g., resistance against moisture and decay	Sinclair, Hansen & Fern 1993; Hansen & Bush 1996; Hansen & Bush 1999; Gold & Rubik 2009; Balázs 2010; Costa et al. 2011; Høibø, Hansen & Nybakk 2015; Strobel, Nyrud & Bysheim 2017; Luo et al. 2018	Economic, environmental
Information related to, e.g., product origin, production process and environmental impacts	Hansmann, Koellner & Scholz 2006; Aguilar & Cai 2010; Costa et al. 2011; Toivonen 2012; Holopainen, Häyrinen & Toppinen 2014	Environmental, social, economic
Product certificates, e.g., Swan Ecolabel, PEFC, FSC	Bigsby & Ozanne 2002; Jensen et al. 2003; Anderson & Hansen 2004; Hansmann, Koellner & Scholz 2006; Roos & Hugosson 2008; Roos & Nyrud 2008; Aguilar & Cai 2010; Thompson et al. 2010; Shoji et al. 2014; Hakala, Autio & Toppinen 2015; Holopainen et al. 2017; Paulin, Nadeau & Dech 2018	Environmental, social
Price, e.g., the price of wood material vs. other materials	Sinclair, Hansen & Fern 1993; Bigsby & Ozanne 2002; Anderson & Hansen 2004; Fell, Thomas & Hansen 2006; Roos & Hugosson 2008; Roos & Nyrud 2008; Balázs 2010; Costa et al. 2011; Hakala, Autio & Toppinen 2015; Luo, Kanzaki & Matsushita 2017	Economic
Coziness, e.g., wood enhances hominess	Rice et al. 2006; Nyrud & Bringslimark 2010; Hu et al. 2016	Social
Origin, e.g., the domesticity of wood	Toivonen 2012; Holopainen, Häyrinen & Toppinen 2014; Paulin, Nadeau & Dech 2018	Social, economic

Sustainability attribute	**Reference**	**Sustainability dimension**
Environmental aspects, e.g., environmental effects of wood	Costa et al. 2011; Toivonen 2012; Toppinen et al. 2013; Holopainen, Häyrinen & Toppinen 2014; Hakala, Autio & Toppinen 2015; Høibø, Hansen & Nybakk 2015	Environmental
Health effects, e.g., effects on well-being and indoor air quality, antibacterial qualities*	Spetic, Kozak & Cohen 2007; Gold & Rubik 2009; Jiménez et al. 2015; Hu et al. 2016; Jiménez et al. 2016	Social
Safety, e.g., fire resistance*	Gold & Rubik 2009; Costa et al. 2011; Hu et al. 2016; Toppinen et al. 2013	Social

*measured only in the case of wooden building products (Article II)

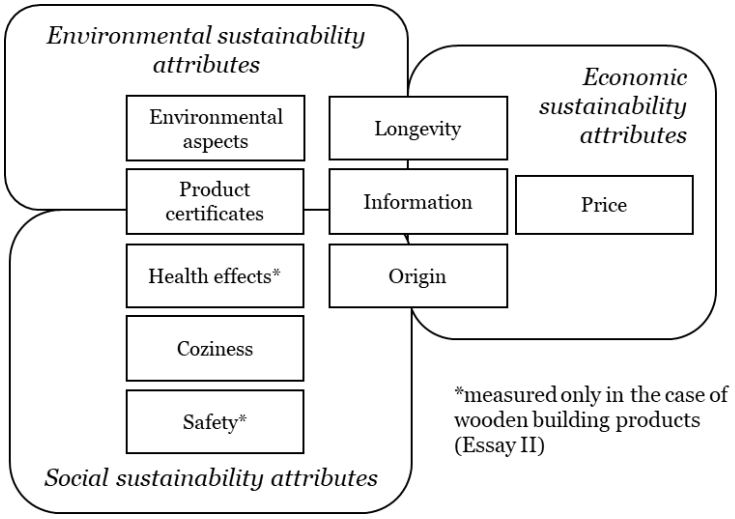

Figure 18. The sustainability attributes of wooden products addressed from environmental, social, and economic viewpoints

The empirical studies of the thesis, Articles II and III, provide information on how consumers evaluate these sustainability attributes when purchasing wooden products. Consumers were asked to rate the importance of various attributes in a choice situation of wooden building or interior products. The evaluations of the sustainability attributes across the product categories were quite similar. In both product categories, coziness (e.g., wood enhances hominess), and longevity (e.g., resistance against moisture and decay) were important for consumers. Furthermore, in the case of wooden building products, consumers valued the material's health effects (e.g., effects of wood on wellbeing, antibacterial qualities,

and effects on indoor air quality). In contrast, information (related to, e.g., raw material or product origin, production process, and environmental effects) and product certificates (e.g., Swan Ecolabel, PEFC, FSC) were the least important sustainability attributes for consumers when choosing wooden building products and interior products. When analyzing the results in terms of the sustainability dimensions, the least valued sustainability attributes, information and product certificates, reflect mostly environmental and social sustainability, but also economic sustainability. For example, the attribute of information included examples of raw material or product origin, production process, and environmental effects. In contrast, the most valued sustainability attributes reflect social sustainability (coziness) and economic sustainability with linkages to environmental sustainability (longevity).

Additionally, the sustainability attributes of origin (e.g., domesticity of wood) and of environmental aspects (e.g., environmental effects of wood) were quite important for consumers, with origin being slightly more significant than environmental aspects. These sustainability attributes were also evaluated as more important than price (e.g., price of wood material compared to other materials) in both product categories. Safety (e.g., fire resistance of wood) was included in the measurement scale only in the case of wooden building products and was rated higher in importance than environmental aspects and origin. However, the differences between the sustainability attributes were not tremendous, with the lowest mean belonging to product certificates (3.62 in wooden building products and 3.52 in wooden interior products) and the highest mean belonging to longevity (4.45 in wooden building products) and coziness (4.28 in wooden interior products).

Longevity, reflecting both environmental and economic sustainability, was rated as one of the most important attributes in a choice situation in the case of both wooden building and interior products. The results support the previous studies where longevity was appreciated when it comes to wooden materials (Kylkilahti et al. 2020). Furthermore, in a study by Costa, Garcia, and Ibanez (2011), product life, which relates strongly to longevity, was the most important attribute for consumers when purchasing wooden windows. Also, based on the results of the empirical studies of the thesis, coziness was one of the most important sustainability attributes in both product categories. This sustainability attribute has a connection with social sustainability by the positive effects of well-being in the home environment, and the results of this thesis suggest that when choosing both wooden building and interior products, coziness is one of the decisive criteria.

The sustainability attributes regarding health effects and safety were included in the measurement scale only in the case of wooden building products. In previous studies, consumers had a positive opinion about the health effects of wood as a material (Jiménez et al. 2015; Jiménez et al. 2016; Andac Guzel 2020; Häyrinen, Toppinen & Toivonen 2020); however, fire safety was still considered to pose an issue (Gold & Rubik 2009; Balázs 2010; Costa, Garcia & Ibanez 2011; Moresová et al. 2019; Viholainen et al. 2020). Based on the results of Article II, consumers considered both health effects and safety issues to be important when choosing wooden products.

The least important sustainability attributes represent mostly extrinsic cues of wooden products, such as product certificates and information, which are used to communicate the sustainability aspects of wood that are credence qualities in nature and cannot be verified by consumers during or after consumption. One might conclude from these results that these aspects might not perhaps be that significant for consumers. However, the sustainability attributes of environmental aspects and origin were still rated as quite important. Therefore, the results of this thesis indicate that these types of extrinsic cues might not be successful in promoting the credence qualities and thus are ignored by consumers in a choice situation. The results are partly in contrast with previous studies in which environmental certification was found to be a favorable and significant attribute for consumers (Anderson & Hansen 2004; Roos & Hugosson 2008; Roos & Nyrud 2008; Aguilar & Cai 2010; Paulin, Nadeau & Dech 2018). However, the results of this thesis are in line with the previous studies that suggest that environmental friendliness is appreciated among consumers (Costa, Garcia & Ibanez 2011; Cai & Aguilar 2014; Andac Guzel 2020).

Furthermore, according to previous studies, origin has been important to consumers. For example, in one study, consumers placed greater value on the country-of-origin of interior decoration products than certificates (Shoji et al. 2014), while in another study, local origin was seen as the most important attribute when comparing it to imported and certified wood products (Paulin, Nadeau & Dech 2018). Also, the results of this dissertation suggest that when choosing wooden products, the sustainability attribute of origin is significant for consumers.

In the existing literature, consumers' perceptions of the price of wooden products have varied depending on the investigated product category. For example, price was of lesser importance in different contexts, such as wooden outdoor furniture (Bigsby & Ozanne 2002), residential wooden decking (Fell, Thomas & Hansen 2006), wooden flooring (Roos & Hugosson 2008), and wooden products in general (Olšiaková, Loučanová & Paluš 2016). There have also been studies that suggested

that price does matter (Strobel, Nyrud & Bysheim 2017; Bernard et al. 2018; Khojasteh-Khosro, Shalbafan & Thoemen 2022). The results of the empirical studies of this dissertation showed that price was evaluated as quite important; however, there were other aspects that consumers valued more. For example, when choosing both wooden building and interior products, consumers appreciated safety, health effects, coziness, longevity, origin, and environmental aspects more than price. This suggests that consumers do value other aspects regarding issues such as environmental, social, and economic sustainability more than price, and that price is not a decisive factor in the case of wooden products.

In conclusion, three main findings from the empirical studies of this thesis regarding the sustainability attributes of wooden products can be presented, as follows. First, consumers' evaluations of the sustainability attributes of wooden products were quite similar across the product categories. However, it is evident that the importance of the sustainability attributes is influenced by the product category and the consumption context. For example, consumers may have different criteria for evaluating wooden materials used in building (e.g., in load-bearing structures) than for wooden interior products, such as furniture.

Second, other sustainability aspects, such as social and economic benefits, in addition to environmental friendliness also mattered in a choice situation involving wooden products. The results indicate that the road to sustainable consumption and choosing sustainable materials, such as wood, does not always require promoting the greenness of the product. For some consumers, other aspects are more decisive, such as social benefits related to mental and physical well-being or economic benefits related to the product's longevity.

Third, certain sustainability attributes of wooden building and interior products, such as certificates and information, were not valued by consumers. This suggests that these attributes might not effectively communicate the credence aspects of wood, such as environmental friendliness and product origin, and therefore are disregarded by consumers. Next, the connections between perceived quality and sustainability attributes are conceptualized and a novel concept – "perceived sustainable quality" – is proposed.

5.3 The perceived sustainable quality of wooden products

In Chapter 2, three different relationships between sustainability attributes and perceived quality were identified from the existing studies. First, some studies positioned sustainability as a determinant of perceived quality with either a

positive or a negative influence on consumers' quality perceptions. Second, some studies considered certain sustainability attributes to be either a quality dimension of their own or a part of a certain quality dimension. Third, there were studies that considered sustainability and perceived quality as separate variables affecting other consumer behavior constructs.

The results of the empirical studies (Articles II-III) showed that the sustainability attributes of wooden building and interior products, reflecting environmental, social, and economic aspects, were integrated in different quality dimensions. Thus, sustainability was seen as a built-in feature of perceived quality and did not represent only one quality dimension. In the current studies, the quality dimension of the "certificates and environmental sustainability" of wooden building products and "environmental friendliness" of wooden interior products consisted of only sustainability attributes, such as product certificates, environmental aspects, and information. In addition, there were quality dimensions that included both sustainability attributes and other quality indicators. For example, the quality dimension of the "technical reliability" of wooden building products consisted of sustainability attributes, such as longevity and safety, and also other quality indicators, such as acoustics. The results were in line with previous studies, discussed in Chapter 2.4.2, where sustainability attributes formed either a quality dimension of their own or were part of another quality dimension (e.g., Krystallis, Chryssochoidis & Scholderer 2007; Toivonen 2012; Wan & Toppinen 2016; Marakanon & Panjakajornsak 2017).

The quality dimensions that included sustainability attributes in the case of wooden building and interior products were similar in many ways. In both product categories, one quality dimension (the "certificates and environmental sustainability" of wooden building products and "environmental friendliness" of wooden interior products) can be seen to reflect mostly the environmental dimension of sustainability with the sustainability attributes of environmental aspects, product certificates, and information. In the case of wooden interior products, origin was also included in this dimension. In addition, this dimension can be seen to be linked with social and economic sustainability through the included sustainability attributes. For example, a sustainability attribute of information was described as "*information related to, e.g., product origin, production process and environmental impacts*" in which information related to product origin connects with both social and economic sustainability, as discussed in Chapter 2.4.2.

Furthermore, the quality dimension of the "versatility of materials" of wooden building products and "fit with lifestyle and home design" of wooden interior

products were different from each other to some extent. In the case of wooden interior products, this quality dimension included attributes addressing the well-being effects of wood via the perceived coziness and hominess of wooden materials that can be seen to be connected with the social dimension of sustainability. In the case of wooden building products, the dimension included the sustainability attribute of origin, which can be seen to reflect both social and economic sustainability aspects. It might be that in the case of wooden building products, the importance of origin (e.g., domesticity) is related to expressing personal values, while in the case of interior products it is considered to be an extrinsic variable similar to product certificates and information.

In addition, the dimensions of the "technical reliability" of wooden building products and the "technical solidity" of wooden interior products comprised sustainability attributes that were related to the technical properties of wood. For example, longevity was included in these quality dimensions in both product categories, and it can be seen to represent the environmental and economic sustainability of wooden products through the possibilities for maintenance and reuse instead of demolition, as discussed in Chapter 2.4.2. In the case of wooden building products, the sustainability attribute of safety aspects, reflecting social sustainability, was also included in this dimension.

Based on the results of the articles, a novel construct is proposed: *perceived sustainable quality,* which refers to the environmental, social, and economic sustainability attributes of wooden products that form a part of perceived quality. The construct of perceived sustainable quality brings together environmental, social, and economic sustainability attributes of wooden products and can be defined as: *the consumer's judgment about a product's overall environmental, social, and economic excellence or superiority*, in accordance with Zeithaml's (1988) definition of perceived quality and Chen's and Chang's (2013) definition of green perceived quality. Perceived sustainable quality can be seen as an extension of green perceived quality (Chen & Chang 2013) and social quality (Mejri & Bhatli 2014); instead of focusing on only aspects such as environmental performance, the social and economic aspects of sustainability are also taken into account when examining the sustainability of wooden products.

Figures 19 and 20 represent the conceptual models of the perceived sustainable quality of wooden building and interior products. Perceived sustainable quality consists of different sustainability attributes that belong to the quality dimensions of wooden building and interior products and reflect environmental, social, or economic sustainability aspects. Perceived sustainable quality can be seen as an inseparable part of perceived quality: Through different quality dimensions, the

sustainability attributes also form a part of perceived quality. In the conceptual models, these sustainability attributes and quality dimensions are highlighted. Some of the attributes represent several sustainability dimensions, as discussed in the previous section.

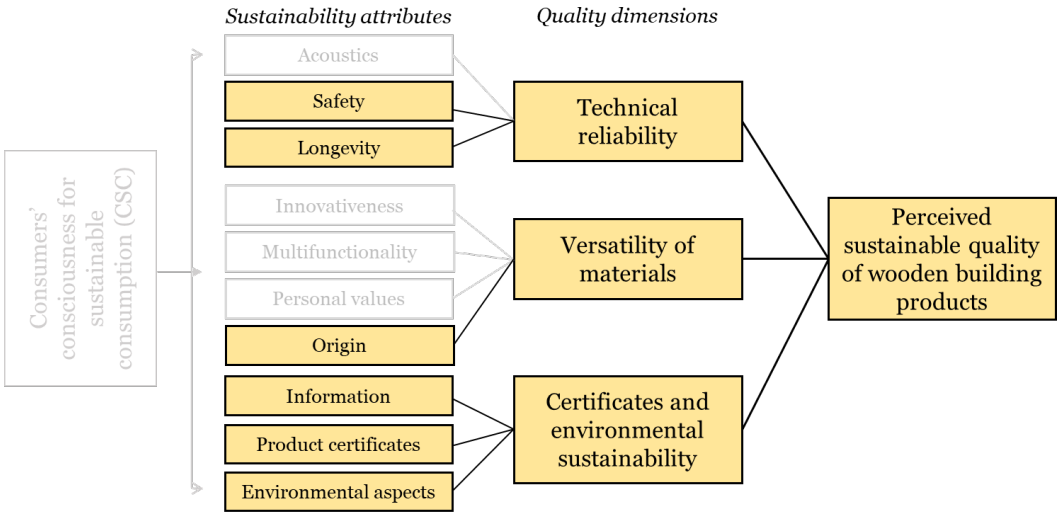

Figure 19. The conceptual model of the perceived sustainable quality of wooden building products

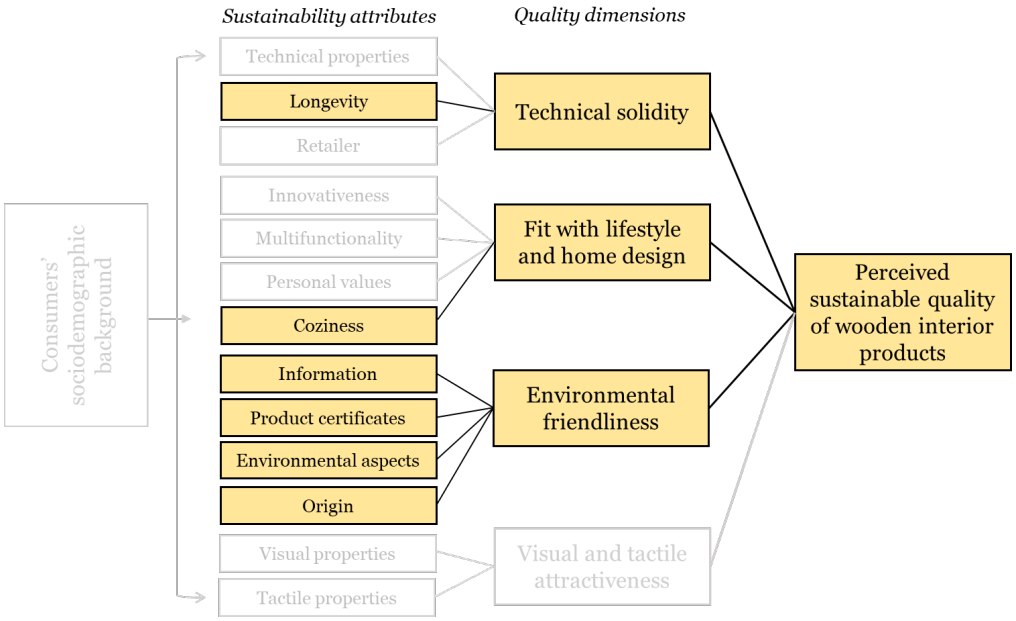

Figure 20. The conceptual model of the perceived sustainable quality of wooden interior products

The perceived sustainable quality of wooden building products consists of the sustainability attributes of safety, longevity, origin, information, product certificates, and environmental aspects, while the perceived sustainable quality of wooden interior products includes longevity, coziness, information, product certificates, environmental aspects, and origin. These are the sustainability attributes that are critical in defining perceived quality. When all three quality dimensions of wooden building products included either environmental, social, and/or economic sustainability attributes, one quality dimension of wooden interior products, "visual and tactile attractiveness," consisted of only visual and tactile properties of the final products and did not contain any sustainability attributes. Therefore, this quality dimension is not considered to be part of the perceived sustainable quality of wooden interior products. Furthermore, in the models, the attributes of technical properties, acoustics, innovativeness, multifunctionality, personal values, and retailer are not considered to be sustainability attributes, based on the discussion in Chapter 2.4.1, and thus they do not form a part of perceived sustainable quality.

Additionally, certain sustainability attributes were omitted from the final factor solutions describing the quality dimensions of wooden building and interior products due to low communalities, low loadings, and/or cross-loadings of the attributes. In the case of wooden building products, these sustainability attributes were health effects, coziness, and price, while price was the only omitted sustainability attribute in the case of wooden interior products. The results might suggest that these sustainability attributes do not differentiate wooden building and interior products in the eyes of consumers, or that they are not perceived as part of quality in the investigated product category. The latter explanation reflects the third relationship introduced in Chapter 2: Certain sustainability attributes, such as health effects and price, might be considered to be separate variables from perceived quality. These results provide several managerial implications that are discussed further in the next section.

5.4 Managerial implications

The results of this study provide significant managerial implications for companies in the wood industry and other stakeholders. In enhancing the transition towards low-carbon housing, all network actors require support and collaboration. The results of this dissertation bring insights on wooden products from consumers' (i.e., end-users' and home-owners') perspective, especially for wood industry companies, such as manufacturers and retailers, non-governmental organizations,

and interest organizations to be used in activities such as product development and conceptualization, and marketing communication.

The articles of this dissertation produced significant information regarding the perceived quality of wooden products that can be utilized in the product development process. It is important to recognize that the perceived quality of wooden products comprises more than just technical or tangible properties of wood. Also, intangible properties, such as sustainability characteristics, matter in consumers' choices. Furthermore, consumers' sociodemographic background and values are related to how they perceive the various aspects of quality. In their product development, companies could aim to enhance the product properties, such as longevity, coziness, and health effects, that consumers appreciated the most when choosing wooden products.

The construct of perceived sustainable quality provides significant managerial implications to be taken into consideration in, for instance, product development and marketing communication. Perceived sustainable quality should be taken into account in the product development process because the construct provides means to enhance product sustainability from consumers' perspective. Companies could use that as a tool to gain a competitive advantage in the markets. As perceived sustainable quality consists of various environmental, social, and economic sustainability attributes, it is important to recognize that perceived sustainable quality is not just a reflection of the environmental friendliness of a product. For example, the perceived sustainable quality of wooden building products consists of the sustainability attributes of safety, longevity, origin, information, product certificates, and environmental aspects, while the perceived sustainable quality of wooden interior products includes longevity, coziness, information, product certificates, environmental aspects, and origin. These sustainability attributes are critical in defining quality and they should be taken into consideration in the development process of new and existing wooden products as well as in marketing communication. Perceived sustainable quality is an essential part of consumers' perceived quality of wooden products and thus it cannot be disregarded.

Companies could also consider the role of consumers in the product development process by involving them from the beginning and allowing them to have an active and central role to prevent product failure. During the process, consumers could provide ideas for new products that will more closely mirror their needs, present proposals for improvements of the existing products, and evaluate new product-service concepts. This type of cocreation may result in significant positive outcomes for both companies (e.g., productivity gains through efficiency, improved effectiveness, increased complexity) and consumers (e.g., fit with

consumer needs, relationship building, engagement and satisfaction) (Hoyer et al. 2010).

In addition to product development, the results of this study can be utilized in marketing communication that is needed to increase the consumer acceptance of wooden products in the context of housing. For example, the results showed that certain social benefits, such as coziness and health effects, were not perceived to be part of the quality of wooden building products. One reason for this could be that consumers do not associate these properties with wooden building products or evaluate wooden building products through these aspects. Emphasizing the facts about the positive health effects of wooden materials for both physical and mental health (e.g., influence on indoor air quality, antibacterial properties, reducing stress) in marketing communication might raise awareness of those effects.

The results also showed that the environmental effects of wooden products were quite important for consumers, while product certificates and information communicating about these aspects were not. This might be explained by the fact that consumers might not be aware of these certificates. Also, certificates might not be enough to convince the consumer that a product is environmentally and socially sustainable, and this provides opportunities for marketers to respond to this issue and enhance the situation. In that case, companies could find other ways to communicate those credence properties and to raise awareness of the sustainability aspects of wooden products. This is also an issue that should be considered in the product development process. Furthermore, the results suggest that even though consumers appreciated the environmental friendliness of wooden products, other sustainability aspects, such as social and economic benefits, should also be promoted to capture the attention of consumers with various values.

5.5 Limitations and future research suggestions

The purpose of this thesis was to conceptualize how the sustainability of wooden products, explored from environmental, social, and economic viewpoints, is connected to perceived quality in consumers' product evaluations in the context of housing. To achieve this purpose, three studies were conducted. Based on the results of these studies, a novel construct, "perceived sustainable quality," was defined and specified. Despite its merits, this thesis is not without limitations. These limitations relate to the operationalization of the perceived quality construct, the development of the measurement scales of wooden building and

interior products, and the generalizability of the results, for instance. These limitations among the opportunities for future research will be discussed next.

One limitation is related to the operationalization of the perceived quality construct. The theoretical foundation for the perceived quality of wooden products used in housing was developed in Chapter 2 and Article I by identifying and analyzing the constituents of perceived quality (i.e., quality indicators, quality dimensions, personal and situational variables). In Article I, the constituents of perceived quality were identified, categorized, and analyzed by one researcher and no other judge was used to cross-check the analysis. However, the article went through the peer review process and the results were critically evaluated by three reviewers. Furthermore, the categorization between quality cues and attributes, and further between intrinsic and extrinsic cues, and experience and credence attributes, was challenging to some extent. For example, functional aspects related to wooden products, such as durability or performance, can be considered to be either an experience or credence attribute depending on the consumers' knowledge. For a consumer who is familiar with wooden products and their properties due to forest sector involvement, for instance, determining certain attributes can be easier than for a consumer who does not have experience with wooden materials. This is something to test in future studies to gain an understanding of how these properties are perceived by consumers with different backgrounds.

Furthermore, the constructed measurement scales may contain deficiencies. The empirical studies of this thesis developed their own measurement scales for the perceived quality of wooden building products and interior products instead of adopting an existing scale. The existing measurement scales by researchers such as Toivonen (2012) and Costa, Garcia, and Ibanez (2011) were inconsistent and limited regarding various sustainability attributes, and therefore it was necessary to develop new scales for wooden building and interior products. Even though the scales were carefully constructed based on the results of a literature review and expert interviews and designed to fit the empirical contexts of wooden building and interior products, there were certain limitations in the sustainability attributes and other quality indicators included in the measurement scales. In the previous literature addressing wood product quality, the quality indicators included mainly tangible and supplier-related properties, and the sustainability attributes of wooden products were examined mostly through their environmental dimension, and this caused inadequacies in the constructed measurement scales. For example, safety and health aspects, reflecting social sustainability, were not included in the measurement scale in the case of wooden interior products. Even though product safety might be more relevant in the case of wooden buildings in terms of fire

safety, for instance, wooden interior products also have issues regarding the material's safety regarding the health effects of used chemicals. Therefore, to test further whether these aspects matter in a choice situation, they should be included in the measurement scales of both product categories in future studies.

As usual when using survey methodology, the wording of the statements in the measurement scales could have been polished. For example, certain sustainability attributes were partly overlapping. The attribute of information also comprised environmental effects as an example, while environmental effects were already included in the measurement scale as a separate attribute. This may have affected the loadings of these attributes on different quality dimensions. Additionally, in this study, the developed scales were not tested with, for instance, tests of dimensionality to determine whether the latent constructs (quality dimensions) are represented as predicted across two independent samples or within the same sample at different time points (e.g., Boateng et al. 2018). Therefore, both further development and testing of the constructed measurement scales is required in future studies.

In addition, the generalizability of the results has its limitations. The data for empirical studies were gathered in Finland, with a limited number of respondents, and most of the respondents lived in urban municipalities. Thus, the results cannot be generalized on a national level. Even though this dissertation did not set out to produce results that are generalizable to all populations, repeating this type of studies on a larger scale and in other countries in future research could be useful to gain generalizable findings. However, choosing Finland as a context to examine consumers' perceptions of different wooden products also provided opportunities. Finnish consumers might attach special meanings to wooden materials (e.g., Jaskari 2011) due to the country's strong traditions and values related to forests and building with wood.

The results of the study raise interesting questions to be considered in further research. For example, contrary to assumptions, the final factor solutions describing the quality dimensions of wooden products did not include certain sustainability attributes, such as health effects or coziness, in the case of wooden building products. This provides interesting possibilities for future studies to investigate the issue further and examine how consumers evaluate wooden products in terms of these social benefits.

Furthermore, because the measurement scales developed in this thesis were for the perceived quality of wooden building and interior products, a specific scale could be developed for perceived sustainable quality, including environmental, social, and economic sustainability attributes. This scale should be also tested in

different product categories because perceived sustainable quality might be different for different products, as the results of this study show. Also, because the role of sustainability attributes in perceived quality studies has been inconsistent, more research is needed to deepen the "perceived sustainable quality" construct.

Based on the results of Article I, the theoretical approaches to investigate consumer behavior were limited in the existing wood product literature. For example, some studies investigated consumer perceptions or preferences without any theoretical framework. Therefore, in future studies, a multidisciplinary approach could be useful when exploring consumers' perceptions of wooden products. Especially marketing and consumer behavior research provide numerous opportunities for scholars with various theories regarding consumers' decision-making process in addition to perceived quality. Additionally, complementing quantitative studies with qualitative studies is highly encouraged. This type of mixed methods approach could be useful in deepening our understanding of the perceived quality of wooden products, which is a complex phenomenon with different cause-effect relationships.

In conclusion, the results of this thesis advance the research on perceived quality and sustainability attributes by introducing a novel construct, "perceived sustainable quality," and in this way the thesis contributes to consumer behavior research. This thesis is the first study that conceptualizes the connections between perceived quality and sustainability attributes and simultaneously examines product sustainability from environmental, social, and economic viewpoints. The thesis thereby also brings novel insights to sustainability science. Furthermore, by scrutinizing the perceived quality construct in the case of wooden products, the thesis introduces novel elements to the field of forest sciences.

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REVIEW PAPER

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The perceived quality of wooden building materials—A systematic literature review and future research agenda

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Abstract

In order to develop strategies for sustainable practices and to enhance the replacement of non-renewable materials with sustainable alternatives such as wood, it is essential to recognize the variables affecting consumers' quality perceptions. Despite this, there is still limited knowledge about the perceived quality of wooden building materials. Wood industry studies have to date approached quality mainly by investigating quality indicators related to the product or supplier, while overlooking the effects of the consumer characteristics on the quality perception process. The purpose of this study is to fill this gap by implementing a systematic literature review of peer-reviewed articles published in international scientific journals during the 2000s using the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol. Literature searches are implemented in two scientific databases (ISI Web of Knowledge and Scopus) to gather the material to be analyzed according to two organizing frameworks (i.e., the TCCM framework and the Model of the Quality Perception Process). The results suggest that the perceived quality of wooden building materials is affected by different quality cues and attributes of wood (i.e., sensory, social, economic, technical, and sustainability properties). Furthermore, different personal variables (consumers' socio-demographic and psychographic characteristics) and situational variables influence consumer behavior regarding wooden building materials. The study contributes to wood products literature by providing new theoretical insights about the perceived quality of wooden building materials and developing a future research agenda that brings forward a number of propositions for future studies based on identified research gaps.

KEYWORDS

consumer behavior, future research agenda, quality perception, systematic literature review, wood consumption

1 | INTRODUCTION

Nowadays, consumers are expected to engage in sustainable consumption and contribute to sustainable development (e.g., Caruana & Crane, 2008). Sustainability has been characterized by corporate responsibility discourses such as "triple bottom line" (TBL) (i.e., profit, people, and planet) that focus on delivering value on the economic, social, and environmental dimensions (Elkington, 2004). Forest product

consumption is considered to be of fundamental importance in supporting sustainable development and the transition toward biobased circular economies (e.g., Bugge et al., 2016; Luhas et al., 2021; Ollikainen, 2014; Toppinen et al., 2020). For example, wooden materials have sustainable properties addressing economic, social, and environmental aspects (e.g., Viholainen et al., 2021), such as longevity in use (Luo et al., 2018), amenity impacts in living environments (Rhee, 2018), compatibility with perceptions of esthetics (Lähtinen et al., 2021), and carbon storage properties and reduced greenhouse gas emissions (Lippke et al., 2011; Petersen & Solberg, 2005).

However, there is still a need for a better understanding of how to engage differently oriented consumers in more sustainable material choices (Kylkilahti et al., 2020). Despite the vast expectations set for wood products to enhance sustainable development in both political agendas (e.g., Wolfslehner et al., 2016) and research (e.g., Ollikainen, 2014), consumer behavior research in the wood products industry has been very limited, although in the recent past it has gained increasing attention among scholars, especially in the context of homebuilding (e.g., Kylkilahti et al., 2020; Viholainen et al., 2020). For example, despite the importance of product quality for both manufacturers and consumers, little is known about the perceived quality of wooden building materials. Earlier studies on perceived quality in other fields of research have suggested that perceived quality has a significant effect on consumers' preferences (e.g., Steenkamp, 1986), perceived value (e.g., Sweeney et al., 1999), and consumers' choice (e.g., Grebitus et al., 2011), for instance. Therefore, the research on perceived quality can be seen to be of major significance also in the wood products industry. Previously, most wood industry studies have investigated quality using the traditional manufacturing approach (e.g., Garvin, 1984) and focused mainly on quality indicators related to the product or supplier (e.g., Hansen & Bush, 1996, 1999; Sinclair et al., 1993). Even though wood product quality studies acknowledge the need for a deeper understanding of the customers' perspective (e.g., Hansen & Bush, 1996, 1999), the role of the consumer in the quality perception process has been largely neglected.

To fill this void, this study provides a comprehensive view of the variables influencing consumer behavior related to wooden building materials using a systematic literature review methodology. This study seeks to achieve the following objectives: (1) to systematically review the existing literature on consumer behavior regarding wooden building materials and (2) to identify, analyze and summarize the variables affecting the perceived quality of wood. Three steps are taken to achieve these objectives. First, the existing research on perceived quality is reviewed and the analytical framework is constructed to guide the identification of the relevant variables influencing the perceived quality of wood. Second, the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol (Paul et al., 2021) is used when collecting data from electronic databases. Third, the results are reported according to Paul and Rosado-Serrano's (2019) TCCM framework, in which T stands for Theory, C for Context, C for Characteristics, and M for Methodology. The paper presents and analyzes the findings of the reviewed literature with a focus on those themes. Also, the variables affecting the perceived quality of wood are identified, analyzed, and summarized in accordance with Steenkamp's (1989) Model of the Quality Perception Process. The focus of the study is on wood material used for building and housing (i.e., load-bearing structures and facades of houses, and interiors such as floors, walls, and roofs). For example, in Europe, these products contribute significantly to the achievement of environmental, economic, and socially sustainable development aims (for examples of assessments, see Päivinen et al., 2012).

So far, there have been no systematic literature reviews on wood product quality in the fields of forest sciences or consumer behavior. This article complements the existing literature on wood consumption by adopting the existing model of perceived quality developed in marketing instead of evaluating only the technical properties of wood for manufacturing different types of products. In addition, the study makes conceptual contributions through identifying and summarizing the variables affecting the perceived quality of wood. Consequently, the results bring forward a number of propositions for future research that are further developed into a future research agenda, especially in connection with the marketing of wood products to enhance sustainable consumption in building and housing.

The article is structured into eight sections: (1) the current introduction section, (2) a section that presents the existing research on perceived quality, (3) the methodology section that describes the literature research process, used inclusion criteria, and study selection, (4) the results section that presents the theories, contexts, characteristics, and methodologies of the reviewed studies, (5) the discussion section that analyzes the findings presented in the previous section and summarizes the variables affecting the perceived quality of wood and consumer behavior related to wooden building materials, (6) a section that presents the research gaps and limitations of the reviewed studies that are further developed into a future research agenda, (7) a section for practical implications and limitations, and (8) a section for conclusions that highlights the significant findings of this systematic literature review.

2 | RESEARCH ON PERCEIVED QUALITY

A number of studies with various approaches to perceived quality have sought to identify the dimensions and capture the nature of product quality (e.g., Olson & Jacoby, 1972; Garvin, 1984; Zeithaml, 1988; Steenkamp, 1989; Aaker, 1991; Mitra & Golder, 2006). Perceived quality has often been considered to exist in opposition to "real" or "objective" quality and has been described as non-quantifiable, imaginary, or subjective (Stylidis et al., 2020). Zeithaml (1988) defined perceived quality as a customer's subjective judgment regarding overall product superiority that differs from objective quality. Steenkamp (1989) defined perceived quality as referring to how a consumer's subjective assessment of the product attributes depends on the consumer's perceptions, needs, and goals, suggesting that quality is neither absolute nor objective. Additionally, perceived quality has been seen as the customer's perception of the overall quality or superiority of a product or service with respect to its intended purpose, relative to the

alternatives (Aaker, 1991). Also, Mitra and Golder (2006) defined perceived quality as the "perception of the customer" and saw it as the opposite of "objective" quality.

The concept of the quality indicators (i.e., quality cues and attributes) is a crucial element in discussing perceived quality (Oude Ophuis & Van Trijp, 1995). Olson and Jacoby (1972) stated that the quality perceptions prior to purchase are based on intrinsic and extrinsic quality cues. Intrinsic cues, such as visual and technical properties, are those which "cannot be changed or experimentally manipulated without also changing the physical characteristics of the product itself," while extrinsic cues, including product information and labels, are connected to the product but are not part of it (Olson & Jacoby, 1972). Steenkamp (1989) contributed to Olson and Jacoby's (1972) research by developing the Model of the Quality Perception Process, which combines both the quality cues (intrinsic and extrinsic cues) and quality attributes (experience and credence attributes). In that model, the quality ques are used to predict the quality attributes that cannot be observed prior to consumption. Experience attributes can be ascertained on the basis of actual experience with the product, while credence attributes cannot be ascertained even after normal use for a long time and/or without consulting an expert (Steenkamp, 1989).

In addition to quality cues and attributes, Steenkamp (1989) suggested that the quality perception process is affected by personal and situational variables. Brucks et al. (2000) also argued that the importance of different quality dimensions may vary for different customers, which supports the assumption that consumer characteristics affect the quality perception process. Situational variables can include, for example, the usage goal for which the product is purchased, physical surroundings, social surroundings, and time pressure (Steenkamp, 1989). In summary, the existing research views perceived quality as a construct that is affected by different quality cues and attributes related to the product, personal variables regarding the consumer characteristics, and situational variables that emerge in the consumer environment and purchasing situation.

This study provides a holistic view of the variables affecting the perceived quality of wooden building materials. The analytical framework of the study is illustrated in Figure 1 to depict how the perceived quality of wooden building materials is in this study addressed as an entity, which comprises the views of consumers on the quality cues and quality attributes, and connections with their characteristics and situational variables. Formulation of the analytical framework is based on the Model of the Quality Perception Process (Steenkamp, 1989).

3 | METHODOLOGY

This study uses a systematic literature review to examine the existing literature on consumer behavior regarding wooden building materials and to identify the relevant variables influencing the perceived quality of wood. Literature reviews contribute significantly to the conceptual, methodological, and thematic development of different domains (Hulland & Houston, 2020; Palmatier et al., 2018). Furthermore, this review is a combination of a domain-based review (Paul & Criado, 2020) and a framework-based review (Paul & Benito, 2018). To develop a rigorous and transparent systematic review, the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol was used (Paul et al., 2021). The SPAR-4-SLR protocol comprises three stages (i.e., assembling, arranging, and assessing) and six sub-stages (i.e., identification, acquisition, organization, purification, evaluation, and reporting) that are presented in Figure 2.

3.1 | Assembling

The first stage, assembling, includes the identification and acquisition of literature that have not been synthesized (Paul et al., 2021). In the sub-stage of identification, the domain, research questions, source type, and source quality are determined. The domain and the research questions, which guided this review are presented in detail in Figure 2. The material of the study consisted of peer-reviewed research articles either published or in a state of "in press" in international peer-reviewed journals. Web of Science journal quality list was used to evaluate the source quality and identification of journals. Furthermore, the quality of articles was assessed with journal impact factors and article citations. The impact factor of the publishing journal (Journal Citation Reports, 2020) was considered as a proxy

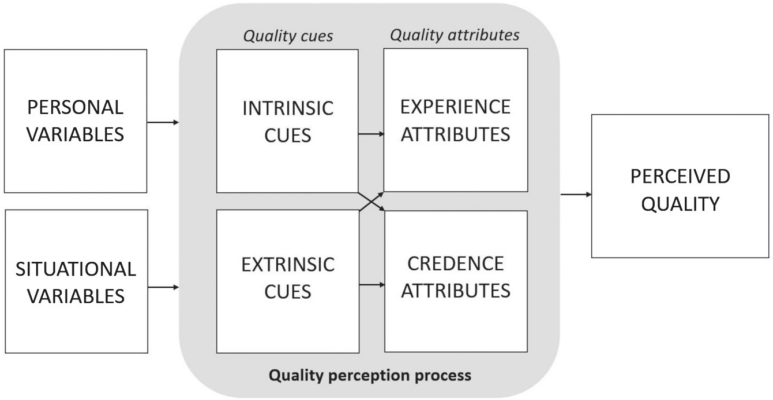

FIGURE 1 Analytical framework of the study to examine the perceived quality of wooden building materials (mod. from the Model of the Quality Perception Process of Steenkamp, 1989)

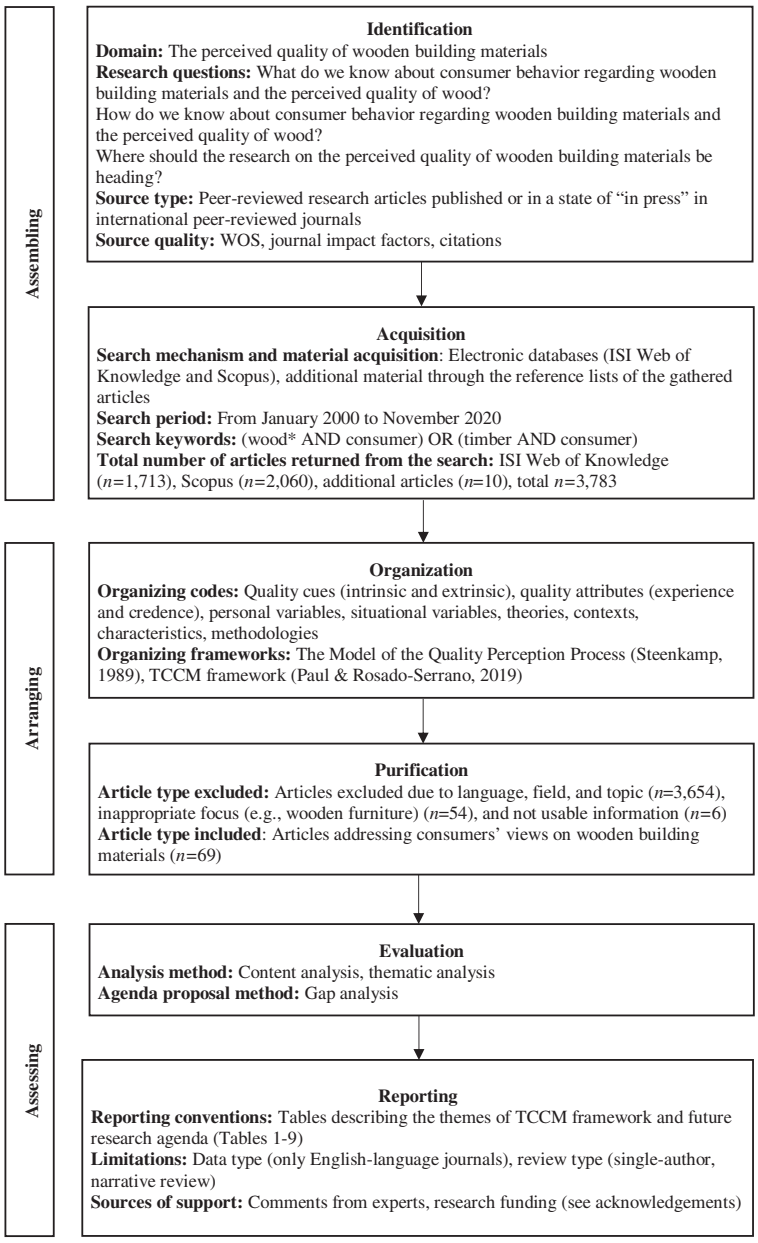

FIGURE 2 Implementation of the systematic literature review according to the SPAR-4-SLR protocol (Paul et al., 2021)

of an article's quality, as in other systematic literature reviews (e.g., Martineau & Pastoriza, 2016). Additionally, the publishing journals were checked to screen out any predatory journals.

In the second sub-stage, acquisition, the research articles published or in a state of "in press" between January 2000 and November 2020 were gathered in November 2020 in two electronic databases (ISI Web of Knowledge and Scopus) using the search words "wood* AND consumer" and "timber AND consumer" for titles, abstracts, and keywords. Research terms generated 1,713 studies in ISI Web of Knowledge and 2,060 studies in Scopus. In addition, the reference lists of the articles found through systematic searches were scrutinized to capture all the relevant material in the background of this review. As a result of this procedure, altogether 10 additional studies were identified to be used as a material of this study. A broad scope was needed to gather relevant information from different fields of science due to the multidisciplinary nature of the research topic, combining the views of forest sciences, consumer behavior, and psychology. 3,783 records were screened based on their publication titles and abstracts.

3.2 | Arranging

The second stage of the SPAR-4-SLR protocol is referred to as arranging, which involves the organization of the literature by

employing organizing codes, and purification of the material (Paul et al., 2021). In this study, the codes were defined based on the organizing frameworks. Steenkamp's (1989) Model of the Quality Perception Process was used to guide the identification of the relevant variables affecting the perceived quality of wooden building materials and therefore, the quality cues (i.e., intrinsic and extrinsic cues), quality attributes (i.e., experience and credence attributes), personal variables and situational variables were used as organizing codes. Furthermore, the articles were coded according to the themes of the TCCM framework (Paul & Rosado-Serrano, 2019).

In the stage of purification, studies from the original searches were included in this systematic review if they met all of the following inclusion criteria:

Field and topic

The database searches aimed to identify the variables influencing the consumers' perceptions of wooden building materials. Instead of evaluating only the technical properties of wood for manufacturing different types of products, the focus was on consumer behavior in the context of perceived quality. To directly address consumers' views and consumer marketing aspects, articles focusing on experts' views, including issues related to business marketing and industrial management, were excluded from the systematic literature searches. Also, due to the study's focus on wooden building materials, wooden furniture was excluded from the searches. For instance, wooden furniture does not have similar technical requirements as wood products used in load-bearing structures (e.g., strength grading). In addition, preferences for furniture also strongly connect to consumer views on functionality and design (e.g., Lähtinen et al., 2014), which do not directly relate to consumer perceptions on wooden materials. However, articles that addressed wooden building materials, such as flooring, in addition to furniture, were included in the review, but the results were reviewed merely in reference to wooden building materials.

Study design

Articles that used the following research design were included: conceptual/theoretical and empirical (regardless of research design, i.e., qualitative or quantitative).

Year of publication

Articles published in the period from January 2000 to November 2020 were included. This search period was chosen because the demands for the sustainability of forest-based production and products combined with increasing emphasis on stakeholder views such as consumer expectations emerged especially in the early 2000s (Lähtinen et al., 2016; Toppinen et al., 2016) and in line with this, connecting consumers' views on wood product quality and sustainability also gained more attention in research.

Language

Only studies written in English were considered.

Publication status

Peer-reviewed research articles published or in a state of "in press" in international peer-reviewed journals were included.

The purification process of this study comprised three steps. Step 1 consisted of screening studies based on publication titles, checking if all inclusion criteria, such as field, topic, and year, were met. For example, studies were excluded from the review due to inappropriate field (e.g., biology) and topic (e.g., focus on the views of experts rather than those of consumers). In step 2, the contents of the abstracts selected in step 1 were studied and studies were excluded if they did not focus on wood as a building material, but instead on wooden furniture. In step 3, potentially appropriate studies were selected and evaluated in detail to determine their relevance in terms of the inclusion criteria. Some studies were excluded in this phase because the results presented were not usable for identifying the variables influencing consumer behavior related to wooden building materials or the perceived quality of wood. Based on the inclusion criteria, 69 studies addressing consumers' views on wooden building materials published in 31 journals were eventually included in the analysis. The reviewed literature was published mostly in the fields of forest sciences, environmental and sustainability studies, and economics, but some studies from the fields of psychology and consumer behavior also fulfilled the inclusion criteria. The advancement of studies with a variety of scientific backgrounds in the evaluation and reporting phase of the systematic literature review is an indication that the risk of bias caused by focusing on an overly narrow scope of scientific fields was reduced during the purification process. From the perspective of the validity of the results, this is an important issue.

3.3 | Assessing

The last stage of assessing includes the evaluation and reporting of the reviewed literature (Paul et al., 2021). In this literature review, the material was analyzed with content analysis and thematic analysis. Content analysis was employed to address the themes of the TCCM framework (theory development, context, characteristics, and methodology), while thematic analysis was utilized to identify the variables, which affected the consumers' perceptions of wooden building materials in the reviewed literature. Through the employment of the TCCM framework as an organizing structure in the evaluation and analysis of the contents of the literature, the reliability

of the results was enhanced. A future research agenda was also developed focusing on the themes of the TCCM framework based on gap analysis where the research gaps of the reviewed literature were evaluated. In the next section, the results are presented according to the TCCM framework to improve the transparency of the reporting of the results. Furthermore, in several tables, the contents of the reviewed literature are illustrated from the perspectives of theory development, research context, characteristics, and methodologies. The limitations of this review are also assessed and discussed at the end of the article along with practical implications of the results.

4 | RESULTS

The results in this section are reported according to Paul and Rosado-Serrano's (2019) TCCM framework. Also, Steenkamp's (1989) Model of the Quality Perception Process is used to identify the quality cues and attributes, and personal and situational variables emerging from the reviewed literature. Corresponding tabular presentations of the categories are presented below (Tables 1–8).

4.1 | Theory development (T)

This section presents all the articles included and analyzed in this literature review from January 2000 to November 2020. Tables 1 and 2 describe the scientific articles used in the literature review during 2000–2010 (Table 1) and 2011–2020 (Table 2). In Tables 1 and 2, the journals, titles, and the number of citations are presented, the article types are defined, and the research contexts and theoretical approaches are listed. Each article is provided with an identification number. Most of the included articles were empirical papers (66), while three of them were theoretical. The articles investigated consumer perceptions (36), preferences (29), willingness to pay (12), attitudes (12), choice (5), acceptance (5), purchase decision (3), values (3), purchase intention (2), and perceived quality (2).

4.2 | Context (C)

The research was conducted mainly in the context of wood flooring (16), wood as a building material (14), wood surfaces (11), wooden buildings (9), certified wood products (8), wooden decking (7), and wooden interior materials (4) (Tables 1 and 2). The reviewed literature was published in 31 journals and the top journals for wood consumption research are presented in Table 3. Most of the studies were published in the field of forest sciences (51), but several other research fields were also represented, such as environmental and sustainability studies (7), sensory studies (4), consumer behavior (3), psychology (2), social and behavioral sciences (1), and applied sciences (1).

Table 4 presents the geographical context of the articles included in the literature review. It shows that most of the published research was conducted in Finland (11), Sweden (8), USA (8), Canada (6), China (6), Norway (6), Austria (4), Japan (4), Slovakia (4), France (3), and Germany (3).

4.3 | Characteristics (C)

The characteristics of the reviewed articles refer to quality cues, quality attributes, personal variables, and situational variables identified from the reviewed literature (Tables 5 and 6). The properties of wood, characteristics of consumers, and situational variables were categorized into several dimensions that are presented in Tables 5 and 6. The numbers that appear in the tables are the article identification numbers corresponding with Tables 1 and 2.

4.4 | Methodology (M)

Tables 7 and 8 demonstrate the different methodologies used in the analyzed literature. Based on the literature review results, quantitative methods (59) were the most popular methodology. For example, experimental design (20) and willingness to pay (WTP) methods (14) were applied. A minority of the studies used qualitative methods (12), such as interviews, focus group discussions, and literature reviews. Few studies used the mixed methods approach (4) with both quantitative and qualitative methods.

5 | DISCUSSION

This section discusses the previous findings according to the TCCM framework (Paul & Rosado-Serrano, 2019) and presents the themes and sub-themes emerging from the reviewed literature.

5.1 | Theory development (T)

Based on the results, most of the reviewed studies investigated consumer perceptions and preferences for wood product attributes in general without applying any specific theory. A couple of studies used Fishbein's (1963) multi-attribute attitude model (Hu et al., 2016; Luo et al., 2017; Nyrud et al., 2008). For example, Nyrud et al. (2008) applied the multi-attribute attitude model when analyzing the relationship between the physical attributes and consumers' preferences for decking materials. In addition, the conceptual framework of consumer behavior toward green buildings with wooden structures by Luo et al. (2017) was based on the multi-attribute attitude model, also addressing consumers' environmental consciousness, socio-demographics, and green building attributes.

Some studies explored consumer attitudes using approaches such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975) or the tri-component model as a basis for their conceptual frameworks. For example, Thompson et al. (2010) applied the Theory of Reasoned

TABLE 1 List of scientific articles used in the literature review (2000–2010)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[1]	*Journal of Wood Science*	Aesthetic properties in knotty wood surfaces and their connection with people's preferences	Broman (2001)	Empirical	Wood surfaces	Consumer preferences	54
[2]	*Forest Products Journal*	Wood in the interior office environment: effects on interpersonal perception	Ridoutt et al. (2002)	Empirical	Wood desk and chairs, wood floor	Consumer perceptions	36
[3]	*Forest Products Journal*	Consumer reactions to environmental labels for forest products: a preliminary look	Teisl et al. (2002)	Empirical	Environmentally certified wood products	Consumer perceptions, preferences, purchase decision	113
[4]	*Forest Products Journal*	Homeowner attitudes and preferences for building materials with an emphasis on treated wood products	Vlosky and Shupe (2002)	Empirical	Wooden building materials (treated wood)	Consumer preferences, attitudes	29
[5]	*Forest Products Journal*	Certification from the U.S. consumer perspective: A comparison from 1995 and 2000.	Ozanne and Vlosky (2003)	Empirical	Certified forest products (i.e., dining room set, kitchen remodeling job, new home)	Consumer preferences, attitudes, willingness to pay	133
[6]	*Forest Products Journal*	Western Canadian consumer attitudes towards certified value-added wood products: An exploratory assessment	Kozak et al. (2004)	Empirical	Certified value-added wood products (furniture, cabinetry, flooring, windows)	Consumer attitudes, willingness to pay, acceptance	82
[7]	*The Forestry Chronicle*	The impact of forest certification labelling and advertising: An exploratory assessment of consumer purchase intent in Canada	Archer et al. (2005)	Empirical	Building products, furniture, tissue/towels, newspapers/ magazines	Consumer preferences, purchase intention	42
[8]	*Journal of Wood Science*	The end consumer's choice of floorcovering in the Netherlands and the United Kingdom: a comparative pilot study of substitute competition	Jonsson (2005)	Empirical	Wooden floorcovering	Consumer preferences, choice	26
[9]	*Forest Products Journal*	Homeowner identity symbolism in Japanese housing constructions	Ridoutt et al. (2005)	Empirical	Wood-based materials and construction techniques, wooden houses	Consumer perceptions	6
[10]	*Forest Products Journal*	What consumers feel and prefer: Haptic perception of various wood flooring surfaces	Berger et al. (2006)	Empirical	Wood flooring	Consumer perceptions, preferences	26
[11]	*The Forestry Chronicle*	Evolving consumer preferences for residential decking materials	Fell et al. (2006)	Empirical	Residential decking materials (wooden decking)	Consumer perceptions, preferences	12
[12]	*Forest Policy and Economics*	Influence of consumers' socioecological and economic orientations on preferences for wood products with sustainability labels	Hansmann et al. (2006)	Empirical	Labeled wood products	Consumer preferences, willingness to pay	81
[13]	*Forest Policy and Economics*	Consumer willingness to pay price premium for environmentally certified wood products in the U.S	Aguilar and Vlosky (2007)	Empirical	Wood products: ready-to-assemble chair, dining room set, kitchen remodeling job, new home	Willingness to pay	235
[14]	*Journal of Applied Sciences*	Preliminary Study on Willingness to Pay for Environmentally Certified Wood Products Among Consumers in Malaysia	Mohamed and Ibrahim (2007)	Empirical	Environmentally certified wood products	Willingness to pay	39
[15]	*Forest Products Journal*	Perceptions of wood flooring by Canadian householders	Spetic et al. (2007)	Empirical	Wood flooring	Consumer perceptions	12

(Continues)

TABLE 1 (Continued)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[16]	*Wood and Fiber Science*	Consumer perceptions and preferences on solid wood, wood-based panels, and composites: a repertory grid study	Jonsson et al. (2008)	Empirical	Wood surfaces (natural wood, wood-based panels, wood-based triad)	Consumer perceptions, preferences	56
[17]	*Canadian Journal of Forest Research*	Product attributes affecting consumer preference for residential deck materials	Nyrud et al. (2008)	Empirical	Wooden decking	Consumer preferences	60
[18]	*Wood Material Science and Engineering*	Consumer preferences for wooden and laminate flooring	Roos and Hugosson (2008)	Empirical	Wood and laminate flooring	Consumer preferences	25
[19]	*Journal of Wood Science*	Description of green versus environmentally indifferent consumers of wood products in Scandinavia: flooring and decking	Roos and Nyrud (2008a)	Empirical	Wooden decking and flooring	Consumer preferences	39
[20]	*Wood and Fiber Science*	Preferences for pressure-treated wooden deck materials	Roos and Nyrud (2008b)	Empirical	Wooden decking	Consumer preferences	12
[21]	*Journal of Cleaner Production*	Consumer attitudes towards timber as a construction material and towards timber frame houses—selected findings of a representative survey among the German population	Gold and Rubik (2009)	Empirical	Timber as a construction material, timber frame houses, timber frame windows	Consumer attitudes, perceptions	92
[22]	*Journal of Wood Science*	Consumer perception of wood surfaces: the relationship between stated preferences and visual homogeneity	Høibø and Nyrud (2010)	Empirical	Wood surfaces (pressure-treated decking materials)	Consumer preferences	46
[23]	*Forest Products Journal*	Character-Marked Red Alder Lumber from Southeastern Alaska: Profiled Panel Product Preferences by Residential Consumers	Nicholls and Barber (2010)	Empirical	Wooden panels	Consumer preferences	9
[24]	*Wood and Fiber Science*	Is interior wood use psychologically beneficial? A review of psychological responses toward wood	Nyrud and Bringslimark (2010)	Theoretical	Wooden interior materials	Consumer perceptions, preferences, attitudes	68
[25]	*Business Strategy and the Environment*	Green segmentation and environmental certification: Insights from forest products	Thompson et al. (2010)	Empirical	Value-added wood products (i.e., furniture), non-value-added wood products (i.e., plywood)	Consumer attitudes, preferences, willingness to pay	149

TABLE 2 List of scientific articles used in the literature review (2011–2020)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[26]	*Forest Sciences*	Do taste and quality perception influence consumer preferences for wood? An econometric model with latent variables	Costa et al. (2011)	Empirical	Wooden windows	Perceived quality, consumer preferences, choice	8
[27]	*Acta Psychologica*	I can't believe this isn't wood! An investigation in the perception of naturalness	Overlievt and Soto-Faraco (2011)	Empirical	Wood surfaces	Consumer perceptions	50
[28]	*Forest Products Journal*	A Study of the visual physical characteristics and psychological images of select Taiwanese Hardwoods	Chen (2012)	Empirical	Wood surfaces	Consumer perceptions	7
[29]	*Drvna Industrija*	A comparative analysis of consumer attitudes on the use of wood products in Slovenia and Croatia	Kuzman et al. (2012)	Empirical	Wooden furniture and construction	Consumer attitudes, perceptions	13
[30]	*Journal of Forest Economics*	Product quality and value from consumer perspective—An application to wooden products	Toivonen (2012)	Empirical	Wooden paneling and flooring, wooden furniture	Perceived quality, consumer value	81
[31]	*Journal of Forest Economics*	Meta-analysis of consumer's willingness-to-pay premiums for certified wood products	Cai and Aguilar (2013)	Theoretical	Certified wood products (i.e., wooden furniture, flooring, homes)	Willingness to pay	110
[32]	*Materials and Design*	A product semantic study of the influence of the sense of touch on the evaluation of wood-based materials	Lindberg et al. (2013)	Empirical	Wood surfaces (solid wood and wood composites)	Consumer perceptions	21
[33]	*Wood and Fiber Science*	A product semantic study of the influence of vision on wood evaluation	Roos et al. (2013)	Empirical	Wood surfaces	Consumer perceptions	1
[34]	*Scandinavian Journal of Forest Research*	Consumer perceptions of environmental and social sustainability of wood products in the Finnish market	Toppinen et al. (2013)	Empirical	Wooden building materials	Consumer perceptions, willingness to pay	55
[35]	*Forest Products Journal*	Corporate social responsibility in the wood products industry: US and Chinese consumers' perceptions	Cai and Aguilar (2014)	Empirical	Certified wood products	Consumer perceptions, preferences	11
[36]	*Journal of Wood Science*	Study of visual evaluations for wood flooring applying fuzzy logic	Chen et al. (2014)	Empirical	Wood flooring	Consumer perceptions	6
[37]	*Scandinavian Journal of Forest Research*	Consumer value dimensions for sustainable wood products: Results from the Finnish retail sector	Holopainen et al. (2014)	Empirical	Wooden terrace materials	Consumer values	26
[38]	*Forest Policy and Economics*	Preferences for certified forest products in Japan: A case study on interior materials	Shoji et al. (2014)	Empirical	Wooden interior materials	Consumer preferences, willingness to pay	22

(Continues)

TABLE 2 (Continued)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[39]	*Journal of Sensory Studies*	Perceived sensory characteristics of wood by consumers and trained evaluators	De Morais and Pereira (2015)	Empirical	Wood surfaces	Consumer perceptions, preferences, choice	7
[40]	*Vision Research*	Perception of the material properties of wood based on vision, audition, and touch	Fujisaki et al. (2015)	Empirical	Wood surfaces	Consumer perceptions	78
[41]	*Canadian Journal of Forest Research*	Building material preferences with a focus on wood in urban housing: Durability and environmental impacts	Høibø et al. (2015)	Empirical	Wood as a building material (structural, exterior, interior)	Consumer preferences	40
[42]	*Forest Products Journal*	Evaluating psychological aspects of wood and laminate products in indoor settings with pictures	Jiménez et al. (2015)	Empirical	Wood and laminate products (floor, cupboard)	Consumer perceptions, purchase decision, quality criteria	5
[43]	*Annals of Forest Science*	Consumers' perceptions and preference profiles for wood surfaces tested with pairwise comparison in Germany	Manuel et al. (2015)	Empirical	Wood surfaces	Consumer perceptions, preferences	24
[44]	*Journal of Sound and Vibration*	Psycho-vibratory evaluation of timber floors—Towards the determination of design indicators of vibration acceptability and vibration annoyance	Negreira et al. (2015)	Empirical	Wood flooring	Consumer perceptions, acceptance	12
[45]	*Procedia – Social and Behavioral Sciences*	Consumer attitudes towards timber frame houses in China	Hu et al. (2016)	Empirical	Timber frame houses	Consumer attitudes	14
[46]	*Forests*	Wood or laminate?—Psychological research of customer expectations	Jiménez et al. (2016)	Empirical	Wood and laminate flooring	Consumer preferences, purchase decision, quality criteria	12
[47]	*Annals of Forest Science*	How do consumers express their appreciation of wood surfaces? Norway spruce floors in Germany as an example	Manuel et al. (2016)	Empirical	Wood flooring	Consumer perceptions	6
[48]	*Frontiers in Psychology*	Sensory and emotional perception of wooden surfaces through fingertip touch	Bhatta et al. (2017)	Empirical	Wood surfaces	Consumer perceptions	11
[49]	*Renewable and Sustainable Energy Reviews*	Acoustic of lightweight timber buildings: A review	Caniato et al. (2017)	Theoretical	Lightweight timber buildings	Consumer perceptions	35
[50]	*Forests*	Forest certification and country of origin: Choice Experiment analysis of outdoor decking material selection in E-commerce market in Finland	Holopainen et al. (2017)	Empirical	Wooden decking	Consumer choice	6
[51]	*International Journal of Consumer Studies*	Promoting green buildings: Do Chinese consumers care about green building enhancements?	Luo et al. (2017)	Empirical	Wooden structures as a green building attribute	Consumer preferences, choice	16

TABLE 2 (Continued)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[52]	*Scandinavian Journal of Forest Research*	Interior wood use: Linking user perceptions to physical properties	Strobel et al. (2017)	Empirical	Wooden interior materials	Consumer perceptions	19
[53]	*BioResources*	American beech in value-added hardwood products: Assessing consumer preferences	Bernard et al. (2018)	Empirical	Wood flooring	Consumer preferences	2
[54]	*Forest Policy and Economics*	Consumer willingness to pay for modern wooden structures: A comparison between China and Japan	Luo et al. (2018)	Empirical	Wooden structure hotels, wooden structure residences	Consumer attitudes, willingness to pay, acceptance	13
[55]	*The International Review of Retail, Distribution and Consumer Research*	Place and certification cue usage with Canadian forest products	Paulin et al. (2018)	Empirical	Wooden commodity products (i.e., "2 × 4" dimensional lumber) and value-added products (i.e., kitchen cabinets)	Consumer attitudes	N/A
[56]	*Wood Material Science & Engineering*	Consumers' perceptions on the properties of wood affecting their willingness to live in and prejudices against houses made of timber	Lähtinen et al. (2019)	Empirical	Wood in the context of construction and housing, multi-storey wooden buildings	Consumer perceptions	22
[57]	*Drvna Industrija*	Consumer perception of environmentally sustainable products of Slovak wood processing enterprises	Malá et al. (2019)	Empirical	Environmentally sustainable products of wood-processing enterprises	Consumer perceptions, willingness to pay	4
[58]	*Acta Facultatis Xylologiae Zvolen*	Perception of wooden houses in the Slovak Republic	Moresová et al. (2019)	Empirical	Wooden houses	Consumer perceptions	8
[59]	*Annals of Forest Science*	Visuo-tactile and topographic characterizations of finished wood surface quality by French consumers and industrials: acceptability thresholds for raised grain	Ramanakoto et al. (2019)	Empirical	Wood surfaces	Consumer preferences, acceptance	1
[60]	*Forest Products Journal*	Effects of eco-label knowledge on Chinese consumer preferences for certified wood flooring: A case study in Chongqing City	Tan et al. (2019)	Empirical	Wood flooring	Willingness to pay, purchase intention	7
[61]	*Sustainability*	Evaluation of wood coverage on building facades towards sustainability	Xu et al. (2019)	Empirical	Wooden building facades	Consumer perceptions, acceptance	4

(Continues)

TABLE 2 (Continued)

No.	Journal	Title	References	Type of article	Research context	Theoretical approach	Citations (based on Google Scholar)
[62]	*BioResources*	Consumer attitudes toward preference and use of wood, woodenware, and furniture: A sample from Kayseri, Turkey	Andac Guzel, 2020)	Empirical	Wooden materials, woodenware, furniture	Consumer preferences, attitudes	10
[63]	*Forest Policy and Economics*	Unravelling the true drivers for eco-certified wood consumption by introducing scarcity	Brusselaers et al. (2020)	Empirical	Eco-certified wood products	Consumer values, attitudes	3
[64]	*Scandinavian Journal of Forest Research*	Finnish young adults' perceptions of the health, well-being and sustainability of wooden interior materials	Häyrinen et al. (2020)	Empirical	Wooden interior materials	Consumer perceptions	3
[65]	*Ambio*	A consumer-driven bioeconomy in housing? Combining consumption style with students' perceptions of the use of wood in multi-storey buildings	Kylkilahti et al. (2020)	Empirical	Multi-storey wooden buildings	Consumer perceptions	10
[66]	*Scandinavian Journal of Forest Research*	Finnish perceptions of log and log architecture	Lakkala et al. (2020)	Empirical	Log construction	Consumer perceptions	1
[67]	*Acta Facultatis Xylologiae Zvolen*	Consumers' perception of retro-innovation of wood products	Loučanová and Olšiaková (2020a)	Empirical	Furniture, buildings, carpentry products and other wood products	Consumer perceptions	N/A
[68]	*Acta Facultatis Xylologiae Zvolen*	Identification of customers' drivers for the wood building as an ecological innovation in building construction in Slovakia	Loučanová and Olšiaková (2020b)	Empirical	Wood as a construction material, wood framed houses	Consumer perceptions	1
[69]	*International Journal of Consumer Studies*	A home made of wood: Consumer experiences of wooden building materials	Viholainen et al. (2020)	Empirical	Wooden building materials	Consumer perceptions	16

TABLE 3 Top journals for wood consumption research (2000–2020)[a]

	Journal name	Number of papers
1.	*Forest Products Journal*	13
2.	*Forest Policy and Economics*	5
3.	*Journal of Wood Science*	5
4.	*Scandinavian Journal of Forest Research*	5
5.	*Wood and Fiber Science*	4
6.	*Acta Facultatis Xylologiae Zvolen*	3
7.	*Annals of Forest Science*	3
8.	*BioResources*	2
9.	*Canadian Journal of Forest Research*	2
10.	*Drvna Industrija*	2

[a]Out of 31 journals which have published wood consumption research.

TABLE 4 Geographical focus of the literature

Number of papers	Geographical context
11	Finland
8	Sweden
8	USA
6	Canada
6	China
6	Norway
4	Austria
4	Japan
4	Slovakia
3	France
3	Germany
2	Taiwan
1	Belgium
1	Brazil
1	Switzerland
1	Netherlands
1	United Kingdom
1	Slovenia
1	Croatia
1	Malaysia
1	Spain
1	New Zealand
1	Turkey
3	N/A

Action when investigating consumer attitudes toward forest certification. Furthermore, the tri-component model of attitudes, which includes the cognitive, affective, and conative components (Ajzen & Fishbein, 1980), was used by Paulin et al. (2018) when examining consumers' attitudes toward Canadian forest products and by Luo et al. (2018) when exploring consumers' willingness to pay for modern wooden structures.

Only a couple of the reviewed studies investigated wood product quality using the perceived quality approach (Costa et al., 2011; Toivonen, 2012) or examining the quality criteria (Jiménez et al., 2015, 2016). Costa et al. (2011) constructed an econometric model that explained consumers' purchase decisions by simultaneously integrating perceived product quality and tastes. They studied the influence of individual characteristics and information on product quality perception of different wood product attributes, such as global quality, thermal insulation, acoustic insulation, maintenance, product life, esthetics, environment, fire resistance, safety, and price. The results showed that socioeconomic factors—among certain other product attributes—affected the choice of window material.

In addition, Toivonen (2012) investigated product quality in the case of wooden products and suggested that perceived product quality should be understood as a hierarchical structure consisting of tangible and intangible dimensions. She assumed that the "total product" comprises two dimensions: a tangible one (the physical good) and an intangible one (services and other intangibles). Both dimensions consisted of more specific subdimensions. The tangible dimension included different subdimensions, such as technical characteristics and appearance, while intangible subdimensions were related to the supplier, service, information, and environment. Toivonen (2012) also defined the perceived product value as customers' judgment of the relationship between perceived product quality and price. In her study, the observed dimensions of perceived product quality and value were logically linked.

Jiménez et al. (2015) and Jiménez et al. (2016) used the quality criteria catalog for green product evaluation when investigating consumer perceptions and preferences for psychological aspects of wood products. The quality criteria catalog for green product evaluation included sustainability, health, physical and mental stimulation, performance enhancement, values, and symbolic functions, perception, atmosphere, mobility and combinability, materials and processing, technical and practical function, and repair and maintenance. In the results of Jiménez et al. (2015), wood products were rated higher than laminate products in 10 of 11 quality criteria. Consumers considered wood products to have more positive health effects than laminate products and viewed wood as a material that can reduce stress, enhance well-being, and increase the quality of life. Jiménez et al. (2016) obtained similar results, suggesting that there was a tendency to evaluate wood floors as being superior to laminate floors in terms of the criterion of "health." In their study, the consumers believed that a wooden floor is more likely to reduce stress, raise well-being and increase the quality of life than a laminate floor.

As only a few of the reviewed studies investigated consumers' perceptions of wood product quality, the studies lack theoretical underpinnings from marketing and consumer behavior research in terms of perceived quality. Also, most of the studies did not examine the effects of consumer characteristics on the quality perception process (e.g., Jiménez et al., 2015, 2016; Toivonen, 2012). Furthermore,

TABLE 5 Quality cues and attributes of wooden building materials

Dimension	Variable	Type of variable	Examples	Number of studies
Sensory dimension	Visual properties	Intrinsic cues	Color [17], [22], [23], [28], [39], [52], [53]; knots [1], [22], [24], [47]; grain [23], [28], [52]; character marks [23]; ring density [22]; stains [22]; brightness [28]; vividness [47]; harmony [47]; evenness [47]; contrast [47]; stripes [47]; pattern [61]	11
	Tactile properties	Intrinsic cues	Smoothness [10], [16], [32], [39], [48], [59]; roughness [32], [39], [48]; hardness [10], [16]; solidness [32]; vibration [44], [69]; temperature [10]; softness [69]	8
	Auditory properties	Intrinsic cues	Wooden sounds [52], [69]; acoustic properties [56]; soundscape [69]	3
	Olfactory properties	Intrinsic cues	Scent [52]; fragrance [69]	2
Social dimension	Safety properties	Credence attributes	Health aspects [15], [29], [34], [37], [42], [45], [46], [57], [62], [64], [66]; naturalness [8], [16], [24], [27], [32], [33], [48], [52], [58], [66], [69]; fire resistance [21], [26], [45], [58], [69]	23
	Symbolic properties	Experience attributes	Well-being [21], [42], [56], [58], [65]; warmness [52], [66]; coziness [64], [69]; brand [30], [37]; feeling of peace [58]; mental and emotional relaxation [62]; effects on first impression [2]; effects on identities [9]; wood feeling [8]; living impression [16]; quality of life [42]; atmosphere [46]; emotional associations [52]; ambience of a space [52]; pleasure [62]; happiness [62]; calming [64]; stressfulness [64]; sympatheticness [69]; homeliness [69]	17
	Esthetic properties	Experience attributes	Esthetics [8], [26], [43], [45], [56], [65]; visual appearance [17], [20], [21], [30], [37]; exclusivity [32], [33]; modern [33]; trendiness [37], [66]; attractiveness [15]; beautifulness [69]	16
Economic dimension	Price and costs	Extrinsic cues	Price [3], [11], [18], [20], [31], [53], [57]; expensiveness [29]; costs [52]; financial demands of the construction [58]; affordability [15]; price sensitivity [19]; price premium [60]	13
Technical dimension	Material properties	Intrinsic cues	Type of material [11], [16], [17], [32], [33], [48]; density [52]; hygroscopic properties [52]; chemical composition [52]; wood species [53]; material properties [40]; structure [24]	10
	Functional properties	Experience attributes	Durability [15], [21], [37], [41], [45], [52], [62], [64]; technical quality [26], [30], [46], [57], [64]; insulation [26], [49], [69]; resistance [46], [52], [58], [62], [64]; maintenance [11], [30], [46], [64], [69]; moisture sensitivity [64], [69]; performance [4]; use properties [30]; stability [46]; thermal conductivity [52]; volume and shape changes caused by temperature and size [58]; lifespan of the construction [58]; length of construction process [58], breathability [64]; longevity [65]; easiness to work with and modify [69]	18
Sustainability dimension	Environmental labels	Extrinsic cues	[3], [5], [6], [7], [12], [13], [14], [18], [19], [20], [25], [31], [35], [37], [38], [50], [52], [55], [57], [60], [62], [63]	22
	Information	Extrinsic cues	Label information [12]; information concerning the environmental effects [37]; information concerning environmentally sustainable products [57]	3
	Environmental friendliness	Credence attributes	[15], [21], [26], [30], [32], [33], [34], [37], [42], [45], [46], [56], [58], [62], [64], [65], [69]	17
	Corporate social responsibility	Credence attributes	Economic, ethical, legal, and philanthropic responsibilities [35]; responsible image of a product company, legal origin of raw material, usage of cheap labor force [37]	2
	Origin	Credence attributes	Origin of wood [64]; domestic origin [30], [37]; origin of wood fiber [6]; local origin [55]; country-of-origin [38], [50]	7
	Other	Credence attributes	Sustainability [37], [42], [46], [52]; perceived social sustainability [34]	5

TABLE 6 Personal and situational variables identified from the reviewed literature

Variable		Type of variable	Examples	Number of studies
Personal variables	Age	Socio-demographic variables	[25], [34], [37], [41], [51], [58], [68]	7
	Gender	Socio-demographic variables	[10], [18], [19], [23], [34], [37], [41], [51], [68]	9
	Income	Socio-demographic variables	[8], [13], [51], [58], [62]	5
	Education	Socio-demographic variables	[18], [19], [51], [54], [68]	5
	Nationality	Socio-demographic variables	[8], [19], [54]	3
	Other	Socio-demographic variables	City [23]; marital status/cohabitation [19]; household size [54]	3
	Experience	Psychographic variables	Growing up in a home with a structure that combined wood with other materials [41]; living in a wooden house [65]; prior experience [54]	3
	Knowledge	Psychographic variables	Prior knowledge [12]; knowledge about wood [41]; knowledge about modern wooden structures [54]; knowledge about the FSC and CEL labels [60]	4
	Interest	Psychographic variables	Interest toward multi-storey wooden buildings [65]	1
	Environmental values	Psychographic variables	Consumers who searched for certified wood products and believed certification can lessen environmental impacts [13]; perceived consumer effectiveness [63]; consumers who emphasized social and ecological aspects of forests over economic values [12]; consumers with strong environmental values [41]; consumers with preferences for eco-labeled wood products [19], [25]; environmental orientation [65]	7
	Other values	Psychographic variables	Self-interest [63]	1
	Consumption habits	Psychographic variables	Planning of purchases [19]; relationship to money, consciousness about consumption [65]	2
Situational variables			Advertising [6], [7], [26], [58]; historical events in the given region [58]; manufacturer [25]; store advisors [26]; usage context (type of room, style of the dwelling) [8]; homeownership [18], [34], service [20]; serviceability of the sales personnel [30]; reputation of the producer [30]; reliability of the supplier [30]; payment and delivery terms [30]	10

sustainability aspects were examined by focusing only on the environmental aspects (e.g., Costa et al., 2011; Toivonen, 2012) and product safety (Costa et al., 2011), and symbolic qualities of wood were investigated only by Jiménez et al. (2015) and Jiménez et al. (2016). Therefore, more research is needed especially in the context of consumer characteristics, sustainability aspects, and symbolic qualities of wood to gain a better understanding of the perceived quality of wooden building materials.

5.2 | Context (C)

Most of the research investigated wood as a building material in the context of wood flooring (Bernard et al., 2018; Manuel et al., 2016; Tan et al., 2019) or decking (Holopainen et al., 2014, 2017) but did not focus on applications such as the use of wood in load-bearing structures, facades of houses, or interior walls. This might be due to the fact that consumers do not necessarily have the possibility to make the decisions about the load-bearing structures or facades of houses in the context of multi-storey construction markets, for instance (e.g., Lähtinen et al., 2022). Furthermore, wooden flooring was seen as a relevant context because, for example, the flooring market was considered to be not only economically important but also highly competitive, as it engages several producers and materials (Roos & Hugosson, 2008). Additionally, a potential for green marketing in this area was identified (Roos & Hugosson, 2008) and the widespread use of eco-labeled wood flooring was considered as an important step in promoting environmental sustainability in countries such as China (Tan et al., 2019). Wooden decking or terrace materials were chosen as a research context because, for example, this product category comprises product attributes, such as general properties

TABLE 7 Methodology-based clustering of the literature

No.	References	Methodology
1.	Broman (2001)	Quantitative (survey, $n = 215$), statistical analysis
2.	Ridoutt et al. (2002)	Quantitative (survey, $n = 69$), statistical analysis supplemented with qualitative content analysis
3.	Teisl et al. (2002)	Qualitative (focus group interviews, $n = 48$)
4.	Vlosky and Shupe (2002)	Quantitative (survey, $n = 451$), statistical analysis
5.	Ozanne and Vlosky (2003)	Quantitative (surveys, $n = 308$)
6.	Kozak et al. (2004)	Qualitative (focus group sessions with questionnaires, $n = 40$)
7.	Archer et al. (2005)	Quantitative (survey, $n = 119$), statistical analysis
8.	Jonsson (2005)	Qualitative (interviews, $n = 67$, $n = 70$), statistical analysis
9.	Ridoutt et al. (2005)	Quantitative (survey, $n = 126$), statistical analysis
10.	Berger et al. (2006)	Quantitative (survey, $n = 200$), statistical analysis
11.	Fell et al. (2006)	Quantitative (surveys, study 1, $n = 600$, study 2, $n = 1{,}285$), WTP measurement (choice-based conjoint analysis), descriptive statistics
12.	Hansmann et al. (2006)	Quantitative (survey, $n = 175$), WTP measurement, statistical analysis
13.	Aguilar and Vlosky (2007)	Quantitative (surveys, $n = 274$, $n = 165$), WTP measurement, statistical analysis
14.	Mohamed and Ibrahim (2007)	Quantitative (survey, $n = 100$), statistical analysis
15.	Spetic et al. (2007)	Quantitative (survey, $n = 867$), statistical analysis
16.	Jonsson et al. (2008)	Qualitative (interviews, $n = 10$), content analysis, statistical analysis
17.	Nyrud et al. (2008)	Quantitative (test with trained evaluators $n = 9$, survey with consumers $n = 94$), statistical analysis
18.	Roos and Hugosson (2008)	Quantitative (survey, $n = 239$), WTP measurement (conjoint analysis), statistical analysis
19.	Roos and Nyrud (2008a)	Quantitative (surveys, $n = 210$, $n = 95$, $n = 106$, $n = 94$, $n = 95$), WTP measurement (conjoint analysis), statistical analysis
20.	Roos and Nyrud (2008b)	Quantitative (survey, $n = 210$), WTP measurement (conjoint analysis), statistical analysis
21.	Gold and Rubik (2009)	Quantitative (survey, $n = 1{,}004$), statistical analysis
22.	Høibø and Nyrud (2010)	Quantitative (surveys, $n = 102$, $n = 119$), statistical analysis
23.	Nicholls and Barber (2010)	Quantitative (survey, $n = 465$), statistical analysis
24.	Nyrud and Bringslimark (2010)	Qualitative, literature review
25.	Thompson et al. (2010)	Quantitative (surveys, $n = 303$, $n = 478$), WTP measurement (conjoint analysis), statistical analysis
26.	Costa et al. (2011)	Quantitative (survey, $n = 940$), WTP measurement (discrete choice model), statistical analysis
27.	Overlievt and Soto-Faraco (2011)	Quantitative (surveys, experiment 1: $n = 32$, experiment 2: $n = 32$, experiment 3: $n = 16$), statistical analysis
28.	Chen (2012)	Quantitative (survey, $n = 72$), statistical analysis
29.	Kuzman et al. (2012)	Quantitative (survey, $n = 743$), descriptive statistics
30.	Toivonen (2012)	Quantitative (survey, $n = 147$), statistical analysis
31.	Cai and Aguilar (2013)	Quantitative (data on previous studies, $n = 19$), meta-analysis, statistical analysis
32.	Lindberg et al. (2013)	Quantitative (telephone survey, $n = 30$), statistical analysis
33.	Roos et al. (2013)	Quantitative (survey, $n = 30$), statistical analysis
34.	Toppinen et al. (2013)	Quantitative (survey, $n = 227$), statistical analysis
35.	Cai and Aguilar (2014)	Quantitative (surveys, $n = 1{,}120$, $n = 892$), WTP measurement (conjoint analysis), statistical analysis
36.	Chen et al. (2014)	Quantitative (survey, $n = 114$), MCDM method (fuzzy logic), statistical analysis
37.	Holopainen et al. (2014)	Quantitative (survey, $n = 208$), statistical analysis
38.	Shoji et al. (2014)	Quantitative (survey, $n = 150$), WTP measurement (discrete choice experiment), statistical analysis
39.	De Morais and Pereira (2015)	Quantitative (test with trained evaluators, $n = 5$, test with users, $n = 60$), statistical analysis
40.	Fujisaki et al. (2015)	Quantitative (survey, $n = 50$), statistical analysis
41.	Høibø et al. (2015)	Quantitative (survey, $n = 503$), statistical analysis
42.	Jiménez et al. (2015)	Quantitative (survey, $n = 93$), statistical analysis
43.	Manuel et al. (2015)	Quantitative (study 1, $n = 112$, study 2, $n = 504$), statistical analysis
44.	Negreira et al. (2015)	Quantitative (survey, $n = 60$), statistical analysis

TABLE 7 (Continued)

No.	References	Methodology
45.	Hu et al. (2016)	Quantitative (survey, *n* = 587), statistical analysis
46.	Jiménez et al. (2016)	Quantitative (survey, *n* = 40), statistical analysis
47.	Manuel et al. (2016)	Quantitative (survey, *n* = 461), statistical analysis
48.	Bhatta et al. (2017)	Quantitative (survey, *n* = 20), statistical analysis
49.	Caniato et al. (2017)	Qualitative, literature review
50.	Holopainen et al. (2017)	Quantitative (survey, *n* = 231), WTP measurement (discrete choice experiment), statistical analysis
51.	Luo et al. (2017)	Quantitative (survey, *n* = 341), WTP measurement (conjoint analysis), statistical analysis
52.	Strobel et al. (2017)	Qualitative (8 focus group discussions, *n* = 53)
53.	Bernard et al. (2018)	Quantitative (face-to-face survey, *n* = 1,042, online survey, *n* = 1,247), WTP measurement (choice-based conjoint analysis), statistical analysis
54.	Luo et al. (2018)	Quantitative (surveys, *n* = 300, *n* = 213), WTP measurement, statistical analysis
55.	Paulin et al. (2018)	Quantitative (survey 1, *n* = 91, survey 2, *n* = 88), statistical analysis
56.	Lähtinen et al. (2019)	Quantitative (survey, *n* = 256), statistical analysis
57.	Malá et al. (2019)	Quantitative (survey, *n* = 754), statistical analysis
58.	Moresová et al. (2019)	Quantitative (survey, *n* = 728), statistical analysis
59.	Ramanakoto et al. (2019)	Quantitative (survey, *n* = 62), statistical analysis
60.	Tan et al. (2019)	Quantitative (survey, *n* = 367), statistical analysis
61.	Xu et al. (2019)	Qualitative and quantitative (focus group discussion, *n* = 10, survey, *n* = 60, eye-tracking study, *n* = 24), statistical analysis
62.	Andac Guzel (2020)	Quantitative (survey, *n* = 412), statistical analysis
63.	Brusselaers et al. (2020)	Quantitative (survey, *n* = 274), statistical analysis
64.	Häyrinen et al. (2020)	Qualitative (focus group discussions, *n* = 19), thematic analysis
65.	Kylkilahti et al. (2020)	Quantitative (survey, *n* = 531), statistical analysis
66.	Lakkala et al. (2020)	Qualitative (interviews, *n* = 18)
67.	Loučanová and Olšiaková (2020a)	Quantitative (survey, *n* = 1,515), statistical analysis
68.	Loučanová and Olšiaková (2020b)	Quantitative (survey, *n* = 990), statistical analysis
69.	Viholainen et al. (2020)	Qualitative (interviews, phase 1: *n* = 7, phase 2: *n* = 6), thematic analysis

TABLE 8 Methods and number of studies

Methods	Number of papers
Quantitative	59
Experimental design	20
WTP measurement methods	14
Qualitative	12
Focus groups	5
Mixed methods	4
Other (i.e., MCDM methods, literature review, meta-analysis)	4

including price and quality, sustainability aspects like different certificates, availability of both domestic and imported products, and attributes regarding health, legality, social, and labor issues (Holopainen et al., 2014).

Many studies examined wood surfaces in general by analyzing the sensory properties of wood (e.g., Høibø & Nyrud, 2010; DeMorais & Pereira, 2015). Especially, the appearance of wood was seen to provide competitive advantages for the forest industry and also to improve consumer satisfaction and welfare if applied to the development of new products in accordance with consumers' needs and requirements (Høibø & Nyrud, 2010). Some studies also explored different contexts, an approach that resulted in different findings. For example, in Aguilar and Vlosky's (2007) study, the results for a new house were different from the other wooden products (ready-to-assemble chair, dining room set, kitchen remodeling job). In addition, the literature review results revealed that most of

the wood consumption research was published in the field of forest sciences and only a minority of the studies represented consumer behavior research. Consumer behavior research is essential for understanding the role of consumers as decision-makers in the markets, and therefore, a distinct research gap exists.

In terms of the geographical area, wood consumption research was scattered around the world, focusing on Europe, North America, and Asia. The majority of the studies focused on developed countries, and most of the research was conducted in Finland (e.g., Kylkilahti et al., 2020; Lakkala et al., 2020; Viholainen et al., 2020). Other Nordic countries, such as Norway (e.g., Høibø et al., 2015; Høibø & Nyrud, 2010) and Sweden (e.g., Negreira et al., 2015; Strobel et al., 2017), were also active in wood consumption research. In the Nordic countries, wood is a locally produced and readily available resource and these countries have long traditions of using timber for construction (Strobel et al., 2017). In previous research, preferences for building materials are considered to be related to tradition (e.g., Craig et al., 2005), which might also explain the research interest in these countries in particular.

Other regions in which research was carried out actively were the United States (e.g., Cai & Aguilar, 2013, 2014), Canada (e.g., Bernard et al., 2018; Paulin et al., 2018), and China (e.g., Tan et al., 2019; Xu et al., 2019). Both the United States and China are significant players in the global wood products market (Cai & Aguilar, 2014). China has an especially long history of using timber as a construction material (Luo et al., 2018) and its construction market is increasingly exploring green options (Luo et al., 2017). In Canada, in turn, the lumber industry represents a significant proportion of the economy (Paulin et al., 2018). However, studies were not conducted in Russia, Africa, or Australia, for instance. In many articles, conducting studies in a specific region was seen as a limitation, and repeating similar studies in other countries was seen as essential to gain generalizable findings (e.g., Malá et al., 2019; Teisl et al., 2002).

5.3 | Characteristics (C)

In this section, the results concerning the identified variables, including quality cues and attributes, and personal and situational variables, are discussed. The section examines each category and presents examples based on the literature analyzed.

5.3.1 | Quality cues and attributes of wooden building materials

The properties of wooden building materials were grouped into five main themes: the sensory, social, economic, technical, and sustainability dimensions. Each attribute was also defined in terms of Steenkamp's (1989) Model of the Quality Perception Process and categorized as an intrinsic or extrinsic cue, or experience or credence attribute.

Sensory dimension

The sensory dimension consists of intrinsic cues of wood, such as visual, tactile, auditory, and olfactory properties affecting consumer preferences for wooden materials. These cues are significant in predicting the quality attributes at the point of purchase (Steenkamp, 1989). *Visual properties*, such as color (Bernard et al., 2018; Chen, 2012; Høibø & Nyrud, 2010; De Morais & Pereira, 2015; Nicholls & Barber, 2010; Nyrud et al., 2008; Strobel et al., 2017), knots (Broman, 2001; Høibø & Nyrud, 2010; Manuel et al., 2016; Nyrud & Bringslimark, 2010), and grain (Chen, 2012; Nicholls & Barber, 2010; Strobel et al., 2017) were investigated in most of the studies. In the results, consumers preferred a homogeneous visual appearance and moderate color intensity in the case of wooden deck materials (Nyrud et al., 2008); furthermore, they preferred wood with fewer knots over wood with many knots (Nyrud & Bringslimark, 2010). *Tactile properties*, such as smoothness (Berger et al., 2006; Bhatta et al., 2017; Jonsson et al., 2008; Lindberg et al., 2013; De Morais & Pereira, 2015; Ramanakoto et al., 2019), roughness (Bhatta et al., 2017; Lindberg et al., 2013; De Morais & Pereira, 2015), and vibration (Negreira et al., 2015; Viholainen et al., 2020) were identified. Several studies concluded that consumers preferred smooth surfaces (Bhatta et al., 2017; De Morais & Pereira, 2015; Ramanakoto et al., 2019), and wood was seen as a soft and warm material (Strobel et al., 2017; Viholainen et al., 2020).

The investigated *auditory properties* were related to the sounds and acoustics of wooden buildings and they were perceived both negatively and positively. On the one hand, wood as a material had a positive effect on the acoustics of the room (Strobel et al., 2017), and a wooden multi-framed building was experienced to have a pleasant soundscape with no echoes (Viholainen et al., 2020). On the other hand, consumers also expressed discontent with old wooden floors that creaked noisily when walked on (Viholainen et al., 2020). Additionally, two studies examined scent and fragrance, which constitute *olfactory properties*. Both studies viewed the olfactory properties of wood positively: the scent of wood was seen as a property that enriched the environment (Strobel et al., 2017), and wood as a building material was considered to be fragrant (Viholainen et al., 2020).

Social dimension

The social dimension comprises the safety properties (credence attributes), symbolic properties (experience attributes), and esthetic properties (experience attributes) of wooden materials. Safety properties are seen as credence attributes because the health effects and naturalness of wood, for example, cannot be ascertained on the basis of actual experience with the products (Steenkamp, 1989), while aspects such as esthetics and relaxation can be easily determined by consumers. In the reviewed studies, *safety properties* were mostly related to health aspects, fire resistance, and the perceived naturalness of wood. In many studies, consumers had a positive opinion about the health effects of wood (Andac Guzel, 2020; Häyrinen et al., 2020; Hu et al., 2016; Jiménez et al., 2015, 2016; Kuzman

et al., 2012; Lakkala et al., 2020; Malá et al., 2019; Spetic et al., 2007) and wood was seen as a natural material (Jonsson, 2005; Lakkala et al., 2020; Strobel et al., 2017; Viholainen et al., 2020). In addition, the naturalness of wood was a favorable attribute among consumers (Bhatta et al., 2017; Jonsson et al., 2008; Moresová et al., 2019; Nyrud & Bringslimark, 2010). However, fire safety was still seen as an issue in some studies (Costa et al., 2011; Gold & Rubik, 2009; Hu et al., 2016; Moresová et al., 2019; Viholainen et al., 2020).

In the results reviewing *symbolic properties*, most of the studies examined the effects of wood on well-being (Gold & Rubik, 2009; Jiménez et al., 2015; Kylkilahti et al., 2020; Lähtinen et al., 2019; Moresová et al., 2019), and coziness (Häyrinen et al., 2020; Viholainen et al., 2020). Wood was seen to have psychological influences by reducing stress (Häyrinen et al., 2020; Jiménez et al., 2015), giving people a feeling of peace (Moresová et al., 2019), pleasure and happiness, and relaxing them mentally and emotionally (Andac Guzel, 2020). *Esthetic properties* investigated in the reviewed studies were mainly esthetics (Costa et al., 2011; Hu et al., 2016; Jonsson, 2005; Kylkilahti et al., 2020; Lähtinen et al., 2019; Manuel et al., 2015) and visual appearance (Gold & Rubik, 2009; Holopainen et al., 2014; Nyrud et al., 2008; Roos & Nyrud, 2008b; Toivonen, 2012). Wood was seen as an esthetic and beautiful material (e.g., Hu et al., 2016; Viholainen et al., 2020) and visual appearance was deemed to be important in a choice situation (Costa et al., 2011; Gold & Rubik, 2009; Jonsson, 2005; Roos & Nyrud, 2008b).

Economic dimension

Price and costs form the economic dimension of wooden properties. Price as an extrinsic cue is significant in predicting the quality attributes at the point of purchase (Steenkamp, 1989) and it was investigated in many studies (Bernard et al., 2018; Cai & Aguilar, 2013; Fell et al., 2006; Malá et al., 2019; Roos & Hugosson, 2008; Roos & Nyrud, 2008b; Teisl et al., 2002). Some studies also investigated the expensiveness of wooden material (Kuzman et al., 2012), costs (Strobel et al., 2017), financial demands of the construction (Moresová et al., 2019), and affordability (Spetic et al., 2007). Price was discovered to be a significant factor influencing purchase decisions in some studies (e.g., Bernard et al., 2018; Strobel et al., 2017). However, when investigating residential wooden decking (Fell et al., 2006) and wood flooring (Roos & Hugosson, 2008), price was of lesser importance. In contrast to Fell et al. (2006), in a study by Roos and Nyrud (2008b), price was seen as an important attribute of wooden deck materials. Therefore, findings concerning the price were inconsistent to some extent and there were differences in some of the results investigating similar wood products, such as wooden decking (Fell et al., 2006; Roos & Nyrud, 2008b).

Technical dimension

The technical dimension consists of material properties (intrinsic cues) and functional properties (experience attributes) of wooden building materials. The material properties are intrinsic cues that cannot be changed without also changing the physical characteristics of the product itself, while functional attributes are ascertained on the basis of actual experience with the products (Steenkamp, 1989). In terms of *material properties*, the type of material was investigated (Bhatta et al., 2017; Fell et al., 2006; Jonsson et al., 2008; Lindberg et al., 2013; Nyrud et al., 2008; Roos et al., 2013). For example, consumers considered untreated, naturally resistant wood superior to treated wood (Nyrud et al., 2008). The reviewed *functional properties* were durability (Andac Guzel, 2020; Gold & Rubik, 2009; Häyrinen et al., 2020; Høibø et al., 2015; Holopainen et al., 2014; Hu et al., 2016; Spetic et al., 2007; Strobel et al., 2017), technical quality (Costa et al., 2011; Häyrinen et al., 2020; Jiménez et al., 2016; Malá et al., 2019; Toivonen, 2012), and maintenance (Fell et al., 2006; Häyrinen et al., 2020; Jiménez et al., 2016; Toivonen, 2012; Viholainen et al., 2020). Durability was seen as an important determinant of a consumer's choice (Høibø et al., 2015), and in the results, consumers had prejudices against the durability of timber as a construction material (Gold & Rubik, 2009; Hu et al., 2016). In terms of technical quality, wood flooring (Jiménez et al., 2016) and environmentally sustainable wood products (Malá et al., 2019) were considered to be of high quality, and quality of construction was seen as a positive aspect of wooden materials (Häyrinen et al., 2020). Regarding maintenance, maintenance was of lesser importance when investigating preferences for different attributes of wooden decking (Fell et al., 2006) but was still seen as a concern in the case of wooden interior materials (Häyrinen et al., 2020) and wooden timber-framed buildings (Viholainen et al., 2020).

Sustainability dimension

The sustainability dimension comprises mostly credence attributes that cannot be ascertained even after normal use for a long time and/or without consulting an expert (Steenkamp, 1989) except for environmental labels and information that can be seen as extrinsic cues. The most researched sustainability properties were environmental labels, environmental friendliness, and origin. Environmental labels were the most researched attribute of wood, investigated in 22 studies (Aguilar & Vlosky, 2007; Andac Guzel, 2020; Archer et al., 2005; Brusselaers et al., 2020; Cai & Aguilar, 2013, 2014; Hansmann et al., 2006; Holopainen et al., 2014, 2017; Kozak et al., 2004; Malá et al., 2019; Mohamed & Ibrahim, 2007; Ozanne & Vlosky, 2003; Paulin et al., 2018; Roos & Hugosson, 2008; Roos & Nyrud, 2008a, 2008b; Shoji et al., 2014; Strobel et al., 2017; Tan et al., 2019; Teisl et al., 2002; Thompson et al., 2010). Environmental certification was found to be a favorable and significant attribute (Paulin et al., 2018; Roos & Hugosson, 2008; Roos & Nyrud, 2008b) affecting consumer behavior regarding wooden materials. Consumers were also willing to pay higher prices for certified wood products (Aguilar & Vlosky, 2007; Kozak et al., 2004).

The sustainability of wooden building materials was investigated mainly in terms of environmental friendliness. Wood was seen as an environmentally friendly material (Kylkilahti et al., 2020; Moresová et al., 2019; Strobel et al., 2017; Viholainen et al., 2020) even though negative impacts relating to environmental sustainability were also recognized, such as the sustainability

of logging (Häyrinen et al., 2020). Sustainability aspects regarding environmental friendliness were appreciated among consumers in many studies (Andac Guzel, 2020; Cai & Aguilar, 2014; Costa et al., 2011). In addition to environmental friendliness, corporate social responsibility was investigated in two studies by focusing on wood product companies' economic, ethical, legal, and philanthropic responsibilities (Cai & Aguilar, 2014) and responsible image of a product company, legal origin of raw material, and usage of cheap labor force (Holopainen et al., 2014). Furthermore, *the origin of wood* was considered to affect consumer behavior related to wood in some studies (Häyrinen et al., 2020; Holopainen et al., 2014, 2017; Kozak et al., 2004; Paulin et al., 2018; Shoji et al., 2014; Toivonen, 2012).

5.3.2 | Personal variables

Personal variables, such as consumers' socio-demographic and psychographic characteristics, affecting consumers' perceptions of wooden building materials were identified from the reviewed literature. Socio-demographic variables regarding gender (Berger et al., 2006; Høibø et al., 2015; Holopainen et al., 2014; Loučanová & Olšiaková, 2020b; Luo et al., 2017; Nicholls & Barber, 2010; Roos & Hugosson, 2008; Roos & Nyrud, 2008a; Toppinen et al., 2013), age (Høibø et al., 2015; Holopainen et al., 2017; Loučanová & Olšiaková, 2020b; Luo et al., 2017; Moresová et al., 2019; Thompson et al., 2010; Toppinen et al., 2013), education (Loučanová & Olšiaková, 2020b; Luo et al., 2017, 2018; Roos & Hugosson, 2008; Roos & Nyrud, 2008a) and income (Aguilar & Vlosky, 2007; Andac Guzel, 2020; Jonsson, 2005; Luo et al., 2017; Moresová et al., 2019) were the most researched variables in the reviewed studies.

In the results concerning *age*, the role of younger consumers was addressed by suggesting that young consumers are more likely to appreciate environmental certification (Thompson et al., 2010) and place high importance on environmentally friendly materials, and are considered to be the best target group for wood-based urban housing (Høibø et al., 2015). Also, Loučanová and Olšiaková (2020b) stated that demand for wood-framed houses is influenced by the decisions of younger people. In the results concerning *gender*, the role of female consumers was emphasized. Female consumers preferred eco-labeled wood products (Roos & Nyrud, 2008a) and it was found that those females who appreciated durability, solidity, and environmental friendliness, and who had high knowledge about wood and experiences of living in a house featuring wood combined with other materials, had higher preferences for wood as a material (Høibø et al., 2015). However, according to the findings of Luo et al. (2017), female consumers were more likely to reject modern wood structures.

Education was seen to affect consumer behavior related to wooden materials and especially certified wood products. In general, it was found that the demand for wood-framed houses is influenced by the decisions of university-educated consumers (Loučanová & Olšiaková, 2020b). When investigating certified wood products, university students placed a high emphasis on the ecolabeling of wood flooring (Roos & Hugosson, 2008) and consumers with secondary education had preferences for eco-labeled wood products (Roos & Nyrud, 2008a). Higher education levels also corresponded with a higher willingness to pay to support green buildings with modern wood structures (Luo et al., 2017). In addition, consumers' *income* affected aspects such as consumers' willingness to pay for certified wood products (Aguilar & Vlosky, 2007), purchasing preferences for wood products with different corporate social responsibility (CSR) levels (Cai & Aguilar, 2013) and perceptions of wooden houses (Moresová et al., 2019). Higher-income individuals were most concerned with price when investigating consumer behavior toward green buildings with modern wood structures (Luo et al., 2017), while in another study, higher-income consumers thought that wood promotes mental and emotional relaxation (Andac Guzel, 2020).

Personal variables regarding consumers' psychographic characteristics, such as personal values (Aguilar & Vlosky, 2007; Brusselaers et al., 2020; Hansmann et al., 2006; Høibø et al., 2015; Kylkilahti et al., 2020; Roos & Nyrud, 2008a; Thompson et al., 2010), knowledge (Hansmann et al., 2006; Høibø et al., 2015; Luo et al., 2018; Tan et al., 2019), and experience (Høibø et al., 2015; Kylkilahti et al., 2020; Luo et al., 2018) were recognized based on the literature review results. *Personal values*, such as environmental orientation and self-interest, were found to affect perceptions. In the results, consumers' appreciation of environmental friendliness was associated with higher probabilities of paying a premium for labeled products (Aguilar & Vlosky, 2007; Hansmann et al., 2006; Thompson et al., 2010). Additionally, Brusselaers et al. (2020) suggested self-interest as a driver for eco-certified purchases. In addition, *knowledge* about the FSC label influenced consumers' intentions to purchase forest-certified products and pay a price premium for them (Tan et al., 2019). However, higher levels of knowledge about modern wooden structures negatively impacted the likelihood of paying a premium for modern wooden structure hotels in China (Luo et al., 2018). The effects of *prior experience* were studied when evaluating consumers' willingness to pay for modern wooden hotels (Luo et al., 2018) and consumer perceptions of multi-storey wooden buildings (Kylkilahti et al., 2020). Experiences of living in a home with a structure combining wood with other materials (Høibø et al., 2015) and in a wooden house (Kylkilahti et al., 2020) affected consumer perceptions and preferences positively.

5.3.3 | Situational variables

The reviewed articles included studies that briefly discussed the effects of situational variables on consumer behavior related to wooden building materials. The most studied situational variable was advertising (Archer et al., 2005; Costa et al., 2011; Kozak et al., 2004; Moresová et al., 2019). Marketing communication, such as advertising, and the information conveyed by store advisors were seen to negatively affect consumers' perceptions of wood in the case of windows (Costa et al., 2011), while the promotion of wooden

houses in the context of historical events in the region was seen as the main factor influencing consumer perceptions of wooden houses (Moresová et al., 2019). Additionally, consumers stated that labeling would be more likely to influence their purchase decision than advertising (Archer et al., 2005). Other mentioned situational variables included, for example, historical events in the given region (Moresová et al., 2019), usage context (type of room, style of the dwelling) (Jonsson, 2005), and serviceability of the sales personnel, reputation of the producer, reliability of the supplier, and payment and delivery terms (Toivonen, 2012).

5.4 | Methodology (M)

In the reviewed literature, most of the studies applied quantitative methods. Quantitative methods were mostly conducted with a survey and analyzed with statistical analysis and multivariate methods. The studies analyzing the sensory properties of wood usually used an experimental design complemented with survey and statistical analysis (e.g., Høibø & Nyrud, 2010; DeMorais & Pereira, 2015). Multi-Criteria Decision-Making (MCDM) methods, such as fuzzy logic, were applied when analyzing consumer perceptions and preferences for different types of wood flooring (e.g., Chen et al., 2014). One-fifth of the studies used willingness to pay (WTP) measurement methods and applied, for example, conjoint analysis (e.g., Bernard et al., 2018; Fell et al., 2006; Luo et al., 2017; Thompson et al., 2010) and discrete choice experiment (Holopainen et al., 2017; Shoji et al., 2014). Qualitative studies with, for example, focus group discussions (e.g., Häyrinen et al., 2020; Xu et al., 2019) and interviews (e.g., Viholainen et al., 2020) were not popular, even though some of the reviewed studies recognized the need for qualitative methods as well (Roos & Nyrud, 2008a; Toivonen, 2012). However, only four of the studies (Jonsson et al., 2008; Jonsson, 2005; Ridoutt et al., 2002; Xu et al., 2019) used the mixed methods approach with qualitative and quantitative methods.

6 | RESEARCH GAPS IN THE REVIEWED LITERATURE AND FUTURE RESEARCH AGENDA

Based on the research gaps of the reviewed literature, a number of propositions for future research can be presented in terms of theory development, context, characteristics, and methodology according to the TCCM framework (Paul & Rosado-Serrano, 2019). Table 9 illustrates a future research agenda regarding these themes.

In terms of theory development, only a couple of studies have investigated wood product quality in the 2000s, using the perceived quality approach (Costa et al., 2011; Toivonen, 2012) and by examining the quality criteria for green product evaluation (Jiménez et al., 2015, 2016). In the reviewed studies, there were inconsistencies in the definitional domains of perceived quality in the context of wooden materials. For example, on the one hand, Costa et al. (2011) referred to quality perception as the quality level estimated by consumers on the basis of product attributes and assumed that each

TABLE 9 Proposed topics for future research

Thematic area	Proposed topics based on identified research gaps
Theory development	Conceptual specifications of the perceived quality and the quality dimensions in the context of wooden building materials
	Operationalization of the perceived quality construct and a measurement scale in the context of wooden building materials
Context	More research on different contexts, such as load-bearing structures, facades of houses, and interiors
	The perceived quality of wood in a specific product category to improve the accuracy and the generalizability of the results
	Research in other fields of sciences in addition to forest sciences, especially marketing and consumer behavior; multi-disciplinary approach
	Research in developing countries where the forest industry is a major source of growth and employment
Characteristics	The role of auditory and olfactory cues of wood in the quality perception process
	The role of price in the quality perception process
	The role of symbolic qualities of wood in the quality perception process
	The role of sustainability of wood (environmental, social, and economic aspects) in the quality perception process
	The link between socio-demographic characteristics and perceived quality
	The link between psychographic characteristics and perceived quality
	The link between situational variables and the perceived quality
Methodology	Qualitative methods to complement quantitative methods; mixed methods approach
	Observing consumers' actual behavior in field settings outside the laboratory
	Longitudinal research; exploring consumers' quality perceptions over a period of time

consumer forms a quality perception for each attribute and might judge the quality level of attributes differently for differentiated products. On the other hand, Toivonen (2012) suggested that perceived product quality is two-dimensional and reflects consumer perceptions of the quality of product tangibles and intangibles and expected that the number and contents of these dimensions are similar in different wood product categories. Thus, there is a need for a better conceptual understanding of the perceived quality construct in the context of wooden building materials.

Furthermore, a comprehensive measurement scale of perceived quality in the context of wooden materials should be constructed in future studies. In the reviewed literature, Nyrud et al. (2008) suggested that in the future it could be worthwhile to develop a set of generic attributes that relates to all kinds of wood products. For example, Costa et al. (2011) and Toivonen (2012) constructed empirical models to explore perceived quality in the context of wooden materials; however, the scales were not consistent in terms of wood quality attributes. This study developed a categorization of the variables affecting consumers' perceptions of quality in reference to wooden materials used in building and housing, and this can be seen as a starting point for conceptual specification of the perceived quality of the wooden building materials, operationalization of the construct and developing a measurement scale.

In the results, the research contexts varied and the articles largely investigated wood flooring, wood surfaces in general or wooden decking. More research is needed especially on the perceived quality of wood used in load-bearing structures, facades of houses, or interiors, such as walls. Further empirical research could also focus on some specific wood product categories to improve the accuracy and generalizability of the results. In this way, it would be possible to investigate the wood quality perception process in a more accurate manner in relation to specific aims of societal sustainable development.

Furthermore, the research was mainly implemented in the context of forest sciences and it would benefit from the work of researchers from other disciplines with different types of insights in their scientific thinking. Further research is needed especially in the field of consumer behavior research to understand the consumers' decision-making process and the evaluations of wood product quality to fill the gap in the literature. Also, the research was conducted mainly in Europe, North America, and Asia. Most of the studies were conducted in developed countries; however, some developing countries, such as China (e.g., Luo et al., 2018; Tan et al., 2019; Xu et al., 2019) and Brazil (e.g., De Morais & Pereira, 2015) were also represented. In developing countries, the forest industry is a major source of growth and employment (e.g., OECD, 2009), and thus there are significant research opportunities in the area of wood consumption for future studies.

In terms of characteristics, the auditory and olfactory cues were investigated only in a couple of studies (e.g., Strobel et al., 2017; Viholainen et al., 2020) and perceived both negatively and positively, and thus should be studied further. Also, the effects of price on the quality perception process require further investigation due to inconsistencies in the results in the same product category (Fell et al., 2006; Roos & Nyrud, 2008b). Symbolic qualities of wood, such as hedonistic types of attributes, were not studied in the reviewed wood product quality studies (e.g., Costa et al., 2011; Toivonen, 2012) and further research was suggested (e.g., Toivonen, 2012). Also, the investigations of the sustainability of wood have mainly regarded environmental aspects (e.g., Toivonen, 2012), while views on social and economic sustainability and their linkages with technological durability have been largely ignored. Therefore, the role of the sustainability of wood—also addressing social and economic aspects—in the wood quality perception process could be worth studying in the future.

Even though many reviewed papers examined the effects of consumers' socio-demographic characteristics on wood consumption to some extent (e.g., Høibø et al., 2015; Loučanová & Olšiaková, 2020b; Luo et al., 2017; Moresová et al., 2019), only Costa et al. (2011) acknowledged the role of individual characteristics in the wood quality perception process. Thus, there is a need for more research on how consumers' socio-demographic background affects the perceived quality of wood. The need for studying consumers' psychographic characteristics, such as culture and values, was also recognized in many studies (e.g., Holopainen et al., 2017; Mohamed & Ibrahim, 2007; Roos & Nyrud, 2008a). Future research could also examine situational variables. Even though certain situational variables were mentioned in some of the papers, the reviewed articles did not analyze the role of consumer surroundings in the quality perception process in depth. This study acknowledged the role of both personal variables (socio-demographic and psychographic characteristics) and situational variables as relevant elements influencing consumer behavior related to wooden building materials.

Regarding the methodologies employed in the existing studies, three different thematic areas for future research can be suggested. First, different variables affecting wood consumption were to a large extent approached quantitatively. Even though generalizing the findings was seen as difficult in qualitative studies (e.g., Kozak et al., 2004; Teisl et al., 2002), some of the reviewed studies recognized the need for the use of qualitative methods as well (Roos & Nyrud, 2008a; Toivonen, 2012) to complement the existing results. Therefore, the mixed methods approach could be useful for researchers in the future. In all, the perceived quality of wooden materials is a complex phenomenon with different cause-effect relationships and thus diverse methods, both qualitative and quantitative, are needed to deepen our understanding. Second, the limitation of many reviewed studies was that the study was conducted in a laboratory and the consumers' actual behavior was not observed (Archer et al., 2005; Costa et al., 2011; Thompson et al., 2010). Therefore, researchers should investigate and observe the actual behavior of consumers instead of their stated intentions or preferences. Third, only a couple of the reviewed studies were longitudinal (e.g., Fell et al., 2006; Ozanne & Vlosky, 2003), and thus conducting longitudinal studies is seen as essential in future research (e.g., Häyrinen et al., 2020; Nyrud & Bringslimark, 2010; Xu et al., 2019).

7 | PRACTICAL IMPLICATIONS

The motivation for implementing this study connects to the increasing importance of sustainable consumption and enhancing wood usage in society to support sustainable development through, for example, benefits in renewability, reusability, and recyclability. Understanding why consumers choose different wood products and materials is significant in enhancing the appropriate use of raw materials to ensure the sustainability of natural resources (De Morais & Pereira, 2015). Also, scientific knowledge about different cues and attributes affecting the perceived quality of wood is necessary when, for example, designing wood industry communication to enhance wood usage in a modern biobased economy that revolves around the usage of renewable resources and circularity.

The study identified different variables affecting consumer perceptions of wooden building materials, and the findings of the study have important implications for wood industry companies, such as manufacturers and retailers. These companies need to consider all the different elements influencing the perceived quality of wood in order to develop successful product-service concepts and marketing strategies. For example, one way for different actors, such as companies, governmental agencies, and interest organizations, to enhance wood consumption in society could be to promote the strengths of the material, such as its environmental friendliness, naturalness, health impacts, and symbolic properties via integrated marketing communication and aim to dispel existing prejudices against the wood with respect to issues such as fire resistance and durability. In addition, from the perspective of marketing, understanding how consumer characteristics influence the perceptions of wooden materials enables businesses to develop sustainable product-service entities that meet the specific needs of consumers with different types of value expectations for offerings.

Concerning the adopted framework by Steenkamp (1989), the distinction between quality cues and quality attributes enhances the understanding of the way in which quality perceptions are formed and is also relevant for marketing managers (e.g., Steenkamp, 1989): it can be seen as instrumental in closing the quality perception gap between the company's or marketing manager's perspective and the consumer's view on quality. Consumers use these quality cues, such as intrinsic cues (material properties, and visual, tactile, auditory, olfactory cues) and extrinsic cues (environmental labels, price, information), to predict the quality attributes because direct information about these attributes is not usually available to consumers at the point of purchase (Olson & Jacoby, 1972; Steenkamp, 1989). Quality cues can be seen to be especially significant in the context of promoting the credence attributes of wood, such as environmental friendliness, which is a major strength of the wooden material but cannot be predicted at the point of purchase.

Regarding the empirical use of the results of this review, the categorization between the quality cues and attributes is one limitation of the study. For example, for a consumer who is familiar with wood products and their properties, determining certain attributes, such as durability or performance, can be easier than for a consumer who does not have experience with wooden materials. In that case, the property can be either an experience or a credence attribute depending on the consumer's background.

Another limitation of the study is that studies focusing on wooden furniture were excluded from the literature review. However, the broad focus of the review on wood as a building material used in, for example, flooring and other interior materials, surfaces, and building structures, can also be considered as a limitation. As consumer behavior research in the wood products industry is very limited, it would have been difficult to collect a sufficient amount of data for the systematic literature review if the study had been focused only on a specific product category. In addition, a couple of the reviewed studies did not define the specific product category investigated when examining, for instance, certified wood products, but were still included in the analysis. Furthermore, the review is a single-author review, which prevented the cross-checking of the analysis or interpretation of the results, for example. To avoid the issues caused by this, organizing frameworks were adopted to identify the variables affecting the perceived quality of wooden building materials and to report the results transparently. Additionally, the reviewed studies were limited to those that had been published in peer-reviewed English-language journals; that is a significant limitation, but also enables the repetition of the study.

8 | CONCLUSIONS

The objectives of this study were to systematically review the existing literature on consumer behavior regarding wooden building materials and to identify, analyze and summarize the variables affecting the perceived quality of wood. To the best of the author's knowledge, this study is one of the first systematic literature reviews on the perceived quality of wood. To develop a rigorous and transparent systematic review, the "Scientific Procedures and Rationales for Systematic Literature Reviews" (SPAR-4-SLR) protocol (Paul et al., 2021) was employed. In all, 3,783 academic studies published in international peer-reviewed journals were screened, of which 69 fulfilled the selection criteria. The results were reported and analyzed according to Paul and Rosado-Serrano's (2019) TCCM framework, and the variables influencing the perceived quality of wooden building materials were identified in accordance with Steenkamp's (1989) Model of the Quality Perception Process.

According to the results, several variables regarding the properties of wood, characteristics of consumers, and situational variables were identified and categorized into different dimensions. The properties of wooden materials were grouped into five main themes: the sensory, social, economic, technical, and sustainability dimensions. Each variable was also categorized as an intrinsic or extrinsic cue, or experience or credence attribute. Some of these variables had a positive effect on consumer perceptions, such as certain visual, tactile, auditory, and olfactory cues, environmental labels, health effects, and the naturalness and environmental friendliness of wood. Some factors could be seen as barriers and these barriers were related to certain attributes, such

as durability, fire safety, and sustainability of logging. Along with quality cues and attributes, personal variables, such as consumers' socio-demographic and psychographic characteristics, and situational variables affecting consumers' perceptions were identified from the reviewed literature. Socio-demographic characteristics included, for example, age, gender, income, and education, while psychographic characteristics were related to consumers' experience, knowledge, and personal values. When evaluating the results concerning socio-demographic variables, for instance, the consumers who favored wood were educated and young. Also, situational variables, such as usage context, affected consumer behavior regarding wooden materials.

From a theoretical point of view, the paper advances wood consumption research by highlighting how consumers evaluate wooden building materials based on different variables and sets guidelines on how to approach the perceived quality of wooden building materials in future studies. This study makes conceptual contributions through identifying and summarizing the variables affecting consumer behavior regarding wooden building materials and perceived quality. Furthermore, instead of using the manufacturing approach that most of the previous wood product quality studies have adopted (Hansen & Bush, 1996, 1999; Sinclair et al., 1993), this study approaches the perceived quality of wood by categorizing the properties of wood into quality cues and quality attributes and further into different dimensions. The results of this study also yield new insights concerning the connection between the consumer characteristics and the perceived quality of wooden building materials, since, in the earlier studies, the effects of consumer characteristics on the wood quality perception process have not been addressed in depth, which has resulted in deficiencies in understanding the role of consumers as decision-makers in the markets.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

DATA AVAILABILITY STATEMENT

The material of the study is composed of published scientific articles reported in the study available in scientific databases (ISI Web of Knowledge and Scopus).

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Consumers' Consciousness for Sustainable Consumption and Their Perceptions of Wooden Building Product Quality

Charlotta Harju
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Abstract

Wood products are seen globally as an important solution to substitute nonrenewable materials in the construction sector to enhance the life cycle sustainability of buildings. Globally, the most prominent opportunities for sustainability change in housing production lie in multistory residential buildings, which are built mainly of concrete, steel, and bricks. The possibilities of achieving multiple benefits from the use of wood in multistory residential buildings have gained interest among scholars, especially in the 2000s. However, the research has been dominated by views of production (especially construction processes), while scientific knowledge of consumption (especially the occupational phase of buildings) remains very limited. Information about how consumers with differing views of sustainable consumption evaluate the quality of wooden building materials particularly is scarce. This study aimed to investigate consumer perceptions of wooden building product quality and examine how the perceptions connect with consumers' consciousness for sustainable consumption (CSC). The research data were gathered in 2018 by a postal survey sent to 1,000 people living in Finland (response rate 25.6**%**) and analyzed with exploratory factor analysis and the Mann-Whitney *U* test. According to the results, respondents' views of wooden building product quality indicators can be grouped into three factors: technical advantages, environmental sustainability of materials, and social benefits at home. The strength of CSC was found to be linked with respondents' views of wooden building product quality. The results of consumers' CSC views help actors involved in the wood and construction industries better meet consumer expectations both for different aspects of sustainability and for lifestyles.

Cities as built environments contribute to the majority of the use of global resources (Madlener and Sunak 2011). Furthermore, it has been estimated that one-third of global carbon dioxide emissions derives from manufacturing of building materials (all types of buildings) and the use of residential buildings (United Nations Environment Programme 2021). At the same time, rapidly increasing urban population is in need of dwellings that provide good living conditions. Thus, the development of sustainable construction solutions for urban areas is in a key role to both adapt to climate change and to offer comfortable housing conditions for humans (He 2019). In cities, apartment buildings are the most resource-efficient dwelling options (e.g., less living space per capita to be heated or cooled) (Wiedenhofer et al. 2018), explaining why multistory residential construction receives much focus in seeking sustainability change in urban buildings.

Since the early 20th century, the dominant materials in multistory residential buildings have been concrete, steel, and bricks (Urban 2012), and it has been estimated that by 2050, the highest global increase in the stock of building materials will be in such properties (Marinova et al. 2020). Thus, substituting nonrenewable materials with renewable ones in multistory residential construction is a focal area of sustainability change in urban construction (Dangel 2016) that may be enhanced globally through the use of wood (Churkina et al. 2020, Himes and Busby 2020, Pauliuk et al. 2021). Substituting nonrenewable materials with wood brings benefits both for construction (e.g., decarbonization

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and energy efficiency) and for the occupational phase of buildings (e.g., carbon storage and energy efficiency when combined with well-controlled heat, ventilation, and air-conditioning systems) (Dangel 2016, Nore et al. 2017, Amiri et al. 2020).

External drivers (i.e., changes in regulatory frameworks and technological infrastructures) (Toppinen et al. 2019) have been introduced to increase the use of wood in multistory residential buildings, especially in the 2000s (e.g., Dangel 2016). From the perspective of demand in the housing markets, this has resulted in the need for information to understand how consumers accept and evaluate the quality of wooden building products (Viholainen et al. 2020a). Furthermore, it is significant to recognize how these evaluations relate to consumers' overall consciousness for sustainable consumption (CSC) in their everyday lives. For example, for Finnish consumers, living in a home made of wood in urban areas may be linked with other sustainable consumption patterns in their daily lives (Ottelin et al. 2021).

The need for sustainability changes in the residential construction sector is strongly related to the UN Sustainable Development Goals, which bring forth consideration of environmental, social, and economic life cycle sustainability in building (Ogunmakinde et al. 2022). Traditions among construction-sector businesses have been characterized by a focus on building processes, while the occupational phase has received the most attention from consumers (Maloney 2002, Uusitalo and Lavikka 2020, Viholainen et al. 2020b, Lähtinen et al. 2022). From the perspective of the life cycle of the building, this has been a considerable deficiency.

Sustainability change in the construction sector requires producers (e.g., architects) to develop new capabilities that enable consideration of life cycle sustainability aspects already in the design phase (Dokter et al. 2021). In addition, consumers need to accept solutions (e.g., materials and technologies) developed for sustainability change in the residential building sector (Zhao et al. 2015). It is also important that construction-sector professionals do not misunderstand consumer expectations for housing. For example, architects may falsely expect consumers to be willing to pay higher prices for having a home in a wooden multistory building, although this is not straightforwardly the case (Lindblad and Gustavsson 2020).

Consumer preferences for building materials relate to lifestyles (Lähtinen et al. 2021, Ottelin et al. 2021), which connect life cycle sustainability of residential buildings to socioeconomic aspects (Mora et al. 2011, Hasu 2018). Abreast with environmental sustainability, the use of wood in multistory residential buildings also brings opportunities for technological, economic, and social advantages. For example, technical and economic gains may be acquired through off-site prefabrication of modules and use of building solutions with easy repairability (e.g., Brandner et al. 2016, Pelli and Lähtinen 2020), while social benefits connect issues such as aesthetics of living spaces and well-being in housing (e.g., Rhee 2018, Lähtinen et al. 2021).

In all, the benefits of wooden multistory residential construction are linked with broader requests to seek new sources of competitiveness for the construction sector through sustainability and the consideration of customer needs (Jussila et al. 2022). Traditionally, both construction-sector businesses and wood-industry firms have had a strong production focus (e.g., Maloney 2002, Lähtinen and Häyrinen 2022). As a result of that, also studies on consumer expectations or value creation in the wood-industry firms have also been strongly dominated by the views of production (e.g., Stehn and Bergström 2002; Hemström et al. 2011; Brege et al. 2014; Toppinen et al. 2018, 2019; Pelli and Lähtinen 2020). In the context of construction-sector businesses, consumer expectations have been addressed mostly through the opinions of business customers acting as suppliers for future residents (e.g., Kärnä 2004, Swarts 2020).

In recent years, views of consumption (e.g., consumer behavior) have also gained increasing interest among scholars, especially in the context of wooden multistory residential buildings (e.g., Kylkilahti et al. 2020, Viholainen et al. 2020b). Yet, a profound understanding of consumer needs for living in wooden multistory residential buildings is still very limited. As a result of this, businesses in the wood construction sector miss possibilities to enhance their competitiveness through new value creation for future residents and by offering new sustainable building solutions for the housing markets (e.g., Lähtinen et al. 2021, Jussila et al. 2022).

Because industrial construction processes have requirements, for example, for efficiency and speed (e.g., Pelli and Lähtinen 2020), integration of consumers into the building design is a challenge. Currently, consumers seldom have possibilities to affect the material choices in multistory residential building projects (e.g., Lähtinen et al. 2022), although dwellers have been found to have a significant role in sustainability change for residential buildings (Martek et al. 2019). According to Piroozfar and Piller (2013), both sustainability and customer value creation in the construction sector could be significantly enhanced through the uptake of mass-customization tools that would integrate consumers in the building design processes.

In general, consumer acceptance of building with wood and living in wooden homes is higher among consumers in forested countries (Viholainen et al. 2020b). Still, Nordic consumers with urban lifestyles are also more likely to be prejudiced against living in wooden homes than those who appreciate living in less urbanized neighborhoods (Lähtinen et al. 2021). Consumers may also appreciate the sustainability benefits of wood in buildings differently (e.g., environmental, technical, aesthetic, or well-being benefits), and this may further reflect their willingness to live in wooden homes (Lähtinen et al. 2019).

Like marketing research on the wood industries, early research on wooden product quality has concentrated mainly on production-related attributes (i.e., tangible product properties or the views of suppliers) (e.g., Sinclair et al. 1993; Hansen and Bush 1996, 1999). In line with this, the connection between consumer characteristics and perceived quality has been largely bypassed, although the number of consumer studies on wooden materials and products has increased in recent years (e.g., Luo et al. 2017, 2018; Loučanová and Olšiaková 2020; Oblak et al. 2020), focusing on sociodemographics such as gender, age, and education (Holopainen et al. 2014; Høibø et al. 2015; Luo et al. 2017, 2018; Kaputa et al. 2018; Aguilar et al. 2022). However, previous research has generally addressed consumer views or preferences for materials and products, while consideration of quality as a more complex theoretical phenomenon has been lacking.

Previous studies have shown that consumers' environmental orientation affects their perceptions of wooden materials, especially in the case of certified wood products (e.g., Hansmann et al. 2006, Aguilar and Vlosky 2007, Thompson et al. 2010). However, to the best of our knowledge, no studies exist that would have also taken social and economic sustainability values into consideration when investigating the choice of wood products. In this study, we will address sustainable consumption as an environmental, social, and economic phenomenon by using a CSC scale developed by Balderjahn et al. (2013). Earlier, the scale has been used to investigate anticonsumption (Seegebarth et al. 2016, Balderjahn et al. 2020, Ziesemer et al. 2021), fast-moving consumer goods (Balderjahn et al. 2018), university students (Pena-Cerezo et al. 2019), frugal behavior (Suárez et al. 2020), and consumers of fashion (Haines and Lee 2021). However, it has not been adopted in the context of wooden building products or other building materials.

The overall purpose of this study is to fill the gaps in the existing academic information about the linkages between consumer perceptions of wooden building product quality and their CSC, addressed through two aims. The first aim is to add knowledge concerning how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures). The second aim is to investigate the connections between consumers' perceptions of wooden building product quality indicators and their CSC, addressed from environmental, social, and economic viewpoints.

Literature Review

Research on the perceived quality of wooden materials

Perceived quality is defined as ''the consumer's judgment about a product's overall excellence or superiority'' (Zeithaml 1988). In the existing research, perceived quality has been considered to be subjective rather than objective (e.g., Zeithaml 1988, Steenkamp 1989) and a multidimensional construct (e.g., Stylidis et al. 2020) evaluated with different quality indicators, such as quality cues and attributes (e.g., Olson and Jacoby 1972, Steenkamp 1989, Oude Ophuis and Van Trijp 1995). For example, a product consists of different cues that consumers use as the basis for making judgments about the product (Cox 1962). Furthermore, perceived quality attributes can be defined as product characteristics that deliver functional and psychosocial advantages of a product to consumers (Steenkamp 1990). Another accepted view in the existing literature is that consumers' perceptions of quality attributes before purchase are based on quality cues (Steenkamp 1989).

Previously, research on wood product quality has examined mostly quality attributes in terms of the tangible product properties or views of suppliers (e.g., Sinclair et al. 1993; Hansen and Bush 1996, 1999). For example, Sinclair et al. (1993) tested Garvin's (1984) eight quality dimensions (i.e., performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality) in the case of office furniture, but the study's results failed to support the eight-dimensional structure of quality. Furthermore, a study by Hansen and Bush (1996) divided the quality characteristics of softwood lumber into five dimensions: supplier/salesperson characteristics, supplier facilities, supplier services, lumber performance, and lumber characteristics.

Only a few of the existing wood-industry studies have investigated consumers' perceptions of wood product quality, and the studies therefore lack a theoretical foundation concerning the perceived quality of wooden materials (Harju 2022). For example, in wood-industry studies, perceived quality has been investigated in the context of wooden windows (Costa et al. 2011), wooden furniture, paneling and flooring (Toivonen 2012), wooden interior products (Harju and Lähtinen 2021), and wooden building materials (Harju 2022).

A study by Costa et al. (2011) revealed that various attributes of wooden windows, such as global quality, thermal insulation, acoustic insulation, maintenance, product life, aesthetics, environment, fire resistance, safety, and price, affected consumers' quality perceptions. Furthermore, Toivonen (2012) suggested that product quality included tangible and intangible dimensions consisting of more specific subdimensions. The tangible dimension relates to the physical good, while the intangible dimension addresses services and other intangibles, such as environmental issues. Harju and Lähtinen (2021) grouped the quality indicators of wooden interior products into four factors: products' environmental friendliness, fit with lifestyle and home design, visual and tactile attractiveness, and technical solidity. Their results indicated quality indicators to be connected in various ways with environmental, social, economic, and technological aspects. The results of a systematic literature review by Harju (2022) suggest that the perceived quality of wooden building materials is affected by various quality cues and attributes of wood, such as sensory, social, economic, technical, and sustainability properties.

Consumers' quality perceptions are also influenced by consumer characteristics and situational factors at the purchasing place (e.g., Steenkamp 1989, Oude Ophuis and Van Trijp 1995). In the existing wood product quality research, a few studies have investigated the connections between consumers' sociodemographic characteristics and their quality perceptions (Costa et al. 2011, Harju and Lähtinen 2021). For example, quality perceptions of wooden interior products have been shown to relate to consumers' gender, age, education, forest-sector involvement, and forest ownership (Harju and Lähtinen 2021). However, the interlinkages between other consumer characteristics, such as consumers' CSC and perceived quality, have not been addressed in the existing literature.

CSC

In line with the triple-bottom-line concept (Elkington 1997), sustainable consumption patterns have been defined as mindful consumption that is ''guided and underpinned by a mindful mindset that reflects a conscious sense of caring toward self, community, and nature'' (Sheth et al. 2011). In this definition, caring for oneself concerns happiness, life, satisfaction, and work–life balance; caring for community refers to the valuing of social networks and support for public goods; and caring for nature includes environmental matters, such as environmental protection and the sparing use of natural resources (Balderjahn et al. 2013).

Balderjahn et al. (2013) contributed to the discussion of sustainable consumption by defining CSC as ''an intention to consume in a way that enhances the environmental,

social, and economic aspects of the quality of life.'' They suggested that CSC consisted of three interrelated but distinct dimensions—environmental, social, and economic sustainability—and identified the key factors for the conceptual model (Table 1). They also developed a comprehensive measurement of the CSC by operationalizing consciousness by weighting consumers' personal beliefs on the importance of aspects linked with the three sustainability dimensions.

The CSC scale has been used in several studies (Seegebarth et al. 2016, Ziesemer et al. 2016, Balderjahn et al. 2018, Hüttel et al. 2018, Pena-Cerezo et al. 2019, Balderjahn et al. 2020, Suárez et al. 2020, Haines and Lee 2021, Ziesemer et al. 2021). However, some criticism of the scale has emerged (Gupta and Agrawal 2018, Pena-Cerezo et al. 2019, Quoquab et al. 2019) because CSC does not consider, for example, the behavioral aspect of the consumer (Quoquab et al. 2019). In contrast, the validity of the scale used has not been criticized (Pena-Cerezo et al. 2019). Confirmation for the original structure of the CSC scale was received by Pena-Cerezo et al. (2019) in their measurement of the degrees of CSC among university students. In addition, Suárez et al. (2020) explored the effects of CSC alongside materialism and a consideration of the future consequences of frugal behaviors. Their results showed that the dimensions of CSC had a significant influence on frugal behavior.

Furthermore, the short version of the CSC scale has been used in some studies (e.g., Ziesemer et al. 2016, Balderjahn et al. 2018, Haines and Lee 2021). For example, Balderjahn et al. (2018) examined sustainability-conscious consumers, and Haines and Lee (2021) investigated consumers' consumption patterns and disposal behavior using the short CSC Scale by Ziesemer et al. (2016). The short CSC scale consists of only 12 items obtained from each CSC dimension (i.e., environmental, social, and economic). However, the collaborative consumption subdimension is not included (Ziesemer et al. 2016). In addition, a study by Seegebarth et al. (2016) measured voluntary simplicity and collaborative consumption based on the original CSC scale. Hüttel et al. (2018), Balderjahn et al. (2020), and Ziesemer et al. (2021) also measured only the aspects related to consciousness for voluntary simplicity, collaborative consumption, and debt-free living, representing the economic dimension of the original CSC scale.

In conclusion, perceived quality research in the wood industry has been scarce, and there is limited knowledge of the role CSC plays in consumers' evaluations of quality in the context of wooden building products. The lack of information results in gaps in the understanding of the acceptability of wooden building materials among consumers, which further may affect the potential for sustainability change in the construction sector. To investigate the connections between consumers' CSC (i.e., environmental, social, and economic orientation) and perceptions of wooden building product quality, two steps are taken. First, based on the assumption that perceived quality is a multidimensional construct (Stylidis et al. 2020), this study explores the dimensions of perceived quality by investigating how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures). The study then examines the interlinkages between consumers' CSC and consumers' perceptions of the quality dimensions of wooden building products. The measurement of CSC is based on the CSC scale of Balderjahn et al. (2013).

Table 1.—Key factors for the conceptual model of consciousness for sustainable consumption (adapted from Balderjahn et al. 2013).

Consciousness for environmental consumption
Recycling and disposing
Packaging
Use of resources and energy
Local/regional production
Climate impact
Consciousness for social consumption
Human rights
Social minimum standards
Child labor/forced labor
Discrimination
Disciplinary sanctions/mistreatment
Fair compensation
Consciousness for economic consumption
Voluntary simplicity
Material simplicity
Durability
Frugality
Debt-free consumption
Financial budget
Safeguarding for future
Price performance
Collaborative consumption
Renting
Leasing
Borrowing

Materials and Methods

The study's material was collected in Finnish with a survey that, alongside the views and knowledge of the general public concerning wood products (see previous results in Lähtinen et al. 2019, Harju and Lähtinen 2021), also investigated the CSC and perceptions of quality indicators of wooden building products. In all, 1,000 people between the ages of 18 and 74 and permanently residing in Finland in the spring of 2018 were invited to participate in the study. The recipients' contact information was collected through random sampling by the Population Register Centre, which governs the official ''Population Information System'' database in Finland. The database does not contain electronic contact information (e.g., e-mail addresses) of residents in Finland, so paper versions of the survey materials (i.e., cover letter and questionnaire) were the primary method of communication with potential respondents.

After two phases of data gathering (the first round in late June, the second in late July), a total of 256 respondents participated in the survey. It should be mentioned that although all the participants were contacted by postal mail only, in the second round of data gathering, they had an opportunity to choose between a paper or an electronic version of the questionnaire (electronic link and QR code given in the reminder letter). The final response rate was 25.6 percent, which is comparable to the typical response rates for postal mail and electronic surveys (Kaplowitz et al. 2004).

The average age of respondents was 53 (information about the age of each recipient was received from the

Population Register Centre in Finland). In comparison, the average age of people between the ages of 18 and 74 in Finland in 2018 was 46 (Statistics Finland 2021). However, other sociodemographic variables (i.e., gender and municipality of residence) were very similar to the Finnish population in 2018 (Statistics Finland 2021), and therefore the data can be considered applicable for analyzing the general consumer perceptions in Finland. Furthermore, the chi-square test of independence (Berenson et al. 2002) was conducted to detect the differences between the respondents. According to the results, there were no indications of statistically significant differences between early and late respondents. Therefore, it was assumed that nonresponse bias would not cause significant risks regarding the reliability of the results.

The questionnaire included several questions on consumer knowledge and opinions concerning issues related to the properties and quality of wood-based products, their usability for different purposes, and forest-sector communication in Finland. Furthermore, to have more profound information on the respondents' CSC, respondents were asked to evaluate the importance of various environmental, social, and economic sustainability aspects in their daily purchasing choices. This study used data on consumers' perceptions of the quality indicators of wooden building products (i.e., exteriors, interiors, and load-bearing structures) and consumers' CSC, which have not been used or analyzed in previous studies. Detailed information on those questions is presented in the Supplemental Material.

To operationalize the wooden building product quality indicators, a literature review of peer-reviewed journal articles addressing consumer behavior regarding wood products was implemented (see also Harju 2022). Table 2 presents the quality indicators and the existing studies examining those indicators. For conceptual validity, all statements were carefully designed for the fit between theoretical and empirical aspects of the characteristics of wooden building products (i.e., interiors, exteriors, and load-bearing structures).

As a result of operationalization, the variables in the statements were connected to various wooden building product quality indicators comprising both general properties of wooden materials (e.g., technical properties and acoustics) and properties more connected to various sustainability aspects (e.g., product certificates, safety, healthiness, and price). Thus, in this study, quality was addressed as a multidimensional construct extending beyond the technical quality properties (e.g., strength grading standards or defects like knots, splits, twists, and wanes for sawn wood). The finalization of the questionnaire was preceded by interviews with the stakeholders from interest organizations representing the different phases of forestry–wood-industry value chains (i.e., the Central Union of Agricultural Producers and Forest Owners, the Finnish Sawmills Association, and the Federation of the Finnish Woodworking Industries). These stakeholders pretested the questionnaire and evaluated the empirical validity of the contents addressed in the questionnaire.

In the questionnaire, CSC was measured through the aspects of environmental, social, and economic sustainability. However, compared to the original CSC scale (Balderjahn et al. 2013), the authors chose to focus on the aspects of voluntary simplicity and collaborative consumption as the main themes of the economic dimension (see Table 1) since, compared to environmental and social sustainability, there were considerably more statements on economic sustainability in the original CSC scale (Balderjahn et al. 2013). To enhance the balance of information between the various sustainability aspects, the items describing debt-free consumption connected to economic aspects were therefore omitted from the questionnaire. In addition, variables on sustainability aspects especially relevant in the forestry–wood-industry value chains (i.e., origin of raw material, energy efficiency in production, and workers' health and safety) were added to the questions (e.g., Holopainen et al. 2014, Lähtinen et al. 2016, Paulin et al. 2018). Detailed information on the statements presented in the questionnaire is presented in Table 3.

The data were analyzed in two stages by using multivariate research methods to identify whether there were any underlying factors in consumers' perceptions of wooden building product quality and if the perceptions described by the factors might relate to the CSC of the respondents. As research methods, exploratory factor analysis (EFA) (Kim and Mueller 1978) and the nonparametric Mann-Whitney U test (Berenson et al. 2002) were implemented with IBM SPSS Statistics software (version 25.0). In the statistical analysis, as evidence of the statistical significance of the analysis results, the threshold values were $0.05 \leq P$ value < 0.1 = suggestive evidence of statistical significance, $0.01 \leq P$ value < 0.05 = moderate evidence of statistical significance, and < 0.01 P value = very strong evidence of statistical significance.

The analysis of the results started with EFA with Kaiser normalization, maximum likelihood estimation, and varimax rotation. In EFA, the data on respondents' perceptions of the quality indicators of wooden building products were used. The assumption of the EFA is that a certain phenomenon may be scrutinized by recognizing latent variables (i.e., factors), which are the covariation in the data of original variables and of which there are fewer compared to the original variables (Kim and Mueller 1978, Henson and Roberts 2006). EFA execution and the quest for a final solution is based on both subjective considerations (e.g., background of theories and empirics) and statistical measures (Kim and Mueller 1978, Henson and Roberts 2006, Beavers et al. 2013).

The Kaiser eigenvalue >1 rule was used in EFA as a statistical background criterion to determine the number of factors to be kept. Simultaneously, the EFA results were also evaluated with Kaiser-Meyer-Olkin measures (with a minimum value of 0.50 for sampling size adequacy) and the Bartlett test of sphericity (i.e., the correlation between the original variables). To retain an original variable in the models, a threshold factor loading value of 0.4 was used. In seeking an empirically valid solution, the conceptual consistency of the factors (i.e., the loadings of the original variable and their signs) were also assessed. As a result of EFA, latent variables illustrating respondents' views of wooden building product quality were gained.

The second and final phase of analysis comprised the implementation of nonparametric Mann-Whitney U tests to assess whether statistical evidence would be gained on the connections between the respondents' CSC and the EFA factors describing the respondents' perceptions of wooden building product quality. The nonparametric Mann-Whitney U test is usable with data based on sets of observations measured on an ordinal or interval scale in comparison with

Table 2.—Peer-reviewed studies used to operationalize the quality indicators of wooden building products in the survey.[a]

Quality indicators of wood products connected to construction	Studies of wood product quality	Studies of other issues connected to wood product quality
Technical properties (e.g., solidity, hardness)	Sinclair et al. (1993), Hansen and Bush (1996, 1999), Costa et al. (2011), Toivonen (2012)	Høibø et al. (2015), Strobel et al. (2017)
Acoustics (e.g., soundproofing properties)	Sinclair et al. (1993), Costa et al. (2011)	Strobel et al. (2017)
Information (e.g., raw material origin, production process, and environmental effects)	Costa et al. (2011), Toivonen (2012)	Hansmann et al. (2006), Holopainen et al. (2014)
Certificates (e.g., Swan Ecolabel, PEFC, FSC)	N/A	Roos and Hugosson (2008), Roos and Nyrud (2008), Thompson et al. (2010), Shoji et al. (2014), Holopainen et al. (2017), Paulin et al. (2018)
Price (e.g., price compared to other materials)	Sinclair et al. (1993), Costa et al. (2011)	Teisl et al. (2002), Fell et al. (2006), Roos and Hugosson (2008), Roos and Nyrud (2008), Luo et al. (2017)
Safety (e.g., fire resistance)	Costa et al. (2011)	Gold and Rubik (2009), Hu et al. (2016), Toppinen et al. (2013)
Health effects (e.g., effects on well-being and indoor air quality, antibacterial qualities)	N/A	Spetic et al. (2007), Gold and Rubik (2009), Jiménez et al. (2015), Hu et al. (2016), Jiménez et al. (2016)
Coziness (e.g., effects on homeyness)	N/A	Hu et al. (2016)
Multifunctionality (e.g., usability for multiple purposes)	Sinclair et al. (1993), Toivonen (2012)	N/A
Longevity (e.g., resistance against moisture and decay, life cycle durability)	Sinclair et al. (1993), Hansen and Bush (1996, 1999), Costa et al. (2011)	Spetic et al. (2007), Gold and Rubik (2009), Høibø et al. (2015), Strobel et al. (2017), Luo et al. (2018)
Personal values (e.g., medium to express one's identity and personal status)	Sinclair et al. (1993)	Ridoutt et al. (2002, 2005)
Origin (e.g., domesticity)	Toivonen (2012)	Holopainen et al. (2014), Paulin et al. (2018)
Environmental aspects (e.g., environmental impacts and sustainability)	Costa et al. (2011), Toivonen (2012)	Toppinen et al. (2013), Holopainen et al. (2014), Høibø et al. (2015)
Innovativeness (e.g., new ways to use wooden materials in construction)	N/A	Goverse et al. (2001)
Constructor or architect (e.g., the expertise of construction company's salespersons or architects concerning use of wood in construction)	Toivonen (2012)	Roos et al. (2010), Hemström et al. (2011), Markström et al. (2018)

[a] N/A = not available.

tests assuming the data to be normally distributed (e.g., Student *t* test and analysis of variance ANOVA). By analyzing the differences in the median values (Nahm 2016), the Mann-Whitney *U* test is the nonparametric equivalent to the Student *t* test to compare two independent samples (Berenson et al. 2002). The Mann-Whitney *U* test was used in group comparisons for CSC regarding environmental, social, and economic sustainability.

To enhance the interpretability of the results of the second stage of analysis, prior to actual calculus, the information on the original CSC statements (i.e., responses on individual variables of environmental, social, and economic sustainability, illustrated in Table 4) of the respondents were compressed into environmental, social, and economic CSC by composing summative variables (for the procedure, see, e.g., Lähtinen et al. 2022). At this point, the internal consistency of the information was also related to statements on each sustainability dimension and measured by calculating values for the Cronbach alpha, which provides information on the suitability of the data on individual variables to be condensed by using summative variables. As a result, for the statements describing CSC for environmental aspects, the Cronbach alpha was 0.857, for social aspects 0.856, and for economic aspects 0.782. Because the values of the Cronbach alpha are very good in terms of environmental and social CSC and respectable in terms of economic CSC (for interpretation of Cronbach alpha values, see DeVellis 2012, pp. 95–96), the results supported the reliability of the scales and combining the statements into summative variables.

The summative variables calculated for each respondent by environmental, social, and economic CSC were then converted into binary variables, which were to be used as categories for CSC strength in the Mann-Whitney *U* test. In binary variable coding, summative environmental, social, and economic CSC variables with Likert scale values of 4 and 5 (i.e., fair or complete agreement with the statement on CSC) were coded with a value of 1 (a proxy for strong CSC), and values between 1 and 3 were given a value of 0 (a proxy for weak CSC). As a result of the second and final stage of our analysis, information on the potential linkages between the respondents' perceptions of wooden building product quality and the strength of their CSC was gained by analyzing the EFA results by binary CSC variables with Mann-Whitney *U* tests.

Table 3.—Statements used in the questionnaire to measure views of respondents on consciousness for sustainable consumption (CSC).

	Statements in the questionnaire
Environmental CSC	I buy a product when it is produced in a material- and energy-efficient manner (e.g., minimizing the amount of waste, utilizing modern technologies)
	I buy a product when it is produced in an environmental manner (e.g., avoiding environmentally hazardous substances or utilizing renewable materials)
	I buy a product when it is made from recycled materials (e.g., promoting the circular economy)
	I buy a product when it can be disposed of in an environmentally friendly manner (e.g., recycling opportunities)
Social CSC	I buy a product when it is of local origin (e.g., supporting local economies)
	I buy a product when workers' human rights are adhered to and workers are treated equally in its production
	I buy a product when minimum standards regarding workers' health and safety have been followed (e.g., work safety and labor code) in its production
	I buy a product when workers' opportunities for professional development are considered (e.g., varying work tasks and gaining expertise) in its production
Economic CSC	When I buy different products, I prefer those I really need and that are purchased based on consideration
Voluntary simplicity	When I buy different products, I prefer those I consider to be useful (e.g., the newness of a product in the markets is not their primary value)
	When I buy different products, I prefer those I consider to be durable and of high quality
	When I buy different products, I prefer those I absolutely need
	When I buy different products, I prefer those I don't consider unnecessary luxuries
	When I buy different products, I prefer those I don't already own (e.g., I don't want to replace a functioning old product with a new one)
	When I buy different products, I prefer those that are in accordance with the principle of frugal consumption (e.g., longevity, repairability)
Collaborative consumption	I want to buy a product because I don't want to borrow it from others (e.g., due to the feeling of exploiting others)
	I want to buy a product because I want to own it and control its use independently (e.g., it is always available for my use, and I know its condition)
	I want to buy a product because I don't want to rent or lease it (e.g., due to special product qualities and challenges on scheduling timetables

Results

CSC among respondents

Table 4 describes the results of respondents' CSC ($n = 256$) by the level of agreement on individual variables. The results show that most statements with which the respondents agreed (81.2% to 94.4% of respondents agreed or strongly agreed, and 0.0% to 4.8% strongly disagreed or disagreed) were linked to economic sustainability, especially views of voluntary simplicity (i.e., respondents' needs for and usefulness, longevity, and quality of products). The statements the respondents agreed with least (8.0% to 17.0% of respondents strongly disagreed or disagreed, and 41.1% to 61.0% agreed or strongly agreed) were connected to environmental sustainability (i.e., energy- and material-efficient production and recycled materials), social sustainability (i.e., workers' opportunities for professional development), and economic sustainability describing collaborative consumption (e.g., borrowing and renting products).

Respondents' perceptions of quality indicators

Respondents' perceptions of variables, which describe different wooden building product quality indicators, are presented in Table 5. The results show that the least important variables (11.8% to 19.6% of respondents considered them ''not important'' or ''not very important'') were information (e.g., product origin, production process, and environmental impacts), product certificates (e.g., Swan Ecolabel, PEFC, and FSC), and personal values (e.g., expressing one's identity by using wood). In contrast, the most important variables (90.9% to 94.2% of the respondents considered them ''quite important'' or ''very important'') were health effects (e.g., effects of wood on well-being, antibacterial qualities, and effects on indoor air quality), coziness (e.g., wood enhances homeyness), and longevity (e.g., resistance against moisture and decay).

Factor solutions for the quality indicators of wooden building products

The implementation of EFA resulted in a three-factor outcome in respondents' perceptions of different wooden building product quality indicators. In all, 10 variables from the survey were included in the final solution, which explains about 66 percent of the variation in our data (Table 6). The omitted variables with a factor loading values smaller than 0.4 (i.e., loadings were not 0.4 or above in any of the three factors) and/or low values for communality were technical properties, price, coziness, health effects, and constructor or architect. The Kaiser-Meyer-Olkin measure of factorability for the results was 0.828, supporting the applicability of the data to be used in EFA. The Bartlett test of sphericity rejected the null hypothesis that no correlation among the original variables existed ($P = 0.000$). According to the three-factor solution, consumer perceptions of different wooden building product indicators relate to perceived technical advantages (Factor 1: technical reliability), environmental sustainability of the materials (Factor 2: certificates and environmental sustainability), and social benefits at home (Factor 3: versatility of materials).

The technical reliability factor consists of the technical properties of wooden materials (i.e., safety aspects, longevity, and acoustics), while the certificates and environmental sustainability factor consists of the environmental sustainability aspects of processes, including infor-

*Table 4.—Consciousness for sustainable consumption (CSC) views (% of responses for each statement) of the respondents (*n = *256) by sustainability dimensions (Env = environmental; Soc = social; Econ = economic). The variables agreed with least are in italic, and the variables agreed with most are in bold. Likert-scale measures are denoted as follows: 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.*

CSC scale variables by sustainability dimensions	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean
I buy a product when . . .						
it is produced in a material- and energy-efficient manner, e.g., minimizing the amount of waste or utilizing modern technologies (Env)	*4.4*	*12.7*	41.8	31.9	9.2	*3.29*
it is produced in an environmental manner, e.g., avoiding environmentally hazardous substances or utilizing renewable materials (Env)	1.6	6.4	25.9	45.0	21.1	3.78
it is made from recycled materials, e.g., promoting the circular economy (Env)	*2.0*	*8.8*	34.3	41.8	13.1	*3.55*
it can be disposed of in an environmentally friendly manner, e.g., recycling opportunities (Env)	0.0	4.4	22.3	48.6	24.7	3.94
it is of local origin, e.g., supporting local economies (Soc)	1.2	7.1	20.9	55.7	15.1	3.76
I buy a product when in its production . . .						
workers' human rights are adhered to and workers are treated equally (Soc)	1.6	2.0	27.9	46.6	21.9	3.85
minimum standards regarding workers' health and safety have been followed, e.g., work safety and labor code (Soc)	1.2	2.8	25.9	44.6	25.5	3.90
workers' opportunities for professional development are considered, e.g., varying work tasks and gaining expertise (Soc)	*3.2*	*4.8*	40.9	35.2	15.9	*3.56*
When I buy different products, I prefer those that . . .						
I really need and that are purchased based on consideration (Econ/voluntary simplicity)	0.4	0.8	8.8	**42.0**	**48.0**	**4.36**
I consider to be useful, e.g., the newness of a product in the markets is not their primary value (Econ/voluntary simplicity)	0.4	4.4	15.7	**46.2**	**33.3**	**4.08**
I consider to be durable and of high quality (Econ/voluntary simplicity)	0.0	0.0	5.6	**49.8**	**44.6**	**4.39**
I absolutely need (Econ/voluntary simplicity)	0.4	1.6	10.0	**39.6**	**48.4**	**4.34**
I don't consider unnecessary luxuries (Econ/voluntary simplicity)	0.8	4.4	29.4	43.5	21.9	3.81
I don't own, e.g., I don't want to replace a functioning old product with a new one (Econ/voluntary simplicity)	0.4	5.2	16.1	41.0	37.3	4.10
are in accordance with the principle of frugal consumption, e.g., longevity or repairability (Econ/voluntary simplicity)	0.0	4.0	14.8	**47.2**	**34.0**	**4.11**
I want to buy a product because . . .						
I don't want to borrow it from others, e.g., due to the feeling of exploiting others (Econ/collaborative consumption)	*2.0*	*15.5*	27.9	33.1	21.5	*3.57*
I want to own it and control its use independently, e.g., it is always available for my use, and I know its condition (Econ/collaborative consumption)	1.6	7.2	14.3	44.0	32.9	4.00
I don't want to rent or lease it, e.g., due to the special properties of the product or due to special product qualities and challenges in scheduling timetables (Econ/collaborative consumption)	*0.8*	*13.9*	24.3	37.5	23.5	*3.69*

mation and certificates. The versatility of materials factor includes variables that describe the social benefits regarding the multifunctionality and innovativeness of wooden materials and the personal values that relate either to using wood and expressing one's identity or to origin by appreciating the domesticity of wood.

From the perspective of products' sustainability and life cycle impacts, technical reliability (Factor 1) and versatility

*Table 5.—Variables of wooden building product quality indicators and the proportions of respondent views of their importance (*n = *256). The least valued variables are in italic, and the most valued variables are in bold. Likert-scale measures are denoted as follows: 1 = not important at all; 2 = not very important; 3 = neither important nor unimportant; 4 = quite important; 5 = very important.*

Wooden building product quality indicators	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean
Technical properties, e.g., solidity and hardness	0.0	2.8	9.8	55.1	32.3	4.17
Acoustics, e.g., soundproofing properties of wooden materials	1.2	4.7	17.2	50.0	27.0	3.97
Information related to, e.g., raw material origin, production process, and environmental effects	*1.6*	*10.2*	27.8	42.7	17.6	*3.65*
Certificates, e.g., Swan Ecolabel, PEFC, FSC	*1.6*	*11.1*	28.9	41.1	17.4	*3.62*
Price, e.g., price of wood material compared to other materials	0.4	3.5	18.0	54.9	23.1	3.97
Safety, e.g., fire resistance of wood	1.2	3.5	14.5	43.0	37.9	4.13
Health effects, e.g., effects of wood on well-being, antibacterial qualities, and effects on indoor air quality	0.4	2.0	6.7	**36.6**	**54.3**	**4.43**
Coziness, e.g., wood enhances homeyness	0.0	0.8	7.8	**43.8**	**47.7**	**4.38**
Multifunctionality, e.g., usability of wood for multiple purposes	0.0	2.4	16.3	50.4	31.0	4.10
Longevity, e.g., resistance against moisture and decay	0.0	0.0	5.9	**43.4**	**50.8**	**4.45**
Personal values, e.g., expressing one's identity by using wood	*3.9*	*15.7*	26.4	34.6	19.3	*3.50*
Origin, e.g., domesticity of wood	0.0	5.1	14.8	46.5	33.6	4.09
Environmental aspects, e.g., environmental effects of wood	0.4	5.9	16.1	44.3	33.3	4.04
Innovativeness, e.g., the new ways to use wooden materials in construction	1.6	8.3	29.1	44.1	16.9	3.67
Constructor or architect, e.g., the expertise of construction company's salespersons or architects in use of wood in construction	0.8	9.8	19.1	42.2	28.1	3.87

Table 6.—Results from the final rotated three-factor solution for the wooden building product quality. Values in bold are the highest factor loadings in absolute values.

	Communalities (extraction)	Factor 1 Technical reliability	Factor 2 Certificates and environmental sustainability	Factor 3 Versatility of materials
Acoustics	0.323	**0.503**	0.174	0.201
Information	0.795	0.161	**0.850**	0.215
Certificates	0.550	0.255	**0.676**	0.168
Safety	0.628	**0.770**	0.185	0.014
Multifunctionality	0.492	0.239	0.050	**0.657**
Longevity	0.358	**0.529**	0.118	0.255
Personal values	0.466	0.042	0.281	**0.621**
Environmental aspects	0.560	0.273	**0.575**	0.394
Innovativeness	0.525	0.224	0.219	**0.654**
Origin	0.477	0.113	0.415	**0.540**
Cronbach alpha		0.663	0.814	0.760
Eigenvalues		1.413	1.890	1.871
Explained variance, %		11.321	41.427	12.851

of materials (Factor 3) are more connected to the usage phases of houses (e.g., acoustics, safety, and personal values) than certificates and environmental sustainability (Factor 2), with stronger linkages to the manufacture of products and building (e.g., information and certificates on environmental effects). Regarding the views of social and economic sustainability, technical reliability (Factor 1) is characterized by linkages with both social (e.g., safety) and economic (e.g., longevity) sustainability, while versatility of materials (Factor 3) is more strongly connected to social sustainability (e.g., personal values), especially respondents' expectations of a particular lifestyle in housing.

Connections between the strength of CSC and factors of wooden building product quality

The Mann-Whitney *U* test results for the connections between respondents' strength of CSC by sustainability aspects and the latent variables describing respondents' views of wooden building product quality are summarized in Table 7. As can be seen, strong CSC for environmental, social, and economic sustainability showed signs of being statistically significantly connected with latent variables of respondents' views of wooden building product quality (i.e., factors received through EFA).

In relation to all three factors, very strong evidence was found with the Mann-Whitney *U* test that respondents' views differed statistically significantly in terms of environmental CSC ($P < 0.001$). Similar results were found concerning social CSC. However, the evidence regarding technical reliability was at a moderate level ($P = 0.012$). Additionally, in relation to technical reliability, very strong evidence was found that respondents' views differed statistically significantly in connection with economic CSC ($P < 0.001$). Furthermore, in relation to versatility of materials, moderate evidence was found that respondents' views differed statistically significantly in connection with economic CSC ($P = 0.010$).

The results of the Mann-Whitney *U* test do not provide information on how strong or weak CSC affects the opinions of respondents on wooden building product quality factors. To gain such information, comparisons of average factor scores of technical reliability, certificates and environmental sustainability, and versatility of materials between respondents with strong and weak CSC by environmental, social, and economic aspects were made. In all, respondents with strong CSC for any of the sustainability aspects appreciated wooden building product quality factors more than those with weak CSC (Figs. 1 through 3). Regarding differences with indications of statistical significance, strong environmental (Fig. 1) and social (Fig. 2) CSC was connected with higher appreciation of all types of general building product quality properties (i.e., technical reliability, certificates and environmental sustainability, and versatility of materials). In addition, the respondents with strong economic CSC appreciated technical reliability and versatility of materials more than those with weak economic CSC.

Figures 1 and 2 illustrate average factor scores of wooden building products' quality factors by strong and weak CSC that are very alike regarding views on environmental and social sustainability. This indicates that the respondents of this study consciously or unconsciously connect environmental and social sustainability (strong or weak) in their general purchasing behavior. In contrast, Figure 3 on economic CSC shows a different pattern referring to

Table 7.—Connections with the variables of consciousness for sustainable consumption (CSC) and the latent variables of respondents' views of wooden building product quality. Indication of statistical significance is denoted with a P *value, and lack of statistical proof is denoted with "—".*[a]

	Factor 1 Technical reliability	Factor 2 Certificates and environmental sustainability	Factor 3 Versatility of materials
Environmental CSC	<0.001***	<0.001***	<0.001***
Social CSC	0.012**	<0.001***	<0.001***
Economic CSC	<0.001***	—	0.010**

[a] * Suggestive evidence of statistical significance = 0.05 ≤ P value < 0.1; ** Moderate evidence of statistical significance = 0.01 ≤ P value < 0.05; *** very strong evidence of statistical significance = < 0.01 P value.

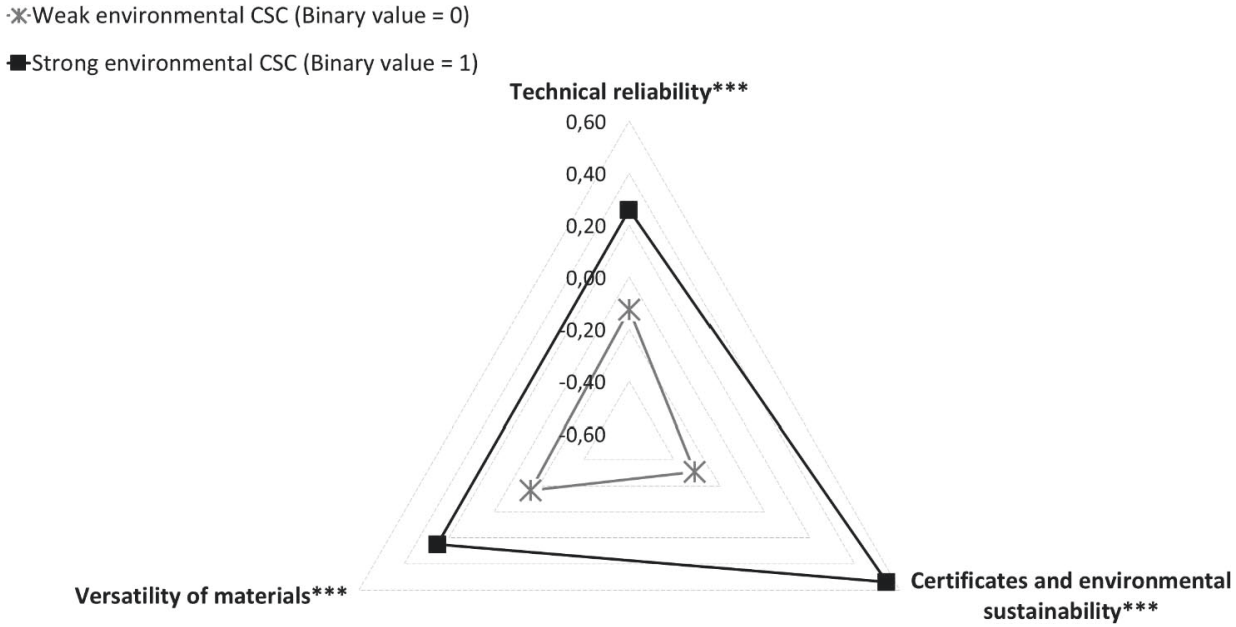

Figure 1.—Differences in average factor scores between respondents with weak and strong environmental consciousness for sustainable consumption.

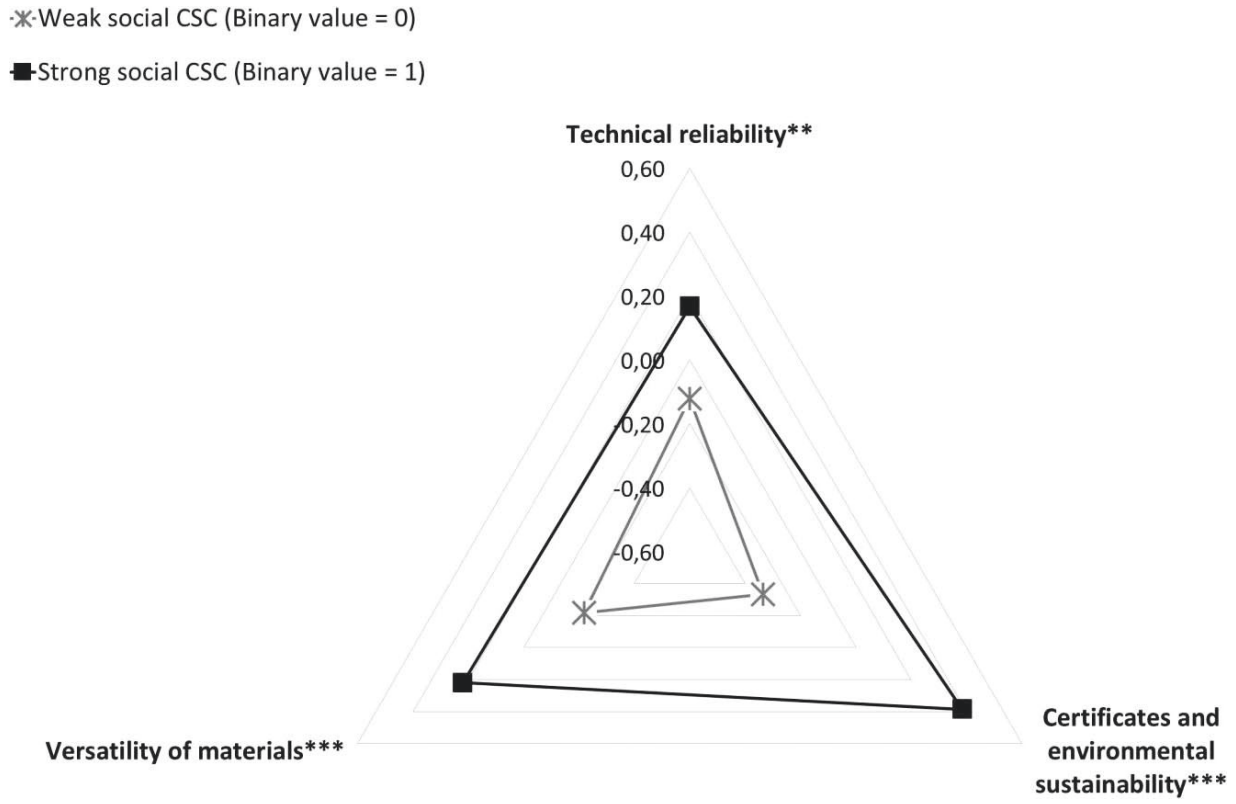

Figure 2.—Differences in average factor scores between respondents with weak and strong social consciousness for sustainable consumption.

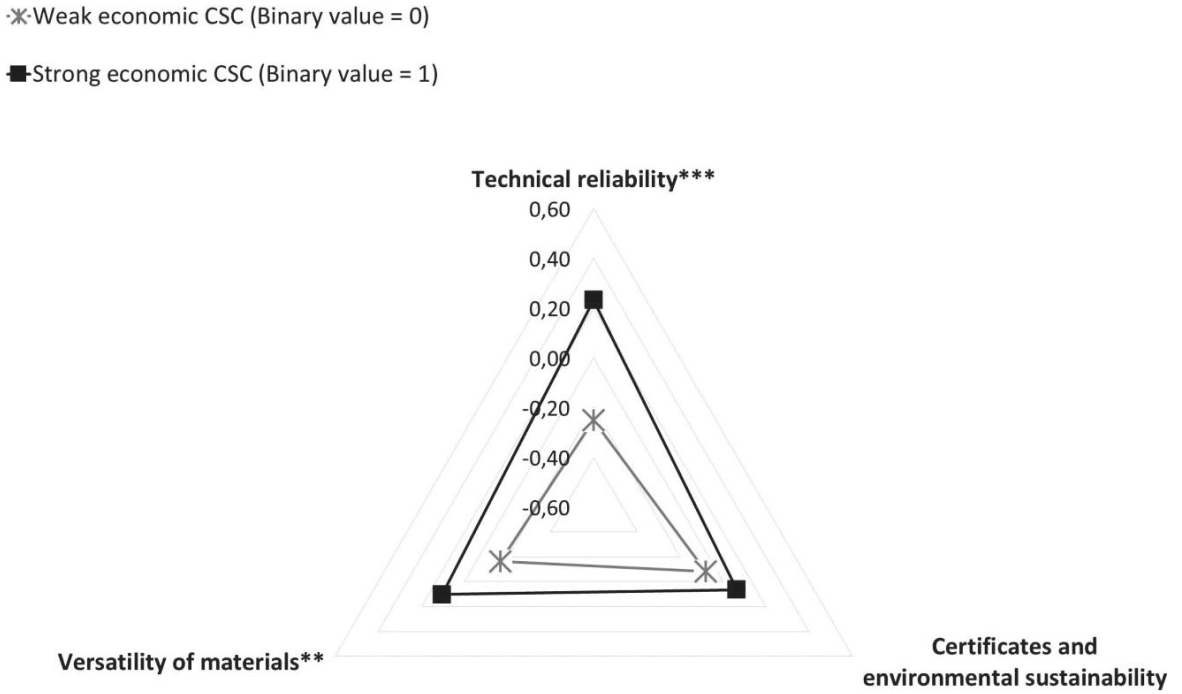

Figure 3.—Differences in average factor scores between respondents with weak and strong economic consciousness for sustainable consumption.

economic CSC being to some extent disconnected from environmental and social CSC.

Discussion

This study's purpose was to contribute to academic information on the linkages between consumers' CSC and their perceptions of wooden building product quality. The study's material was composed of consumer survey data gathered in 2018 with a random sample of 1,000 recipients ($n = 256$, response rate 25.6%) analyzed with EFA and a nonparametric statistical test (Mann-Whitney U test). Regarding consumers' environmental, social, and economic CSC, most of the respondents appreciated economic aspects in their purchasing decisions. For example, respondents bought products that they considered to be useful and durable and after careful consideration. In contrast, respondents did not consider borrowing or leasing a product or whether a product is made of recycled materials or produced in a material- and energy-efficient manner. In addition, consumers did not consider certain worker-related issues, such as their opportunities for professional development. These results indicate that, for some consumers, environmental or social sustainability aspects are not of particular importance in product purchases, but that economic sustainability aspects do matter in their purchasing decisions.

A similar phenomenon is also visible in the evaluations of quality indicators of wooden building products. According to our results, the least valued indicators are those related to environmental and social sustainability, such as certificates, information (e.g., raw material origin, production process, and environmental effects), and personal values (e.g., expressing one's identity by using wood). It seems that the symbolic qualities of wood, such as expressing one's identity, were not appreciated, although previous studies have indicated that the use of wood in housing construction affects perceptions of home owners' identities (Ridoutt et al. 2005). In addition, extrinsic cues informing consumers about the environmental aspects, such as certificates and information, were not considered important. This was in contrast with many studies, in which environmental certification was found to be a favorable and significant attribute (Anderson and Hansen 2004, Roos and Hugosson 2008, Roos and Nyrud 2008, Aguilar and Cai 2010, Paulin et al. 2018).

Furthermore, our results show that longevity, health effects, and coziness are the most important wooden building product quality indicators. The results are in line with previous research. In recent discussions, wooden multistory residential buildings have been found to have a positive image among consumers due to their perceived qualities related to longevity and technical factors (Kylkilahti et al. 2020) and coziness (Häyrinen et al. 2020, Viholainen et al. 2020b). Furthermore, consumers have been found to have a positive opinion of the health effects of wood as a material (Spetic et al. 2007; Kuzman et al. 2012; Jiménez et al. 2015, 2016; Malá et al. 2019; Andac Guzel 2020; Häyrinen et al. 2020; Lakkala et al. 2020).

The results of EFA of consumers' perceptions of wooden building product quality resulted in a three-factor solution, which explained about 66 percent of the variation in the data. The factors were technical reliability, certificates and environmental sustainability, and versatility of materials. Technical reliability related to the various benefits of wood concerning the technical properties of wooden materials, such as the material's longevity and acoustics, and social

benefits, such as safety aspects. The certificates and environmental sustainability factor consisted of the environmental sustainability aspects of processes, including information and certificates, while versatility of materials consisted of variables that were related to the multifunctionality and innovativeness of wooden materials, wood origin, and personal values when using wooden materials.

Regarding the connections between consumers' perceptions of wooden building product quality and their CSC, our Mann-Whitney *U* test results showed that there were statistical indications of differences between respondents in their environmental, social, and economic CSC. The strength of CSC was found to relate to the appreciation of various wooden building product quality properties. More specifically, the technical advantages of wooden building products (i.e., technical reliability) and social benefits of wooden building products (i.e., versatility of materials) were more appreciated by those respondents with strong environmental, social, and economic CSC than those with weak CSC in these aspects.

In contrast with previous results, the environmental sustainability of wooden building products (i.e., certificates and environmental sustainability) was found to be valued more by the respondents who considered environmental and social sustainability in their consumption than those with weak environmental and social CSC, while no evidence of such behavior was found for economic CSC. This is in line with previous research showing that buying decisions motivated by financial sustainability usually do not involve environmental or social aspects (Balderjahn et al. 2013). However, economic CSC may result in beneficial sustainability outcomes, such as in the environmental life cycle impacts, when the valuing of economic sustainability relates to the appreciation of technical quality and longevity of products in use. Evidence of such a phenomenon was obtained by our results.

Furthermore, it is significant to note that a consumer who is conscious about sustainable consumption and interested in environmental, social, or economic sustainability appreciates more the various characteristics of wooden materials compared to those consumers who ignore the sustainability issues in their daily purchasing choices. This indicates that one target group for wooden multistory construction might be consumers who are environmentally oriented but also share the interest for social and economic issues in society. Results are in congruence with the findings of Ottelin et al. (2021) suggesting that favoring wood building is likely connect with other sustainable consumption habits.

The results of this study are useful for wood and construction businesses to better meet consumer expectations, both for different aspects of sustainability and for lifestyles, in their production to enhance the acceptability and desirability of materials in the housing markets. For example, companies could use the information about the importance of various wooden material properties in their marketing communication and promote the aspects of longevity, health effects, and coziness that are highly valued by consumers. In addition, from the marketing perspective, the results provide significant information about how consumers with strong CSC appreciate different properties of wooden building materials. Understanding how consumers' personal values influence their perceptions of these products enables businesses to develop sustainable products that meet the specific needs of consumers, who vary in their values and preferences.

Our results contribute to the scientific knowledge of the topic, which has gained very little attention in previous studies. However, a limitation of the study is that the data provided no information on consumer choices in actual purchasing situations but addressed only their general views of wooden building product quality properties and CSC. In future studies, it would be valuable to investigate consumers' perceptions of quality with experimental data to gain knowledge of how the various quality indicators of wood affect consumer behavior in the actual purchasing context. Because our study provides information only on the views of Finnish consumers, the results cannot be generalized in an international context. In addition, Finland is a forest-rich country with strong traditions of building with wood (detached houses and summer cottages). However, because it has been found that Finnish consumers also have different preferences in the use of wood, the results of our study are a starting point for implementing research on the same topic in broader geographical contexts.

Other significant limitations were related to the chosen methodology and used measurement scales. First, because the Cronbach alpha values were only minimally acceptable in the case of Factor 1 (technical reliability) and respectable in terms of the summative variable for economic CSC (DeVellis 2012), the results must be interpreted with caution, and further investigations and development of the scales are required. Furthermore, because certain quality indicators were overlapping to some extent (e.g., information and environmental friendliness) and some of them had specific examples in the questionnaire, this might have caused response bias and also influenced the analysis results. Another limitation is that the study does not investigate whether consumers perceive the quality indicators in question to connect with wooden building products or examine how they perceive wooden building products in terms of these indicators. In addition, the study does not aim to compare the consumers' views of quality indicators of wooden building products with their views of quality indicators of other building materials. However, these limitations provide several opportunities to address these issues profoundly in future studies. Additionally, in further research, it would be significant to evaluate how consumers' sociodemographic background influences their perceptions of wooden building product quality to recognize the relevant consumer segments for, for example, wooden multistory buildings.

Conclusions

There are strong efforts to increase the use of wood, especially in multistory residential buildings, around the world (e.g., Churkina et al. 2020, Himes and Busby 2020, Pauliuk et al. 2021). Despite this, research on consumers' views is very limited in the context of both construction and the wood industry, although end users have been found to play a significant role in the sustainability change for residential building (Martek et al. 2019). If the use of wood in multistory residential buildings is to enhance the sustainability change in the construction industry, more information is needed on how consumers in different geographical regions appreciate and are willing to accept the use of wood in their homes.

When promoting wooden materials used in building and housing, it is important to recognize that consumers with different values appreciate different properties of wood, and different appreciations may result in multiple sustainability benefits. Our findings show that consumers are not a homogeneous group but rather people showing great variation in both their CSC and their views of wooden building product quality. For example, based on the results, economic CSC aspects were emphasized in respondents' purchasing decisions compared with environmental or social CSC. Because the long life cycles of building products play a fundamental role in enhancing the sustainability of the construction industry, strong economic CSC may also result in environmental and social benefits if products are manufactured responsibly (i.e., raw material extraction and manufacture of products). Furthermore, according to our results, consumers with economic CSC especially value the technical and social benefits of wooden building products (e.g., longevity and safety aspects). Therefore, for such consumers, promoting the environmental friendliness of wood, which is commonly seen as a strength of wooden materials, is not the main key to achieving success in marketing efforts. It is therefore important for practitioners to know what types of wood building product quality characteristics are appreciated by different consumer types and how these properties can be promoted successfully to them.

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1

Supplemental Material. Questions and variables used in the analysis in the study "Consumers' consciousness for sustainable consumption and their perceptions on wooden building product quality". In the following tables, the original phrasings in Finnish are in tables marked with yellow, and English translations with identical contents in green.

3. Mikä merkitys on seuraavilla tekijöillä valitessasi kotisi puisia ulko- ja/tai sisärakenteita? Esim. runkorakenteet, sisustuspaneelit, lattiat.

	Ei ollenkaan tärkeää	Ei kovin tärkeää	Ei tärkeää, muttei merkityksetöntäkään	Melko tärkeää	Hyvin tärkeää
a **Tekniset ominaisuudet** esim. lujuus, kovuus	[ ]	[ ]	[ ]	[ ]	[ ]
b **Akustiikka** esim. puumateriaalin äänieristävyys	[ ]	[ ]	[ ]	[ ]	[ ]
c **Informaatio** esim. raaka-aineen alkuperä, tuotantoprosessit ja ympäristövaikutukset	[ ]	[ ]	[ ]	[ ]	[ ]
d **Tuotesertifikaatit** esim. Joutsenmerkki, PEFC, FSC	[ ]	[ ]	[ ]	[ ]	[ ]
e **Hinta** esim. puumateriaalin hinta vs. muut materiaalit	[ ]	[ ]	[ ]	[ ]	[ ]
f **Turvallisuus** esim. puun palonkestävyys	[ ]	[ ]	[ ]	[ ]	[ ]
g **Terveellisyys** esim. puun vaikutukset hyvinvointiin, puun antibakteerisuus ja sisäilmavaikutukset	[ ]	[ ]	[ ]	[ ]	[ ]
h **Viihtyisyys** esim. puu lisää kodikkuutta	[ ]	[ ]	[ ]	[ ]	[ ]
i **Monikäyttöisyys** esim. puu soveltuu eri tarkoituksiin	[ ]	[ ]	[ ]	[ ]	[ ]
j **Pitkäikäisyys** esim. puun kosteuden- ja lahonkestävyys	[ ]	[ ]	[ ]	[ ]	[ ]
k **Henkilökohtainen arvomaailma** esim. puun käyttö oman identiteetin ilmentäjänä	[ ]	[ ]	[ ]	[ ]	[ ]
l **Alkuperä** esim. puun kotimaisuus	[ ]	[ ]	[ ]	[ ]	[ ]
m **Ekologisuus** esim. puun ympäristövaikutukset	[ ]	[ ]	[ ]	[ ]	[ ]
n **Innovatiivisuus** esim. puumateriaalin uudet käyttömuodot rakentamisessa	[ ]	[ ]	[ ]	[ ]	[ ]
o **Rakennuttaja tai arkkitehti** esim. rakennusliikkeen myyjän tai arkkitehdin tietotaito puun rakennuskäytöstä	[ ]	[ ]	[ ]	[ ]	[ ]

2

3. What is the importance of following factors, when you choose wooden exterior and/or interior structures for your home? For example, load-bearing structures, panels, floors.

	Not important at all	Not very important	Neither important, nor without importance	Quite important	Very important
a **Technical properties** e.g., solidity, hardness	[ ]	[ ]	[ ]	[ ]	[ ]
b **Acoustics** e.g., soundproofing properties	[ ]	[ ]	[ ]	[ ]	[ ]
c **Information** e.g., raw material origin, production process, and environmental effects	[ ]	[ ]	[ ]	[ ]	[ ]
d **Certificates** e.g., Swan Ecolabel, PEFC, FSC	[ ]	[ ]	[ ]	[ ]	[ ]
e **Price** e.g., price compared to other materials	[ ]	[ ]	[ ]	[ ]	[ ]
f **Safety** e.g., fire resistance	[ ]	[ ]	[ ]	[ ]	[ ]
g **Health effects** e.g., effects on wellbeing and indoor air quality, antibacterial qualities	[ ]	[ ]	[ ]	[ ]	[ ]
h **Coziness** e.g., effects on homeyness	[ ]	[ ]	[ ]	[ ]	[ ]
i **Multifunctionality** e.g., usability for multiple purposes	[ ]	[ ]	[ ]	[ ]	[ ]
j **Longevity** e.g., resistance against moisture and decay, life cycle durability	[ ]	[ ]	[ ]	[ ]	[ ]
k **Personal values** e.g., medium to express one's identity and personal status	[ ]	[ ]	[ ]	[ ]	[ ]
l **Origin** e.g., domesticity	[ ]	[ ]	[ ]	[ ]	[ ]
m **Environmental aspects** e.g., environmental impacts and sustainability	[ ]	[ ]	[ ]	[ ]	[ ]
n **Innovativeness** e.g., new ways to use wooden materials in construction	[ ]	[ ]	[ ]	[ ]	[ ]
o **Constructor or architect** e.g., the expertise of construction company's salespersons or architects concerning use of wood in construction	[ ]	[ ]	[ ]	[ ]	[ ]

3

7. Valitse seuraavista vaihtoehdoista eniten yleistä ostokäyttäytymistäsi kuvaava vaihtoehto.

		Täysin eri mieltä	Eri mieltä	Ei samaa eikä eri mieltä	Samaa mieltä	Täysin samaa mieltä
Ostan tuotteen silloin, jos se on…						
a	**…tuotettu materiaali- ja energiatehokkaasti** esim. hukkamateriaalien määrän minimointi, modernien teknologioiden hyödyntäminen	[ ]	[ ]	[ ]	[ ]	[ ]
b	**…tuotettu paikallisesti tai lähialueilla** esim. paikallistalouksien tukeminen	[ ]	[ ]	[ ]	[ ]	[ ]
c	**…tuotettu ekologisesti** esim. välttäen ympäristölle haitallisia aineita tai hyödyntäen uusiutuvia materiaaleja	[ ]	[ ]	[ ]	[ ]	[ ]
d	**…valmistettu kierrätysmateriaaleista** esim. kiertotalouden edistäminen	[ ]	[ ]	[ ]	[ ]	[ ]
e	**…hävitettävissä ympäristöystävällisellä tavalla** esim. kierrätysmahdollisuudet	[ ]	[ ]	[ ]	[ ]	[ ]
Ostan tuotteen silloin, jos sen valmistuksessa on…						
f	**…kunnioitettu työntekijöiden oikeuksia ja kohdeltu työntekijöitä tasapuolisesti**	[ ]	[ ]	[ ]	[ ]	[ ]
g	**…noudatettu työntekijöiden terveyteen ja turvallisuuteen liittyviä minimistandardeja** esim. työturvallisuus ja työaikalainsäädäntö	[ ]	[ ]	[ ]	[ ]	[ ]
h	**…huomioitu työntekijöiden mahdollisuudet ammatilliseen kehittymiseen** esim. työtehtävien vaihtuminen ja tieto-taidon kartuttaminen	[ ]	[ ]	[ ]	[ ]	[ ]
Ostaessani erilaisia tuotteita suosin niitä, joita…						
i	**…pidän tarpeellisina ja joiden hankinta perustuu harkintaan**	[ ]	[ ]	[ ]	[ ]	[ ]
j	**…pidän hyödyllisinä** esim. tuotteen uutuus markkinoilla ei ole itseisarvo	[ ]	[ ]	[ ]	[ ]	[ ]
k	**…pidän kestävinä ja laadukkaina**	[ ]	[ ]	[ ]	[ ]	[ ]
l	**…ehdottomasti tarvitsen**	[ ]	[ ]	[ ]	[ ]	[ ]
m	**…en pidä tarpeettomana luksuksena**	[ ]	[ ]	[ ]	[ ]	[ ]
n	**…minulla ei ole** esim. en halua korvata uudella täysin toimivaa vanhaa tuotetta	[ ]	[ ]	[ ]	[ ]	[ ]
o	**…voi mieltää niukan kulutuksen ajattelutavan mukaisiksi** esim. pitkäikäisyys, korjattavuus	[ ]	[ ]	[ ]	[ ]	[ ]
Ostan tuotteen omaksi, koska…						
p	**…en halua lainata sitä muilta** esim. toisista hyötymisen tunteen takia	[ ]	[ ]	[ ]	[ ]	[ ]
q	**…haluan omistaa sen ja hallita sen käyttöä itsenäisesti** esim. tuote on aina tarvittaessa käytössäni ja tietämässäni kunnossa	[ ]	[ ]	[ ]	[ ]	[ ]
r	**…en halua vuokrata sitä** esim. aikataulujen suunnitteluun liittyvien haasteiden tai erityisten tuotteeseen liittyvien ominaisuuksien takia	[ ]	[ ]	[ ]	[ ]	[ ]

4

7. Choose below the options, which best describe your general purchasing behavior.

		Strongly disagree	Disagree	Neither agree, nor disagree	Agree	Strongly agree
I buy a product when…						
a	**…it is produced in a material- and energy-efficient manner** e.g., minimizing the amount of waste, utilizing modern technologies	[ ]	[ ]	[ ]	[ ]	[ ]
b	**… it is produced in an environmental manner** e.g., avoiding environmentally hazardous substances or utilizing renewable materials	[ ]	[ ]	[ ]	[ ]	[ ]
c	**…it is made from recycled materials** e.g., promoting the circular economy	[ ]	[ ]	[ ]	[ ]	[ ]
d	**…it can be disposed of in an environmentally friendly manner** e.g., recycling opportunities	[ ]	[ ]	[ ]	[ ]	[ ]
e	**it is of local origin** e.g., supporting local economies	[ ]	[ ]	[ ]	[ ]	[ ]
I buy a product when in its production…						
f	**…workers' human rights are adhered to, and workers are treated equally**	[ ]	[ ]	[ ]	[ ]	[ ]
g	**…minimum standards regarding workers' health and safety have been followed** e.g., work safety and labor code	[ ]	[ ]	[ ]	[ ]	[ ]
h	**…workers' opportunities for professional development are considered** e.g., varying work tasks and gaining expertise	[ ]	[ ]	[ ]	[ ]	[ ]
When I buy different products, I prefer those that…						
i	**…I really need, and which are purchased based on consideration**	[ ]	[ ]	[ ]	[ ]	[ ]
j	**…I consider to be useful** e.g., the newness of a product in the markets is not their primary value	[ ]	[ ]	[ ]	[ ]	[ ]
k	**…I consider to be durable and of high quality**	[ ]	[ ]	[ ]	[ ]	[ ]
l	**…I absolutely need**	[ ]	[ ]	[ ]	[ ]	[ ]
m	**…I don't consider unnecessary luxuries**	[ ]	[ ]	[ ]	[ ]	[ ]
n	**…I don't own** e.g., I don't want to replace a functioning old product with a new one	[ ]	[ ]	[ ]	[ ]	[ ]
o	**…are in accordance with the principle of frugal consumption** e.g., longevity, repairability	[ ]	[ ]	[ ]	[ ]	[ ]
I want to buy a product because…						
p	**…I don't want to borrow it from others** e.g., due to the feeling of exploiting others	[ ]	[ ]	[ ]	[ ]	[ ]
q	**…I want to own it and control its use independently** e.g., it is always available for my use, and I know its condition	[ ]	[ ]	[ ]	[ ]	[ ]
r	**…I don't want to rent or lease it** e.g., due to the special properties of the product or due to special product qualities and challenges in scheduling timetables	[ ]	[ ]	[ ]	[ ]	[ ]

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Perceptions of wooden interior product quality – insights on sustainability views among Finnish consumers

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Highlights

- The quality indicators of wooden interior products can be grouped into four factors relating to products' environmental friendliness, fit with lifestyle and home design, visual and tactile attractiveness, and technical solidity, which are in multiple ways connected with sustainability.
- The sociodemographic background of the respondents was found to be linked with consumer scores for those factors.
- Wooden interior products should be designed to meet different types of product quality expectations in the home environment.

Abstract

Evaluation of product attributes and the overall quality significantly affect consumer purchasing decisions. Previous studies on wooden products have mostly addressed wood product quality from technical viewpoints, while largely disregarding environmental, social, and economic aspects in the assessments. Therefore, knowledge on how sustainability aspects are evaluated as a feature of wood product quality is narrow. This study investigated consumer perceptions of different quality indicators (i.e., quality cues and attributes) of wooden interior products with a special focus on sustainability and value chain phases. In addition, the connections between consumers' sociodemographic background and their perceptions of the quality features of wooden interior products were evaluated. The material of the study was based on data gathered in 2018 with a postal survey sent to 1000 people living in Finland with a response rate of 25.6%. As methods of analysis, exploratory factor analysis, the Mann-Whitney U test, and the Kruskall-Wallis test were utilized. The results show that the quality indicators of wooden interior products can be grouped into four factors relating to products' environmental friendliness, fit with lifestyle and home design, visual and tactile attractiveness, and technical solidity, which are in multiple ways connected with sustainability. The sociodemographic background of the respondents was found to be linked with consumer scores for those factors. Engaging consumers in sustainable consumption choices requires providing them with information on wooden product value chains that meets their individual needs in relation to their existing knowledge of those issues and individual values.

Keywords consumer behavior; perceived quality; sociodemographic variables; sustainable consumption; wood products
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1 Introduction

The importance of sustainability in defining the quality features of wood products has increased among consumers in recent decades (Toppinen et al. 2013; Holopainen et al. 2014). Especially in the context of housing, sustainability is a multidimensional concept comprising the environmental, social, and economic aspects of consumer expectations for wood product quality (Viholainen et al. 2021). For example, carbon storage properties (Lippke et al. 2011), amenity impacts in living environments (Rhee 2018), and compatibility with perceptions of aesthetics (Lähtinen et al. 2021) connect to the environmental and social sustainability aspects of wood products. In addition, longevity in use (Luo et al. 2018) is linked with both technical durability and the potential to reduce economic costs through longer product life cycles (Petersen and Solberg 2004).

In the context of wood product purchasing choices, preferences for environmental, social, or economic sustainability are not usually separate from each other, but are instead intertwined with each other among consumers to differing extents (Toppinen et al. 2013). In addition, depending on the intended use of the product (i.e., visible surfaces or non-visible purposes), the purchasing preferences of the consumers may vary, for example, due to differing expectations for longevity or aesthetics. The focus of this study is on wooden interior products (e.g., furniture, small home ornaments), which do not have similar technical requirements to wood products used in load-bearing structures (e.g., strength grading). In addition, since visual and tactile properties are also important aspects of wooden interior products (Strobel et al. 2017), these products provide an interesting starting point to evaluate how consumers perceive sustainability in relation to different attributes.

According to previous studies, consumers consider wood products to be environmentally sustainable (Hakala et al. 2015; Strobel et al. 2017; Moresová et al. 2019; Kylkilahti et al. 2020; Viholainen et al. 2020), and they also appreciate the environmental benefits of wood products (Choi et al. 2011; Costa et al. 2011; Cai and Aguilar 2013, 2014; Andac Guzel 2020; Khojasteh-Khosro et al. 2020). In contrast to unambiguously positive views on the environmental sustainability of wood products as such, consumers still have doubts about how forest management practices and logging affect natural ecosystems (e.g., deforestation and negative impacts on wildlife habitats) (Häyrinen et al. 2020; Viholainen et al. 2021). From the perspective of forest management practices, impacts on ecosystems is a topical issue (Holm 2015).

According to the results of Hansmann et al. (2006), consumers with expectations concerning the environmental and social sustainability of forestry are also more likely to buy wooden products with sustainability labels. However, while sustainability expectations for forest management practices are intertwined between environmental and social aspects, in the case of wood products (e.g., in the context of wooden buildings) social sustainability commonly also comprises a dimension of its own. For example, it may be related to perceived health and well-being impacts either in buildings (Lähtinen et al. 2019; Viholainen et al. 2020) or more comprehensively in connection with living environments (Lähtinen et al. 2021, 2022).

The evaluation of different product attributes and the role of quality perceptions in consumers' purchasing choices have been studied in many fields of research; earlier findings suggest, for example, that perceived quality has a significant effect on aspects such as consumers' preferences (Steenkamp 1986), perceived value (Sweeney et al. 1999), and consumers' choices (Grebitus et al. 2011). However, only a few studies in the existing wood product literature have investigated consumers' perceptions of wood product quality, and the studies lack theoretical underpinnings from marketing and consumer behavior research in terms of perceived quality (Harju 2021).

In the previous studies on wood products, quality indicators have been addressed mostly through product or supplier properties (Sinclair et al. 1993; Hansen and Bush 1996, 1999), while sustainability as a feature of quality that affects purchasing choices has largely been neglected.

As exceptions, in the studies of Costa et al. (2011) and Toivonen (2012), environmental aspects have also been addressed in the context of perceived wood product quality. Furthermore, Costa et al. (2011) included social aspects through the perceived safety of wooden windows. However, if addressing studies previously carried out in the context of wood product quality, information on the connections between different sustainability aspects and wood product quality is still very limited. Thus, regarding responsible purchasing behavior and consumer communication, there is a lack of information on how consumers could be engaged in more sustainable material choices, especially in the context of wood products (Lähtinen et al. 2017; Kylkilahti et al. 2020).

Not only there is a lack of information on sustainability as a quality feature of wood products, the current understanding on the role of personal variables (e.g., consumer characteristics) is also scarce. Previously, studies on wood products have investigated the effects of different consumer characteristics on consumer behavior in general (Luo et al. 2017, 2018; Loučanová and Olšiaková 2020; Oblak et al. 2020). For example, it has been found that sociodemographic factors like age (Holopainen et al. 2014; Høibø et al. 2015; Osburg et al. 2016a), gender (Luo et al. 2017, 2018; Aguilar et al. 2021), education (Kaputa et al. 2018), forest ownership (Ranacher et al. 2017), and connections with the forest sector (e.g., education profession) (Aguilar et al. 2021) may affect consumer perceptions of wood products. However, only Costa et al. (2011) have acknowledged the effects of individual characteristics in the wood product quality perception process.

To fill the void in the existing knowledge, this study provides information on how sustainability in the case of wooden interior products connects to consumer perceptions of quality assessed with various indicators. The material of the study is based on survey data, which are analyzed quantitatively with multivariate methods. The first aim of the study is to evaluate how the environmental, social, and economic sustainability of forestry-wood value chains contribute to the perceived quality of wooden interior products through different quality indicators. The second aim is to investigate the interlinkages between consumers' sociodemographic background and their perceptions of wooden interior product quality.

2 Empirical background on perceived product quality and sustainability

Perceived quality has been defined as a customer's subjective judgment regarding overall product superiority that differs from objective quality (Zeithaml 1988). Steenkamp (1989) stated that the perceived quality approach differs from other product quality approaches because it refers to quality neither as absolute nor as objective. He defined perceived quality as the consumer's subjective assessment of the product attributes that depends on the consumer's perceptions, needs, and goals. In addition, Mitra and Golder (2006) defined perceived quality as the "perception of the customer" as opposed to the "objective" quality of the product. The recent definition by Stylidis et al. (2020) approaches perceived quality as a complex, multidimensional entity, where a human is seen as the main agent.

The concept of quality indicators, which include quality cues and attributes, is a critical element in discussing perceived quality (Oude Ophuis and Van Trijp 1995). Olson and Jacoby (1972) stated that quality perceptions prior to purchase are based on quality cues, such as intrinsic and extrinsic cues. Intrinsic cues are those which are physically part of the product, such as technical and visual properties, while extrinsic cues, such as product information and certificates, are connected to the product but not part of it (Olson and Jacoby 1972). Steenkamp (1989) contributed to the research on perceived quality by developing a Model of the Quality Perception Process that combines both quality cues (intrinsic and extrinsic cues) and quality attributes (experience and credence attributes). In that model, the quality cues are used to predict the quality attributes that

Table 1. Examples of sustainability attributes in the existing literature.

Sustainability attributes	Examples and sources
Environmental sustainability attributes	Preserving natural ecosystems and biodiversity, and management of production processes to reduce amount of waste, usage of energy, and carbon dioxide emissions (Lähtinen et al. 2016a; Bangsa and Schlegelmilch 2020).
Social sustainability attributes	Health, welfare, and social justice issues connected to impacts on workers and suppliers, consumers, and communities at different phases of value chains (i.e., raw material extraction, primary and secondary production, and use of final product) (Elkington 1997; Lähtinen et al. 2016b; Catlin et al. 2017).
Economic sustainability attributes	Financial performance (e.g., cost reductions and value creation), and "economic interests of external stakeholders (e.g., improvements in economic well-being and standard of living)" (Sheth et al. 2011; Lähtinen et al. 2016b).

cannot be observed prior to consumption. Experience attributes, such as functional properties, can be ascertained on the basis of actual experience with the product, while credence attributes, such as environmental friendliness and origin of the product, cannot be ascertained even after normal use for a long time and/or without consulting an expert (Steenkamp 1989).

Alongside quality cues and attributes, Steenkamp (1989) suggested that the quality perception process is affected by personal and situational variables such as purchasing place. In addition, Brucks et al. (2000) argued that the importance of different quality dimensions may vary for different consumers. Therefore, consumers' characteristics, for example their sociodemographic background, can be seen to affect the product quality perception process. Based on the reviewed literature, perceived quality is a multidimensional construct affected by different cues and attributes related to the product, the consumer's characteristics, and situational variables in the purchasing environment.

Sustainability of products and sustainability attributes have been a focal topic within the research on sustainable consumption (Trudel 2019), which can be seen to be linked with social, environmental, and economic aspects (Elkington 2004) (see Table 1). Even though environmental and social sustainability aspects capture what consumers associate most strongly with sustainability attributes (Catlin et al. 2017), economic sustainability attributes also influence consumer decision-making (Choi and Ng 2011; Balderjahn et al. 2018). In consumer communication, sustainability may be expressed (Bangsa and Schlegelmilch 2020), for example, through labels (e.g., FSC and PEFC labels) (Hansmann et al. 2006; Shoji et al. 2014; Holopainen et al. 2017), narrative claims, such as "environmentally friendly" or "sustainable" (Andac Guzel 2020; Higgins et al. 2020), and physical appearance, such as biodegradable packaging (Steenis et al. 2018). This study investigates the quality indicators of wooden interior materials in reference to environmental, social, and economic sustainability aspects as quality cues and attributes.

3 Analytical framework to assess wood product quality indicators

Most of the earlier wood industry studies have approached quality from the perspective of manufacturing (Garvin 1984a) and only a couple of them have investigated the perceived quality of wood (Costa et al. 2011; Toivonen 2012). Studies carried out in the 1990s focused mostly on quality indicators related to the product or supplier (Sinclair et al. 1993; Hansen and Bush 1996, 1999) and did not acknowledge the environmental aspects of wood as quality attributes. For example, when assessing industrial forest product quality in the context of office furniture, Sinclair et al. (1993) tested Garvin's (1984b) eight quality dimensions: performance, features, reliability, conformance,

durability, serviceability, aesthetics, and perceived quality. However, the results of Sinclair et al. (1993) did not provide support for the eight-dimensional structure of quality.

Furthermore, consumer perceptions of softwood lumber quality were examined in a couple of studies (Hansen and Bush 1996, 1999). Hansen and Bush (1996) combined the models by Garvin (1984b) and Parasuraman et al. (1988), who extended the thinking of Garvin by considering services as factors for quality. According to Parasuraman et al. (1988), there are five dimensions of service quality: service reliability, responsiveness, assurances, empathy, and tangibles. Hansen and Bush (1996) assumed that quality can be generalized across products and the dimensions of quality are the same for all (Zeithaml 1988), but modified the dimensions in several ways to make them more applicable to softwood lumber. In their results, quality characteristics were divided into five dimensions: supplier/salesperson characteristics, supplier facilities, supplier services, lumber performance, and lumber characteristics. In their subsequent work, Hansen and Bush (1999) developed a condensed measurement model for softwood lumber quality. Although Sinclair et al. (1993) and Hansen and Bush (1996, 1999) all emphasized the need to understand quality as perceived by the customer, these studies did not focus on consumers, but rather on the businesses involved in the supply of wood products.

Demand for sustainable forest-based production and products emerged especially in the early 2000s (Lähtinen et al. 2016b). In line with this, research also dedicated greater attention to connecting the views on wood product quality and sustainability. Employing the perceived quality approach, the studies of Costa et al. (2011) on wooden windows and Toivonen (2012) on wooden floors, panels, and furniture considered the environmental aspects of wood as quality attributes. Alongside the consideration of environmental views, Costa et al. (2011) included social aspects through perceived safety as a quality attribute and also acknowledged the role of consumer characteristics in the perceptions of wood product quality. They studied the influence of individual characteristics and information on the product quality perception of different wood product attributes, such as global quality, thermal insulation, acoustic insulation, maintenance, product life, aesthetics, environment, fire resistance, safety, and price, and their results showed that socioeconomic factors among certain product attributes affected the choice of window material.

Toivonen (2012) continued investigating perceived quality in the case of wooden products and suggested that perceived product quality should be understood as a hierarchical structure consisting of tangible and intangible dimensions. She assumed that the "total product" comprises two dimensions: a tangible one (the physical good) and an intangible one (services and other intangibles). The tangible dimension included different subdimensions, such as technical characteristics and appearance, while the intangible subdimensions were related to the supplier, service, information, and environment. However, she did not examine how consumer-related variables, such as sociodemographic factors, affect the perceived product quality.

There is evidence that social sustainability is linked with the use of wood products in interiors (Rice et al. 2006; Spetic et al. 2007; Gold and Rubik 2009; Nyrud and Bringlinsmark 2010), emphasizing the need to address wood product quality broadly on the basis of multiple sustainability aspects. In addition, alongside general sociodemographic factors such as gender and age, connections to forest ownership and involvement with the forest sector have also been found to affect consumer perceptions of wood products and forest industry businesses more generally (Luo et al. 2017, 2018; Ranacher et al. 2017; Aguilar et al. 2021).

By considering sustainability as a multidimensional entity comprising environmental, social, and economic aspects, which are also linked with technical issues, this study brings new insights on the existing knowledge on consumer studies in the context of wooden interior products. In previous studies on perceived wood product quality, consideration of sustainability has mainly regarded environmental aspects (Costa et al. 2011; Toivonen et al. 2012), while largely neglecting views

Fig. 1. Analytical framework of the study to assess consumer perceptions of wooden interior product quality as a combination of quality cues and attributes and their connections with consumers' sociodemographic background (mod. from the Model of the Quality Perception Process of Steenkamp 1989).

on social and economic sustainability as well as their linkages with technical durability. Fig. 1 illustrates the analytical framework of the study and presents how wooden interior product quality is in this study addressed as a construct, which comprises the perceptions of consumers on the quality indicators (e.g., quality cues and attributes) and connections with their sociodemographic background. The analytical framework has been formulated based on the Model of the Quality Perception Process (Steenkamp 1989).

4 Material and methods

4.1 Survey design and data gathering

The material of the study was gathered in two rounds in 2018 (first contact in late June, reminder for non-respondents in late July) with a questionnaire sent to 1000 people aged 18–74 living in Finland. The recipients of the questionnaire were selected from the Population Register Centre in Finland with a simple random sampling from the official Population Information System database. Since the database only includes postal addresses for residents in Finland, all materials (i.e., cover letter, questionnaire) were sent to the recipients in paper versions.

In the first round of material gathering, the questionnaire could only be returned by postal mail in order to facilitate tracking (i.e., number code placed in the returning envelope) of those who had already participated in the survey. The second round of data gathering and the reminder letter were targeted at non-respondents, who were given an opportunity to choose between a paper or electronic version of the questionnaire. For using the electronic questionnaire, both a URL link and QR Code were given in the reminder letter. As a result of the two-round material gathering, altogether 256 respondents filled out the questionnaire (response rate 25.6%); 158 of the questionnaires were returned in the first round of material gathering, and 100 (76 paper versions, 24 electronic versions) after the reminder letter was sent in the second round of data gathering. Two of the returned questionnaires were not filled and thus were removed from the final dataset. According to Kaplowitz et al. (2004), the response rate can be considered to be typical of mail and online surveys.

The questionnaire comprised many types of questions on wood products (for earlier results, see Lähtinen et al. 2019). This study employed questions connected to purchases of wooden interior products and information on the sociodemographic background of the respondents (i.e., gender, age, education, municipality of residence, forest sector involvement, forest ownership). Operationalization of the quality indicators to be assessed by the respondents as variables affecting their purchasing choices was based on a literature review of peer-reviewed journal articles connected to different aspects of wood product quality, marketing, and/or end users (Table 2). This approach made it possible to address quality as a diversified and multidimensional concept, which also comprises human perceptions of product attractiveness, instead of focusing purely on technical quality (e.g., sawnwood measured with established criteria and definition of defects such as knots, splits, twists, and wanes).

Table 2. Peer-reviewed journal articles used to operationalize the quality indicators of wooden interior products in the questionnaire.

Quality indicators	Wood product quality studies	Other wood product studies indirectly connected with quality
Wood species used in the product, e.g., oak, birch	--	Donovan et al. 2004; Nicholls et al. 2004; Brinberg et al. 2007; Bumgardner et al. 2007; Nicholls and Bumgardner 2007; Scholz and Decker 2007; Arowosoge and Tee 2010
Product is made of solid wood, e.g., furniture made of solid wood	--	Jonsson et al. 2008; Lindberg et al. 2013
Visual properties, e.g., surface patterns	Aesthetics (Sinclair et al. 1993); overall lumber appearance, lumber straightness (Hansen and Bush 1996, 1999); aesthetics (Costa et al. 2011); appearance/visuality (Toivonen 2012)	Knots (Broman et al. 2001); character marks (Bumgardner et al. 2009); grain (Arowosoge and Tee 2010); aesthetic attributes (Scholz and Decker 2007); aesthetics (Hakala et al. 2015)
Tactile properties, e.g., surface	--	Smoothness, hardness (Jonsson et al. 2008); smoothness, roughness, solidness (Lindberg et al. 2013); smoothness, roughness (Bhatta et al. 2017); smoothness (Ramanakoto et al. 2017)
Technical properties, e.g., solidity, hardness	Acoustics, structural integrity (Sinclair et al. 1993); stiffness/strength of lumber (Hansen and Bush 1996, 1999); global quality, thermal insulation, acoustic insulation (Costa et al. 2011); technical quality (Toivonen 2012)	Hardness (Jonsson et al. 2008); solidness (Lindberg et al. 2013)
Longevity, e.g., resistance against moisture and decay	Absence of failure, service life, resistance to wear (Sinclair et al. 1993); durability of lumber, failure rate, long service life (Hansen and Bush 1996, 1999); product life (Costa et al. 2011)	Water sensitivity, warping, resistance against insects (Balázs 2010)
Information related to, e.g., product origin, production process and environmental impacts	Received information (Costa et al. 2011); availability of information about the producer, availability of product information (Toivonen 2012)	Product information (Donovan et al. 2004); label information (Hansmann et al. 2006); information on source of timber (Aguilar and Cai 2010); product information (Osburg et al. 2016a)
Product certificates, e.g., Swan Ecolabel, PEFC, FSC	--	Bisgby and Ozanne 2002; Teisl et al. 2002; Jensen et al. 2003; Ozanne and Vlosky 2003; Anderson and Hansen 2004; O'Brien and Teisl 2004; Veisten and Solberg 2004; Hansmann et al. 2006; Aguilar and Cai 2010; Hakala et al. 2015; Paulin et al. 2018
Price, e.g., the price of wood material vs. other materials	Sinclair et al. (1993), Costa et al. (2011)	Pakarinen and Asikainen 2001; Bigsby and Ozanne 2002; Teisl et al. 2002; Anderson and Hansen 2004; Bumgardner et al. 2007; Balázs 2010; Kuzman et al. 2012; Hakala et al. 2015; Knauf 2015
Coziness, e.g., wood enhances hominess	--	Rice et al. 2006; Nyrud and Bringslimark 2010; Hu et al. 2016
Multifunctionality, e.g., wood has many applications	Multifunctionality of product (Sinclair et al. 1993); use properties (Toivonen 2012)	--
Personal values, e.g., expressing one's identity by using wood	Ability to enhance status of the user (Sinclair et al. 1993)	Ridoutt et al. 2002; Ridoutt et al. 2005
Origin, e.g., the domesticity of wood	Domestic origin (Toivonen 2012)	Paulin et al. 2018
Environmental aspects, e.g., environmental effects of wood	Environment (Costa et al. 2011); environmental friendliness (of the product) (Toivonen 2012)	Attributes of environmental impact (Pakarinen and Asikainen 2001); attributes of environmental impact (Donovan 2004); ecological aspects (Hakala et al. 2015)
Innovativeness, e.g., new ways to use wood in housing	--	Osburg et al. 2016b
Retailer, e.g., the salesperson's knowledge of wood	Supplier/salesperson characteristics (Hansen and Bush 1996; 1999); information conveyed by store advisors (Costa et al. 2011); service (related to the product), serviceability of the sales personnel (Toivonen 2012)	Place of purchasing (Arowosoge and Tee 2010); service, shopping experience (Ji et al. 2020)

Statements are measured on a five-point Likert scale (1 = not important at all –5 = very important)

Prior to the finalization of the questionnaire, face-to-face discussions with experts from interest organizations were held (i.e., the Central Union of Agricultural Producers and Forest Owners (MTK), the Finnish Sawmills Association and the Federation of the Finnish Woodworking Industries). The experts both pretested the questionnaire and checked the relevance of the questions from a business point of view to different phases of forestry-wood value chains (i.e., operations in forestry, manufacture and refinement of sawnwood for consumer products) (for value chain examples, see Lähtinen et al. 2016b). The purpose of the two-stage process (literature review, expert discussions) was to ensure the conceptual validity of the operationalized quality indicators (quality cues and attributes) with respect to both general wood product properties (e.g., species and technical properties) and sustainability features (e.g., product certificates and personal values).

Table 3 shows that the sociodemographic background by subcategories of the respondents is, with the exception of age classes, very similar to the Finnish population in 2018 (Statistics Finland 2021). This indicates that the data are applicable for use in assessing general consumer views in the country. However, comparable statistics on education, forest ownership (respondent or family member is a forest owner), and forest sector involvement (respondent has an education or job in forest industries or in a business branch connected to forest industries, e.g., transportation or building) were not available. Regarding forest ownership, in Finland there are approximately 600 000 non-industrial private forest landowners who possess at least two hectares of forest (appr. 11% of population) (Natural Resources Institute Finland 2021). The proportion of respondents who own

Table 3. Sociodemographic background of the respondents on the survey to assess their opinions on the wooden interior product quality (n = 256) in comparison with the population in Finland aged 18–74 years in 2018 (in total 3 947 859) (StatiFin).

	% respondents	% of people living in Finland
Gender		
Female	51.6	49.8
Male	48.4	50.2
Age		
18–34 years	19.9	29.0
35–59 years	38.3	44.2
60 years or older	41.8	26.7
Education		
Basic education	6.1	N/A
General upper secondary education	6.1	N/A
Vocational upper secondary education	35.9	N/A
Higher education at university of applied sciences	24.1	N/A
Higher education at university, other academic education	25.3	N/A
Other	2.5	N/A
Municipality of residence*		
Urban municipality	72.5	72.7
Semi-urban municipality	15.3	14.9
Rural municipality	12.2	12.4
Forest ownership (oneself or family member)		
Yes	33.7	N/A
No	66.3	N/A
Forest sector involvement		
Yes	15.1	N/A
No	84.9	N/A

* Classification based on Statistics Finland (https://www.stat.fi/meta/kas/til_kuntaryhmit_en.html).

forest is higher in this survey, as the question also covered the forest holdings of family members; in Finland, forests tend to be owned by families rather than individuals (Takala et al. 2017).

As a proxy for non-response bias, the sociodemographic profiles of the first and second round respondents were compared with each other (Armstrong and Overton 1977). The results of the Chi-Square Test of Independence (Berenson and Levine 2002) did not show any indications of statistically significant differences between early and late respondents, and thus it was assumed that non-response bias would not pose significant reliability risks in the results. In addition, at this point, the means and medians of respondent Likert-scale ratings on the wood quality indicators were checked by subcategories in each sociodemographic group to assess the distributions of those sub-datasets. This was implemented to choose between parametric and non-parametric methods in analyzing the impacts of sociodemographic factors on respondent opinions (Harpe 2016). The assessments showed differences in the distributions (i.e., differences in medians for some variables by sociodemographic subcategories), which was to be taken into account in the analysis of the data described next.

4.2 Data analysis with multivariate methods

The data were analyzed with IBM SPSS Statistics 25.0 software by employing multivariate research methods in two stages. In the first stage, it was determined whether there were any factors underlying the consumers' views on different quality indicators of wooden interior products. In the second stage, it was evaluated if the views described with the factors may be connected with the sociodemographic background of the respondents.

As methods of analysis, exploratory factor analysis (EFA) (Kim and Mueller 1978; Henson and Roberts 2006; Beavers et al. 2013), the nonparametric Mann-Whitney U test (equivalent to Student's t-test to compare two independent samples such as sociodemographic groups of respondents), and the nonparametric Kruskal-Wallis test (equivalent to ANOVA with three or more independent samples (Bergmann et al. 2000; Berenson et al. 2002) were employed. The nonparametric equivalents of parametric tests were chosen, as the data were not normally distributed (Nahm 2016). In addition, there were also differences in the distributions of ratings (i.e., responses on wooden quality indicators using the Likert scale) by respondents belonging to different sociodemographic subcategories (Harpe 2016).

In the first stage of analysis, EFA with Kaiser normalization, Maximum Likelihood Estimation, and Varimax rotation was executed by employing data on respondents' views on the quality indicators of wooden interior products. The EFA assumes that a particular phenomenon may be examined by identifying latent factors caused by covariation in the data of original variables, and which are smaller in number than the original variables. Implementation of the EFA is driven both by subjective considerations (e.g., in reference to the existing theoretical and empirical literature) and statistical measures to find the final solution. As a statistical background criterion, Kaiser's eigenvalue >1 rule was employed to define the number of factors to be retained. At this phase, the results were also scrutinized with Kaiser–Meyer–Olkin measures (a minimum value of 0.50 for sampling size adequacy was used) and Bartlett's test of sphericity (i.e., correlation between the original variables). To retain an individual variable in the models, a threshold factor loading value of 0.4 was used. For reaching a solution with empirical validity, the conceptual consistency of the factor loadings and their signs were additionally scrutinized. As an outcome of the EFAs, latent variables describing respondents' perceptions of the wooden interior product quality indicators were constructed.

In the second stage of analysis, nonparametric Mann-Whitney U tests and Kruskal-Wallis tests were executed to test the relationships between the respondents' sociodemographic vari-

ables (Table 3) and the latent variables describing respondents' views on wooden interior product quality features derived from the EFA. In the results of those analyses, as evidence of statistical significance, the threshold values were $0.05 \leq p$-value < 0.1 = suggestive evidence on statistical significance, $0.01 \leq p$-value < 0.05 = moderate evidence on statistical significance, and p-value < 0.01 = very strong evidence on statistical significance. We employed Mann-Whitney tests using two-category group comparisons (i.e., gender, forest ownership and forest sector involvement), and executed Kruskal-Wallis tests for group comparisons with more than two categories (i.e., age, education, and municipality of residence).

The results of the Mann-Whitney U tests and Kruskal-Wallis tests do not provide information on how different sociodemographic groups seem to value different features of wooden interior product quality. To gain insights on that, in the final phase of analysis, the average factor scores for the constructed factors were calculated by sociodemographic groups of respondents. Average factor scores may be considered as variables, which represent how much each of the respondents scores through individual variables (e.g., wooden interior product quality indicators) on each of the factors (Young and Pearce 2013). In the context of forest sciences, a similar approach has been used previously in studies by Häyrinen et al. (2015) and Ranacher et al. (2017).

5 Results

5.1 Consumer views on individual quality cues and attributes

Table 4 illustrates the variables used in the questionnaire to assess consumer views on the quality cues and attributes of wooden interior products. The results show that the least important variables (which 11.4–19.2% of the respondents considered "not important" or "not very important") were Personal values (e.g., expressing one's identity by using wood), Product certificates (e.g., the Swan Ecolabel, PEFC, FSC), Information (e.g., product origin, production process, and environmental impacts), and Innovativeness (e.g., new ways of using wood in housing). In contrast, the most important variables for respondents (which 79.5–90.3% of the respondents considered "quite important" or "very important") were Coziness (e.g., wood enhances the feeling of hominess), Longevity (e.g., resistance against moisture and decay), Technical properties (e.g., solidity, hardness), and Multifunctionality (e.g., wood has many applications). In reference to our analytical framework, the least important variables were extrinsic cues (i.e., information, certificates) and experience attributes (i.e., personal values, innovativeness). In comparison, the most valued ones comprised both intrinsic cues (i.e., technical properties) and experience attributes (i.e., coziness, multifunctionality, longevity).

5.2 Factor solutions for consumer perceptions of the quality features of wooden interior products

The EFA on respondents' opinions on different cues and attributes of wooden interior products resulted in a four-factor outcome. In all, 13 variables from the survey were included in the final factor solution, which explains about 59% of the variation in our data (Table 5). The omitted variables with factor loading values smaller than 0.4 were related to wood species, usage of solid wood in products, and price.

The Kaiser-Meyer-Olkin measure of factorability for the results is 0.837, supporting the applicability of the data for use in exploratory factor analysis. Bartlett's test of sphericity rejected the null hypothesis that no correlation among the original variables existed ($p = <0.001$). According

Table 4. Variables on quality indicators of wooden interior products addressed in the questionnaire and the proportions of respondents with different views on their importance (n = 256). The least valued variables are underlined, and the most valued variables are bolded in the table.

Variable	Not important %	Not very important %	Neither important nor without importance %	Quite important %	Very important %	Mean
Wood species used in the product, e.g., oak, birch	1.6	8.6	27.1	41.6	21.2	3.72
Product is made of solid wood, e.g., furniture made of solid wood	0.8	7.5	24.7	45.9	21.2	3.79
Visual properties, e.g., surface patterns	--	5.5	22.0	50.2	22.4	3.89
Tactile properties, e.g., surface	0.4	3.6	20.6	54.9	20.6	3.92
Technical properties, e.g., solidity, hardness	--	2.7	13.7	**58.8**	**24.7**	**4.05**
Longevity, e.g., resistance against moisture and decay	0.4	2.7	10.6	**44.7**	**41.6**	**4.24**
Information related to, e.g., product origin, production process and environmental impacts	0.8	11.4	29.5	41.3	16.9	3.62
Product certificates, e.g., Swan Ecolabel, PEFC, FSC	1.6	12.9	30.9	41.4	13.3	3.52
Price, e.g., the price of wood material vs. other materials	0.4	3.5	22.7	53.5	19.9	3.89
Coziness, e.g., wood enhances hominess	--	1.2	8.6	**51.2**	**39.1**	**4.28**
Multifunctionality, e.g., wood has many applications	0.8	4.7	15.0	**53.0**	**26.5**	**4.00**
Personal values, e.g., expressing one's identity by using wood	3.5	15.7	28.0	33.5	19.3	3.49
Origin, e.g., the domesticity of wood	0.4	7.0	19.1	43.8	29.7	3.95
Environmental aspects, e.g., environmental effects of wood	1.6	5.9	17.8	49.4	25.3	3.91
Innovativeness, e.g., new ways to use wood in housing	1.2	10.2	26.8	45.7	16.1	3.65
Retailer, e.g., the salesperson's knowledge of wood	2.7	7.8	26.2	37.9	25.4	3.75

Table 5. Results from the final rotated four-factor solution on the variables affecting the perceived quality of wooden interior products. Bolded values are the highest factor loadings in absolute values.

Variable	Communalities (Extraction)	Factor 1 Environmental friendliness	Factor 2 Fit with lifestyle and home design	Factor 3 Visual and tactile attractiveness	Factor 4 Technical solidity
Information related to, e.g., product origin, production process, and environmental effects	0.767	**0.847**	0.171	0.058	0.131
Product certificates, e.g., Swan Ecolabel, PEFC, FSC	0.725	**0.816**	0.063	0.086	0.220
Origin, e.g., the domesticity of wood	0.576	**0.648**	0.346	0.117	0.149
Environmental aspects, e.g., environmental effects of wood	0.555	**0.670**	0.256	0.119	0.163
Coziness, e.g., wood enhances hominess	0.456	0.070	**0.603**	0.243	0.167
Multifunctionality, e.g., wood has many applications	0.657	0.175	**0.740**	0.031	0.277
Personal values, e.g., expressing one's identity by using wood	0.494	0.303	**0.602**	0.196	0.032
Innovativeness, e.g., new ways to use wood in housing	0.558	0.414	**0.564**	0.181	0.188
Visual properties, e.g., surface patterns	0.999	0.036	0.174	**0.976**	0.126
Tactile properties, e.g., surface	0.419	0.188	0.202	**0.572**	0.127
Technical properties, e.g., solidity, hardness	0.404	0.151	0.196	0.203	**0.549**
Longevity, e.g., resistance against moisture and decay	0.770	0.144	0.113	0.024	**0.858**
Retailer, e.g., the salesperson's knowledge of wood	0.301	0.276	0.194	0.115	**0.417**
Cronbach's a		0.870	0.780	0.763	0.665
Eigenvalues		5.138	1.594	1.261	1.102
Explained variance, %		15.774	29.442	7.309	6.543

to the results, the quality indicators can be grouped into four factors describing the quality features of wooden interior products: perceived environmental sustainability of the product (Factor 1: Environmental friendliness), perceived social benefits in use at home (Factor 2: Fit with lifestyle and home design), perceived aesthetics and appeal of the surface of the final product (Factor 3: Visual and tactile attractiveness), and perceived technical sustainability and information received at retail store (Factor 4: Technical solidity).

The results indicate that the factors connect in multiple ways with sustainability and different value chain phases. The "Environmental friendliness" factor comprises extrinsic cues and credence attributes describing the environmental sustainability aspects of processes and the final product, while "Fit with lifestyle and home design" relates to social issues (e.g., human wellbeing). It is composed of experience attributes (i.e., coziness, personal values, multifunctionality, and innovativeness). From the perspective of value-chain phases, all attributes connect only to the appreciation of interior wooden product qualities revealed at the actual consumption phase. Compared to other factors, "Visual and tactile attractiveness" is the only factor that is solely comprised of intrinsic cues (i.e., visual properties, tactile properties). In "Technical solidity," one of the attributes directly connects with intrinsic cues (i.e., technical properties), one with experience attributes (i.e., longevity), and one with extrinsic cues (i.e., retailer) that relate to the salesperson's knowledge of wood.

Fig. 2 illustrates the connections between the four-factor solution and a value chain of carpentry products, which comprises forest management and logging (i.e., operations in forestry), processing of wooden interior products (i.e., manufacture and refinement of sawnwood for consumer products), and the utilization of the products by end users. In comparison with the first and second factors describing consumer perceptions of environmental and social sustainability, both the third and fourth factors are more related only to the properties of the final products from the perspective of either attractiveness or solidity. In addition, while the "Visual and tactile attractiveness" factor describes the existence of consumer preferences mainly driven by self-evaluated properties of the product, which are subjective and not necessarily rational, the "Technical solidity" factor is an indication of the existence of value preferences that are more connected to the rational evaluation of the applicability of wooden interior products for a particular use. In addition, the longevity of products is also connected to long-term economic benefits due to, for example, the possibilities for maintenance and reuse instead of demolition.

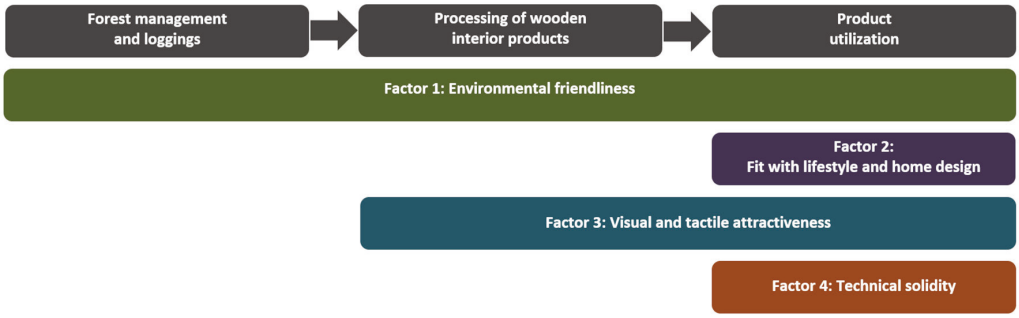

Fig. 2. Connections between four-factor solution for consumer views on wooden interior product quality and different phases of forestry-wood value chains.

5.3 Connections between consumer perceptions of wooden interior product quality and sociodemographic background

Mann-Whitney results on two-category sociodemographic groups (i.e., gender, forest ownership, forest sector involvement) are presented in Table 6, and Kruskal-Wallis test results for sociodemographic groups with more than two categories (i.e., age, education, municipality of residence) are illustrated in Table 7. Apart from municipality of residence, all other sociodemographic variables showed signs of being statistically significantly related to at least some latent variables on respondent views on the quality features of wooden interior products.

For "Environmental friendliness," there is statistical evidence that age is a sociodemographic characteristic connected with differing views on wooden interior product quality features (for all age groups $p=0.037$). The opinions of respondents varied especially between those aged 18–34 and 60 or older ($p=0.013$). According to statistical analysis, opinions linked with "Fit with lifestyle and home design" were especially related to gender ($p=0.028$), education ($p=0.031$), forest ownership ($p=0.068$), and forest sector involvement ($p=0.004$), while for views on "Visual and tactile attractiveness" statistical evidence was found only for a relationship with gender (p-value 0.082). Based on the statistical analysis, "Technical solidity" was linked to forest sector involvement ($p=0.023$) and education ($p=0.001$).

Furthermore, the average factor scores for "Environmental friendliness", "Fit with lifestyle and home design", "Visual and tactile attractiveness", and "Technical solidity" were calculated by sociodemographic groups of respondents (indications of statistically significant differences between groups are also shown in Figs. S1–S5, see Supplementary file S1 at https://doi.org/10.14214/sf.10605). Such results for municipality of residence are not illustrated due to the lack of indications of statistically significant differences between respondents living in urban, semi-urban, or rural areas. For "Environmental friendliness," the higher average factor scores originated from ratings given by respondents aged 60 or older than those aged 18–34 while in the case of "Fit with lifestyle and home design" and "Visual and tactile attractiveness" the average scores were higher in the group of females than males. "Fit with lifestyle and home design" also received higher averages for factor scores among those with connections to forest ownership and forest sector involvement than from those without such linkages. Furthermore, for "Fit with lifestyle and home design", the higher average factor scores originated from ratings given by respondents with vocational upper secondary education than respondents with general upper secondary education, basic education,

Table 6. Mann-Whitney U test results, which showed statistically significant differences in respondent views on wooden interior product quality indicators (i.e., factors derived from exploratory factor analysis) by sociodemographic groups.

Factor	Groups compared	*p*-value
Fit with lifestyle and home design	Female vs. male	0.028**
Visual and tactile attractiveness	Female vs. male	0.082*
Fit with lifestyle and home design	Forest sector involvement vs. no forest sector involvement	0.004***
Technical solidity	Forest sector involvement vs. no forest sector involvement	0.023**
Fit with lifestyle and home design	Forest ownership vs. no forest ownership	0.068*

* = Suggestive evidence on statistical significance = 0.05 ≤ p-value < 0.1;
** = Moderate evidence on statistical significance = 0.01 ≤ p-value < 0.05;
*** = Very strong evidence on statistical significance = < 0.01 p-value.

Table 7. Kruskal-Wallis test results, which showed statistically significant differences in respondent views on wooden interior product quality indicators (i.e., factors derived from exploratory factor analysis) by sociodemographic groups.

Factor	Groups compared	*p*-value for all groups	*p*-value for groupwise comparisons
Environmental friendliness	All age groups	0.037**	
	18–34 years vs. 35–59 years		0.238
	18–34 years vs. 60 years or older		0.013**
	35–59 years vs. 60 years or older		0.335
Fit with lifestyle and home design	All education groups	0.031**	
	General upper secondary education vs. higher education at university, other academic education		0.050**
	General upper secondary education vs. vocational upper secondary education		0.009***
	Basic education vs. vocational upper secondary education		0.037**
	Vocational upper secondary education vs. higher education at university of applied sciences		0.092*
Technical solidity	All education groups	0.001***	
	Basic education vs. vocational upper secondary education		0.012**
	Basic education vs. general upper secondary education		0.013**
	Higher education at university, other academic education vs. vocational upper secondary education		0.001***
	Higher education at university, other academic education vs. general upper secondary education		0.006***
	Vocational upper secondary education vs. higher education at university of applied sciences		0.022**
	Higher education at university of applied sciences vs. general upper secondary education		0.039**

* = Suggestive evidence on statistical significance = $0.05 \leq p$-value < 0.1;
** = Moderate evidence on statistical significance = $0.01 \leq p$-value < 0.05;
*** = Very strong evidence on statistical significance = < 0.01 p-value.

or higher education at the university of applied sciences. In addition, both the respondents with general and vocational upper secondary education and those with forest sector involvement gave higher average scores to the "Technical solidity" of wooden interior products than the respondents with other types of educational backgrounds or those without forest sector involvement.

6 Discussion

The purpose of the study was to provide information on how sustainability issues connect to consumer perceptions of quality in the case of wooden interior products. As an analytical framework, we employed the Model of the Quality Perception Process (Steenkamp 1989) for identification of the quality indicators by using peer-reviewed journal articles linked with different aspects of wood product quality, marketing, and/or end users.

According to the results of exploratory factor analysis (EFA), the quality indicators can be grouped into four latent variables describing consumer perceptions of the quality features of wooden interior products (i.e., four factors that explained 59% of variation in the data): "Environmental friendliness", "Fit with lifestyle and home design", "Visual and tactile attractiveness",

and "Technical solidity", which are in multiple ways connected with sustainability (e.g., perceived environmental or social sustainability, or technical durability). In addition, technical durability is also linked with environmental and economic sustainability, for example, through the repairability of wooden interior products. Earlier studies such as Toppinen et al. (2013) have also arrived at similar findings on the connections between consumer preferences for environmental, economic, or social sustainability.

In the results, "Fit with lifestyle and home design" connects with seeking individual well-being in home environment in the form of social sustainability, while "Visual and tactile attractiveness" describes the appeal of the final products and does not reflect any preferences for sustainable consumption. However, the factors of "Environmental friendliness" and "Technological solidity" are more comprehensively connected to various sustainability aspects at different phases of forestry-wood value chains. "Environmental friendliness" connects to altruistic expectations on environmental sustainability, and although "Technical solidity" as such refers to preferences concerning the intrinsic technical properties of products, the longevity of wooden interior products is also linked with environmental sustainability. This is especially the case when the raw material originates from sustainably managed forests and the processing of the final products has been environmentally and socially responsible.

Furthermore, forest management and logging have varying environmental impacts, and if those practices are appropriate in specific habitats from the perspective of both environmental and technical aspects, synergic sustainability benefits may be gained. For example, forest management practices can be aligned to enhance both multiple ecosystem services and timber quality (Holm 2015). In processing, for example, automatization in scaling and sorting of logs and sawnwood enables increasing efficiency (e.g., decrease in use of virgin materials and environmental impacts) and improving the technical quality of wooden interior products (e.g., sawnwood grading). Finally, in addition to the choice of the right materials for the right purposes (e.g., product information or knowledge of retailers), the technical durability of wooden interior products is affected by, for example, surface treatments (e.g., environmentally friendly thermal or chemical modifications), and the life-cycle of products can be extended.

Different types of purchasing choices may all result in sustainable consumption (e.g., technical durability connects with longevity, which may support environmental sustainability). Thus, it is important that consumers with varying preferences are provided with comprehensive information about the products, especially to avoid prejudices caused by lack of knowledge (Lähtinen et al. 2019). Aligned with our results on "Environmental friendliness" and "Technical solidity" in particular, earlier studies have found that consumers appreciate both the environmental (Anderson and Hansen 2004; Roos and Hugosson 2008; Roos and Nyrud 2008; Aguilar and Cai 2010; Paulin et al. 2018) and technical properties (Lähtinen et al. 2019; Kylkilahti et al. 2020; Khojasteh-Khosro et al. 2020) of wooden products in their homes. Furthermore, although some consumers may appreciate certain intrinsic technical properties of wood, for others prejudices due to deficiencies in their knowledge on more extrinsic cues (i.e., information on technical properties) may hinder the use of wood products in homes (Lähtinen et al. 2019).

Connected to our results on consumer expectations on "Fit with lifestyle and home design" and "Visual and tactile attractiveness," evidence on similar consumer preferences has also been gained in earlier studies. For example, according to Häyrinen et al. (2020) and Viholainen et al. (2020), consumers consider wooden materials to be cozy. In addition, there is also evidence that the use of wood in housing construction affects homeowners' perceptions of their identities (Ridoutt et al. 2005). Especially with respect to the visual and tactile properties of wood, it has been found that consumers prefer smooth surfaces in particular (De Morais and Pereira 2015; Ramanakoto et al. 2017; Ramanakoto et al. 2019), and that by using vision and touch they are capable of distin-

guishing natural wood from artificial materials (Overlievt and Soto-Faraco 2011). Yet, although consumers have been found to appreciate the naturalness of wood in the home environment (Jonsson et al. 2008; Nyrud and Bringslimark 2010; Bhatta et al. 2017; Moresová et al. 2019), this does not necessarily lead to sustainable purchasing behavior. In particular, if consumers lack interest in the environmental or technical properties of wooden interior products, which leads them to choose offerings that cannot be repaired, reused, or recycled, preferring wood products as such does not necessarily lead to sustainable consumption choices.

Regarding the connections between consumer perceptions of wooden interior product quality and their sociodemographic background, our Mann-Whitney U test and Kruskal-Wallis test results showed that statistical indications of such phenomena seem to exist. In general, differences between respondents were found to exist by gender, age, education, forest ownership, and forest sector involvement. According to the results, the municipality of residence did not seem to relate to consumers' perceptions of the quality features of wooden interior products.

The environmental sustainability of wooden interior products (i.e., "Environmental friendliness") was rated higher by older respondents (60 years old or older) than younger respondents (18–34 years old). In the context of Finland, Holopainen et al. (2014) have obtained similar findings that older consumers especially value the sustainability of wood products, while in an international context, younger consumers have been commonly seen as a group of consumers that especially appreciates their environmental properties (Thompson et al. 2010; Høibø et al. 2015). Our results indicate that appreciation of the environmental sustainability of wood interior products may not be straightforwardly connected to younger generations, but may be affected by factors such as cultural traditions, experiences, and knowledge of using wood in the home environment in either interiors or load-bearing structures (Lähtinen et al. 2021). This is also an indication that, similar to sustainability aspects, linkages between intrinsic and extrinsic properties are multidimensional and support each other as factors of quality in the eyes of consumers.

Preferences for social well-being (i.e., "Fit with lifestyle and home design") was in comparison with other groups of respondents mostly valued by females, respondents with vocational upper secondary education, forest owners (respondent or family member), and respondents with forest sector involvement (education or profession). In earlier studies, forest ownership (Ranacher et al. 2017) and forest sector involvement (Aguilar et al. 2021) have been found to affect consumer views on forest and wood products in general. However, according to our knowledge there is no previous research information on how gender or other sociodemographic variables might be linked with consumer expectations on wooden interior products as a part of their self-identity in the home environment. For example, for some groups of consumers, wooden interiors might not be primarily connected to home decoration with finished products, but instead to the possibility to express oneself with more demanding do-it-yourself building and design projects. In addition, the aim of seeking to foster well-being benefits in the home environment does not directly indicate that other wooden product quality aspects would not matter. These aspects may also be important and such consumers might prefer wood in their home environment because they perceive it as an environmentally sustainable material.

The visual and tactile intrinsic cues of wooden interior products (i.e., "Visual and tactile attractiveness") were more valued by females than men. In previous studies, gender has been found to affect the preferences for different wood species (Nicholls and Bumgardner 2007) and wooden panels (Nicholls and Barber 2010). Furthermore, wood character marks have been found to increase willingness-to-pay among female consumers (Bumgardner et al. 2009). Thus, our results support the existing information on the differences in visual and tactile wood product properties by gender.

The technical aspects of wooden interior products (i.e., "Technical solidity"), were especially appreciated by respondents with a vocational or general upper secondary education and

those with forest sector involvement compared to respondents with higher education (universities or other academic education) or those without forest sector involvement. To our best knowledge, the effects of education or forest sector involvement on the appreciation of perceived technical sustainability have not been studied before. Our results may be explained by the fact that people with blue collar professions and/or connections with the forest sector may have more personal experiences of working with wood and the intrinsic properties of wood products, and are thus also more aware of the variety of wooden interior products (e.g., species, surface treatments, properties of final products). As a result of this, they may also have more skills to evaluate the technical properties of wood products and greater interest in acquiring more information on them than those respondents without specific personal experience or knowledge on, for example, the variety of timber products available in the markets.

The findings of our study show that consumer perceptions of wooden interior product quality are not affected solely by the physical attributes of wood products. Instead, preferences are much more complex phenomena driven by culture, experiences, lifestyle, and knowledge, which are either directly or indirectly reflected in views and knowledge on wooden interior products in relation to both quality cues and attributes. Indications of such patterns can be perceived especially through the results on connections between sociodemographic factors such as forest ownership, which a study by Ranacher et al. (2017) also found to be connected with consumer attitudes toward forest-based services and products. In addition, preferences other than the ones related to environmental sustainability and intrinsic properties of wood products may also result in sustainable choices (e.g., technical durability) if environmentally responsible practices are followed in forest management, logging, and manufacturing processes. Regarding preferences on technical durability, in our results respondents with lower education levels seem to have more sustainable wooden interior product quality preferences than others.

It is also worth noting that due to the complexity of drivers affecting perceptions of wooden interior product quality, one may not straightforwardly conclude that some sociodemographic groups would act more responsibly than others. For example, our results show that in the context of wooden interior products, it is not self-evident that younger generations are environmentally aware. It must also be kept in mind that although a consumer may especially appreciate some quality attributes in wooden interior products, she/he may also have other, less conscious views on products that are reflected in his/her product preferences. For example, the perceived well-being benefits received through wooden interior products in home environments may be driven by a consumer's interest in positioning him-/herself as someone who appreciates the utilization of durable high-quality materials. Regarding our results, broader linkages with self-identity could also explain why, for example, forest sector involvement seems to be connected with appreciation of the social benefits of wooden interior products in home environments.

As a limitation of the study, it must be kept in mind that although the random sample of consumers comprised 1000 recipients, and the response rate (25.6%) was relatively high as compared with surveys in general (Kaplowitz et al. 2004), the results are still based on a limited number of consumers living in Finland. In addition, most of the respondents lived in urban municipalities (72.5%). It is also worth pointing out that our survey questions measured consumer perceptions of specific wooden interior product attributes instead of, for example, addressing the choices consumers make in actual purchasing situations. However, since it is challenging to acquire reliable information on purchasing behavior through surveys, in the future it would be useful to gather consumer data in actual purchasing contexts (e.g., retail stores). This would enable obtaining more profound knowledge in a real-life situation such as with respect to how different sensory (e.g., smell, touch) and psychographic (e.g., experience, beliefs, knowledge, personal values) aspects affect consumer purchasing choices (Osburg 2016; Luo et al. 2018; Tan et al. 2019; Kylkilahti et al. 2020).

Enhancing sustainable consumption of wood products enables seeking possibilities for increasing carbon storage and reducing greenhouse gas emissions in housing (Petersen and Solberg 2005; Luo et al. 2018). According to our findings, consumers perceive the features of wooden interior product quality as mixes of intrinsic and extrinsic cues, and experience and credence attributes, which are linked with sociodemographic characteristics. In addition, especially from the perspective of the self-identity of consumers, wooden interior products should be designed to meet different types of product quality expectations in the home environment. In all, our results indicate that the sustainability of wooden interior products does not only relate to environmental aspects or particular value chain phases. Consequently, sustainability should be addressed as a multidimensional issue with environmental, social, and economic aspects connected with different phases of forestry-wood value chains. In the future, more information is needed on how consumers with different motivations evaluate the dimensions of sustainability in the context of wood product purchasing choices.

Supplementary files

S1.pdf; Average factor scores by sociodemographic groups, available at https://doi.org/10.14214/sf.10605.

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Authors' contributions

Charlotta Harju: Survey design for data gathering, implementation of data gathering, idea of the study, selection of the theoretical framework, formulation of the research questions, design and implementation of the analysis, interpretation of the results, scientific writing of the manuscript, and finalization of the article.

Katja Lähtinen: Survey design for data gathering, formulation of the research questions, design and implementation of the analysis, interpretation of the results, and scientific writing of the manuscript.

Declaration of openness of research materials and data

The data were collected from Finnish consumers and it is confidential and thus not available. All calculus has been implemented according to SPSS standards (visual user interface), and opened up in detail in the text. Thus, those descriptions are comparable with syntax coding.

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Supplementary file S1: Average factor scores by sociodemographic groups

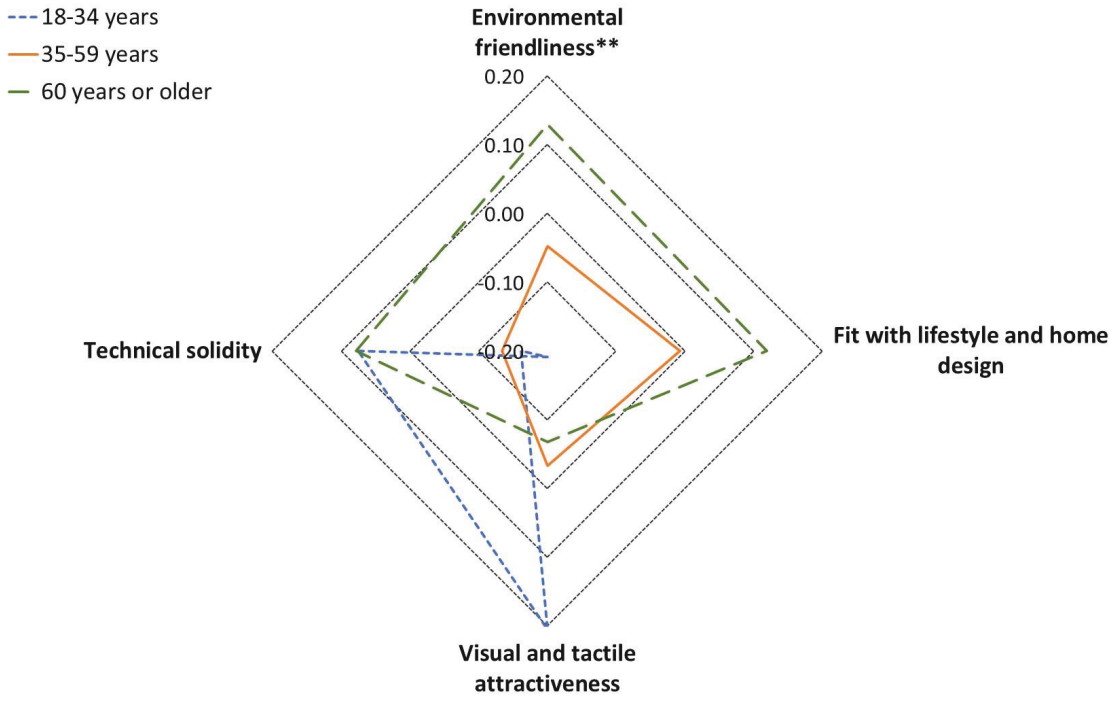

Figure S1. Average factor scores for respondent views on wooden interior product quality features by age. According to Kruskal-Wallis test results, respondents aged 60 or older are more likely to value "Environmental friendliness" than 18-34-year-old respondents (moderate statistical evidence denoted with **).

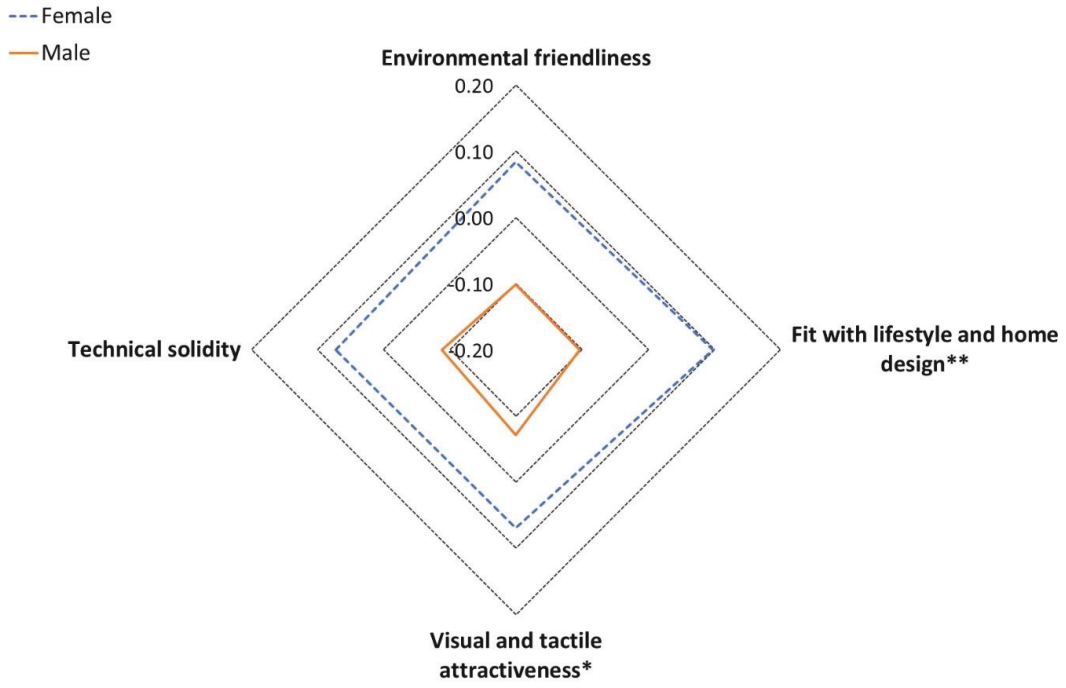

Figure S2. Average factor scores for views on wooden interior product quality features by gender. According to Mann-Whitney U test results, females are more likely to value "Fit with lifestyle and home design" (moderate statistical evidence denoted with **) and "Visual and tactile attractiveness" (suggestive statistical evidence *) than males.

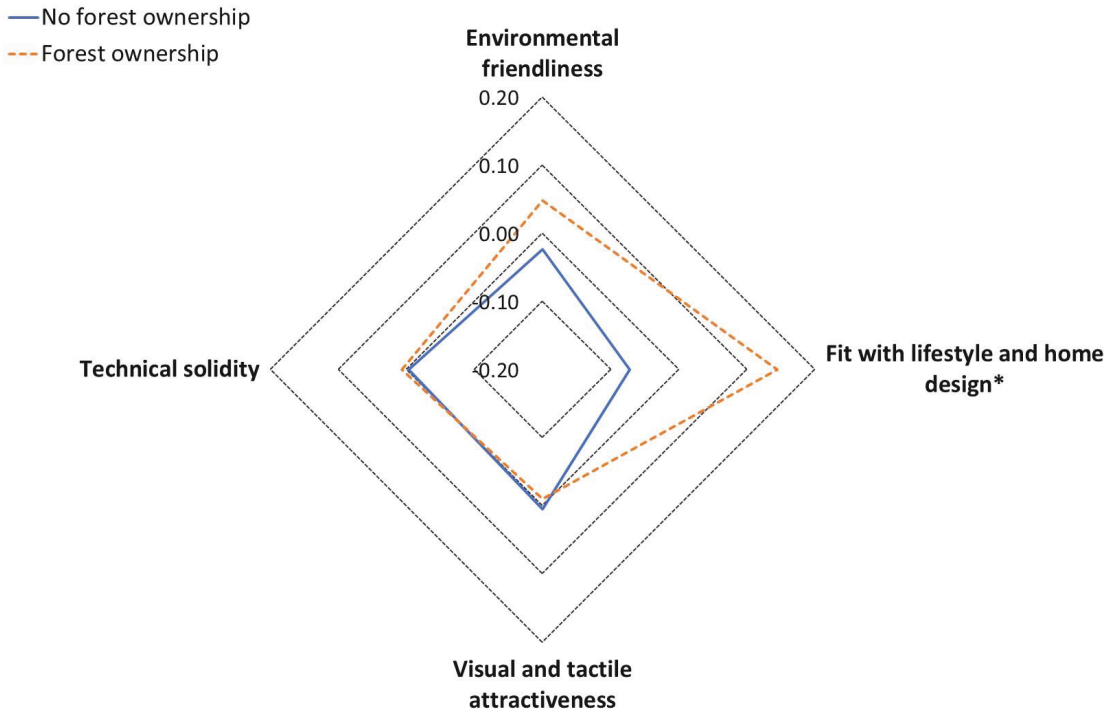

Figure S3. Average factor scores for respondent views on wooden interior product quality features by forest ownership. According to Mann-Whitney U test results, forest owners are more likely to value "Fit with lifestyle and home design" (suggestive statistical evidence denoted with *) than other respondents.

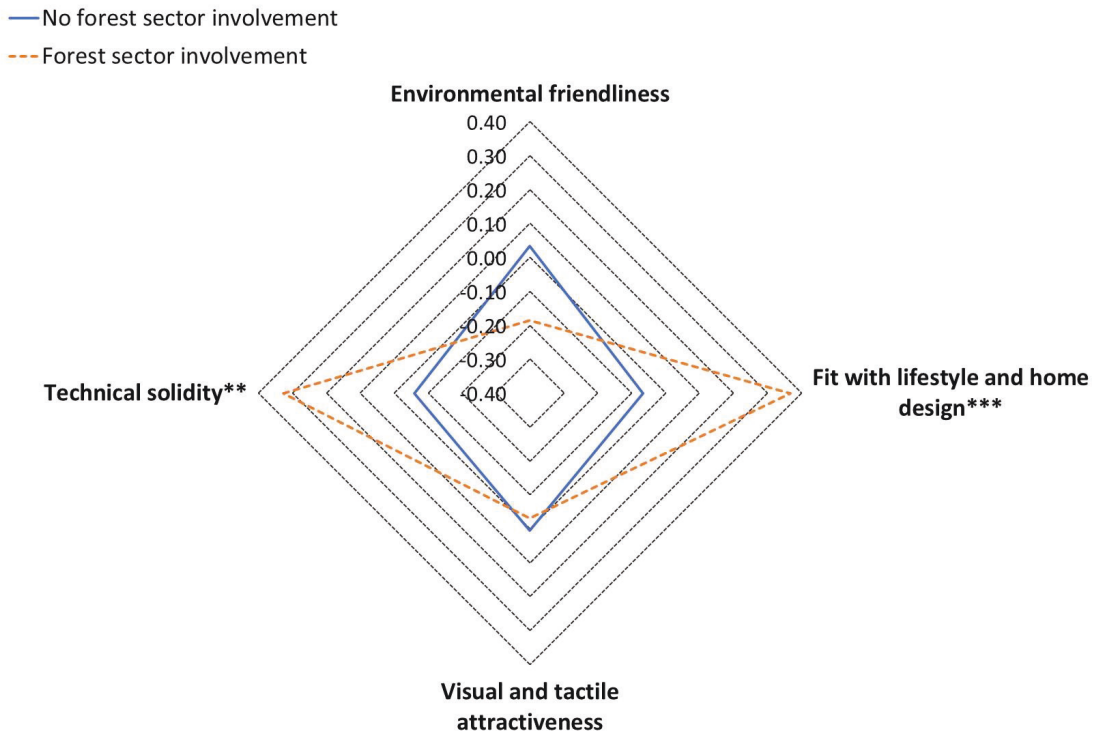

Figure S4. Average factor scores for views on wooden interior product quality features by forest sector involvement. According to Mann-Whitney U test results, respondents with forest sector involvement are more likely to value "Fit with lifestyle and home design" (very strong statistical evidence denoted with ***) and "Technical solidity" (moderate statistical evidence **) than others.

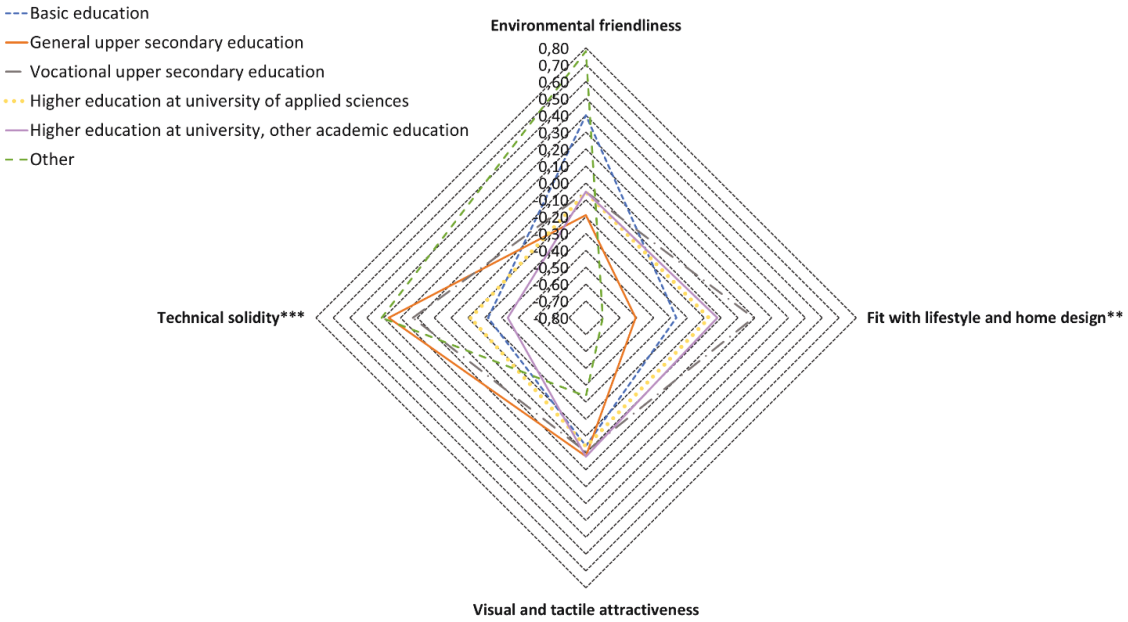

Figure S5. Average factor scores for views on wooden interior product quality features by education. According to Kruskal-Wallis test results, "Technical solidity" (very strong statistical evidence denoted with ***) is more likely to be more valued by respondents with general upper and vocational upper secondary education compared to others, and "Fit with lifestyle and home design" (moderate statistical evidence**) is more likely to be more valued by respondents with vocational upper secondary education compared to others.