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REVIEW PAPER

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

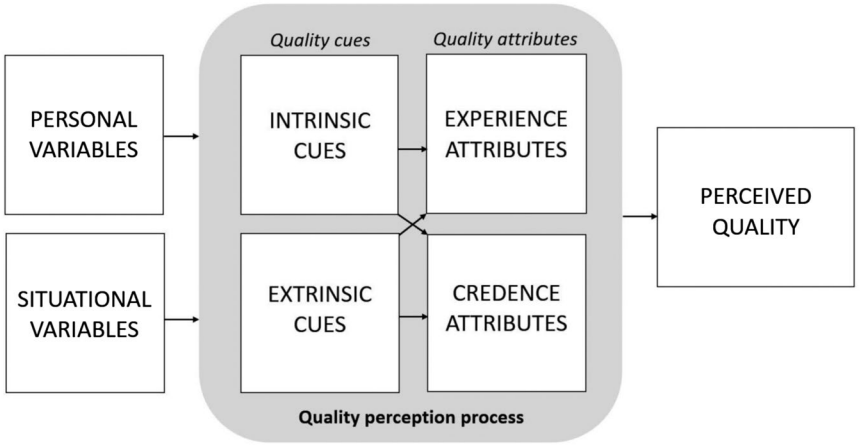

FIGURE 1 Analytical framework of the study to examine the perceived quality of wooden building materials (mod. from the Model of the Quality Perception Process of Steenkamp, 1989)

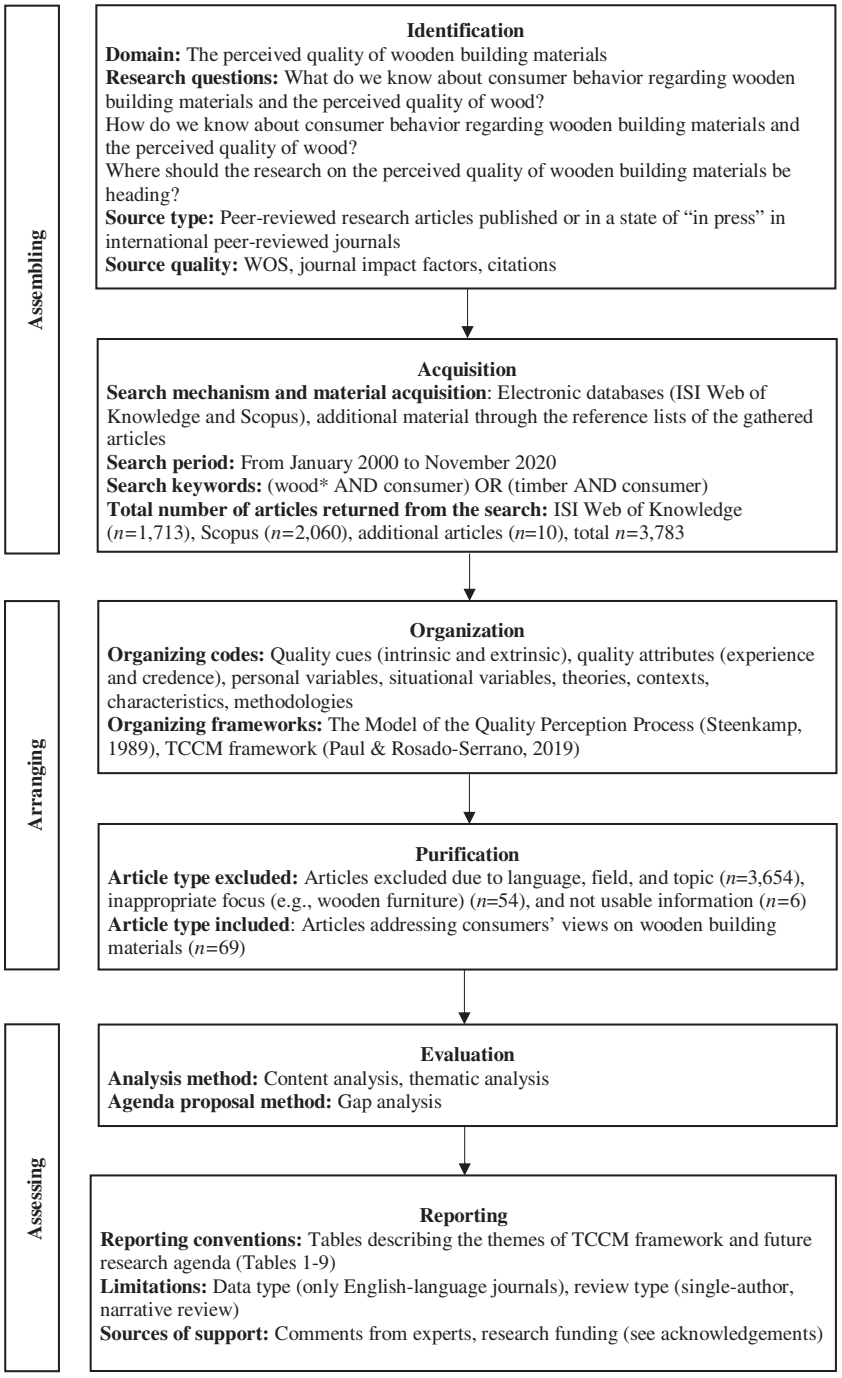

FIGURE 2 Implementation of the systematic literature review according to the SPAR-4-SLR protocol (Paul et al., 2021)

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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