

# How Customers of Small and Medium Wood-processing Slovak Enterprises Perceive a Green Product

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Differentiating and ecologizing of products have gained an increasing amount of importance, and green logistics has achieved an irreplaceable position as an important tool for competitiveness. Small and medium-sized enterprises (SMEs), in this case wood-processing enterprises, can achieve this position through the innovation of green products. Based on the results of research focused on finding out how customers perceive green wood products, the objective of this work is to propose possible ways to implement green products in wood-processing SMEs in Slovakia, while taking into account the requirements of customers related to green products. The research was evaluated by methods of testing the statistical hypothesis (binomial test, Chi-square test, Friedman test, and Wilcoxon test), descriptive statistics, and data visualization. The survey revealed that primary reasons why customers of wood-processing SMEs do not buy green wood products is their high price and an insufficient amount of available information about them. In addition to the price, respondents mainly take the quality and safety of the products into account when making purchases. Based on the analysis performed, three basic green strategies focused on product innovation are proposed for consideration by wood-processing SMEs in Slovakia and elsewhere.

*Keywords:* Green product; Wood-processing; Small and medium enterprises (SMEs); Customer

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## INTRODUCTION

Sustainable solutions are production changes and changes to services or systems that minimize the negative effects and maximize the positive effects on the environment (Lejano and Stokols 2013). One of the criteria for producing new wood products is the concept of design for the environment. Measuring and understanding the eco-qualities of wood products is important for all enterprises regardless of whether or not green strategies are implemented.

Within the strategic orientation of successful enterprises, focusing on customers is important, and so is the need to provide goods on time and to the right place (Uramová *et al.* 2012). As Palúch *et al.* (2012) noted, successful enterprises are flexible in responding to the requirements of their customers and they benefit from the market by including a requirement to protect the environment in the production and development phases of a product. The concept of green wood products is related to sustainable manufacturing and supply chain management, which involves environmentally friendly, planet-friendly, and people-friendly standards, technologies and practices (Palevich 2012).

Based on the analysis of the different authors (Unruh and Ettensin 2010; Dangelico and Pontrandolfo 2010; Dangelico and Devashish 2010; Sousa and Wallace 2006;

Kaebnick and Soriano 2000) and their concepts of a green product, a definition of a green product can be proposed that takes into account its characteristics. A wood green product:

- uses low level timber, certified wood, and local wood resources;
- is designed/produced in such way that it can be re-used, repeatedly dismantled, and re-produced (eco design);
- is made from recyclable (recycled wood) and biologically degradable materials (use of natural or low toxic coatings, low use of impregnating agents);
- uses less materials (smaller dimensions) and energy for its production (minimally processed wood), or, alternatively, renewable energy resources are used;
- uses lower amount of packaging during production, handling, transportation, and use; and
- is ecologically disposable (use of combustion residues as fertilizer).

There is a rising awareness of how important forests are for sequestering and storing carbon from CO<sub>2</sub>, and mitigating global warming. Wood products also play a significant role in extending the time that carbon remains stored. Furthermore, recycling will also enhance this attribute. As to the issue of forest stewardship and sustainable development, what needs to be considered is the challenge of practicing sustainable forestry, which suggests that every harvested tree must be replaced; wood being the only renewable construction material, and the fact that wood in a shelter has to last as long as it takes the forest to replace it. At the same time, it is important to add that wood construction has the softest environmental footprint (de la Roche and Gaston 2001). This all may greatly affect the customers' perception of wood as eco-friendly raw material. Current research indicates the existence of purchase barriers concerning green products, including wood products, which can be ascribed to consumers' mistrust regarding the non-observable environmental impact of wood products (Appelhanz *et al.* 2016). Another aspect that needs to be considered is that to achieve a more efficient resource utilization, it is important to use not only the virgin material (forest wood), but also by-products (sawmill by-product), and waste material (recovered from waste wood) (Osburg *et al.* 2016).

Wood is a renewable material and an ecological material of the future. It can be processed in a waste-free way, is recyclable, and does not burden or harm the environment during its development or disposal.

The wood-processing industry in the Slovak Republic is relatively independent because it is built on a sustainable domestic resource; therefore, it is able to permanently show an active balance with foreign trade. In relation to the positives of using natural resources, their suitable geographic location, and their acceptable energy demands for processing wood, the wood-processing industry represents an important industrial field in the Slovak national economy and enables the further development of small and medium enterprises (SMEs) (Hajdúchová *et al.* 2016). The wood-processing industry is composed of the wood, furniture, and cellulose-paper industries, which are based on processing a domestic ecological resource.

Small and medium enterprises represent a crucial segment of the economic potential in most countries around the world, which is also true in the Slovak Republic (Sedliačiková *et al.* 2016). According to data from the Slovak Business Agency in 2016, SMEs in the Slovak Republic represent as much as 99.9% of the total number of entrepreneurial subjects, provide job opportunities for nearly 75% of the active workforce, and contribute to the gross production and creation of added value by more than 50% (Malá *et al.* 2017b).

It may be assumed that there is a considerable potential for modernization and development of the wood-processing industry in the field of green logistics, where opportunities are seen for reducing negative environmental impacts, not only in wood-processing, but also in wood products manufacturing.

Consumers have recently been seeking green wood products more frequently. According to a survey performed by the German institute EMNID, as many as 92% of the 1,000 respondents prefer products from certified wood with the condition that its price would be the same as that of a common product. Interestingly, 70% of the respondents would choose wood from sustainable forests, even with higher prices (Knauf 2015). The wood-processing industry has been a leader in the development of the Environmental Product Declaration, which is a standardized, third-party-verified label that communicates the environmental performance of a product based on the assessment of its life cycle.

Current ecological, health, economic, and aesthetic imperatives have long labelled wood as the material of the century, which requires a renewable material that is environmentally friendly, energy-efficient, health-beneficial, safe, and visually appealing. Wood products are able to preserve carbon for a long period of time and thus stabilize its occurrence in nature and reduce the impact of global climate change.

When protecting the environment, one of the main goals of green logistics should be to develop highly efficient products that are environmentally friendly and enable customers to reduce their energy consumption, overhead costs, carbon dioxide emissions, and overall negative impact on the environment. For this purpose, wood-processing enterprises should develop products that are green and highly efficient, and at the same time meet or exceed the requirements set by the law, norms, and customers' expectations.

Customers prefer products that are environmentally friendly, and therefore they have a positive attitude towards enterprises that offer these products (Bhatia and Jain 2013; Adámek *et al.* 2015). Malá *et al.* (2017b) claims that while there is an increased interest in green products, the real demand for them is low. Many researchers have suggested that an enterprise has a moral obligation to serve society in a way that is environmentally friendly (Minárová 2014; Sedliačiková *et al.* 2016; Malá *et al.* 2017b). Surveys (Chen *et al.* 2008, Ortega *et al.* 2011, Ubilava and Foster, 2009) have shown that consumers have a higher product trust and purchase intentions when detailed product information is available. Lack of information about green wood products often results in a gap between their environmental concerns and the actual buying behavior, which thus hinders the market share for green wood products (Ohtomo and Hirose 2007). In his study, Osburg *et al.* (2016) reveals that information about the origin (country), environmental impact (sustainable forest management, carbon footprint, recycling), and material (type of wood, material composition, additives and their health effects, composition of the veneer) should be accessible to consumers. Availability of product information may create or increase trust of consumers towards green wood products (Chen *et al.* 2008). One of the basic factors that influences the purchase of green products is their high price compared with common products (Bhatia and Jain 2013). The price of a green product may be lowered by suitable environmental standards. Environmental standards can result in innovations that reduce the costs related to green products or increase its value. Such innovations enable enterprises to use their disposable resources with higher productivity (from natural resources through energies to human resources), and thus compensate for the increased costs related to the reduction of negative impacts on the environment (Malá *et al.* 2017a). Studies have shown that customers are ready to pay more for a green wood product if its environmental effects are perceived (Aguilar and Vlosky 2007, Husted *et al.* 2014, Yamamoto *et al.* 2014).

Research has recognized consumers' perception about green wood products, their price and quality (functional value), their urge to seek knowledge (epistemic value), image concern, peer opinion (social value), influence of promotion and subsidies (conditional value), and their desire to exhibit protective role towards environment (environment value). These factors may have a strong effect on prognosticating green consumers' behavior (Gadenne *et al.* 2011). The results (Maniatis 2016) have revealed that there is a high correlation between consumers' consciousness about environment and economic benefits of the green wood products. Consumers choose green wood products as a part of their perceived responsibilities to the environment, family and society. It is such consumers who are highly interested in green wood products and are greatly concerned about how these products can be used and disposed of in a green manner (Hobson 2013).

The goal of this paper is to find out how a green wood product is perceived by customers of Slovak wood-processing SMEs and determine the factors that influence the decision to buy a green product. On the basis of the empirical studies (Kaebnick and Soriano 2000; Sousa and Wallace 2006; Chen and Chai 2010; Dangelico and Pontrandolfo 2010; Dangelico and Devashish 2010; Unruh and Ettensin 2010; Biswas and Roy 2015; Osburg 2016; Applehantz 2016; Maniatis 2016; Yadav and Pathak 2016; Yu *et al.* 2017), which have dealt with the given problem, the following hypotheses were formulated:

- H1: More than three quarters of customers of wood-processing SMEs in Slovakia agree with the statement that it is necessary to provide green wood products;
- H2: More women than men are familiar with the term green product;
- H3: The quality of a product is important to customers regardless of their income;
- H4: The majority of respondents are willing to pay more for a green wood product than for a common product; and
- H5: The essential factor which influences the decision to buy a green wood product is the price.

Based on the results of their research, the authors propose three basic strategies of green wood product implementation, which have potential to greatly benefit the Slovak wood processing SMEs by positively affecting the perception of their green product(s) by the customers, and thus increase their interest in purchasing these products. The research was evaluated by methods of testing the statistical hypothesis (binomial test, Chi-square test, Friedman test, and Wilcoxon test), descriptive statistics, and data visualization.

The authors have chosen a logical structure of the paper, where in the introduction, the goals and methodology, as well as the description of secondary research are briefly outlined. Furthermore, the primary research and its results are described, which is followed by a proposal of strategies of implementing green products into wood-processing SMEs in Slovakia. The conclusion sums up the findings and recommendations of the research.

## **EXPERIMENTAL**

The research methodology consisted of three phases. In the first phase, methods of summary, synthesis, and analysis were used, and a short review was prepared. In the second phase, a questionnaire was administered to generate empirical data from a sample of adult individuals, or more specifically customers of wood-processing SMEs in Slovakia. To evaluate the results of the research, the statistical program SPSS Statistics 19 (IBM,

Armonk, USA) was used. The results given in the output tables were rounded off at three decimal places. In the third phase, three basic strategies for implementing green product innovations in Slovak wood-processing SMEs were proposed.

## Materials

### *Data collection*

The subject of this research was customers of wood-processing SMEs in Slovakia, and the object was green wood products.

The primary data were collected through a questionnaire that consisted of two parts: Part A: 5 questions concerning the identification of the respondents (A1 – A5); and Part B: 7 questions concerning green products (B1 – B7).

Part A consisted of five questions that identified the characteristics of the participating customers of wood-processing SMEs in Slovakia (Table 1).

**Table 1.** Questionnaire – Part 1

A1	sex	male / female
A2	age	18-24 / 25-34 / 35-44 / 45-54 / 55-64 / 65 and more
A3	work status	full-time employee / part-time employee / freelancer / entrepreneur / on maternity leave / on leave for different reasons / unemployed / student / retired / disabled / housewife or househusband
A4	achieved level of education	elementary / incomplete secondary – without a graduation certificate complete secondary / college or university / doctoral
A5	respondent's net monthly income	less than €300 / €301-500 / €501-1,000 / €1,001-1,500 / €1,501-2,000 / more than 2,000

Part B consisted of seven questions that determined how respondents in Slovakia perceive green wood products and which factors influence their purchasing decisions (Table 2).

**Table 2.** Questionnaire – Part 2

B1	Are you familiar with the term 'green product'?
B2	Determine to what extent you agree with the given statements related to the definition of a green product (1-full agreement to 4-full disagreement)
B3	What factors and how often do you consider when making purchasing decisions? (1-always, 2-often, 3-rarely, 4-never)
B4	Choose three factors you consider the most influential when making purchasing decisions to buy green products.
B5	Choose three factors you consider the most influential when making purchasing decisions not to buy green products.
B6	How much are you willing to pay for a green product?

### *Sample size*

The sample consisted of 754 respondents who participated in the research dealing with the perception of green wood products. For the purpose of this research and to ensure a proper representative sample, 350 correctly and fully completed questionnaires were used. The representativeness of the sample according to the chosen criteria (sex, age, and

education level) was tested by the Chi-squared test. In all cases, the representativeness was confirmed ( $p\text{-value}_{\text{sex}} = 0.983$ ,  $p\text{-value}_{\text{age}} = 1.0$ ,  $p\text{-value}_{\text{education}} = 0.994$ ).

## Methods

### Research evaluation

The survey data were evaluated by descriptive, graphical, and statistical analyses. When testing a hypothesis, a significance level of 0.05 was applied.

When evaluating the research results, the methods for testing the statistical hypotheses were the binomial test, Chi-squared test, Friedman test, Wilcoxon test, methods of descriptive statistics, and data visualization (mean, modus, median, skewness, and frequency tables). To test hypotheses H1 and H4, the exact binomial test was used. Hypotheses H2 and H3 were verified by the significance test of Spearman's correlation coefficient. To test hypothesis H5, the Friedman and Wilcoxon tests were used.

## RESULTS AND DISCUSSION

### Results of the Questionnaire

A total of 350 customers of wood-processing SMEs in Slovakia participated in the research related to green products. The sample consisted of 171 men and 179 women (question A1). The ages (question A2) and education levels (question A4) of the respondents are shown in Table 3.

**Table 3.** Age and Education Level of the Respondents

Age			Level of Education		
Years	Frequency (#)	%	Type	Frequency (#)	%
18 to 24	37	10.6	Elementary	64	18.3
25 to 34	66	18.9	Incomplete secondary (without a graduation certificate)	99	28.3
35 to 44	70	20.0	Complete secondary	127	36.3
45 to 54	57	16.3	University/college	56	16.0
55 to 64	58	16.6	Doctoral (PhD)	4	1.1
65+	62	17.7			

The majority of the respondents were between 35 years and 44 years of age (70) and over 65 years of age (62). The lowest number of respondents were between 18 years and 24 years old (37) and 45 years and 54 years old (57). Most respondents (226) indicated that their highest achieved level of education was secondary, with 99 respondents indicating incomplete secondary and 127 indicating a complete secondary education. The lowest number of respondents achieved a master's degree (56) and doctoral degree (4). Concerning the working status of the respondents (question A3), the majority were full-time employees (54.6%), freelancers or entrepreneurs (13.7%), and retired (17.1%). The lowest number of respondents were housewives/househusbands (0.3%), disabled (1.1%), and unemployed (1.4%). According to the net monthly income (question A5), the distribution of the respondents was as follows: the largest groups were the respondents with an income between 201 € and 400 € (22%) and 401 € and 600 € (24.9 %). The lowest number of respondents indicated an income of over 1,500 € (3.1%) and below 200 €

(4.9%). Thus, it was determined that the majority of respondents (76.9%) earn between 201 € and 1000 €. The representativeness of the sample according to the selected criteria (sex, age, and level of education) was tested by the Chi-squared test. In all cases, the representativeness was validated (Table 4).

**Table 4.** Analysis of the Sample Representativeness

Statistical Testing					
Sex		Age		Education Level	
Chi-square	0.000 <sup>a</sup>	Chi-square	0.011 <sup>a</sup>	Chi-square	0.234 <sup>a</sup>
Number of degrees of freedom	1	Number of degrees of freedom	5	Number of degrees of freedom	4
p-value	0.983	p-value	1.000	p-value	0.994
a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 170.8.		a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 37.1.		a. 1 cell (20.0%) has an expected frequency less than 5. The minimum expected cell frequency is 3.2.	

Question B1 focused on determining whether the respondents were familiar with the term green product. As many as 73.4% of the respondents had already heard of green products, and 26.6% indicated that they have not encountered the term before. The evaluation of question B1 was related to hypothesis H2, which assumed that more women than men are familiar with the term green product. By the test of agreement of Spearman's rank order correlation coefficient, it was established that the responses to the given question were independent of gender (p-value = 0.067). On the basis of this, hypothesis H2 was rejected. It was also found that responses to this question were independent of the age (p-value = 0.54), income (p-value = 0.243), and highest achieved education level (p-value = 0.953) of the respondents. Similarly, Nimse *et al.* (2007) found out that consumers have started showing concern for the environment, and preferring green products and services. Belz and Peattie (2012) claim that consumers are informed about the concept of green products through green marketing, but they do not always obtain relevant information that are essential in making purchasing decisions. Question B2 asked what the respondents think a green product is. The respondents were given fifteen statements that suggested what a green product is and for each of the statements, the respondents were asked to assign a value on the Likert scale. Based on the evaluation of the frequency of responses for each question, it can be claimed that the respondents mostly agreed with the following statements: a green product is an ecologically-friendly (319 respondents) and healthy product (286 respondents). Such perception of green product is incorporated in many of its definitions (Maniatis 2016, Chen and Chai 2016, Biswas and Roy 2015, Yu *et al.* 2016, Osburg *et al.* 2016). The respondents agreed least with the following statements: a green product is of a high quality (62 respondents), it is sold in specialized stores (108 respondents), and it is transported in an environmental way (115 respondents). By use of the Friedman test, it was proven that the significance of the given statements related to a green product is not the same when considering the degree of agreement (p-value = 0.0). The Wilcoxon signed rank test (Table 5) helped to prove which statements were not of the same significance.

It can be claimed that customers of wood-processing SMEs in Slovakia mostly agree with the statement that a green product is environmentally friendly. As many as 91% of the respondents indicated full or partial agreement with this statement. The respondents also agreed with the following statements: a green product is recyclable, its use has an insignificant effect on the environment, and it has an environmental label. Least agreement was noted with the statement that a green product is a product that is transported in an environmental way. Based on the results of this research, it may be stated that the perception of a green product by customers is mostly related to its positive effect on the environment. The recyclability of the product was perceived to be important as well.

**Table 5.** Friedman and Wilcoxon Tests – Question B2

Friedman Test		Wilcoxon Signed Rank Test							
Number of observations	132		oB2g-oB2a	oB2e-oB2g	oB2h-oB2e	oB2b-oB2h	oB2f-oB2b	oB2d-oB2f	oB2l-oB2d
Chi-square	266.63	Z	-2.328 <sup>a</sup>	-0.588 <sup>a</sup>	-0.487 <sup>b</sup>	-2.076 <sup>a</sup>	-0.832 <sup>a</sup>	-1.129 <sup>b</sup>	-2.917 <sup>a</sup>
Number of degrees of freedom	14	p-value	0.020	0.557	0.626	0.038	0.405	0.259	0.004
p-value	0.000		oB2m-oB2l	oB2k-oB2m	oB2o-oB2k	oB2c-oB2o	oB2j-oB2c	oB2i-oB2j	oB2n-oB2i
		Testing statistics	-0.972 <sup>b</sup>	-1.323 <sup>a</sup>	-0.405 <sup>b</sup>	-0.820 <sup>a</sup>	-1.342 <sup>a</sup>	-1.930 <sup>a</sup>	-2.427 <sup>a</sup>
		p-value	0.331	0.186	0.685	0.413	0.180	0.054	0.015

oB2a: ecologically-friendly product; oB2b: healthy product; oB2c: high quality product; oB2d: it has been produced ecologically; oB2e: its use has an insignificant effect on the environment; oB2f: it is made of recyclable materials; oB2g: it is recyclable; oB2h: it has an environmental label; oB2i: it is sold in specialized stores; oB2j: its production uses alternative sources of energy; oB2k: its packaging is ecological; oB2l: its packaging is biodegradable; oB2m: it is made of natural materials; oB2n: it is transported in an environmental way; and oB2o: it has not been tested on animals

Question B3 attempted to find out the degree of agreement with the statement that it is necessary to provide green products. The percentages of respondents that expressed full agreement with, agree with, do not agree with, and were undecided about this statement were 21.1%, 59.4%, 3.4%, and 16%, respectively. After excluding the respondents who were undecided and dividing the rest of the respondents into two groups (those who agree and those who do not), the application of the binomial test confirmed hypothesis H1 (p-value = 0). The hypothesis, which assumed that more than three quarters of Slovaks agree with the need to provide green products, was accepted. In contrast, the study by Joshi and Rahman (2015) claimed that although the attitude of customers towards green products is favorable, they are not interested in buying them.

Question B4 asked about the factors customers consider when making a decision to buy a green product. Customers indicated that they always consider the price and quality of the product. The Friedman test confirmed that the given options were not of the same significance (p-value = 0). Following this, the Wilcoxon signed rank test (Table 7) was used to determine the order of significance of the individual responses/statements. The respondents mostly considered the quality and price of the product, followed by its safety, length of warranty, energy efficiency, and simplicity of use. The least considered factors



were the biodegradability of the product, labeling of the product with an ecological label, and recyclability of the product. The very last in the order of importance was the environmental transportation of the product.

**Table 6.** Friedman and Wilcoxon Tests – Question B4

Friedman Test		Wilcoxon Signed Rank Test							
Number of observations	221		oB4c - oB4a	oB4b - oB4c	oB4f - oB4b	oB4h - oB4f	oB4l - oB4h	oB4k - oB4l	oB4n - oB4k
Chi-square	1336.74	Testing statistics	-0.755 <sup>a</sup>	-4.878 <sup>a</sup>	-2.426 <sup>b</sup>	-4.021 <sup>a</sup>	-0.327 <sup>a</sup>	-2.954 <sup>a</sup>	-5.821 <sup>a</sup>
Number of degrees of freedom	14	p-value	0.450	0.000	0.015	0.000	0.744	0.003	0.000
p-value	0.000		oB4g - oB4n	oB4d - oB4g	oB4j - oB4d	oB4i - oB4j	oB4m - oB4i	oB4e - oB4m	oB4o - oB4e
		Testing statistics	-3.137 <sup>a</sup>	-6.876 <sup>a</sup>	-0.960 <sup>b</sup>	-2.915 <sup>a</sup>	-0.831 <sup>b</sup>	-0.853 <sup>a</sup>	-5.844 <sup>a</sup>
		p-value	0.002	0.000	0.337	0.004	0.406	0.394	0.000

oB4a: product quality; oB4b: product safety; oB4c: product price; oB4d: product recyclability; oB4e: recyclability of product packaging; oB4f: warranty time; oB4g: product is environmentally friendly; oB4h: product is energy efficient; oB4i: product is biodegradable; oB4j: it reduces the amount of waste; oB4k: it is produced in Slovakia; oB4l: simplicity of use; oB4m: it has an environmental label; oB4n: it is made of natural materials; oB4o: it is transported in an environmental way

**Table 7.** Friedman and Wilcoxon Tests – Question B5

Friedman Test		Wilcoxon Signed Rank Test								
Number of observations	350		oB5c - oB5h	oB5f - oB5c	oB5p - oB5f	oB5b - oB5p	oB5o - oB5b	oB5m - oB5o	oB5a - oB5m	oB5i - oB5a
Chi-square	564.60	Testing statistics	-0.775 <sup>a</sup>	-0.079 <sup>a</sup>	-3.558 <sup>a</sup>	-0.173 <sup>a</sup>	-0.368 <sup>a</sup>	-1.889 <sup>a</sup>	-0.322 <sup>a</sup>	-0.442 <sup>a</sup>
Number of degrees of freedom	15	p-value	0.439	0.937	0.000	0.863	0.713	0.059	0.748	0.659
p-value	0.000		oB5e - oB5i	oB5k - oB5e	oB5d - oB5k	oB5l - oB5d	oB5n - oB5l	oB5g - oB5n	oB5j - oB5g	
		Testing statistics	-0.119 <sup>a</sup>	-2.364 <sup>a</sup>	-0.164 <sup>a</sup>	-0.343 <sup>a</sup>	-2.357 <sup>a</sup>	-0.632 <sup>a</sup>	0.000 <sup>b</sup>	
		p-value	0.906	0.018	0.869	0.732	0.018	0.527	1.000	

oB5a: good price; oB5b: good image; oB5c: high quality; oB5d: saves money; oB5e: convincing advertising; oB5f: good feeling; oB5g: saves time; oB5h: positive effect on health; oB5i: is/are not toxic; oB5j: improves image; oB5k: longer life-cycle; oB5l: highly effective; oB5m: good availability; oB5n: ecological packaging; oB5o: good design; oB5p: I do not buy green products

Testing of the agreement level showed that when making purchasing decisions, the quality of a product is important for customers, regardless of their gender (p-value = 0.081), age (p-value = 0.178), education (p-value = 0.278), and income (p-value = 0.14). Thus, hypothesis H3, which assumed that the quality of a product is important for a customer regardless of their income, was confirmed and accepted.

This study achieved similar results to those of Liao *et al.* (2012), who discovered that the factors that influence customer behavior when buying green products are the economical use of resources and energy, if the product is made of recyclable materials, whether the product is usable within the requirements of the customer, if it is reusable, recyclable, and does not harm the environment.

Question B5 asked about the reasons why respondents buy green wood products. Respondents could choose from several options and were asked to mark a maximum of three. The Friedman test confirmed that the indicated reasons were not of the same significance ( $p$ -value = 0). The use of the Wilcoxon signed rank test (Table 8) determined the order of importance of the individual reasons.

The most frequently indicated reasons for buying a green wood product were the following: a positive effect of green products on the health of the respondents, high quality, and a good feeling. These reasons were followed by: the good image of the products, the products are not toxic, have a longer life cycle, good price, high efficiency, and convincing advertising. The next reasons were: the ecological packaging, money savings, and good design. The reasons that were chosen least frequently were: improving one's image, saving time, and good availability of the products. The option 'I do not buy green products' was chosen 69 times. The respondents were also given an option called 'other', where 14 respondents answered that they 'do not know why they buy green products' and 37 respondents indicated that they 'support the domestic wood-processing enterprises'.

Several studies (Welsch and Kühling 2009; Liao *et al.* 2012; Eze and Ndubisi 2013) discovered a positive dependence of the purchase of green products on the social status of the customer. Furthermore, subjective norms of behavior also highly influence the purchase of green products (Smith and Paladino 2010; Gadenne *et al.* 2011). Very often customers choose the functionality of the product, which satisfies their needs and desires, over the ethical aspects of the product (Chen and Lobo 2012). The quality and positive effects of the product on the health of the customers are further factors customers give preference to when buying a green product (Chan and Wong 2012).

Question B6 verified why respondents do not buy green products. Respondents were asked to mark a maximum of three options. The Friedman test confirmed that the indicated reasons were not of the same significance ( $p$ -value = 0). The Wilcoxon signed rank test (Table 9) was used to determine the order of importance of the individual reasons.

**Table 8.** Friedman and Wilcoxon Tests – Question B6

Friedman Test		Wilcoxon Signed Rank Test							
Number of observations	350		oB6e - oB6c	oB6d - oB6e	oB6b - oB6d	oB6g - oB6b	oB6a - oB6g	oB6h - oB6a	oB6f - oB6h
Chi-square	547.444	Testing statistics	-4.041 <sup>a</sup>	-0.244 <sup>a</sup>	-6.265 <sup>a</sup>	-2.294 <sup>a</sup>	-2.661 <sup>a</sup>	-0.480 <sup>a</sup>	-0.707 <sup>a</sup>
Number of degrees of freedom	7	p-value	0.000	0.807	0.000	0.022	0.008	0.631	0.480
p-value	0.000								

oB6a: lack of trust for green products; oB6b: I am not sure about the quality of these products; oB6c: they are very expensive; oB6d: low availability in the market; oB6e: insufficient information about green products; oB6f: they are not suitable for regular use; oB6g: there are no benefits for me

The most frequently indicated reason that discourages customers from buying green products was their high price. Based on this finding, hypothesis H5 was accepted. Other reasons that were frequently marked by the respondents were insufficient information about green products and their low availability in the market, which was followed by 'I am not sure about the quality of these products' and 'they do not provide any benefits for me'. The least frequently indicated reasons were a lack of trust for green products and their unsuitability for regular use.

Customers often believe that the information that enterprises provide about their green products and the impact of their activities on the environment are misleading, which is because of the fact that the enterprises primarily focus on improving their sales and image. The report by GfK (2013) stated that 39% of customers do not believe that environmental information is truthful. Another study reported that 48% of respondents claim not to believe the information about green products (Eurobarometer 2009). The authors believe it is the rising uncertainty and doubt of customers about the quality and benefits of green products that are the main reasons why customers do not buy green products.

Question B7 determined how much customers are willing to pay for a green product. The results of the research show that 34% of respondents are willing to pay as much as for a common product, 4.6% are willing to pay less, and 5.4% claimed that the price is irrelevant for them.

The evaluation of question B7 was related to hypothesis H4, which assumed that the majority of Slovaks are willing to pay more for a green product than for a common product. On the basis of the binomial test, it was found that hypothesis H4 was valid ( $p$ -value = 0).

Within the research into corporate social responsibility, Nielsen (2014) found that 55% of customers are willing to pay more for the products and services of enterprises that have a positive environmental and social effect, and 52% have made purchases from such enterprises within the past six months.

From this research, it may be claimed that more than three quarters of customers of wood-processing SMEs in Slovakia agree with the statement that it is necessary to provide green wood products. Wood-processing SMEs should consider implementing the activities of green logistics, which results in a green product and contributes to the protection of the environment. It was found that the majority of Slovaks are willing to pay more for a green wood product than for a common product. In contrast, the price is the most important factor that influences the decision to buy a green product. From the above results, it may be concluded that Slovaks do show an interest in buying green wood products but request that the price only be 5% to 10% higher than the price of a common product. The research has established that consumers have insufficient information about green products, which hinders their ability to make purchasing decisions related to these products. It has been found out that customers prefer green wood product if enough information about its quality, safety, energy efficiency, and its environmental impacts is available to them. They choose to buy green product if they are convinced that the product has a positive impact on their health, is not toxic, and its purchase evokes good feeling. These are the attributes upon which wood processing enterprises should focus in obtaining more content and loyal customers.

## Proposal of Three Basic Strategies for Implementing Green Product in Slovak Wood-processing SMEs

The findings of our research have significant implications, which may help the wood processing SMEs to develop green strategies related to green wood product and help them encourage their customers to buy it. For enterprises, it is essential to be aware of how customers perceive a green product and whether this perception motivates them to buy it.

Based on the outcomes of the conducted research, as well as the results of studies completed by various scholars (Goedkoop *et al.* 2000; Allione 2007; Tamborrini 2009), the basic characteristics of a green wood product were identified, and are as follows: it is reusable, based on experience, non-toxic, refurbished, distributed through a short distribution channel, re-integrable, repairable, environmentally compatible, slow in becoming obsolete, low energy demand, compostable, renewable, biodegradable, recyclable, possible to dematerialize, has an extended material lifespan, lower demand of material, is economical, and uses new materials in its production.

Based on the research results, three main strategies for wood processing SMEs are proposed, which should enable them to design green wood product that possesses such qualities customers prefer and show interest in, and therefore they would be willing to purchase it.

### *First strategy: Use of materials that have a low negative impact on the environment*

This strategy is primarily aimed at optimizing the material inputs, and thus at minimizing the consumption of disposable resources of a wood-processing SME within the entire life cycle of a product. It is characterized by appropriate material inputs that should be energy-efficient, supplied through the shortest possible distribution channel, non-toxic, and made from renewable resources. The results of this research showed how customers ranked the purchase of green wood products among recyclable, energy-efficient, and non-toxic products. As noted by Ashby (2009), energy-efficient materials are characterized by a low energy consumption during production (within the production process – when producing and processing the material), supply (transporting the material to the enterprise), and use (use by the customer or when disposing of the material). An enterprise should be supportive of short distribution channels, which means that it prefers materials that are available locally. An enterprise can reduce the consumption of disposable resources and degree of environmental pollution related to transport by supporting local wood producers. This has been confirmed by the results of this research, where respondents clearly indicated that they buy products from local wood-processing enterprises. The results also suggested that the key reason why enterprises should provide green products is that it supports local (domestic) entrepreneurs, lowers material consumption, and improves the image of the enterprise. This leads to an assumption that green wood products should be widely distributed at most of the places, which on one hand may save the time and effort, and on the other it could provide more opportunities to buy green products (Yadav and Pathak 2016). Renewable materials are defined as materials that originate from renewable sources. The renewability of resources depends on two factors, which are the time of regeneration (the time in which the ecosystem is able to create new resources) and opportunity to extract these resources (availability and economic feasibility). In accordance with Ashby (2009), who defined the renewability of a material based on the above facts, it can be claimed that a material is renewable if the time of its extraction is shorter than the time of its regeneration. Wood clearly fulfills these given attributes. Moreover, thanks to new recycling technologies, there is a sufficient availability of new materials that are added to

wood products and are made from recyclable materials (Osburg *et al.* 2016). The use of wood contributes to reduction of environmental impacts, in terms of greenhouse gases, emissions, and fossil energy demands (Suter *et al.* 2016). Main savings are achieved through substitution of other materials and energy. Nevertheless, wood also has its environmental limitations. Therefore, a deliberate and well-considered use of wood is required to maximize its environmental advantages and reduce its disadvantages. This has been confirmed by a study of Suter *et al.* (2016), who suggest that attention should be paid to particle filtering and sourcing of wood from forests, as well as the appropriate harvesting management, and to cascade utilization of wood, which can help to use the wood resource more efficiently.

A conclusion was drawn that it is possible to produce composite green wood products. With regards to the material composition, an enterprise should closely monitor whether the material does not release toxic substances, not only when being processed during production, but also during its use by the customer and disposal. It is recommended for wood-processing enterprises to be aware of biocompatibility, which indicates whether the used material does not release toxic substances when the product is being processed, distributed, and used. Additionally, it is essential to determine the criteria for storing and disposing of materials that have the potential of being toxic. The results of our research have also been confirmed by other authors (Osburg *et al.* 2016; Yadav and Pathak 2016; Biswas and Roy 2015; Chen and Chai 2010; Appelhanz *et al.* 2016; Malá 2017).

#### *Second strategy: Extend the lifespan of the used product*

The second strategy is concerned with the end of the lifecycle. It should be attempted to postpone waste disposal and use of new resources. The main purpose of this strategy is to reduce the consumption of disposable resources. An enterprise should produce a green wood product that is resistant to obsolescence and reduces environmental burden. The lifespan of a product should not be longer than the expected product lifespan, and the lifespan of the material should not be longer than the lifespan of the product, as this would be uneconomical for the enterprise. If the product contains components that have a shorter lifespan than the product, then it is appropriate to ensure their replacement without the need to substitute the whole product. Components with a shorter lifespan should not be made of resistant materials, as this increases the demand for their disposal. For a wood processing enterprise, it is ideal to choose materials that can ensure functionality of the product for a certain period of time (the lifespan expected by the customer), within a certain environment, and does not have a negative impact on the environment when it is disposed. Consumers have to be empowered so that they individually can be effective in combating environmental problems by means of effective household recycling, energy saving, waste management, and consumption practices (Biswas and Roy 2015). It is essential to ensure that wood utilization is longer than the growth cycle of timber of comparable size and quality (carbon storage). If wood is not naturally sufficiently durable to ensure the required service life, it has to be protected. This is known as conferred durability. Enterprises must respect the environmental criteria if the wood is to remain an eco-material (Suter *et al.* 2016). At the same time, the enterprise should determine an appropriate way of product maintenance that helps to keep the required constant level of functionality during the lifespan of the product. The customers of wood-processing SMEs who participated in this research indicated the warranty as one of the factors that is always or often taken into consideration when buying a product. The last criterion that must be determined is the resistance to obsolescence to clearly determine

those factors that could endanger the reliability of the product, such as exposure of the product to a humid environment, low temperatures, ultraviolet radiation, *etc.* All this information must be provided to customers (Maniatis 2016). In contrast, if the product is at the end of its life cycle, then it may be dismantled, while the components and materials can be used by the enterprise. This approach can be applied only if the enterprise makes products on the basis of reversible construction. In this way, it is possible to extend the lifespan of the individual components and materials. The enterprise can achieve this by preferring recyclable, biodegradable, or compostable products when selecting materials and components, or by using such materials that are easy to dispose. Wood is a very safe material to handle. It is non-toxic and does not break down into environmentally damaging materials. To give an example, in the field of wood-processing industry, current research and development has been mainly focusing on reversible thermochromic wood composites. These wood products have broad application prospects in the field of floor, furniture, and building industries (Fan and Fu 2017).

### *Third strategy: Environmental policy and ethics of SMEs*

This third strategy focuses on creating the appropriate environmental awareness in producers to know their responsibility towards the environment, and encouraging environmentally friendly behavior. This concerns the effort to inform the stakeholders about the benefits related to the environmentally friendly behavior of the enterprise and the advantages of green products. When selecting wood suppliers, an enterprise should give preference to those who actively use environmental policies, have implemented a code of ethics, are adhering to the principles of sustainability (sustainable forest management), or have implemented certified environmental management systems into their operations. The conducted research revealed that customers of wood-processing SMEs cannot find enough information about the environmental aspects of green wood products. A customer or other stakeholders often do not perceive the environmental added value of products offered to them. It is therefore essential for a wood processing enterprise to offer green products with sufficient product information related to its environmental consequences, compliances, and after life disposal. Information should be provided to customers about the following: if the wood the product is made from is sustainably harvested (ensured renewability of the resource), locally harvested (local material may help minimize transportation impact), safe, *i.e.* non-toxic for the user (added toxic binders, coatings, preservatives and pesticides), and recycled (salvaged, recovered or reclaimed wood product – which extends its life cycle). It can be claimed that providing sufficient information is one of the most important strategies how to prevent lack of interest about green wood products among them consumers (Gleim *et al.* 2013). Simple access to information is essential because uncertainty on the side of consumers seldom induces them to actively search for green wood product information (Verbeke 2008). We therefore recommend that enterprises provide this information to consumers as early as in the basic product description that can be easily found in search for the product.

These strategies are not of the same significance for all wood products. For instance, it is not viable for a product with a short lifespan to use materials with longer lifespans. In this case, it would be more appropriate to focus on recyclable materials with short distribution channels. For wood-processing SMEs that are interested in providing green products, it is recommended to choose at least one of these strategies or, alternatively, combine them.

By buying green products, customers can contribute to improving the quality of the environment (Abdul-Muhmin 2007). Spruyt *et al.* (2007) discovered a weak correlation between the attitudes of customers and their green behavior. Their research revealed that customers are insufficiently informed about green products, which affects their purchasing decisions (Bramah and Tweeneboah-Koduah 2011; Salazar *et al.* 2013). Price is one of the factors that influences the decision to buy a green product (Bhatia and Jain 2013). Cherian and Jacob (2012) found that because of the lack of knowledge of green products among customers and their insufficient awareness of environmental issues, enterprises have not yet attempted to focus their product innovations on the environment to a greater extent. The findings of Bhatia and Jain (2013) established the fact that consumers show interest in green products because of their concerns about the state of the environment, which is interesting with regards to this research. Slovak wood-processing SMEs should provide green products, but it is necessary to inform customers about them. Because of the increasing awareness and concerns about the environment, a customer may prefer to buy a green product over a common one. Customers have shown a positive attitude towards green products and are willing to buy them, provided that these products are available and reasonably priced.

The main limitations of the presented research may be seen in its results being partly distorted due to different perception and requirements for green wood products offered by production enterprises and service enterprises. In the future, it is proposed to investigate into how SMEs perceive the support from the government of the country in which they operate, as well as from the European Union. Since the research results have shown that lack of information about green wood products represents a big problem, it would be interesting to focus further research on finding out what type of information wood processing enterprises are providing to their customers, and which information customers would wish to obtain.

## CONCLUSIONS

1. Based on the analysis of the theoretical foundations of the given problem and the results of the performed research, three basic strategies for implementing green innovations were proposed for wood-processing SMEs that are partially modifiable and take into account the specifics of different enterprises. If enterprises implement at least one of the proposed strategies, then they can expect to reduce their negative impact on the environment, which may result from the use of their products. The main objective of this research was achieved.
2. This research found that customers of wood-processing SMEs in Slovakia understand the term green wood product. The research further addressed the opinion of respondents related to the need to provide green products, their considerations when making decisions to buy a green product, the reasons why they do and do not buy green products, and the intensity of their perception of the price. Most respondents understand the concept of a green wood product as an environmentally friendly and healthy product. This has been confirmed by the results of other studies, published in reputable journals (Biswas and Roy 2015, Chen and Chai 2016, Appelhanz *et al.* 2016, Maniatis 2016, Cherian and Jacobs 2012, Kaebernick and Soriano 2010)

3. Consistent with hypothesis H1, the results of this research revealed that more than three quarters of the respondents agreed with the statement that it is necessary to provide green products. Therefore, hypothesis H1 was accepted. In addition, Chen and Chan (2016), and Biswas and Roy (2015) claim that customers find it essential for green wood product to be available, while at the same time their positive impact on the environment should be emphasized.
4. The research revealed that 73.4% of the respondents were familiar with the term green product, and 26.6% have never encountered this term. Hypothesis H2 assumed that more women than men are familiar with the term green product. The test of agreement of Spearman's rank-order correlation coefficient proved that the responses to question A1 were independent of the gender of the respondents. Based on this, hypothesis H2 was rejected. Similarly, the study of Chen and Chan (2006) confirmed that there are no significant differences between men and women in their environmental attitudes and their attitudes to green products.
5. Among the factors that customers take into account when deciding to buy or not buy green wood products, the respondents mostly indicated that they always take into account its price and quality, followed by the product safety, length of warranty, energy efficiency, and simplicity of use. Consumers choose green product as part of their perceived responsibilities to the environment, their family and society (Yu *et al.* 2016). The least considered factor was the environmental transportation of the product. The Chi-squared test proved that when making decisions related to the purchase of green products, the product quality is important for customers, regardless of their income. This confirmed hypothesis H3, which assumed that the product quality is important for a customer, regardless of their income. The consumers primarily focus on financial incentives (Maniatis 2016).
6. It was found that as many as 34% of the respondents are willing to pay as much for a green wood product as for a common product, 4.6% are willing to pay less, and 5.4% stated that the price of the product is irrelevant to them. Consumers are ready to pay a premium for a product marked with credible green labeling, providing that they clearly understand the economic and ecological benefits of the green wood product and are able to trace these benefits to tangible evidence (Owuse and Anifort 2013). Hypothesis H4, which assumed that the majority of Slovaks are willing to pay more for a green product than for a common one, was confirmed on the basis of the binomial test. One of the essential facts is (Chen and Chai 2016) that the price is not the main factor in preventing consumers from purchasing green wood products if they have enough appropriate information (they are pro-environment).
7. Finally, hypothesis H5 assumed that the most important factor that influences the decision to buy a green wood product is the price. The research revealed that the most indicated reason why respondents do not buy green products is the high price. The results of this research thus confirmed hypothesis H5.
8. The most frequent reasons for buying green wood products are their positive effect on the health of the respondents and their high quality. The majority of Slovaks are willing to pay more for products and services of wood-processing enterprises that are known to have a positive environmental influence.



9. A contribution of this study is in the finding that consumers do not have sufficient information related to green products and greenproduction in general. Therefore, on the one hand consumers claim interest in purchasing green products, but on the other, the real demand for such products is rather low. Green products should become an inevitable part of consumers' lives, and they should not be viewed as 'something exceptional'. It is therefore important for Slovak SMEs, due to their position in the Slovak market, to not only provide but also greatly promote green products. The proposed strategies show Slovak SMEs a way how to deal with green business in the future.

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