Customer Preferences for Wood-based Houses in Slovakia

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Housing is one of the basic needs of every person. Most people usually encounter the problems of the availability of financial resources and real construction costs. The objective of this paper is to present customer preferences for the construction of family houses in Slovakia with the assessment of possible perception disproportions regarding economic characteristics in the context of interest and reality. A specific part of this paper includes the presentation of interest in the construction of wood-based houses. The questionnaire survey show that, in the target group (respondents aged 26 to 50 years), significant dependencies were found between the monitored traits and the amount of planned investment. For each dependence, possible disproportions were also revealed, which could lead to an overall threat of the plans for the construction of a family house. The disproportions, which were associated with 25 to 30% of respondents, depended on the amount of investment and net household income as well the outlay and usable floor area. This is an original survey in the field, the benefit of which should be its use for a comparison of similar research.

Keywords: Wood-based houses; Bricked houses; Customers; Preferences; Disproportions

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INTRODUCTION

Wood is a natural and inseparable part of human life. In addition to its significance for individuals, wood is significant for society as a whole. Due to global changes and initiatives to mitigate their impact, the use of wood as a renewable raw material is fully in line with the principles of the green and circular economy. This is also supported by the fact that wood can be processed without waste and reused. The environmental advantage of wood is also the so-called negative balance of carbon emissions. This means that during its life cycle, wood absorbs more carbon emissions than is generated during its subsequent processing and construction (Štefko *et al.* 2014). Búryová and Sedlák (2016), Gustavsson *et al.* (2017), and Iwakiri *et al.* (2020) dealt with this issue in their respective works. Compared to other materials, wood-based products are produced in a low-energy production process with minimal emissions. The use of wood in industry, but especially in the construction sector, seems to be an interesting and promising solution not only in terms of construction but also its environmental properties. Following the trends of energy efficiency of buildings, there is an effort in the construction industry to minimize the environmental impacts of buildings (Sedlák *et al.* 2019). This trend is also confirmed by De Araujo *et al.* (2019, 2020). Mitterpach *et al.* (2020) consider as the main benefits of wood-based structures the local material availability, its low cost, rapid construction, simple processing, and a wide range of structural possibilities. According to Corduban *et*

al. (2017) wood allows civil engineers to construct light, standardized building structures with excellent thermal insulation properties. Maťová and Kaputa (2018) analyzed the attitudes of Slovak architects towards wood as a construction material. Their results claim that most of the active architects prefer masonry-based materials, especially in the cases of civil and industrial buildings. At the same time, they state that in Slovakia, mistrust continues to be found towards wooden structures, for which fire resistance remains the most negatively perceived property of wood. This is followed by properties such as the durability of wood and resistance to weather conditions. Results of the study by Östman *et al.* (2017) and also Gosselin *et al.* (2017) pointed out the questionable technical aspects of wood (acoustic performance, stability and wood shrinkage, humidity, protection against insects, wind, rot, water, and earthquakes) and other main barriers (national building codes, cost, material durability, and fire resistance). In contrast, Müller *et al.* (2016) affirm that the tendency in the area of the wooden building heading to the construction of multifunctional houses is acceptable by a wide community of civil engineers and designers. For example, De Araujo *et al.* (2018) state that the wooden housing production sector in Brazil still faces obstacles in the three observed fields, especially for the negative aspects of house financing, housing technique certification, skilled hand labour, general costs incurred in local production, tax exemptions, public policies, and utilization of wooden houses in public works. From the point of view of the growth potential of wooden buildings, the perceptions of potential customers are especially important. The work's findings of the study by Skultetyova *et al.* (2019) regarding customer preferences of the advantages and disadvantages of wood-based houses provide the following results. The most perceived disadvantages of Slovak customers include low resistance to natural disasters, low lifetime, and low fire resistance. The three most important advantages of wooden buildings include excellent thermal insulation properties, lower operating costs for heating, and a healthy indoor microclimate (Škultétyová 2019).

The wood processing industry is a growing sector in Slovakia that has been trying to look for possibilities of more efficient input raw material recovery with higher added value for several years. The market with wooden buildings has recorded an increasing interest of the wide public in the last decade. This is evidenced by the total number of built family houses, which grows in Slovakia annually. According to the statistics of the Association of Wood Processors of the Slovak Republic (Vašuta 2019), the share of wooden buildings increased to 10% in the last 8 to 10 years. However, the authors' view is a bit more cautious, and a level of 7% is estimated. Approximately 700 wood-based buildings are constructed every year. The arguments for this statement are the result of the authors' telephone survey of regional building authorities in 2019 regarding the acceptance procedures for wood-based houses. The section of wooden buildings of the Association of Wood Processors of the Slovak Republic estimates that by 2025 the share of buildings with a wood-based structure could increase to the level of 30% of the total completed constructions (Architektúra/Stavebníctvo/Biznis 2018). In fact, this is an ambitious plan that will require support not only from the sector itself but also from the state.

For comparison, the share of wooden buildings in the Czech Republic is at the level of 15%, in German-speaking countries 30 to 50%, and in Scandinavian countries more than 70% (Woodhouse Company Ltd. 2020). Available construction systems of wooden buildings were presented in the work of De Araujo *et al.* (2016) for a global scenario. Wood-based buildings have long attracted the attention of both domestic and foreign authors. Most authors deal with the issue of comparing the composition of building

structures and their impact on the environment through the methodology of the Life Cycle Assessment (Su *et al.* 2017; Vilches *et al.* 2017; Potkány *et al.* 2018; Dara *et al.* 2019; Mitterpach *et al.* 2020) or by comparing the efficiency of wooden buildings with different energy standards (Sloup *et al.* 2019). Such studies essentially point to the environmental aspect of wood-based building structures compared to masonry buildings. Other authors (Niemelä *et al.* 2017; Dwaikat and Ali 2018; Potkány *et al.* 2019; Illankoon *et al.* 2020) deal with economic aspects, while they analyze the costing of building structures with respect to individual life cycle costs through the methodology Life Cycle Costing.

For the development of the construction sector, it is necessary to pay attention to another important aspect. This aspect is the potential customer and individual preferences and requirements. Knowledge of the customer's preferences is a necessary part of the success of the product on the market. People´s preferences are based on knowledge of the psychological perception of customers' ideas in terms of the utility properties of the product. For family dwelling buildings, it is a feeling of comfort, sufficient usable floor area, as well as a visual idea of the house attractiveness. However, it is important to note, that structural features are mainly regarded in this point, since many populations still consider wood as a second-rate construction material, and thus a timber building has been seen as secondary alternative. However, some of these customer´s requirements can be transformed into the conditions of a reference building. Therefore, this area has become one of the secondary goals of this survey.

Lenoch and Hlaváčková (2015) examined the opinion of customers and partially also the preferences of the users of wooden buildings on the sample of more than 1,000 Czech households. Their findings dealt with differences in socio-economic characteristics of satisfied and dissatisfied users of wooden family houses and made recommendations for the elimination of the number of the dissatisfied users. German authors Gold and Rubik (2009) classified eight customer groups of wooden buildings on a representative sample of German respondents. They identified up to 47% of the population as a potential target group for marketing activities promoting wood-based houses. Finnish scientists Gibler and Tyvimaa (2014) studied socio-economic parameters of users of wood-based houses in Finland. Toppinen *et al.* (2013) researched consumer perceptions of environmental and social sustainability of wood products in the Finnish market. The perceived environmental and social sustainability of wood products was observed to be a two-dimensional construct consisting of "General environmental and social sustainability" and "Specific social sustainability" reflecting strong consumer need for product safety. The results of a study by Wang *et al.* (2014) verify the crucial role that the UK government has played in GB formation, promotion and development and showed a positive increase in using wood in the UK construction sector, supporting the notion that the environmental performance of wood is the major driver in embracing wood in the GB concept. One of the criteria was the financial situation of the users, which divided the customers into four type groups. Schauerte (2013) tried to identify product attributes for quality function deployment (QFD) from the point of consumer perceptions of wooden multi-storey houses. Results revealed ten product attributes ranked by importance, to be further translated into engineering characteristics within QFD. Wang *et al.* (2014) examined customer preferences in the context of green marketing requirements. Within the analysis of available literature, the current authors have not found any study that would deal with the analysis of possible disproportions of customer preferences of wooden building users. Available information includes the disproportion analysis between the expected and delivered functionality of

information technologies solutions (Charvat and Voracek 2012) as well as the analysis of differences between the opinions of Slovak and Croatian customers concerning materials for wooden furniture (Kaputa *et al.* 2018). Additionally, the facts led the current authors to carry out this survey, which they consider to be original. The main aim of this paper is, through the results of a questionnaire survey, to present customer preferences for the construction of family houses in Slovakia with an assessment of possible disproportions in the emotional perception of economic characteristics in the context of interest *vs.* reality. A specific part of this paper includes the presentation of interest in the construction of wood-based houses.

EXPERIMENTAL

Questionnaire Design

Based on the results of the survey with a selected sample of respondents, the research objective was to identify customer preferences for the reference building through technical and economic conditions. The intention is to reveal possible disproportions in the target group of customers within the analysis of economic preferences with an assessment of the real possibilities of their financing. With the use of the questionnaire survey, the paper aimed to determine the awareness about wooden buildings and user-preferences of customers in the area of interest and realization of the construction of wood-based family houses. The methodology consisted of two phases. The first phase analyzed the theoretical background of domestic and foreign studies presented in available databases in the subject matter. In this phase, the principles of scientific methods of analysis, synthesis of analogy, and deduction were used. The second phase focused on the evaluation of primary sources obtained through an empirical questionnaire. The third phase presented the results and findings within the limitations of the survey.

The main part was the primary survey, which was preceded by a pre-survey. The purpose of the pre-survey was to reveal problem questions, and these results were used only to refine specific answers in the questionnaire. Fifty respondents participated in the pre-survey. The primary survey was carried out from February to May 2019 through an electronic questionnaire platform published *via* the questionnaire system SURVIO (SURVIO, Brno, Czech Republic). Potential respondents were addressed individually with subsequent sharing *via* social networks.

The questionnaire was divided into several independent parts:

Part 1 – To obtain the basic demographic data and economic and social characteristics of the respondents;

Part 2 – To find out interest and awareness of wooden buildings with the identification of the perception of potential advantages and disadvantages of wood-based buildings;

Part 3 – To discover customer preferences regarding the construction of a family house.

This paper does not provide the complete wording of the questions from the questionnaire. The reason is their considerable extent. The intention is to analyse only a partial part of the answers. The meaning of the individual questions will be clear from the results presented in the separate part of this paper.

Data Collection and Sample Size

The first step identified a target demographic of the survey – adult people, both men and women over the age of 18, interested in solving their housing by building a family house.

Next, the optimal sample size to estimate population parameters was quantified. Assuming a large population (size more than 20,000) following the Cochran's formula (a 0.95 degree of confidence and a 5% margin error) it was necessary to get minimum 385 complex answers from survey respondents (Mason and Lind 1990),

$$n = \left(\frac{z}{e}\right)^2 \cdot p \cdot (1 - p) \quad (1)$$

where *z* is the value associated with degree of selected confidence, *e* is the maximum allowable error, and *p* is the estimated proportion (p = 0.50 in the case of no logical estimate). Under these conditions the sample size of 385 was a sufficient minimum, as indicated in Eq. 2.

$$\mathrm{n} \geq \frac{1.96^2 \cdot 0.5 \cdot 0.5}{0.5^2} \doteq 385 \text{ respondents} \quad (2)$$

This number means the correctly completed questionnaires, not just the number of people invited to take the survey. Based on previous experience with the response rate when the amount of people who properly responded to our surveys varied from 35 to 65%, it was decided to invite 2,500 people to reach the desired sample size.

An online survey was distributed by emails to a given list of contacts. These were obtained by directly addressing the visitors to the Slovak exhibitions and fairs; the emails focused partly on presenting producers of wooden buildings in Slovakia and the subsequent consent of visitors to participate in the survey. The electronic questionnaire platform published *via* the questionnaire system SURVIO (SURVIO, Brno, Czech Republic) helped the authors to accurately collect survey responses and turn them into an analyzed report. The research was carried out from February to May 2019.

The survey succeeded in collecting a total of 1,228 responses from respondents of the target demographic. The response rate was 49%. The number of 1,228 was restricted to a finite group of 802 respondents in the age category of 26 to 50. This most productive group has a logical assumption not only of the greatest interest in the construction of a family house but also a realistic assumption of the fulfilment of this idea.

The information on the age composition of the target population was obtained from Statistical Office of the Slovak Republik (Table 1).

Table 1. Proportions of Age Categories

Age category	Population		Sample	
26 to 35 years	799,866	38.57%	305	38.03%
36 to 50 years	1,274,088	61.43%	497	61.97%
Total	2,073,954	100%	802	100%

The representativeness of the sample was tested according to the age using the Chi-square goodness-of-fit test (Table 2). There was no significant difference (p=0.755) between the age category proportions of the sample and the target population.

Table 2. Chi-Square Goodness-of-Fit Test

	Observed vs. Expected Frequencies Chi-Square Goodness-of-Fit = 0.097 df=1 p=0.755			
Age category	O	E	O - E	(O – E)2/O
26 to 35 years	305	309	-4.30	0.06
36 to 50 years	497	493	4.30	0.03
Total	802	802	0.00	0.09

Depending on the evaluation research question, the authors used the chi-quadrat test. The explanation of the applied testing methodology can be found in Kohler (1988). The analysis of possible disproportions was tested at the significance level of $\alpha = 0.05$ using the statistical program SPSS (SPSS Inc., Chicago, IL, USA). The authors were interested in answering the following research question: Research question RQ1 "Are there any disproportions based on the perception of selected economic ideas of the target group of potential Slovak customers and the real possibilities of their financing?"

RESULTS AND DISCUSSION

During the primary survey, a total of 1,228 responses were obtained, which were then further analyzed based only on input from respondents in the age category of 26 to 50 based on logical arguments. The basic characteristics of this research sample are presented in Table 3. Selected demographic characteristics (gender and age structure of respondents which demonstrated interest in building a family house) are also presented in Fig. 1.

Table 3. Composition of the Research Sample

Indicator		Frequency	
		Absolute	**Relative**
Gender	Female	386	48.13%
	Male	416	51.87%
Age	26 to 35 years	404	50.37%
	36 to 50 years	398	49.63%
Education	Lower education	42	5.23%
	Upper education	246	30.67%
	Higher education	514	64.10%
Location	Capital city	30	3.74%
	Town 50.000-250.000	172	21.45%
	Town 25.000-50.000	164	20.45%
	Town 10.000-25.000	104	12.96%
	Town/village to 10.000	332	41.40%
Current State of Housing	Tenement house	280	34.91%
	Apartment in a brick house	112	13.97%
	Brick house	380	47.38%
	Wooden house	30	3.74%

Thus, a total of 802 opinions of respondents in the target group of 26 to 50 years were processed. From this amount, those respondents who expressed a real interest in solving their housing situation in the form of the construction of a family house in the near future were subsequently selected. A total of 564 respondents were identified in this way, which is in terms of the representativeness methodology (Eq. 1), a sufficient sample to generalize the obtained opinions. Apart from that amount, only more than a third (35%, which represents approximately 200 respondents) was considering the possibility of a family-house building produced with wood. The remaining 65% preferred conventional masonry construction (Fig. 1). The authors' attention was also focused on the level of awareness of the wooden buildings of these respondents. The results show that up to 288 respondents had no or only partial information on wooden buildings. Low awareness may be one of the reasons why the construction of classic brick houses was generally preferred. This clearly indicates a low level of awareness about timber construction producers and the benefits and potential effects of wood-based houses. Additionally, 76 respondents who preferred masonry buildings had information in a broader context about the wooden buildings. However, despite this fact, they expressed a negative attitude. This may also be due to persistent concerns about the risk of construction of wood-based houses. They are presented in the works of Östman *et al.* (2017) and Draghici and Maican (2018) and include stability and wood shrinkage, humidity, protection against insects, wind, rot, water, and earthquakes) and other main barriers (national building codes, cost, material durability, and fire resistance). The research of Lähtinen *et al.* (2019) considers views of consumers on the benefits of wood from technological, ecological, social, and economic perspectives. According to the factor analysis results, there are two main consumer categories based on their perceptions on sustainability benefits of wood, *i.e.* those favouring ecological and physio-technological benefits of wood and those favouring aesthetic and well-being benefits of wood.

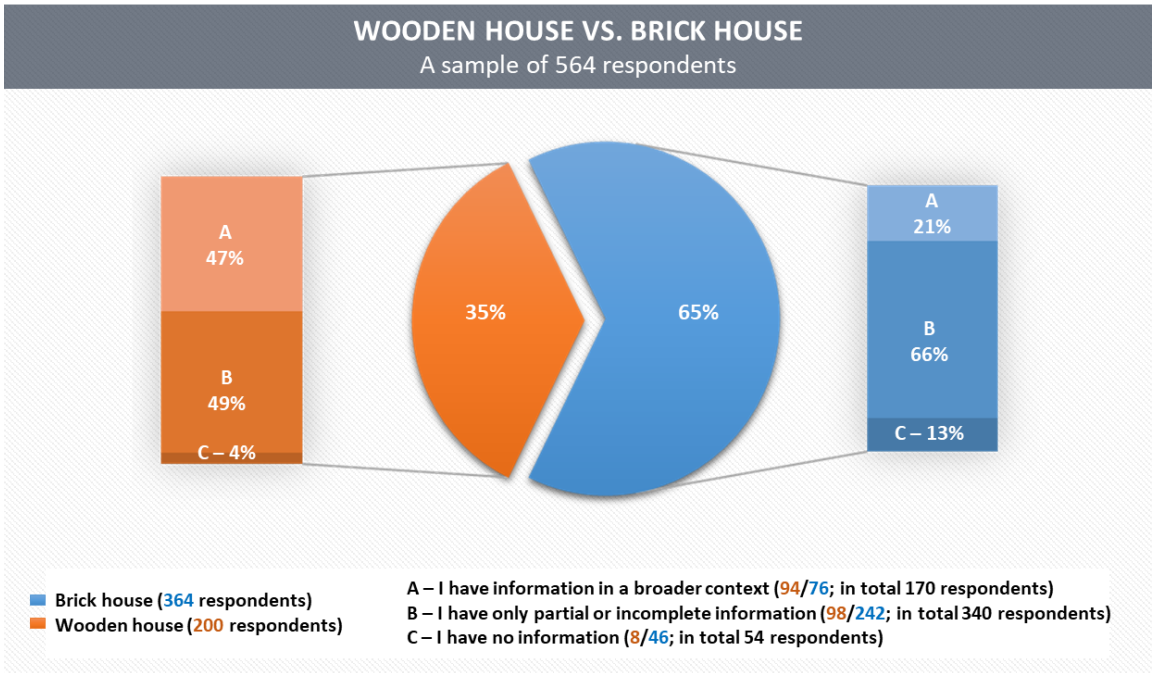

Fig. 1. Preferences of brick buildings in relation to the knowledge about the construction of wooden buildings

Information was considered relative to the basic characteristics of the customer's profile type and the technical conditions of the reference building, with the definition of economic ideas of financing to be relatively important and interesting in the results of the survey. The results of the survey, by analyzing specific questions, define the type of the customer´s profile as follows: family with at least one child, aged from 26 to 50 years, with a university education, living in a block of flats or at their parents' home, with a net household income at the level of € 1,200 to € 2,000/month with an investment plan in the range of € 75,000 to € 100,000 considering the co-financing share of 50%. Table 4 presents the technical conditions of a reference building with the relative share of preferences according to results of questionnaire survey. This information could become the basis for addressing the target group of customers for future purchases from the perspective of Slovak producers of wooden buildings.

Table 4. Technical Conditions of Reference Building for a Future Purchase

		Preference
Type of Building	Bungalow (without/with cellar)	70.37%
Type of Structure	Platform-frame construction	39.01%
Usable Floor Area	101 to 120 m^2	31.56%
Number of Rooms	4 to 5	82.27%
Type of Roof	Gable	47.09%
Type of Windows	Wooden	47.16%
Type of Heating	Solid fuel boiler in combination with a solar system or a gas condensing boiler	10.37%/8.89%

The construction of a family house currently requires a relatively large amount of funds. An investment of this nature represents a significant intervention in the household budget and must therefore take into account the need to invest not only in construction, operation, and maintenance, but also in the maturity of the loan. Marszal and Heiselberg (2011), Gerlach-Kristen and Merola (2019), and Yusof and Jamaluddin (2018) dealt in their works with the structure of costs, divided into investment, financial, operational, and other cost related to housing.

The first dependence was the analysis of household income in relation to the amount of investment of a family-house construction. Based on the analysis of the offers of Slovak producers of wooden constructions, it is possible to consider the need for building funds in the amount of more than € 70,000. The amount of the initial investment depends on the degree of completion of the building, the usable floor area, and the selected structure. Within the classification option, respondents were offered various answer options ranging from € 50,000 and more. The available options were understood as the total value of the investment, *i.e.*, also with the possibility of drawing a loan. For this reason, the possibility of funding at a level of less than € 50,000 was considered to be unrealistic or a misinterpretation of the explanation of the substance of the issue. Data of contingency presented in Table 5 shows a two-dimensional distribution of the sample of respondents regarding net household income and the idea of the amount of investment. Based on the results of the Chi-square test (Table 6), there was a significant dependence between the monitored traits ($p = 0.000$) and the amount of household income that affects the amount of the investment idea. The value of the contingency coefficient of size 0.51 informs the work about a medium-strong dependence. Therefore, it was confirmed that the monthly household income affects the amount that potential customers are willing to invest

in the construction of a house. Slovak customers preferred mostly the amount of investment in the range from € 75,000 to € 100,000 (34.75%) and subsequently in the range from € 100,000 to € 125,000 (20.92%). In this context, it is necessary to consider the amount of income, the level of which would be sufficient to cover the living cost as well as the future total cost for operation of the family house, together with a certain amount of loan repayment. With an investment of € 110,000 with a model example of 50% co-financing, under the current conditions of mortgage loans in Slovakia, it is possible to assume a monthly payment of € 212, at an interest rate of 1.2% per annum, 3-year fixation period, and repayment period of 25 years (Actual hypo calculator of Slovenská Sporitelna, https://www.slsp.sk/en/calculators). At the same time, it is necessary to consider the need to cover the operating costs of the construction and a certain reserve fund for repairs and maintenance. Smith (2013) and Potkány and Škultétyová (2020) dedicated to this issue the evaluation of the affordability of wooden buildings. Based on this fact, for a net household income below the level of € 1,200, it will be difficult or even impossible to realize such an amount of investment. Approximately 30% of respondents (in Table 5 the values are marked with the symbol *) can be included in this category. Thus, this share shows a certain disproportion of unrealistic ideas of potential customers.

Table 5. Net Household Income *vs.* Investment Amount into the Construction of a Family House

Contingency Table	Less Than € 50,000	From € 50,000 to 75,000	From € 75,000 to 100,000	From € 100,000 to 125,000	More Than € 125,000	Line Frequencies
Less Than € 600	***1.42%****	*1.77%**	*0.35%**	*0.00%**	*0.35%**	3.90%
€ 601 to 800	*1.42%**	***3.55%****	*2.48%**	*2.13%**	*0.35%**	9.93%
€ 801 to 1,000	1.77%	3.90%	***6.38%****	*0.71%**	*0.00%**	12.77%
€1,001 to 1,200	0.00%	**7.09%**	*6.03%**	*2.48%**	*0.71%**	16.31%
€1,201 to 1,500	1.06%	4.61%	**8.51%**	3.55%	2.48%	20.21%
€ 1,501 to 2,000	1.42%	1.42%	8.16%	**7.45%**	3.19%	21.63%
More than € 2,000	0.35%	1.42%	2.84%	4.61%	**6.03%**	15.25%
Column Frequencies	7.45%	23.76%	34.75%	20.92%	13.12%	100.00%

Table 6. Chi-square Test for Dependence of Household Income *vs.* Investment Amount

	Chi-square Test	Degree of Freedom	p-Value	Contingency Coefficient
Pearson's Chi-square Test	203.17	df = 24	0.000	0.51

Of course, the decisive factor in the amount of expenses is the family size (including childrens) in general. Based on the data in Fig. 2, which presents the marital status and the family size depending on the amount of net income, it is possible to state that in a given target group, a family relationship with children with an income level higher than € 1,200 (202 respondents in total) predominates. A similar amount of income is also reported in families without children but in a lower absolute number (a total of 60 respondents). For

single investors, the highest numbers are recorded at income levels from € 600 to € 1,200. In this category, there was reported the greatest assumption of the occurrence of the mentioned disproportions, because such an amount of income is insufficient for the investment.

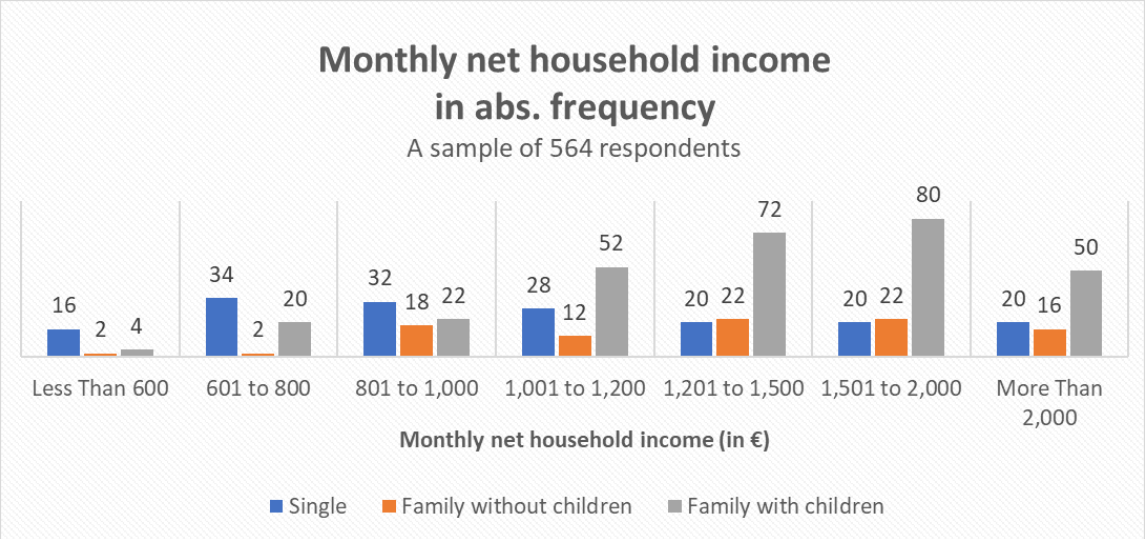

Fig. 2. Monthly household income in relation to the household type

One of the essential criteria that the investor considers when building a family house is the requirement for the size of the usable floor area. It is the sum of all floor areas of the house. Projecting the required area into real space can be demanding for a potential customer. It is logical that with the growing idea of the need for usable floor area, the investment plan should also be realistic. Based on the current conditions of the energy efficiency of buildings, it is necessary that the house meets the energy certificate in the category of primary energy class "A0". This is set by the decree on energy efficiency in buildings at 54 kWh/ (m^2.a) (Decree No. 364/2012). If starting again from the experience and price offers of Slovak producers of wooden buildings, then to meet the mentioned conditions, it is necessary to count with a purchase price of € 700 to € 1,000 per m^2 of usable floor area depending on the degree of completion, selected construction, and requirements of the investor.

The contingency table (Table 7) presents the two-dimensional distribution of the examined sample based on the described variables (the amount of investment and the idea of the usable floor area of a family house). The results of testing the dependencies (Table 8) manifest that the given dependence was significant ($p = 0.000$), and the contingency was medium strong. The value of the contingency coefficient was 0.51. In a more detailed examination of the observed dependence on the basis of the highest absolute values of residual frequencies (whose exact absolute values are not as important as their position in the contingency table - highlighted by bold), the authors can generally state that the idea of the target group of the required usable floor area grows proportionally with the amount of investment. The group indicating the amount of investment at the level of less than € 50,000 is perceived as problematic group, which has unrealistic ideas in the context of the usable floor area requirement. However, a similar situation occurred in the group of respondents with an investment of up to € 75,000 (or up to € 100,000), where there was a high risk that

their idea of a usable floor area of 121 m^2 and more (or 151 m^2 and more) was unfeasible under the given conditions. These respondents, representing a share of 25%, show a certain disproportion in their opinions (in Table 7 the values are marked with the symbol *).

Table 7. Investment Amount *vs.* Idea About Usable Floor Area

Contingency Table	Up to 85 m^2	86 to 100 m^2	101 to 120 m^2	121 to 150 m^2	151 to 200 m^2	Over 200 m^2	Line Frequencies
Less Than € 50,000	**1.77%**	2.13%*	2.48%*	0.71%*	0.35%*	0.00%*	7.45%
€ 50,000 to 75,000	2.48%	**7.09%**	6.38%*	6.38%*	0.71%*	0.71%*	23.76%
€ 75,000 to 100,000	0.71%	6.38%	**14.18%**	10.28%	2.84%*	0.35%*	34.75%
€ 100,000 to 125,000	0.00%	2.13%	6.74%	**8.51%**	2.84%	0.71%*	20.92%
More Than € 125,000	0.00%	0.35%	1.77%	3.90%	**4.61%**	**2.48%**	13.12%
Column Frequencies	4.96%	18.09%	31.56%	29.78%	11.35%	4.26%	100.00%

Table 8. Chi-square Test for Dependence of Investment Amount *vs.* Idea About Usable Floor Area

	Chi-square Test	Degree of Freedom	p-Value	Contingency Coefficient
Pearson's Chi-square Test	196.22	df = 20	0.000	0.51

Within the testing of other dependencies, the authors focused on examining the relationship between the investment and the degree of completion of the construction. From the point of view of finalization of construction work, it is possible to consider the degree of completion of the house with walls and roof construction, the house without fixtures, and a complete house with the alternative of construction of the base plate by a supplier or on its own. It is clear that with a higher degree of completion, it is necessary to consider the increasing amount of investment. The measured data through relative frequencies in a contingency table are presented in Table 9. The results of testing (Table 10) show that the amount of investment statistically significantly ($p = 0.000$) affects the consideration of potential customers about the degree of completion of the family house. However, based on the value of the contingency coefficient (0.28), it is possible to state a weak degree of dependence. Based on the analysis of residual frequencies (bold text in Table 7), it can be seen that there were possible disproportions in the group of customers willing to invest less than € 50,000, who have the same ideas as the customers who intend to invest from € 100,000 to € 125,000 in the turnkey completion phase (in Table 9 the values are marked with the symbol *). Such an idea is basically unrealistic, as well as the idea of the phase house without fixtures. Nevertheless, for all analyzed customer groups, it is important to supplement the usable floor area data to the completion phase. The given dependencies are presented for the target group with the investment plan from 50,000 to € 75,000 (Fig. 3). The authors' point of view sees possible disproportions when considering the degree of completion of the complete house with the requirement of a usable floor area higher than 101 m^2, as well as the phase of the house with walls and roof construction from 121 m^2. This disproportion was presented by a relatively small proportion of respondents at the level of 5%.

Table 9. Investment Amount *vs.* Degree of Completion of the Construction

Contingency Table	House With Walls and Roof	House Without Fixture	Turnkey House Without Base Plate	Turnkey House with Base Plate	Line Frequencies
Less Than € 50,000	1.06%	2.13%*	**2.84%***	1.42%*	7.45%
€ 50,000 to 75,000	3.90%	**10.64%**	5.32%	3.90%	23.76%
€ 75,000 to 100,000	4.61%	**15.96%**	6.38%	7.80%	34.75%
€ 100,000 to 125,000	2.13%	6.38%	**2.84%**	9.57%	20.92%
More Than € 125,000	0.71%	4.26%	3.54%	**4.61%**	13.12%
Column Frequencies	12.41%	39.37%	20.92%	27.30%	100.00%

Table 10. Chi-square Test for the Dependence of the Investment Amount *vs.* Degree of Completion of the Construction

	Chi-square Test	Degree of Freedom	*p*-Value	Contingency Coefficient
Pearson's Chi-square Test	48.99	df = 12	0.000	0.28

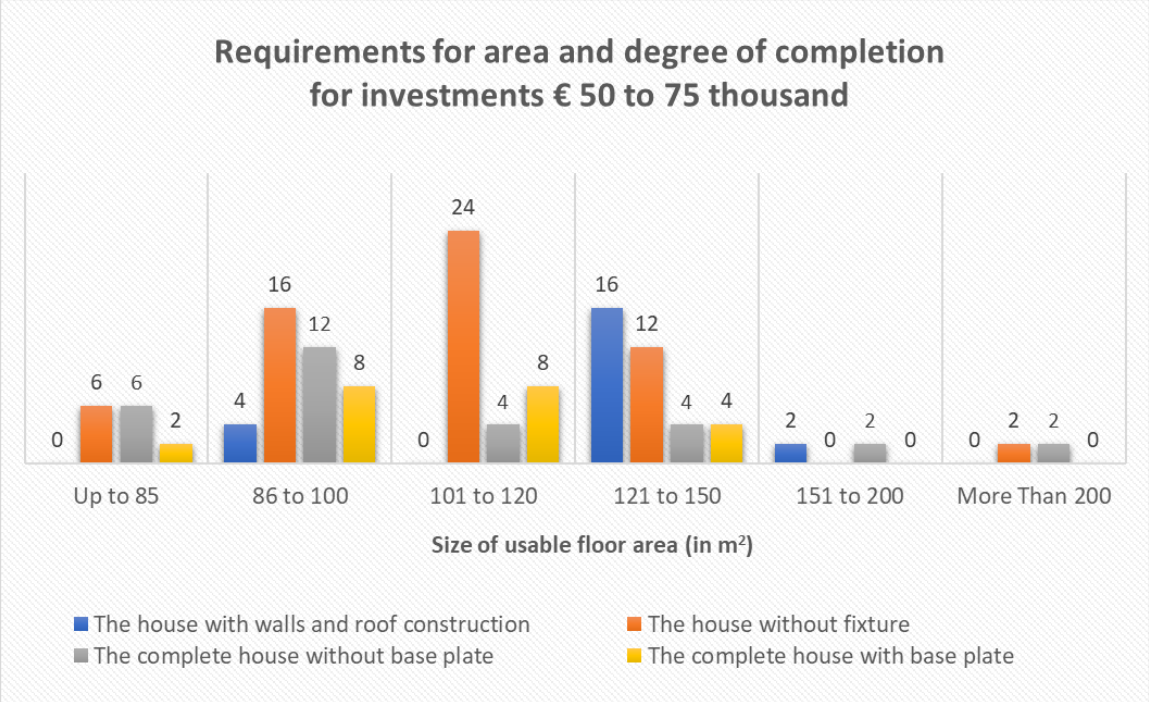

Fig. 3. Idea of usable floor area and degree of completion of the construction

In the context of solving the layout of a family house, the potential customer is limited by the chosen usable floor area. When building a small family house up to 85 m^2, the investor cannot consider a big number of rooms, because a certain living comfort must be kept. That is why the last tested dependence was the relationship between the size of the usable floor area and the number of rooms. The two-dimensional distribution of the sample set is presented in Table 11. Within the respondents, the consideration of five rooms in the

category up to 100 m^2 for the total house usable floor area is unrealistic, similarly to the disproportion of 4 rooms at the area above 200 m^2. Based on the results of the Person's chi-square test (Table 12), the dependence of the observed traits is statistically significant ($p = 0.000$). This is a medium-strong contingency. The value of the contingency coefficient is 0.62 (Table 12). From the absolute highest values of residual frequencies (cells of the contingency Table 11 with bold text), it can be stated that customers with a usable floor area of up to 85 m^2 (or up to 100 m^2) most often consider three rooms. For others, it is possible to state a high rate of realistic requirements for the total house usable floor area and the number of rooms. The ideas of customers at the level of 86 to 100 m^2 are connected with 4 rooms. Customers at the level of 101 to 200 m^2 tend to imagine 5 rooms. Customers with the area over 200 m^2 require more than 5 rooms. In general, customers' opinions about the number of rooms depending on the usable floor area are realistic (in Table 11 the unrealistic values are marked with the symbol *).

Table 11. Idea of Total House Usable Floor Area *vs.* Number of Rooms

Contingency Table	3 Rooms	4 Rooms	5 Rooms	More Than 5 Rooms	Line Frequencies
Up to 85 m^2	**3.19%**	1.42%	*0.35%**	0.00%	4.96%
86 to 100 m^2	4.61%	**9.93%**	*3.55%**	0.00%	18.09%
101 to 120 m^2	1.77%	**20.92%**	**8.51%**	0.35%	31.56%
121 to 150 m^2	0.35%	11.70%	**14.89%**	2.84%	29.78%
151 to 200 m^2	0.00%	1.77%	**7.80%**	1.77%	11.35%
Over 200 m^2	0.00%	*0.71%**	0.71%	**2.84%**	4.26%
Column Frequencies	9.93%	46.45%	35.82%	7.80%	100.00%

Table 12. Chi-square Test for the Dependence of the Usable Floor Area *vs.* Number of Rooms

	Chi-square Test	Degree of Freedom	p-Value	Contingency Coefficient
Pearson's Chi-square Test	352.95	df = 15	0.000	0.62

CONCLUSIONS

1. The type profile of the potential customers interested in wooden construction is a family with at least one child, aged from 26 to 50 years, with a university degree, living in a apartment flat or at their parents' home, with a net monthly household income at the level of € 1,200 to € 2,000 with an investment in the range of € 75,000 to € 100,000, considering a 50% co-financing share.
2. The conditions of the reference building can be summarized in the prevailing notions of the house in the design of bungalows with a usable area of 101 to 120 m^2, 4 to 5 rooms, gable roof, and wooden windows. Regarding wooden construction, the preferred type of construction is a platforme-frame construction. In terms of heating solution, a combination gas condensing boiler, and solid fuel boiler is considered.

3. The results of the survey on a sample of respondents representing the target group confirmed that there are significant dependencies between the idea of the amount of investment and the examined traits (household income, usable floor area, degree of building completion, and the idea of the number of rooms). The valid conclusion is that potential customers can realistically consider the relationships between the examined variables, which are the basis for the successful realization of their plans to build a family house. Nevertheless, the authors pointed out several disproportions in the research, which could disrupt the construction process, either at the beginning or during it. The highest level of disproportions was found in the dependence between the amount of investment and net household income, the amount of investment and usable floor area, where 30 or 25% of respondents presented disproportionality.
4. This paper provides an information database for raising awareness of the issue, revealing a certain level of disproportions but also the level of knowledge of customer preferences for Slovak timber construction producers. The authors' presented information could become a starting point for targeted marketing support for the construction of wooden buildings, but in a coordinated form, the progress of which is currently absent on the market. It can be stated with certainty that the potential for market growth in Slovakia exists. This statement is confirmed by the results of the survey concerning the interest in the construction of wood-based houses among Slovak customers and also the progressively increasing year-on-year share of wooden buildings in comparison with classic masonry buildings. Exploiting this potential would significantly help the wood processing sector to contribute to the growth of added value and utilization of domestic sources of renewable raw materials. The results of this survey could also be a starting point for comparison in studies focused on customer preferences.

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