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IDENTIFICATION OF CUSTOMERS' DRIVERS FOR THE WOOD BUILDING AS AN ECOLOGICAL INNOVATION IN BUILDING CONSTRUCTION IN SLOVAKIA

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ABSTRACT

Sustainable development became a discussed issue and its main idea is to find out how to satisfy present needs without compromising the capacity of future generations, guaranteeing the social well-being, balance among economic growth, and care for the environment. The building industry as one of the industries trying to fulfil the consumer demands connected with environmental and health requirements is presented in this paper. It deals with the importance of innovation in the building construction materials for sustainability focusing on wood structures representing eco-innovation and an alternative to silicate building materials in this context. A comparison of conventional building materials and innovated alternative ecological option used in the building construction (wood-framed house) is given in the paper. The primary method for assessing the perception of these options was the Kano model. Subsequently, the customers´ drivers for wooden structures in Slovakia were identified by methods such as correlation matrix and force field of innovation.

Key words: ecological innovation, building materials, Kano model, sustainable growth.

INTRODUCTION

The issue of sustainable development deals with the economic growth regarding the requirements of the society by creating the welfare conditions in short term, medium term as well as in long term period. Economic and demographic development naturally increases demand for natural resources. The approaches to the corporate social responsibility that are constantly innovated encourage the continual commitment to participate in the sustainable development by ecological innovations of individual key components adjusted to customers and trends in world markets when applying the principles of sustainable development (LOUČANOVÁ *et al*. 2015, ŠTERBOVÁ *et al*. 2016, PAROBEK *et al*. 2015, LOUČANOVÁ *et al*. 2017).

Current lifestyle trends, especially in the area of housing, point to a preferred return to a more natural, more personalized housing that is provided by family houses against the impersonal and often restrictive housing that is typical for living in a block of flats. Changes in preferences can be met through a wide range of options. The traditional and long-established types of construction materials (e.g. brick and concrete) are supplemented by modern, innovative, and viable construction alternatives. One of the most popular alternatives is wood. Modern methods of construction promote the idea and application of environmentally and energetically efficient constructions. Just as the construction process itself significantly contributes to the depletion of natural resources, the production of construction materials contributes to significant environmental pollution and greenhouse emissions (particularly CO_2) (ŠVAJLENKA and KOZLOVSKÁ 2018).

Sustainable construction is a chance how the building industry can contribute to sustainable development. This idea lies in transforming the demand for sustainable development into an opportunity, creating and breaking into new markets, and innovating responses that satisfy traditional demands in the industry and the new societal demands for sustainable development (ŠTEFKO *et al.* 2013, MITTERPACH and ŠTEFKO 2016, BOURDEAU 1999). According to data in the European Union (EU) the building sector contributes to 42 % of final energy consumption, 35 % of total GHG emissions, 50 % of the utilization of extracted materials, and 30 % of water consumption (European Commission, 2011). Following the mentioned figures, we can state that construction and housing play a fundamental role when aiming at enhancing societal goals for sustainable development. By developing the construction and utilization of buildings in the EU, it is claimed that the total final energy consumption could be decreased by approximately 40 %, total greenhouse gas (GHG) emissions by 35 %, and the use of building materials by 50 % (HERCZEG *et al*. 2014, OLŠIAKOVÁ *et al*. 2017).

The environmental requirements for innovative product management in relation to corporate social responsibility (CSR) based on the principles of sustainable development are implemented by the environmentally oriented management program (KOLLÁR and BROKEŠ 2005). Dealing with environmentally oriented management of product portfolio, it is necessary to apply activities that allow overcoming the conflicts among market, society and environment by ecological innovation. This is the reason why the companies try to improve the environmental performance of their products. The company regards also social and economic aspects when it considers environmental behaviour to ensure safer product for customers when creating the added value of the product (KALAMÁROVÁ *et al*. 2014, OLŠIAKOVÁ *et al*. 2016, PAROBEK *et al*. 2016, PALUŠ *et al*. 2018, HÄKKINEN 2007).

HURMEKOSKI *et al*. (2015) states that environmental impacts of construction practices are considered in the context of material renewability and recyclability, as well as within the possibilities for choice of construction material with regard to the climate change mitigation.

Sustainable development is a much discussed issue in considering the acceptability and efficiency of solutions based on building and living preferences. There is a significant environmental change in societal values toward sustainability and sustainable development (e.g. AUTIO *et al*. 2009, PÄTÄRI *et al*. 2016). The values are reflected in the customer's purchasing behaviour. This idea can be also applied in the area of household preferences.
The use of wood in residential as well as in non-residential constructions has increased in previous years, but it is not used traditionally at all (TOPPINEN *et al*. 2016). There are different approaches from the perspective of architects and customers regarding the specific country. ROOS *et al*. (2010) found out that architects and structural engineers in Sweden prefer wood because of its strength, environmental friendliness, easy handling, and appropriateness for use in conjunction with other materials. HEMSTRÖM *et al*. (2011) assessed the perceptions, attitudes, and interest of Swedish architects in wood using. They detected that architects and contract managers also associate it with several disadvantages and uncertainties, primarily with respect to fire safety, stability, durability, and acoustic properties.

The attitudes of architects towards wood were also reviewed in papers by O'CONNOR *et al*. 2004, BAYNE and TAYLOR 2006, BYSHEIM and NYRUD 2009, ROBICHAUD *et al*. 2009, KAPUTA and PALUŠ 2014, MAŤOVÁ and KAPUTA 2018.

Consumers and also construction material companies consider the environmental quality of wood to be important (TOIVONEN 2011, 2012). In the study by TOPPINEN *et al*. (2013), elements related to the environmental sustainability of wooden products in housing, the social acceptability of products, and the aesthetic characteristics of wood can all be associated with a distinct consumer lifestyle, consisting of a complex interplay among consumer backgrounds, values, and behaviour. According to TOIVONEN and HANSEN (2003), wood is additionally an attractive material compared to many other materials. However, environmental quality is typically not the main quality attribute driving consumers or organizational customers in construction materials choice.

Although the consumer perceptions of the environmental quality of wooden products can be identified and logical (TOIVONEN 2012), the practical meaning of environmental attributes can still be vague for the majority of consumers. In a study by HOIBO *et al*. (2015) from Norway, younger people with strong environmental values were found to be the best target for increasing wood-based urban housing. The domestic origin of wood materials has been found to associate with environmental quality in Europe (RAMETSTEINER 1998), and also in particular in Finland (TOIVONEN 2012). Also in other contexts, the environmental quality of wood has been found to connect with consumer willingness to buy and even to pay premiums for products of higher environmental quality (HANSMANN *et al*. 2006, O'BRIEN and TEISL 2004). Overall, consumer knowledge probably is yet likely to be relatively low when it comes to building materials impact on human health (KEITH 2011).

The results of this paper present growing differences in Slovak consumer behaviour considering the construction material. They mainly focus on chosen parameters representing their satisfaction but also the dissatisfaction in case their requirements are not met. This paper is aimed at identifying the customers´ drivers for wood buildings as an ecological innovation from the point of view of sustainable development of building construction in Slovakia.

MATERIALS AND METHODS

The Kano model is the principal applied method of the research aimed at the identification of customers' drivers of the wood building as an ecological innovation from the point of view of sustainable development of building construction in Slovakia is. The data were analysed according to the methodology of CHEN *et al*. (2010), LOUČANOVÁ (2016), DUCÁR *et al*. (2006), ULLAH and TAMAKI (2011) and LOUČANOVÁ *et al*. (2015).

GOODPASTURE (2003), TOMEK and VÁVROVÁ (2009) and TROMMSDORFF and STEINHOFF (2009) applied the Kano model for monitoring customers' views regarding the requirements of the observed object which is elementary in a thorough understanding by customers.

To implement the Kano model, we took the following steps:

1. We identified the main requirements of the consumer: perception of wood housing, fire safety, lifetime, construction, thermal insulating properties, sound insulation, housing costs, price and quality of wood building.
2. We prepared a Kano questionnaire respecting the Kano model rules: according to pre-queried customer requirements; a positive and negative question is formulated to each single requirement. The respondents could answer within the scope of the Likert scale.
3. We set a sample of respondents. The validity of the survey was determined by the methodology for respondents' sample calculation:

$$n = \frac{Z_{1\ \alpha/2}^{2} * S^{2}}{H^{2}} \quad (1)$$

where:
$Z_{1\ \alpha/2}^{2}$ - required confidence level
H - margin of error
s - standard deviation

The sample of respondents was determined at the confidence level of 99 %, with a tolerance error of +/- 5 % of the standard deviation of 0.5, which at the given data represented the value of 665.64, i.e., 666 respondents. Finally, 990 respondents were interviewed and the results according to a confidence level, standard deviation, and margin of error were relevant.

4. Evaluation of results and their interpretation: for each variable, individual responses to the positively and negatively asked question (statement) by the Kano cross rule (Table 1) were individually evaluated to specify the requirements for chosen types of building constructions. This approach classifies individual measured variables into requirements: mandatory (M), one-dimensional (O), attractive (A), irrelevant (I) or questionable (Q).

Tab. 1 Kano Model to evaluate customer requirements.

		Negatively formulated question				
		Strong agree	Partially agree	Neutral attitude	Partially disagree	Strong disagree
Positively formulated question	Strong agree	Q	A	A	A	O
	Partially agree	R	I	I	I	M
	Neutral attitude	R	I	I	I	M
	Partially disagree	R	I	I	I	M
	Strong disagree	R	R	R	R	Q

Source: DUCÁK *et al.* 2006

Individual categories of product requirements affecting the customer satisfaction can be characterized by CHEN *et al*. (2010) as follows:

Mandatory requirements (M) are obligatory requirements that customers consider as normal and are automatically expected. These requirements can be identified as primary or basic. Customers deal with them only in the case of non-compliance. Identifying them is an elementary importance mainly because even though their fulfilment is reflected in customers' satisfaction, their deficit and failure is reflected in customers' dissatisfaction immediately as they realize it.

One-dimensional requirements (O) are represented by those product attributes that lead to fulfilment and satisfaction or in the case of non-compliance to customers' dissatisfaction, i.e., the higher degree of compliance with these requirements is, the more satisfied customers are, but compared to the mandatory requirements customers automatically do not expect them.

Attractive requirements (A) have a clear impact on customers' satisfaction because they are requirements that customers did not expect. If attractive requirements are not met, it does not reflect customer dissatisfaction.

Reverse requirements (R), in some literature (DUCÁR *et al*. 2006, ULLAH and TAMAKI 2011) also called contradictory or exactly opposite, represent product attributes where customers react oppositely.

Irrelevant requirements (I) do not have any influence on customers. This category involves the attributes that are not critical for customers and their presence or absence does not affect their satisfaction or dissatisfaction (DUCÁR *et al*. 2006).

In addition to the above mentioned categories of product requirements, the Kano model also identifies the inconclusive, respectively questionable requirements (Q). Those represent a controversial outcome, which relates either to incorrectly formulated questions or it is caused by lack of understanding by customers.

Based on the identified customers´ requirements there were determined pro-innovative and anti-innovation forces for wood building that are presented in innovative force field of wood building.

Identified customers' requirements were divided into groups and redistributed considering the shares of respondents' sample in percentages. In order to generalize and determine individual dependencies among identified properties of houses and better knowledge of customer´s requirements, data from the database were evaluated by statistical methods. The degree of dependence among individual variables (identified characteristics of chosen types of building constructions) was determined through a correlation coefficient. Its interpretation was carried out according to CHRÁSKA (2000), who describes the dependence among individual variables as positive from the limit from 0.20 to 1 (where the growth of the given variable causes the growth of the dependent variable), the opposite (negative) dependence from –0.2 to –1. COHEN (1988) presented these values for the interpretation of correlation coefficients in psychological research - a scale of correlation (in absolute value) below 0.1 was trivial, 0.1–0.3 small, 0.3–0.5 medium and above 0.5 large. A correlation of 0.7–0.9 is often reported as very large and 0.9–1 as almost perfect.

RESULT AND DISCUSSION

A database of gathered data was processed after the survey application by the Kano questionnaire. Within the demographic data, we focused mainly on gender, age and education level of respondents.

From the database of gathered data related to our survey, we evaluated the individual answers for each question by cross rule of the Kano model using the Kano table which is presented in the paper methodology. The determined properties were subsequently specified as one-dimensional (O), attractive (A), mandatory (M), questionable (Q), reverse (R) and indifferent (I) requirements. Their detailed specification is also described in the methodology.

Regarding the values presented in Table 2 which are based on the KANO model, we found out that the perception of wood buildings had no influence on respondents; actually they perceived this concept contradictory (44.44 %). It means that respondents had exactly opposite requirements representing the features of a competitive product of silicate building materials.

Respondents also perceived contradictory the requirements for the lifetime of these constructions, which were agreed by almost half of the respondents (49.49 %). Other requirements such as fire safety, wood building construction, thermal insulating properties, sound insulation, housing costs, price and wood building quality did not affect at all satisfaction, respectively customer dissatisfaction. It means that these were requirements that were not decisive for the customer and he is not interested in whether they are or they are not met.

On the contrary, respondents in Slovakia perceived silicate building materials much more positively. Especially the critical point of wood buildings - their lifetime - was perceived as an attractive requirement (40.4 %) in silicate building materials. It means that this requirement had clear impact on customers' satisfaction. The quality of these buildings was equally attractive for Slovak respondents (40.41 %). The price presented a mandatory requirement of silicate building materials and it was considered to be standard and automatically expected part of a product by customers (69.7 %). These requirements could be identified as primary or basic. Customers dealt with them only in the case of non-compliance. Their identification had an elementary importance because their fulfilment was reflected in customers' satisfaction, their deficit and failure was reflected in customers' dissatisfaction immediately as they realized it. Fire safety, construction, thermal and acoustic properties and the cost of living in a house made of silicate building materials were requirements that did not affect customers and so they wee considered to be insignificant.

Based on the above findings, we can present these results by an innovative force field for wood building, which shows a significant prevalence of anti-innovation forces over for innovation force for the wood building.

Tab. 2 Results of surveys of customers' requirements for wood building versus silicate building materials.

	Attributes	Attractive		Mandatory		Irrelevant		One-dimensional		Questionable		Reverse		Identified
		Multiplicity												
		Abs.	Relat.	Abs.	Relat.	Abs.	Relat.	Abs.	Relat.	Abs.	Relat.	Abs.	Relat.	
Wood building	Perception of wood houses	60	6.06	10	1.01	440	44.44	30	3.03	10	1.01	440	44.44	I/R
	Fire safety	20	2.02	10	1.01	490	49.49	0	0	10	1.01	460	46.46	I
	Lifetime	70	7.07	10	1.01	400	40.4	10	1.01	10	1.01	490	49.49	R
	Construction	30	3.03	20	2.02	510	51.52	20	2.02	20	2.02	390	39.39	I
	Thermal insulating properties	160	16.16	20	2.02	650	65.66	20	2.02	10	1.01	130	13.13	I
	Sound insulation	40	4.04	0	0	570	57.58	10	1.01	20	2.02	350	35.35	I
	Housing costs	130	13.13	20	2.02	660	66.67	60	6.06	30	3.03	90	9.09	I
	Price	120	12.12	40	4.04	690	69.7	10	1.01	30	3.03	100	10.1	I
	Quality	130	13.13	0	0	410	41.41	40	4.04	70	7.07	340	34.34	I
Silicate building materials	Fire safety	160	16.16	80	8.08	490	49.49	220	22.22	10	1.01	30	3.03	I
	Lifetime	400	40.4	10	1.01	320	32.32	160	16.16	10	1.01	90	9.09	A
	Construction	270	27.27	10	1.01	510	51.52	110	11.11	20	2.02	70	7.07	I
	Thermal insulating properties	110	11.11	0	0	650	65.66	20	2.02	10	1.01	200	20.2	I
	Sound insulation	250	25.25	20	2.02	570	57.58	80	8.08	20	2.02	50	5.05	I
	Housing costs	80	8.08	0	0	660	66.67	10	1.01	30	3.03	210	21.21	I
	Price	70	7.07	690	69.7	20	2.02	10	1.01	30	3.03	170	17.17	M
	Quality	410	41.41	30	3.03	310	31.31	0	0	70	7.07	170	17.17	A

Abs. = Absolute, Relat. = Relative

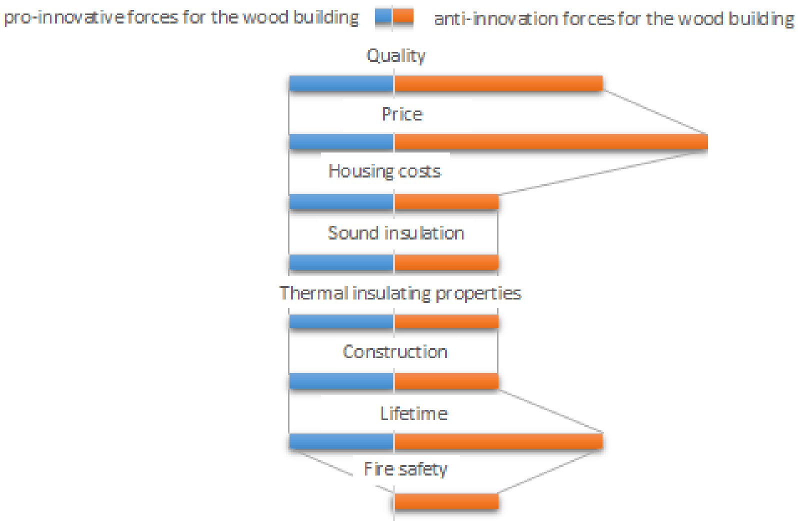

Fig. 1 Innovative force field of wood building.

For a deeper analysis of the gathered data, we carried out further analysis to find out how respondents perceived individual types of buildings. A correlation matrix was calculated to generalize the monitored wood building and building made of silicate materials parameters. It refers to the relationship among monitored variables (Table 3).

Based on the correlation matrix, we could see that respondents were more or less aware (dependence power) of the relationships between the individual parameters of wood or silicate building materials.

Within wood buildings, they were aware of the strong dependence between the construction and the lifetime (0.66) of these buildings, which was also related to their quality. Strong correlation was demonstrated in quality and fire safety (0.5). Medium correlation of quality was shown with heat-insulating and sound-insulating properties. Similarly, the medium correlation was proved between the price and lifetime of wood buildings, the housing costs and lifetime, and the construction and thermal insulating and acoustic properties, as well as the housing costs. Other parameters of wood building presented low correlation among themselves.

To identify the customers' drivers of wood buildings as an ecological innovation from the perspective of sustainable development of building construction in Slovakia, we had to monitor a positive correlation of demographic data and parameters of wood buildings, as well as a negative correlation of wood and silicate building materials data.

The mean correlation was between university-educated respondents and wood building construction. Low correlation was identified between both genders and construction, age category from 15 to 25 years and the fire safety, lifetime and wood buildings construction.

A negative correlation was shown between the 26–45 age category and lifetime. However, the positive perceiving of living costs in wood buildings was connected with age category 46–60 years. University-educated respondent perceived equally positively safety, lifetime, thermal insulation properties and quality of wood buildings (low correlation).

All negative correlations of silicate building materials and wood buildings pointed to the fact that silicate building materials are a strong competition for this innovative building alternative in all parameters in lower or stronger correlation. So they represent an anti-innovation forces for wood building and not customers´ drivers for wood building in the market. HEMSTRÖM *et al*. (2011) presented comparison of wood and silicate building materials from the point of view of respondents' attitudes. From the study follows that wood buildings are associated with disadvantages, respectively uncertainties, especially in the area of fire safety, lifetime and acoustic properties.

Based on data from the correlation matrix we could identify the basic customers´ drivers for wood buildings in Slovakia. They were their construction, fire safety, housing costs, quality, thermal insulating properties and lifetime, which are positively evaluated only by university educated respondents and some respondents of the youngest age category.

Finally, we can conclude that wood buildings in Slovakia have strong competition in buildings of silicate materials. TOPPINEN *et al*. (2013) state that they present an alternative in the building industry, but they are not traditionally used.

The main customer driver of wood buildings in Slovakia is their construction. As ROOS *et al*. state (2010) this construction is preferred by engineers because of wood strenght and environmental friendliness as well as its easy handling and connection with other materials.

As it is presented by HEMSTRÖM *et al*. (2011) and given correlation matrix, lower or stronger correlation od wood buildings is related to fire safety, housing costs, quality, thermal insulating properties and lifetime.

Tab. 3 Correlation matrix.

		Demographics									Wood building									Brick building							
		Gender		Age categories				Education																			
		Woman	Men	15-25	26-45	46-65	65 +	EL	SE	UN	D	FS	Life	CS	TIP	SI	HC	Price	Q	FS	Life	CS	TIP	SI	HC	Price	Q
Demographics	Woman	1.00																									
	Men	-1.00	1.00																								
	15-25	0.02	-0.02	1.00																							
	26-45	0.06	-0.06	-0.51	1.00																						
	46-65	0.06	-0.06	-0.47	-0.38	1.00																					
	65 +	-0.25	0.25	-0.20	-0.16	-0.15	1.00																				
	Elementary (EL)	-0.24	0.24	-0.14	-0.11	-0.11	0.70	1.00																			
	Secondary (SE)	-0.25	0.25	-0.10	-0.09	0.20	0.01	-0.17	1.00																		
	University (UN)	0.34	-0.34	0.15	0.13	-0.17	-0.25	-0.17	-0.94	1.00																	
Wood building	Definition (D)	0.15	-0.15	0.14	-0.06	0.04	-0.25	0.04	-0.09	0.15	1.00																
	Fire safety (FS)	0.18	-0.18	0.14	-0.16	0.14	-0.24	-0.17	-0.16	0.22	0.41	1.00															
	Life	0.12	-0.12	0.19	-0.20	0.10	-0.19	-0.20	-0.07	0.14	0.50	0.54	1.00														
	Construction (CS)	0.21	-0.21	0.15	-0.06	0.03	-0.23	-0.13	-0.26	0.30	0.66	0.53	0.61	1.00													
	Thermal insulating properties (TIP)	0.02	-0.02	0.05	-0.19	0.15	-0.02	0.08	-0.19	0.16	0.42	0.16	0.34	0.42	1.00												
	Sound insulation (SI)	-0.03	0.03	0.16	-0.03	-0.03	-0.22	-0.20	0.08	-0.01	0.43	0.40	0.49	0.38	0.16	1.00											
	Housing costs (HC)	0.03	-0.03	0.01	-0.10	0.20	-0.20	-0.17	-0.02	0.08	0.26	0.47	0.32	0.34	0.36	0.25	1.00										
	Price	0.10	-0.10	-0.02	0.01	0.09	-0.15	-0.11	-0.03	0.07	0.29	0.36	0.18	0.21	0.11	0.25	0.46	1.00									
	Quality (Q)	0.06	-0.06	0.18	-0.14	0.04	-0.15	-0.13	-0.15	0.20	0.56	0.50	0.60	0.65	0.34	0.34	0.28	0.19	1.00								
Silicate building materials	Fire safety (FS)	-0.14	0.14	-0.04	0.03	-0.10	0.21	0.15	0.15	-0.20	-0.43	-0.76	-0.33	-0.40	-0.13	-0.35	-0.27	-0.28	-0.34	1.00							
	Life	0.03	-0.03	-0.09	0.19	-0.04	-0.09	-0.13	0.09	-0.05	-0.37	-0.39	-0.85	-0.44	-0.37	-0.33	-0.13	-0.04	-0.48	0.24	1.00						
	Construction (CS)	-0.02	0.02	-0.16	0.11	0.06	0.00	-0.16	0.22	-0.17	-0.53	-0.38	-0.56	-0.73	-0.44	-0.40	-0.20	-0.18	-0.44	0.32	0.64	1.00					
	Thermal insulating properties (TIP)	-0.03	0.03	-0.10	0.20	-0.10	0.01	-0.07	0.23	-0.21	-0.32	-0.19	-0.26	-0.32	-0.85	-0.10	-0.36	-0.10	-0.29	0.18	0.30	0.35	1.00				
	Sound insulation (SI)	-0.05	0.05	-0.08	0.00	-0.01	0.18	0.18	0.05	-0.11	-0.40	-0.24	-0.44	-0.41	-0.15	-0.71	-0.17	0.05	-0.30	0.20	0.34	0.44	0.03	1.00			
	Housing costs (HC)	-0.02	0.02	0.00	0.04	-0.06	0.04	-0.10	0.08	-0.04	-0.17	-0.35	-0.14	-0.15	-0.34	-0.15	-0.59	-0.36	-0.15	0.11	0.22	0.27	0.31	0.08	1.00		
	Price	-0.09	0.09	0.04	-0.05	-0.10	0.19	0.18	0.06	-0.13	-0.22	-0.19	-0.22	-0.22	-0.03	-0.08	-0.33	-0.61	-0.12	0.04	0.08	0.13	-0.01	0.27	0.20	1.00	
	Quality (Q)	-0.02	0.02	-0.11	0.08	0.01	0.05	-0.05	0.28	-0.26	-0.61	-0.25	-0.44	-0.49	-0.57	-0.33	-0.29	-0.09	-0.52	0.27	0.46	0.60	0.52	0.28	0.30	0.00	1.00

Cohen correlation coefficient interpretation		
Color	The value of the correlation coefficient	Interpretation
(black)	0,0-0,1	trivial correlation
(light green)	0,1-0,3	low correlation
(yellow)	0,3-0,5	medium correlation
(brown/orange)	0,5-0,7	strong correlation
(magenta)	0,7-0,9	very strong correlation
(red)	0,9-1,0	almost perfect correlation

From the Slovak customers´ point of view wood buildings are important (positive correlation to perception of wood buildings), but they still icreasingly prefer buildings made of silicate materials. As it is described by TOIVONEN (2011, 2012, 2013), consumers and companies more likely consider wood buildings to be environmentally friendly and important, they associate them with sustainability in building industry. Consumers like them, mainly their aesthetic qualities, but like TOIVONEN and HANSEN (2003) present, these are not the key attributes in decision making of consumer and companies.

Demand for wood framed houses, as our study points out, is influenced by decisions of university educated consumers and younger people. This finding is also confirmed by HOIBO *et al*. (2015), who found out that young people are the best target for increasing wood-based housing, as well as a study by ROOS *et al*. (2010), which states that engineers prefer wood buildings to buildings made of silicate materials because of their construction. As it is reported by TOIVONEN (2012) and HOIBO *et al*. (2015), the main target group of these constructions is created mainly by people with strong environmental values and with willingness to buy and even pay for products of higher environmental quality (HANSMANN *et al*. 2006, O'BRIEN and TEISL 2004). As it is reported by WANG *et al*. (2014) the ascending trend of wood building as an ecological invention of buildings, , is possible through hybrid structures. It means combinations of wood or wood composite materials with other materials.

CONCLUSION

Innovation together with sustainable growth has a substantial place in mainstream market economy. Sustainable growth is a persistently developing and essential factor in a globalized world which is constructed on three pillars - economic, social and environmental.

In order to support sustainable growth a lot of improvements have become an essential part of the building industry where the consumers challenge the question which type of the building is more suitable for them – a wood building or abuilding made of silicate materials. This idea is also the part of many studies focusing on attitudes towards determined attributes of individual types of buildings.

Based on our findings, we can state that Slovak consumers are rather traditional what is reflected in their preferred type of building construction. Only university educated consumers and respondents from the lowest age category present higher interest in wood houses, that is connected with their properties such as type of construction, fire safety, housing costs, quality, thermal insulating properties and lifetime. These are the requirements that must be taken into account in marketing strategies focusing on wood buildings.

REFERENCES

AUTIO, M., HEISKANEN, E., HEINONEN, V. 2009. Narratives of "Green" consumers–the antihero, the environmental hero and the anarchist. In Journal of Consumer Behaviour, 2009. 8(1): 40–53.
BAYNE, K., TAYLOR, S. 2006. Attitudes to the use of wood as a structural material in nonresidental building applications: opportunities for growth. Austrian Government: Forest and Wood Products Res. And Development Corporation.
BOURDEAU, L. 1999. Sustainable development and the future of construction: a comparison of visions from various countries. In Building Research & Information, 1999. 27(6): 354–366.
BYSHEIM, K., A. Q. NYRUD. 2009. Using a predictive model to analyze architects' intentions of using wood in urban construction. In Forest Products Journal[online]. 2009, 59(7): 65–74. ISSN 00157473.

COHEN, J. 1988. Statistical power analysis for the behavioral sciences (2nd ed), Hillsdale, NJ: Lawrence Erlbaum Associates, 1988. 400 p. ISBN: 0-8058-0283-5.
DUCÁR, S., NAŠČÁKOVÁ, J., MALÁK, M. 2006. Návrh systému merania spokojnosti zákazníkov Kano modelom. In Transfer inovácií, 2006. Vol. 9, p. 137–139.
GOODPASTURE, J. 2003. Quantitative Methods in Project management. USA: J. Ross Publishing. 288 p. ISBN 1-932159-15-0.
HÄKKINEN, T. 2007. Assessment of indicators for sustainable urban construction. In Civil Engineering and Environmental Systems, 2007. Vol. 24, Issue 4, p. 247–259.
HANSMANN, R., KÖLLNER, T. R.W. 2006. ScholzInfluence of consumers' socio ecological and economic orientations on preferences for wood products with sustainability labels. In For. Policy Econ., 8, pp. 239–250.
HEMSTRÖM, K., MAHAPATRA, K., LEIF, G. 2011. Perceptions, attitudes and interest of Swedish architects towards the use of wood frames in multi-storey buildings. In Resources Conservation and Recycling, 2011. Vol. 55. p. 1013–1021.
HERCZEG, M., MCKINNON, D., MILIOS, L., BAKAS, I., KLAASSENS, E., SVATIKOVA, K., WIDERBERG, O. 2014. Resource efficiency in the building sector. Final report for DG Environment. ECORYS and Copenhagen Resource Institute, 2014, p. 128.
HURMEKOSKI, E., HETEMÄKI, L., LIDENN, M. 2015. Factors affecting sawnwood consumption in Europe. In Forest Policy and Economics, 2015. Vol. 50, Issue 1, p. 236–248.
CHEN, L.S., LIU, C.H., HUU, C.C., LIN, C.S. 2010. Kano Model : a Novel Approach for Discovering ttractive Quality Elements. In Total Quality Management, 2010. Vol. 21, Issue 11 p. 1189–1214.
CHRÁSKA, M. 2000. Základy výzkumu v pedagogice. Olomouc: VUP. 257 s. ISBN 80-7067-798-8.
KALAMÁROVÁ, M., PAROBEK, J., LOUČANOVÁ, E., TREBUŇA, P. 2014. Competitiveness evaluation of the Slovak forest industry. In Position and role of the forest based sector in the green economy : proceedings of scientific papers. Zagreb: International Association for Economics and Management in Wood Processing and Furniture Manufacturing - WoodEMA, 2014, p. 58–62. ISBN 978-953-57822-1-6.
KAPUTA, V., PALUŠ, H. 2014. Architects and wood as a construction material: a case of Slovakia. Zagreb: WoodEMA i.a., ISBN: 978-953-57822-1-6.
KOLLÁR, V., BROKEŠ, P. 2005. Environmentálny manažment. Bratislava: SPRINT, 2005. 327 s. ISBN 80- 89085- 37- 7.
LOUČANOVÁ, E., KALAMÁROVÁ, M., OLŠIAKOVÁ, M. 2017. The importance of innovation in building materials in terms of sustainable growth. In Intercathedra, 2017. Vol. 33, Issue 1. P. 7–11. ISSN 1640-3622.
LOUČANOVÁ, E., PAROBEK, J., KALAMÁROVÁ, M., PALUŠ, H., MAŤOVÁ, H., REPKOVÁ ŠTOFKOVÁ, K. 2015. Innovation activities in micro and small companies in Slovakia. In Globalization and its socio-economic consequences : 15th international scientific conference, 2015, p. 378–381.
LOUČANOVÁ, E., PALUŠ, H., DZIAN, M. 2016. A Course of Innovations in Wood Processing Industry within the Forestry-Wood Chain in Slovakia: A Q Methodology Study to Identify Future Orientation in the Sector. In Forests, 2016. Vol. 8, Issue 6, p. 0–13. ISSN: 1999-4907.
LOUČANOVÁ, E., PAROBEK, J., KALAMÁROVÁ, M., PALUŠ, H., LENOCH, J. 2015. Eco-innovation performance of Slovakia. In Procedia - economics and finance, 2015. Vol. 26, p. 920–924. ISSN 2212-5671.
MAŤOVÁ, H., KAPUTA, V. 2018. Attitudes of active and upcoming architects towards wood: the case study in Slovakia. In Acta Facultatis Xylologiae Zvolen. 2018. Vol. 60, Issue. 2, p. 199–209. ISSN 1336-3824
MITTERPACH, J., ŠTEFKO, J. 2016. An environmental impact of a wooden and brick house by the LCA Method. In Key Engineering Materials. Trans Tech Publications Ltd, 2016. p. 204–209.
O'BRIEN, K.A., Teisl M.F. 2004. Eco-information and its effect on consumer values for environmentally certified forest products. In J. For. Econ., 10, pp. 75–76.
O'CONNOR, J., KOZAK, R., GASTON, C., FELL, D. 2004. Wood use in non residential buildings: opportunities and barriers. In Forest Products Journal, 54(3): 19–28.

OLŠIAKOVÁ, M., LOUČANOVÁ, E., KALAMÁROVÁ, M. 2017. Application of new trends of marketing communication as a competitiveness tool in furniture industry. In More wood, better management, increasing effectiveness: starting points and perspective: proceedings of scientific papers [elektronický zdroj]. Prague : Czech University of Life Sciences Prague ; Zagreb: WoodEMA, 2017. p. 5–10. ISBN 978-80-213-2761-0.
OLŠIAKOVÁ, M., LOUČANOVÁ, E., PALUŠ, H. 2016. Monitoring changes in consumer requirements for wood products in terms of consumer behavior. In Acta Facultatis Xylologiae Zvolen, 2016. Vol. 58, Issue 1, p. 137–147. ISSN: 1336-3824.
PALUŠ, H., PAROBEK, J., DZIAN, M., ŠUPÍN, M. 2018. Determinants of Sawnwood Consumption in Slovakia. In BioResources, 2018. Vol. 13, Issue 2, p. 3615–3626.
PAROBEK, J., LOUČANOVÁ, E., KALAMÁROVÁ, M., ŠUPÍN, M., REPKOVÁ ŠTOFKOVÁ, K. 2015. Customer window quadrant as a tool for tracking customer satisfaction on the furniture market. In Procedia - economics and finance, 2015. Vol. 34, p. 493–499.
PAROBEK, J., PALUŠ, H., KALAMÁROVÁ, M., LOUČANOVÁ, E., ŠUPÍN, M., KRIŽANOVÁ, A., PAROBEK, J., PALUŠ, H., LOUČANOVÁ, E., KALAMÁROVÁ, M., GLAVONIĆ, B. 2016. Competitiveness of central european countries in the EU forest products market with the emphasis on Slovakia. In Acta Facultatis Xylologiae Zvolen, 2016. Vol. 58, Issue 1, p. 125–136. ISSN: 1336-3824.
PÄTÄRI, S., TUPPURA, A., TOPPINEN, A., KORHONEN, J. 2016. Global sustainability megaforces in shaping the future of the European pulp and paper industry towards a bioeconomy. In Forest Policy and Econics, Elsevier, 2016. Vol. 66, p. 38–46.
RAMETSTEINER, E. 1998. The Attitude of European Consumers Towards Forest and Forestry FAO, 1998. Available at http://www.fao.org/docrep/x0963e/x0963e0a.htm
REPKOVÁ, K. 2016. Energy Utilization of Renewable Resources in the European Union ― Cluster Analysis Approach. In BioResources, 2016. Vol. 11, Issue 1, p. 984–995. ISSN: 1930-2126.
ROBICHAUD, F., KOZAK, R., RICHELIEU, A. 2009. Wood use in nonresidential construction: a case for communication with architects. In Forest Products Journal, 59(1/2): 57.
ROOS A., WOXBLOM, L., MCCLUSKEY, D. 2010. The influence of architects and structural engineers on timber in construction – perceptions and roles. In Silva Fennica, 2010. Vol. 44, Issue 5.
ŠTEFKO, J., BEBEJ, D., BEDNÁR, J. 2013. Envelope Structures of Low Energy Wooden Houses Considering Indoor Climate. In Advanced Materials Research. Trans Tech Publications Ltd, 2013. p. 69–72.
ŠTĚRBOVÁ, M., LOUČANOVÁ, E., PALUŠ, H., IVAN, Ľ., ŠÁLKA, J. 2016. Innovation Strategy in Slovak Forest Contractor Firms—A SWOT Analysis. In Forests, 2016. Vol. 7, Issue 6. 12 p.
ŠVAJLENKA, J., KOZLOVSKÁ, M. 2018. Houses Based on Wood as an Ecological and Sustainable Housing Alternative—Case Study. In Sustainability, 2018. Vol. 10, Issue 5, 1502.
TOIVONEN, R. 2011. Dimensionality of quality from customer perspective in the wood industry. Dissertationes Forestales 114, 2011, 71 p.
TOIVONEN, R. 2012. Product quality and value from consumer perspective - an application to wooden products. In Journal of Forest Economics, 2012. Vol. 18, Issue 2, p. 157–173.
TOIVONEN, R., HANSEN, E. 2003. Quality dimensions of wood products – perceptions of German organizational customers. In Helles, F., Strange, N., Wichmann, L. Recent Accomplishments in Applied Forest Economics Research, 2003. Vol. 74, p. 2019–2226.
TOMEK, G., VÁVROVÁ, V. 2009. Jak zvýšit konkurenční schopnost firmy. Praha : C. H. Beck. 241 p. ISBN 9788074000980.
TOPPINEN, A., TOIVONEN, R., VALKEAPÄÄ, A., RÄMÖ, A. 2013. Consumer perceptions on environmental and social responsibility of wood products in the Finnish markets. In Scandivian Journal of Forest Research, 2013, Vol. 28, Issue 8), p. 775–783.
TROMMSDORF, V., STEINHOFF, F. 2009. Marketing inovací. Praha: C. H. Beck, Praha. 291 p. ISBN 9788074000928.
ULLAH, S., TAMAKI, J. 2011. Analysis of Kano-model-based customer needs for product development. In Systems Engineering, 2011, Vol. 14, Issue 2, p. 154–172.
WANG, L., TOPPINEN, A., JUSLIN, H. 2014. Use of wood in green building: a study of expert perspectives from the UK. In Journal of Cleaner Production, 2014. Vol. 65, p. 350–361.

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