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Innovation and Competitive Characteristics in Local Forest Industry Enterprises: A Case Study

Inovacijska i konkurentska obilježja lokalnih poduzeća drvne industrije: studija slučaja

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ABSTRACT • *The forest products industry makes significant contributions to national economies in terms of basic economic indicators such as employment, expansion into rural areas, added value, investment and exports. This study aims to measure the innovation perception, awareness and competitiveness of small and medium-sized forest products enterprises operating in local areas on the basis of different variables. Within the scope of the study, a data collection tool including on-site observation, interviews and the developed scale was used on enterprises located in a local administrative region. The data obtained were subjected to hypothesis testing and correlation analysis. The findings revealed that the perception of innovation in small and medium-sized forest products industry enterprises is affected by demographic factors related to the enterprise managers, and basic factors related to the enterprise such as the number of employees, field of activity, duration of activity, annual average income, and product distribution channels. Furthermore, it has been determined that innovation awareness decreases as the scale of the enterprises shrinks. As a result, it can be said that the innovation and competition characteristics that are valid in the global and national forest products industry market are not yet fully applicable to local-scale and low-capacity enterprises.*

KEYWORDS: *products industry; innovation; small and medium-sized enterprise; competition*

SAŽETAK • *Drvna industrija znatno pridonosi nacionalnim gospodarstvima u smislu osnovnih ekonomskih pokazatelja kao što su zaposlenost, širenje u ruralna područja, dodana vrijednost, ulaganja i izvoz. Cilj ove studije bio je na temelju različitih varijabli izmjeriti percepciju inovacija, svijest i konkurentnost malih i srednjih drvnoindustrijskih poduzeća koja posluju na lokalnim područjima. U sklopu studije primijenjeni su ovi alati za prikupljanje podataka u poduzećima smještenima u lokalnoj administrativnoj regiji: izravno promatranje u poduzeću, intervjui i skala razvijenosti. Dobiveni su podatci podvrgnuti testiranju hipoteza i analizi korelacije. Rezultati su pokazali da na percepciju inovacija u malim i srednjim poduzećima u drvnoj industriji utječu demografski čimbenici povezani s menadžerima poduzeća i osnovni čimbenici povezani s poduzećem poput broja zaposlenika, područja djelovanja, trajanja djelovanja, prosječnoga godišnjeg prihoda i kanala distribucije proizvoda. Nadalje, utvrđeno je da je svijest o inovacijama razmjerna veličini poduzeća, tj. što je poduzeće manje, manja je i svijest o inovacijama.*

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Stoga se može reći da inovacijska i konkurentska obilježja koja vrijede na globalnome i nacionalnom tržištu drvne industrije još nisu u potpunosti primjenjiva na lokalna poduzeća i poduzeća malog kapaciteta.

KLJUČNE RIJEČI: *prerađivačka industrija; inovacija; malo i srednje poduzeće; konkurencija*

1 INTRODUCTION
1. UVOD

With globalization, the significant removal of trade barriers between countries has exposed enterprises to intense competitive conditions (Jovane *et al.,* 2017). On the other hand, developments in technology have emerged as an important qualitative variable in consumer demands (Kotler *et al.,* 2017; Loučanová *et al*., 2022). Global enterprises have the potential to gain a competitive advantage not only by utilizing cutting-edge technology but also through their product and cost policies (Tsai and Shih, 2004). Today, enterprises must compete under challenging conditions not only with companies producing products of the same quality but also with those producing substitute products. Enterprises have had to change their traditional products and production methods in line with changes in market conditions (Aytekin and Pekkaya, 2021; Uhan *et al*., 2023; Humaira, 2024). This process has necessitated innovations in accordance with environmental changes (Moore, 2015). Increased competition in the goods and services market has heightened the importance of the concept of innovation (Vives, 2008).

In other words, innovation is the process of taking an idea from the discovery stage to implementation. It generally includes the research, development, and production stages (Lane and Flagg, 2010). The prediction that enterprises cannot sustain competition by maintaining traditional product and service approaches in changing market conditions has led them to focus on innovation, making innovation a new competitive tool among enterprises (Pirc-Barčić and Motik, 2013). Large enterprises with strong capital structures can allocate more budget to R&D activities and leverage their innovation advantage (Shefer and Frenkel, 2005). On the other hand, large organizational structures and the inability to respond quickly to changes in demand have had a negative impact on large companies in terms of innovation. Small and medium-sized enterprises (SMEs), unlike large enterprises, have been able to achieve greater success in innovation due to their more flexible structures, their ability to maintain close communication with customers, and their capacity to adapt product and service processes to customer requirements (Allocca and Kessler, 2006).

SMEs account for a significant proportion of enterprises in national economies (Robu, 2013; Zafar and Mustafa, 2017; Ndiaye *et al.,* 2018; Barinova and Zempsov, 2019). On the other hand, it carries significant importance in terms of employment, added value, investment, exports, taxes, etc. (Sertić *et al.,* 2018). It is reported that 95 – 99 % of enterprises worldwide are SMEs, with SMEs accounting for 30 – 60 % of investments, 40 – 80 % of total employment, and 30 – 70 % of Gross Domestic Product (GDP). As of the end of 2022, it is seen that SMEs constitute 99.7 % of all enterprises in Turkey. In terms of personnel numbers, SMEs account for 70.6 % of total employment (Ketboğa, 2024). On the other hand, according to the latest statistics released in 2024, the number of personnel employed in the forest products sector in Türkiye was reported as 309,797 (SGK, 2024). This number of employees corresponds to approximately 2 % of total employment. The number of enterprises operating in the Turkish forest products industry (European Union's NACE Rev.2 statistical economic activity classifications 16, 17, and 31) is 46,550 (SGK, 2024). In 40,093 of these enterprises (86 %), the number of employees is less than 10 (SGK, 2024). The Turkish forest products sector accounts for a significant share of the country's economy, but the sector's overall structure consists of small and medium-sized enterprises.

It is clear that SMEs, which occupy an important place in the forest products industry sector, play a significant role in the distribution of capital. It is considered an inevitable necessity for these enterprises to carry out innovation-focused activities in order to maintain their existence and develop their competitive strength. The aim of this study is to determine the level of innovation awareness among local forestry industry enterprises. In this context, the key factors influencing this awareness and the differences in awareness based on these factors will be identified. Consequently, the study will highlight the areas that need to be focused on in order to improve innovation and, consequently, the competitive capabilities of enterprises in the local forestry industry sector.

2 MATERIALS AND METHODS
2. MATERIJALI I METODE

The research was conducted among small and medium-sized enterprises (SMEs) operating in the forest products industry within the province of Gümüşhane. In order to implement the research, it was determined that there was a total of 85 enterprises in the study area according to the records of the Chamber of Commerce and Industry, the Chamber of Tradesmen and Craftsmen in the province and districts, and the

Social Security Institution (SGK, 2024). Therefore, the study was carried out within the scope of the main sectors of "Manufacturing of wood, wood products and cork products (excluding furniture); manufacturing of articles made by weaving reeds, straw and similar materials" (NACE Rev. 2 code 16) and "Manufacturing of furniture" (NACE Rev. 2 code 31).

2.1 Data collection instrument
2.1. Instrument za prikupljanje podataka

In this study, a face-to-face interview-based survey was used as a data collection tool to determine the perception and awareness of innovation among enterprises owners and officials. The statements included in the research scale were structured according to a 5-point Likert scale. The statements were structured as follows: (1) Strongly disagree, (2) Disagree, (3) Undecided, (4) Agree, (5) Strongly agree. The research design consisted of 19 questions and 16 statements, including related sub-questions in the survey section. Different sources related to the subject were used in preparing the survey questions (Kanber, 2010; Demir, 2014; Karaman, 2019). Data was collected between April and August 2024.

2.2 Data collection
2.2. Prikupljanje podataka

In this study, conducted in enterprises engaged in wood, woodworking and furniture manufacturing within the scope of the field of work, the minimum number of participating enterprises required to reach generalizable conclusions regarding innovation was calculated using formula 1 (Baş, 2006).

$$n = (N \cdot t^2 \cdot p \cdot q) / (d^2 \cdot (N-1) + t^2 \cdot p \cdot q) \quad (1)$$

N – number of elements in the universe (total number of workplaces), n – sample size, t – confidence coefficient, p – probability of the attribute being observed in the universe, q – probability of the attribute not being observed in the universe (1-p), d – sampling error.

In the study, sampling error was included in the calculation as $t = 1.96$ for a 95 % confidence level. The variable values p and q were considered as 0.5.

Within the scope of the research area, a total of 85 enterprises were identified in the fields of tree, woodworking and furniture manufacturing (SGK, 2024). Therefore, the research population was determined to be 85. In this study, the minimum sample size required from a known population was calculated as 45. A total of 128 sector employees from 49 enterprises were reached for the study.

The reliability (internal consistency) of the data collection tool was calculated using Cronbach's Alpha Reliability Coefficient. The suitability of the data obtained as a result of the application of the data collection tool for factor analysis was examined using Bartlett's Sphericity test and the Kaiser-Meyer-Olkin (KMO) coefficient (Kalaycı, 2010; Baş, 2006).

2.3 Analysis of data
2.3. Analiza podataka

The scale included in the data collection instrument used in this study was developed specifically for this study. During the scale development process, a pre-test was administered to 15 participants using 20 variables. Based on the evaluation of the pre-test data, 4 variables that were found difficult for participants to understand and evaluate were removed from the scale. The final test of the study was conducted using a 16-variable scale. The data obtained were subjected to validity and reliability analyses, and these findings revealed that the data set was suitable for factor analysis (Kalaycı, 2010).

To determine the analysis method to be used in the study, Kolmogorov Smirnov and Shapiro Wilk normality tests were performed on the 16 statements included in the scale. The results obtained from both tests were significant at the $p < 0.05$ level ($p = 0.000$ for all statements), indicating that the data did not show a normal distribution (Baştürk, 2011). On the other hand, since the calculated Skewness and Kurtosis values did not fall within the range of -2 to +2 (George and Mallery, 2012), it was decided that non-parametric tests should be used in analyses based on the scale.

In order to simplify the statistical analyses to be used, the 16 variables in the scale were grouped into 4 different groups based on the main idea to be measured. These groups are new product development, market research and customer satisfaction, technological development and organizational development, new enterprises ideas, methods and information.

The study included hypothesis testing as well as correlation analysis aimed at identifying the relationship between innovation factors and research variables. In this context, SPSS version 20 statistical analysis software (IBM Corp., Armonk, NY, USA) was utilized.

3 RESULTS AND DISCUSSION
3. REZULTATI I RASPRAVA

In the study, a KMO validity analysis was applied to test the validity of the data and the suitability of factor analysis. As a result of the analyses, the KMO coefficient was calculated as 0.657, and the Bartlett test result was found to be significant ($p < 0.05$) with a $p = 0.000$ value. These values indicate that the data collection tool meets the KMO coefficient adequacy condition of KMO>0.500 (Kalaycı, 2010). The reliability of the data was tested using the Cronbach Alpha method, one of the most preferred methods in data collection tools (Kula Kartal and Mor Dirlik, 2016), and

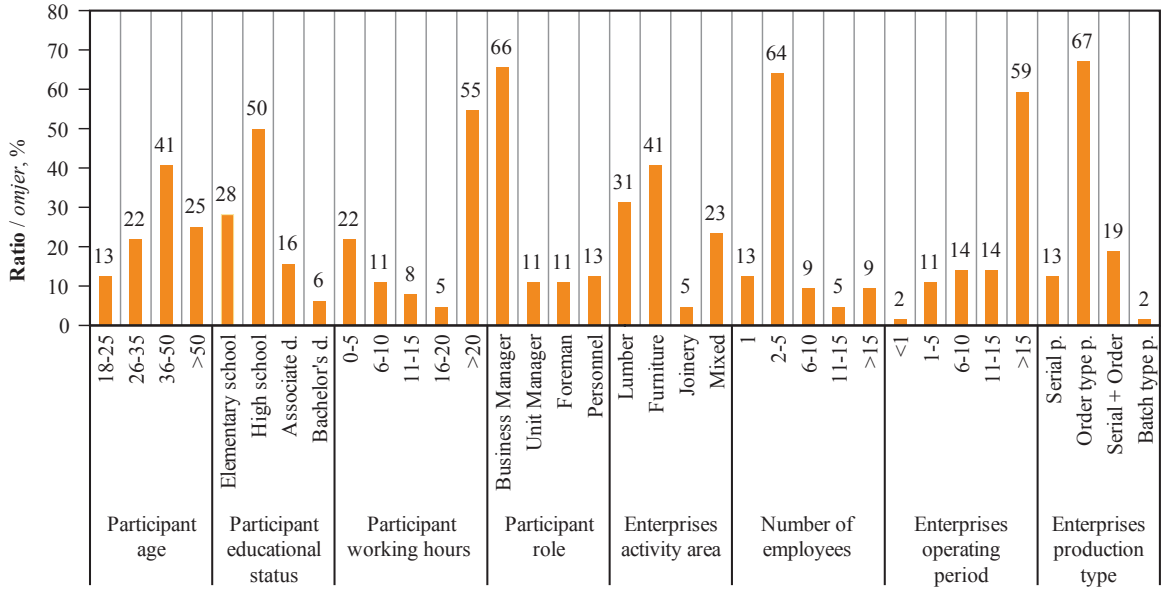

Figure 1 Distribution of participants and enterprises based on certain variables
Slika 1. Raspodjela sudionika i poduzeća na temelju određenih varijabli

the Cronbach Alpha Coefficient (α) was calculated as 0.849. The fact that the reliability coefficient meets the condition of $0.80 < \alpha < 1.00$ indicates that the data is highly reliable (Kalaycı, 2010; Yıldız and Uzunsakal, 2018).

Participants in the study were clustered as follows: 63 % were aged 26-50, 78 % had a high school education or below, 60 % had over 15 years of work experience, and 66 % were enterprises executives. On the other hand, the enterprises were clustered as follows: 41 % in the furniture sector, 77 % with 1-5 employees, 59 % operating for over 15 years, and 67 % engaged in order-type production (Figure 1).

Information regarding the enterprises examined in this study is given in Figure 2. Furniture enterprises had the highest participation rate at 45 %, while joinery enterprises had the lowest at 6 %. It was determined that 65 % of the participating enterprises had between 2 and 5 employees. 55 % of the enterprises had been operating for less than 10 years in total. 71 % of the participating enterprises carry out order-based production.

It has been observed that enterprises plans regarding innovation-driven machine renewal (5 %) and production system renewal (2 %) factors remain at a low level. On the other hand, it has been understood that plans for machine renewal are related to increasing production capacity. It has been determined that the current situation is largely considered sufficient, or that machine renewal is seen as a priority goal to ensure the

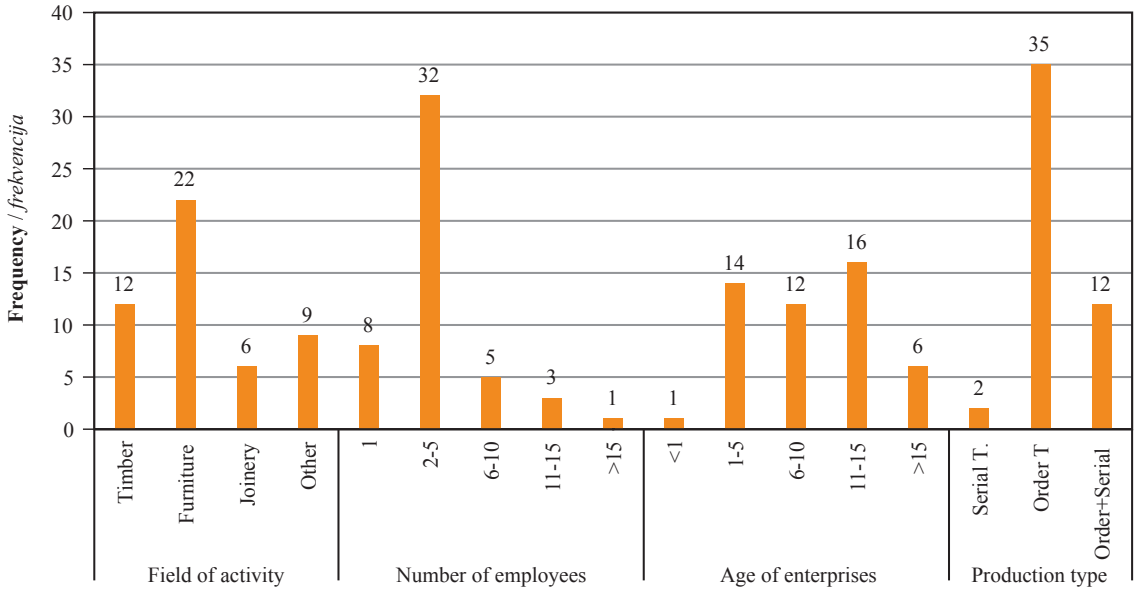

Figure 2 Distribution of participants and enterprises based on certain variables
Slika 2. Raspodjela sudionika i poduzeća na temelju određenih varijabli

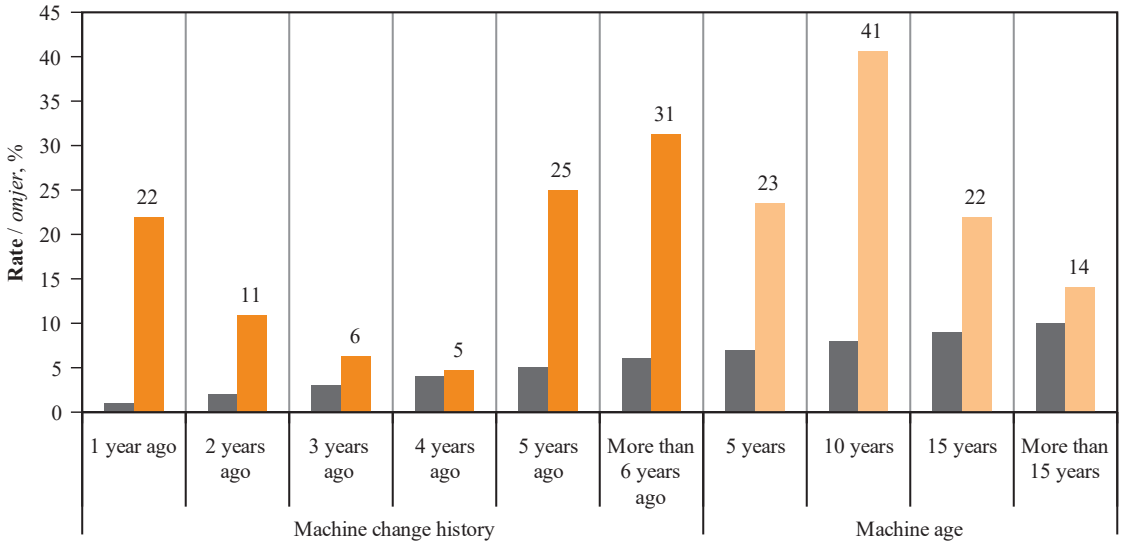

Figure 3 Machinery and equipment renewal history of enterprises
Slika 3. Povijest obnove strojeva i opreme poduzeća

employment of workers for the increase in production capacity. Similarly, in the Zambian timber industry, the Cobb-Douglas model showed that sawn timber recovery depends on operator skills, especially in non-automated machines, which are common (Mandiringana *et al.,* 2022).

Within the scope of the study, 75 % of the enterprises evaluated the use of direct sales methods, while 20 % offer their products to consumers in company-owned stores. It was found that only 5 % of enterprises use wholesaler or retailer marketing channels. On the other hand, it was determined that 63 % of enterprises do not use any product promotion method, while 37 % of enterprises engage in product promotion on a limited scale.

It was determined that 56 % of the enterprises included in the study had renewed their machinery and equipment more than five years ago, while 33 % have renewed their machinery and equipment in the last two years. Furthermore, it was found that 77 % of the existing machines in the enterprises had been in use for over 10 years (Figure 3). On the other hand, it was observed that 86 % of the enterprises have not made any changes to inputs such as raw materials or semi-finished products since their establishment.

The study found that the age of employees working in the companies included in the study was a differentiating factor in their views on innovation factors. Employees aged 18-25 were the group with the most positive attitude toward innovation factors. Employees aged 26-35, on the other hand, were found to be the group with the lowest average positive opinion overall. Statistically significant differences ($p < 0.05$) were found between the educational levels of enterprises employees and their views on innovation factors. In terms of innovation factors, it was determined that the average opinions of participants with a high school education level were generally high, while participants with a bachelor's degree had the lowest average opinions across all factors (Table 1).

Innovation factors were determined using relevant literature (Table 1) (Cao and Hansen, 2006; Çetin and Gedik, 2017; Ayşin, 2019).

The study found statistically significant differences ($p < 0.05$) between participants' views on innovation factors and their length of service in the sector. The results showed that employees with 0-5 years of work experience in the sector and participants with more than 20 years of work experience had on average the highest opinion on innovation factors. On the other hand, participants with 16-20 years of work experience had on average the lowest opinion on innovation factors. The analyses revealed differences in participants' views on the new product development innovation factor based on the average annual income levels of enterprises. It was observed that an increase in average annual income levels raised awareness of new product development in the sector (Table 2).

In the analyses based on the participants' roles within the company, statistically significant differences in opinion ($p < 0.05$) were found in market research and customer satisfaction, technological development and organizational development, and new enterprises ideas, methods, and knowledge factors. It was determined that enterprises owners had the highest level of awareness in the specified innovation factors. On the other hand, it was observed that innovation awareness among employees without administrative roles in the enterprises remained at a low level. Statistically significant differences ($p < 0.05$) were found between the opinions of participants regarding the innovation factor of new product development based on the activity area

Table 1 Kruskal-Wallis analysis results on innovation factors scale according to age and education status of employees
Tablica 1. Rezultati Kruskal-Wallisove analize inovacijskih čimbenika s obzirom na dob i razinu obrazovanja zaposlenika

Innovation factors *Inovacijski čimbenici*	**Age** *Dob*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig.** (**p* < 0.05)	**Educational status** *Razina obrazovanja*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig.** (**p* < 0.05)
New product development *razvoj novog proizvoda*	18-25	16	92.5	11.932	0.008*	Elementary school / *osnovna škola*	36	61.17	13.191	0.004*
	26-35	28	58.29			High school / *srednja škola*	64	73.63		
	36-50	52	63.77			Associate d. / *stručni studij*	20	55.10		
	> 50	32	57.13			Bachelor's d. / *prvostupnik*	8	30.00		
	Total *Ukupno*	128				Total / *Ukupno*	128			
Market research and customer satisfaction *istraživanje tržišta i zadovoljstvo kupaca*	18-25	16	81.63	18.014	0.000*	Elementary school / *osnovna škola*	36	71.67	22.281	0.000*
	26-35	28	43.64			High school / *srednja škola*	64	70.06		
	36-50	52	70.42			Associate d. / *stručni studij*	20	51.70		
	> 50	32	64.56			Bachelor's d. / *prvostupnik*	8	19.75		
	Total *Ukupno*	128				Total / Ukupno	128			
Technological development and organizational development *tehnološki i organizacijski razvoj*	18-25	16	61.13	10.304	0.016*	Elementary school / *osnovna škola*	36	65.94	16.728	0.001*
	26-35	28	46.21			High school / *srednja škola*	64	73,69		
	36-50	52	69.73			Associate d. / *stručni studij*	20	47.10		
	> 50	32	73.69			Bachelor's d. / prvostupnik	8	28.00		
	Total *Ukupno*	128				Total / *Ukupno*	128			
New enterprises ideas, methods, and knowledge *nove ideje, metode i znanja poduzeća*	18-25	16	70.00	10.021	0.018*	Elementary school / osnovna škola	36	68.17	17.522	0.001*
	26-35	28	45.71			High school / *srednja škola*	62	70.11		
	36-50	52	69.26			Associate d. / stručni studij	20	51.10		
	> 50	32	66.81			Bachelor's d. / *prvostupnik*	8	22.25		
	Total *Ukupno*	128				Total / *Ukupno*	126			

Table 2 Kruskal-Wallis analysis results on innovation factors scale according to enterprises annual average revenue and participants' work duration
Tablica 2. Rezultati Kruskal-Wallisove analize inovacijskih čimbenika s obzirom na prosječni godišnji prihod poduzeća i radni staž zaposlenika

Innovation factors *Inovacijski* ***čimbenici***	**Annual average income, USD**** *Prosječni godišnji prihod, USD***	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig. (*$p < 0.05$)**	**Working period, years** *Radni odnos, godine*	**Freq., N** *Frekv., Br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig. (*$p < 0.05$)**
New product development *razvoj novog proizvoda*	< 17870	34	63.62	10.896	0.028*	0-5	28	88.71	19.462	0.001*
	17870-23827	28	55.14			6-10	14	60.36		
	23827-35741	14	45.64			11-15	10	44.30		
	35741-47654	20	70.70			16-20	6	41.17		
	> 47654	32	78.00			> 20	70	60.53		
	Total	128				Total	128			
Market research and customer satisfaction *istraživanje tržišta i zadovoljstvo kupaca*	< 17870	34	68.50	4.699	0.320	0-5	28	65.57	19.288	0.001*
	17870-23827	28	68.14			6-10	14	53.36		
	23827-35741	14	51.07			11-15	10	61.70		
	35741-47654	20	57.00			16-20	6	14.17		
	> 47654	32	67.63			> 20	70	71.01		
	Total	128				Total	128			
Technological development and organizational development *tehnološki i organizacijski razvoj*	< 17870	34	64.68	6.558	0.161	0-5	28	60.86	13.010	0.011*
	17870-23827	28	78.64			6-10	14	42.36		
	23827-35741	14	63.79			11-15	10	55.70		
	35741-47654	20	59.00			16-20	6	40.83		
	> 47654	32	55.69			> 20	70	73.67		
	Total	128				Total	128			
New enterprises ideas, methods, and knowledge *nove ideje, metode i znanja poduzeća*	< 17870	34	66.74	8.147	0.086	0-5	28	66.00	20.525	0.000*
	17870-23827	28	75.71			6-10	14	49.21		
	23827-35741	14	46.93			11-15	8	53.75		
	35741-47654	18	60.28			16-20	6	11.83		
	> 47654	32	58.44			> 20	70	70.90		
	Total	126				Total	126			

**As of 10/22/2025, the exchange rate is 1USD = 41.9692 TL
**Tečaj dana 22.10.2025. 1USD = 41,9692 TL

Table 3 Kruskal-Wallis analysis results on innovation factors scale according to participants' roles and enterprises activity
Tablica 3. Rezultati Kruskal-Wallisove analize inovacijskih čimbenika s obzirom na ulogu ispitanika i aktivnosti poduzeća

Innovation factors *Inovacijski čimbenici*	**Task** *Uloga*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig.** (**p* < 0.05)	**Field of activity** *Područje aktivnosti*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig.** (**p* < 0.05)
New product development *razvoj novog proizvoda*	Ent. Owner / *vlasnik*	84	65.60	1.544	0.672	Lumber / *piljena građa*	40	81.70	15.229	0.002*
	Unit manager / *voditelj*	14	53.64			Furniture / *namještaj*	52	52.81		
	Foreman / *predradnik*	14	68.64			Joinery / *stolarija*	6	70.83		
	Other / *drugo*	16	64.63			Other / *ostalo*	30	60.57		
	Total / *Ukupno*	128				Total / *Ukupno*	128			
Market research and customer satisfaction *straživanje tržišta i zadovoljstvo kupaca*	Ent. Owner *vlasnik*	84	69.76	16.557	0.001*	Lumber / *piljena građa*	40	68.05	1.425	0.700
	Unit manager / *voditelj*	14	68.36			Furniture / *namještaj*	52	61.73		
	Foreman / *predradnik*	14	63.64			Joinery / *stolarija*	6	73.50		
	Other / *drugo*	16	34.25			Other / *ostalo*	30	62.77		
	Total / Ukupno	128				Total / *Ukupno*	128			
Technological development and organizational development *tehnološki i organizacijski razvoj*	Ent. Owner / *vlasnik*	84	76.95	29,962	0,000*	Lumber / *piljena građa*	40	65.70	0.685	0.877
	Unit manager / *voditelj*	14	31.36			Furniture / *namještaj*	52	66.50		
	Foreman / *predradnik*	14	46.5			Joinery / *stolarija*	6	59.83		
	Other / *drugo*	16	43.88			Other / *ostalo*	30	60.37		
	Total / *Ukupno*	128				Total / *Ukupno*	128			
New enterprises ideas, methods, and knowledge *nove ideje, metode i znanja poduzeća*	Ent. Owner / *vlasnik*	82	72.87	19,88	0,000*	Lumber / *piljena građa*	38	58.71	5.909	0.116
	Unit manager / *voditelj*	14	49.21			Furniture / *namještaj*	52	64.54		
	Foreman / *predradnik*	14	53.5			Joinery / *stolarija*	6	94.50		
	Other / *drugo*	16	36.75			Other / *ostalo*	30	61.57		
	Total / *Ukupno*	126				Total / *Ukupno*	126			

Table 4 Kruskal-Wallis analysis results on innovation factors scale according to distribution channels of enterprises
Tablica 4. Rezultati Kruskal-Wallisove analize inovacijskih čimbenika s obzirom na distribucijske kanale poduzeća

Innovation factors *Inovacijski čimbenici*	**Distribution channels** *Distribucijski kanali*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig.** (**p* < 0.05)
New product development *razvoj novog proizvoda*	Direct delivery / *direktna dostava*	96	66.92	2.053	0.358
	Own store / *vlastita trgovina*	26	58.96		
	Wholesale/retail / *veleprodaja/maloprodaja*	6	49.83		
	Total / Ukupno	128			
Market research and customer satisfaction *istraživanje tržišta i zadovoljstvo kupaca*	Direct deliveryd / *direktna dostava*	96	67.50	4.298	0.117
	Own store / *vlastita trgovina*	26	58.19		
	Wholesale/retail / *veleprodaja/maloprodaja*	6	43.83		
	Total / *Ukupno*	128			
Technological development and organizational development / *tehnološki i organizacijski razvoj*	Direct delivery / *direktna dostava*	96	71.52	17.403	0.000*
	Own store / *vlastita trgovina*	26	37.96		
	Wholesale/retail / *veleprodaja/maloprodaja*	6	67.17		
	Total / *Ukupno*	128			
New enterprises ideas, methods, and knowledge *nove ideje, metode i znanja poduzeća*	Direct delivery / *direktna dostava*	94	68.97	9.958	0.007*
	Own store / *vlastita trgovina*	26	45.73		
	Wholesale/retail / *veleprodaja/maloprodaja*	6	54.83		
	Total / *Ukupno*	126			

of the enterprise. Accordingly, the highest average opinion was recorded in the lumber sector, while the lowest was recorded in the furniture sector (Table 3).

Statistically significant differences in opinion were identified among enterprises based on distribution channels, technological development, and organizational development, as well as innovation factors of new enterprise ideas, methods, and knowledge. For both innovation factors, it was found that the average opinion scores of employees working for enterprises that offer their products to consumers in their own stores were the lowest, while the highest average opinion scores belonged to employees working for enterprises that deliver directly (Table 4).

Based on the total number of employees in enterprises, statistically significant differences in opinion were identified regarding the innovation factor in new product development. Analyses determined that the highest average opinion was among participants in enterprises with more than 15 employees, indicating that positive opinions regarding innovation awareness increase with enterprises scale. Based on the duration of enterprises operations, statistically significant differences in opinions were identified regarding innovation factors such as new product development, market research, and customer satisfaction. It revealed that the highest average opinion for both innovation factors was among enterprises with 6-10 years of operation. In

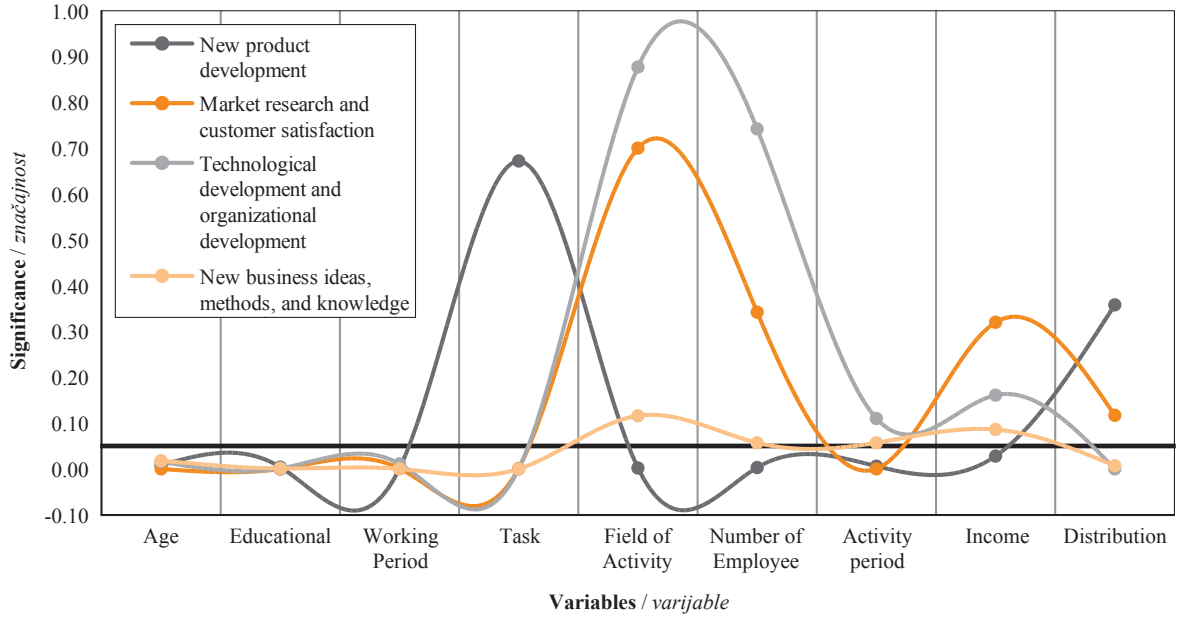

Figure 4 Statistical significance of innovation factors based on different variables
Slika 4. Statistička značajnost inovacijskih čimbenika na temelju različitih varijabli

Table 5 Kruskal-Wallis analysis results on innovation factors scale according to the number of employees and duration of operations
Tablica 5. Rezultati Kruskal-Wallisove analize inovacijskih čimbenika s obzirom na broj zaposlenika i trajanje poslovanja

Innovation factors *Inovacijski čimbenici*	**Number of employees** *Broj zaposlenika*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig. (*$p < 0.05$)**	**Duration of activity, years** *Trajanje aktivnosti*	**Freq., N** *Frekv., br.*	**Mean rank** *Rang srednje vrijednosti*	**Chi-Square** *hi-kvadrat*	**Sig. (*$p < 0.05$)**
New product development *razvoj novog proizvoda*	1	16	60.00	15.778	0.003*	< 1	2	37.50	14.277	0.006*
	2-5	82	59.72			1-5	14	65.64		
	6-10	12	56.83			6-10	18	92.83		
	11-15	6	89.83			11-15	18	61.83		
	> 15	12	98.17			> 15	76	58.92		
	Total / *Ukupno*	128				Total / *Ukupno*	128			
Market research and customer satisfaction *istraživanje tržišta i zadovoljstvo kupaca*	1	16	68.88	4.508	0.342	< 1	2	43.50	21.358	0.000*
	2-5	82	63.33			1-5	14	36.64		
	6-10	12	53.00			6-10	18	88.50		
	11-15	6	62.17			11-15	18	66.06		
	> 15	12	79.33			> 15	76	64.13		
	Total / *Ukupno*	128				Total / *Ukupno*	128			
Technological development and organizational development *tehnološki i organizacijski razvoj*	1	16	58.00	1.965	0.742	< 1	2	33.50	7.529	0.110
	2-5	82	63.01			1-5	14	56.50		
	6-10	12	73.00			6-10	18	53.39		
	11-15	6	73.17			11-15	18	80.94		
	> 15	12	70.50			> 15	76	65.53		
	Total / *Ukupno*	128				Total / *Ukupno*	128			
New enterprises ideas, methods, and knowledge *nove ideje, metode i znanja poduzeća*	1	16	73.63	9.182	0.057	< 1	2	94.50	9.155	0.057
	2-5	82	59.65			1-5	14	41.79		
	6-10	10	49.10			6-10	18	72.72		
	11-15	6	71.17			11-15	16	59.63		
	> 15	12	84.50			> 15	76	65.32		
	Total / *Ukupno*	126				Total / *Ukupno*	126			

enterprises under 5 years of operation, the average opinion remained low overall (Table 5).

Analyses conducted on the data obtained revealed that the variables of age, education, and participants' length of service caused differences in opinion among employees regarding all innovation factors. Therefore, it was understood that there is a high level of correlation between these variables and innovation factors (Figure 4).

Among the innovation factors, the highest level of opinion divergence was observed in the new product development factor. The effect of the other three innovation factors on the divergence of opinions was found to be at the same level (Figure 4). Similar to the findings of this study, a study aiming to measure the competitiveness level of forest industry enterprises concluded that enterprises considered themselves sufficient in terms of new product development (Akyüz *et al.,* 2010). Another study in the literature reports that forest industry enterprises, particularly at the SME level, predominantly use traditional production methods (Karayılmazlar *et al.,* 2008). Therefore, it can be said that innovation has emerged as an important requirement for enterprises at the SME level. On the other hand, similar to the results of this study, it has been stated that 85.5 % of SME-level forest industry enterprises in Turkey Balıkesir strive to keep up with new developments, but capital inadequacy poses a significant problem (Kalafat, 2012). Another study conducted in Turkey *İnegöl* reported that 97.4 % of enterprises follow sectoral innovations and developments (Sevim Korkut and Bozkurt Küçük, 2016).

Innovation factors and research pattern variables were examined using correlation analysis. A positive correlation was found between the ages of industry representatives and their willingness to develop technology and organization. Additionally, a negative correlation was found between the participants' education level and all innovation factors. Similarly, there is a negative correlation between the participant's length of service and the new product development factor. A negative correlation was found, indicating that interest in innovation factors increased as the participants' level of authority in the company decreased. A positive correlation was observed between the duration of the company's operations and the factors of conducting market research and considering customer satisfaction (Table 6). The main reasons for the low perception of the sector among demographic factors are the limited career development opportunities due to the dominance of family-controlled small and medium-sized enterprises (SMEs) in the sector and the discouraging attitudes of family members and friends (Ratnasingam *et al.,* 2022).

Forest industry enterprises face difficulties in obtaining capital, qualified personnel, technical equipment, and the supply of raw materials or semi-finished products of the desired quality (Karayılmazlar *et al.,* 2008). It is reported that the growth of these enterprises and their desire to expand into different markets are restricted by the large amount of capital required (Ng and Thiruchelvam, 2012; Ratnasingam *et al.,* 2018). It has been emphasized that the transition to innovative production and the creation of greater added value in these enterprises can be achieved through clustering initiatives (Şener Uzcan and Karayılmazlar, 2018; Ratnasingam *et al.,* 2018).

4 CONCLUSIONS
4. ZAKLJUČAK

This study examined the perception of innovation in local forestry industry enterprises and the individual and company-specific factors influencing these perceptions. The results showed that the enterprises are largely small-scale, have traditional production structures, and that innovation-focused investments are limited. The long frequency of machinery and production system renewals, the long-term use of existing machinery, and the lack of changes in the input structure indicate that innovation is mostly perceived as a functional element for ensuring production continuity, rather than a strategic competitive tool.

Analyses of demographic variables showed that age, education level, and length of service in the sector led to significant differences in perceptions of innovation factors. Younger employees had a more positive attitude towards innovation, while innovation awareness decreased as education level and sector experience increased.

Based on company characteristics, it was observed that awareness, particularly regarding new product development, increased with the number of employees and annual income level. This reveals that financial capacity and organizational scale are important factors supporting innovation activities. Furthermore, the fact that business owners have higher innovation awareness compared to non-managerial employees indicates that innovation knowledge has not been sufficiently disseminated within the business. Overall, the study results reveal that the level of innovation in local forestry industry enterprises is closely related to human capital characteristics, enterprise scale, and economic capacity.

In this context, strengthening access to finance for small-scale enterprises, expanding training and capacity-building programs aimed at increasing innovation awareness, and supporting organizational structures that encourage knowledge sharing can contribute

Table 6 Correlation analysis of innovation factors and research variables
Tablica 6. Korelacijska analiza inovacijskih *čimbenika* i istraživanih varijabli

Variables *Varijable*	**New product development** *Razvoj novog proizvoda*			**Market research and customer satisfaction** *Istraživanje tržišta i zadovoljstvo kupaca*			**Technological development and organizational development** *Tehnološki i organizacijski razvoj*			**New enterprises ideas, methods, and knowledge** *Nove ideje, metode i znanja poduzeća*		
	Pearson Corr.	Sig. (*$p < 0.05$)	N	Pearson Corr.	Sig. (*$p < 0.05$)	N	Pearson Corr.	Sig. (*$p < 0.05$)	N	Pearson Corr.	Sig. (*$p < 0.05$)	N
Age *dob*	-0.144	0.106	128	-0.008	0.932	128	0.192*	0.030	128	0.056	0.533	126
Educational status razina obrazovanja	-0.175*	0.049	128	-0.281*	0.001	128	-0.268*	0.002	128	-0.250*	0.004	126
Working period *radni odnos*	-0.186*	0.036	128	0.113	0.204	128	0.202*	0.022	128	0.098	0.273	126
Task *uloga*	-0.021	0.815	128	-0.353*	0.000	128	-0.369*	0.000	128	-0.365*	0.000	126
Field of activity *područje aktivnosti*	-0.141	0.113	128	-0.013	0.881	128	-0.063	0.483	128	-0.015	0.868	126
Number of employees *broj zaposlenih*	0.285*	0.001	128	0.034	0.702	128	0.107	0.228	128	0.092	0.306	126
Activity period *trajanje aktivnosti*	-0.155	0.08	128	0.179*	0.043	128	0.063	0.477	128	0.123	0.169	126
Income *prihod*	0.088	0.325	128	-0.011	0.903	128	-0.146	0.101	128	-0.118	0.188	126
Distribution *distribucija*	-0.069	0.442	128	-0.132	0.139	128	-0.271*	0.002	128	-0.197*	0.027	126

to increasing innovation-based competitiveness in the sector.

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