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The Impact of Knowledge Management Practices on Innovation in Logistics and Distribution Enterprises in Hungary

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Abstract

Purpose: The study aims to assess the innovation activity of SMEs operating in the Hungarian logistics sector, with particular regard to the knowledge-based operations of the companies, and to highlight the fundamental differences between the external and internal knowledge transfer of companies, which depend on management attitude and employee activity. **Research design, data and methodology:** The empirical research was conducted using a questionnaire survey among 628 Hungarian logistics enterprises. The questionnaire was distributed electronically among Hungarian logistics enterprises in 2024. Data collection was carried out anonymously. **Results:** The logistics and distribution companies examined in the survey show significant differences in the methods of external and internal knowledge transfer. However, it is a finding valid for all companies that both leadership attitude and employee activity play an essential role in the development of innovation policies that determine corporate knowledge management. **Conclusions:** Logistics companies that apply knowledge-sharing methods can respond faster to market changes and gain a competitive advantage. External knowledge transfer (collaboration with universities, research institutes, and industrial partners) enhances innovation. Internal knowledge management (employee rotation, knowledge-sharing culture) fosters organizational learning and creative solutions. Thus, strategic knowledge management is key to operational efficiency in logistics.

Keywords : Knowledge Management, Innovation, Logistics, Logistic Enterprises, Trade Performance, Trade Competitiveness, Supply Chain

JEL Classification Code: D80, J24, O12

1. Introduction

Innovation is one of the most critical factors in the efficiency and development of companies. The strategic importance of innovation lies in its ability to stimulate productivity growth and create new solutions, which directly leads to economic and social benefits (Kireyeva et

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al., 2019; Gamidullaeva et al. 2024). Companies that support innovation are more flexible, able to adapt to global challenges, and realize a sustainable vision (Hassan et al., 2024; Raji et al., 2024). The innovation activity of companies is determined by two main factors: on the one hand, the industry affiliation (e.g., there are more innovation opportunities in a given industry, while in other industries, there are much fewer), and on the other hand, the company size (small and medium-sized enterprises are less innovative than large companies or multinational companies) (Csákné Filep et al., 2023). Given the critical role of logistics and trade in supporting national and global supply chains, innovation in these areas becomes essential for sustained business competitiveness.

Small and medium-sized enterprises (SMEs) play an important role in developing economies, and their efficiency is determined by their ability and willingness to innovate. Companies open to innovation are more flexible and respond quickly to the challenges of the changing social and economic environment (Iqbal et al., 2023). SMEs account for about 90% of the world economy and provide about 50% of employment (Iyelolu et al., 2024). Despite the fact that more than 90% of economies are made up of SMEs, these companies are less characterized by a well-structured innovation policy. These are caused by several institutional and resource limitations. SMEs lack adequate financial and human resources for use in innovation or are not supported sufficiently by adequate institutional resources or incentives in pursuing systematic methods in innovation. All this erodes the capacity of small firms to come up with and effect systematization of policies in innovation. As a result, the development of SMEs stagnates and they gradually lose their competitiveness in the market (Chen et al., 2023). Supply chain management extends from the procurement of raw materials to the production, distribution, and delivery of products to the final consumer, thus covering various processes such as procurement, production, logistics, and the systems needed to manage them. Effective supply chain management can reduce waste, optimize resource use, improve adaptability to changing markets, and enhance competitive advantage in logistics and trade operations (Adenekan et al., 2024).

The integrated supply chain system enables strategic cooperation between partners, for companies operating in the same corporate environment. In fact, it outlines how all activities, from suppliers to consumers, can be integrated into one system. Forming a complex system, it includes suppliers, producers, distribution centers, warehouses, and retailers. Internal integration means cooperation between functional areas within the company, information, and knowledge sharing, while external integration means a system of relationships established with suppliers and customers (Munizu et al., 2024; Islam et al., 2024). Innovative companies can perform about 30% better than their competitors and achieve better market and financial performance (Rubio-Andrés et al., 2023). Innovation aims to expand existing knowledge and achieve sustainable development (Sarango-Lalangui et al., 2023).

This study examines the impact of knowledge management on the innovation activity of Hungarian logistics companies. The focus is on both external and internal knowledge transfer, as well as the role of managers and employees in shaping the company's innovation strategy. The research aimed to analyze the innovation activity of Hungarian enterprises operating in the field of logistics and distribution in relation to knowledge management.

2. Literature Review

Enterprises in the logistics and distribution sectors that effectively apply innovation are able to increase their knowledge assets and competencies. Agility, knowledge sharing, effective communication, and active employee involvement are key factors in enhancing both innovation and distribution performance (Budiono & Bongso, 2024). Innovation-driven companies in Hungary typically operate in the fields of engineering, natural sciences, research and development (R&D), IT, and biotechnology, and increasingly, in logistics and distribution services (Szoboszlai, 2024). Knowledge transfer in the traditional sense has been replaced by collaborative joint knowledge creation. Innovation systems are globalizing, which poses challenges for economies where the efficiency of innovation systems lags behind the EU average, including Hungary. Based on the EU average, Hungary ranked 25th in terms of innovation in 2020. Only 29.2% of companies employing <10 people were considered innovation-driven (Rideg et al., 2023).

Effective innovation activity also depends on the openness shown towards the external environment and the adaptation capacity of SMEs. Internalizing new practices and procedures in the company increases innovation (Carrasco-Carvajal et al., 2023). Innovations within the company also affect the expectations of employees. For this reason, leadership style is an important factor in the management and implementation of innovation (Avelar et al., 2024). Organizational innovation also involves reforming internal operations, such as changes in leadership style (Kireyeva et al., 2019; Anzules-Falcunes & Novillo-Villegas, 2023). Ethical and responsible leadership has a positive impact, whereas an autocratic leadership style has a negative impact on corporate innovation.

Transformational leadership fosters long-term goals, a clear vision, and loyalty to the company by enhancing employee trust and encouraging them to be creative and develop their skills, thereby increasing their willingness to

innovate (Zhu & Huang, 2023). Training and involving the workforce in innovation increases their commitment and performance (Rubio-Andrés et al., 2023). The results of Agustina and Arganata (2023) indicate that cooperation between companies has a significant impact on their innovation performance, and knowledge management has a direct influence on the innovation activities of companies. Innovation depends significantly on knowledge sharing and the utilization of knowledge from the external environment. Knowledge management within the company encompasses creating, sharing, developing, and utilizing individual knowledge, all of which are crucial in optimizing logistics operations and distribution efficiency (Scuotto et al., 2024).

Well-established knowledge management provides companies with continuous learning and development opportunities, especially in logistics and trade-related operations, where timely knowledge flow supports supply chain agility and business adaptability. In the development of effective knowledge management, the company's management and employees' ability to acquire new knowledge and apply technologies are key indicators (Jasin et al., 2023). Innovation denotes the ability to create value within a company, while knowledge sharing encompasses the distribution of work-related knowledge, experiences, and information among employees, as reflected in the exchange of information and mutual support (Oktaroza et al., 2022).

In knowledge-based operations, corporate competence and effective knowledge management play a key role in driving innovation. Knowledge management not only supports the acquisition and utilization of new knowledge but also enhances employees' ability to adopt innovative solutions. When aligned with human resource management practices, such as training and skills development, it significantly increases a company's innovation potential. In the context of logistics and distribution enterprises, this synergy enhances operational efficiency and strengthens competitive advantage in dynamic trading environments (Lestari et al., 2020; Sukoroto & Wahyuningsih, 2023).

López and Yepez (2024) emphasized the importance of developing appropriate knowledge management in SMEs, which is the key to their innovation policy. They consider it necessary to reform internal knowledge transfer, which affects the examination of internal systems and cooperation networks. Sucena et al. (2024) showed in their study of SMEs operating in the construction industry that the combination of effective knowledge management and intellectual capital plays a key role in the successful operation of SMEs. Well-established knowledge management can increase internal knowledge transfer, i.e., the sharing, retention, and effective utilization of knowledge and skills within the company. In addition, the company has ensured the opportunity to be up-to-date and respond quickly to the challenges of the external environment. The importance of external knowledge transfer should not be forgotten, which means the cooperation of strategic relationships and partnerships established by companies. Nazir et al. (2024) draw attention to the efficiency of knowledge management and supply chains, emphasizing the importance of sharing knowledge as an organizational resource for companies operating in the supply area. Hashem et al. (2024) made important findings regarding the introduction of a digital supply chain in SMEs, which depends on companies' openness to innovation and their ability to manage knowledge effectively.

The successful implementation of innovations in a company requires the development of an organizational culture that values new initiatives and assumes risk and responsibility. Encouraging employees who support such a corporate culture and actively participate in the processes, and developing them with training programs is essential in adapting to new trends and incorporating practices (Gamidullaeva et al., 2024). In addition, the involvement of partners, suppliers, research institutions, and industry experts with companies, utilizing their resources and knowledge, also facilitates knowledge and access to the latest practices (Bekbossinova et al., 2023). According to Akbar and Hartono (2024), there is a positive correlation between the innovative capacity of SMEs and their openness to innovation, as companies are constantly aware of the need to adapt to changing market trends through innovation.

Furthermore, logically built knowledge management within companies also increases the willingness to apply innovative solutions, as well as the development and cooperation of employees. Properly built knowledge management increases the efficiency of internal and external knowledge transfer, all through the implementation of innovative solutions applied within the company (new organizational solutions) and outside (R&D activities). As the literature shows, the effectiveness of companies' innovation methods is influenced by the activity of employees in corporate innovation and leadership attitudes. In line with previous literature sources, the following hypotheses were formulated in this research:

H1: There is a significant correlation between employees' innovation activity and external knowledge transfer methods.

H2: There is a significant correlation between employees' innovation activity and internal knowledge transfer methods.

H3: There is a significant relationship between leadership attitude and external knowledge transfer methods.

H4: There is a significant relationship between leadership attitude and internal knowledge transfer methods.

3. Methodology

The research followed a deductive research logic, complemented by descriptive statistical analysis of the survey results. The validity of the hypotheses based on the literature can be proven with statistical tests. A quantitative research method, including a questionnaire survey, was used for the empirical research, a standardized data collection technique that organizes the data into a unified database. The questionnaire was distributed electronically among Hungarian logistics enterprises in 2024. Data collection was carried out anonymously, in compliance with data protection regulations. The questionnaire consisted of a total of 26 questions.

The respondents' preferences were ranked on a seven-point Likert scale, where 1 meant a little or not at all important and 7 meant options to a great extent. In connection with scale-type questions, the Cronbach alpha value, which is a measure of internal consistency and reliability, was quantified and provides information on the appropriate measurement of the scale items. Cronbach alpha can take a value between 0 and 1, and its reference value is 0.7. Furthermore, Hotelling's T-squared multivariate statistical test was also run for scale-type questions, which shows whether the means of two or more groups are significantly different at a significance level of ($p < 0.05$). The hypothesis test was performed using IBM SPSS Statistics 23. After generating the Kolmogorov-Smirnov normality test, it was determined that the data did not come from a normal distribution ($p < 0.001$). Therefore, non-parametric statistical tests can be used to verify the validity of the hypotheses. The Kruskal-Wallis H test was used to verify the hypotheses. The non-parametric statistical test is the equivalent of the parametric ANOVA test, it is based on rank and can be used to determine whether there is a statistically significant difference between two or more groups of an independent variable. Additional procedures were further carried out in testing the strength of the results. Spearman correlation tests were used in cases of testing the association between main variables (because data are not normally distributed) and a multivariate regression analysis was also used in testing the effect of knowledge management practices on innovation performance when firm characteristics are controlled. These additional procedures yielded the same outcomes in line with the results of the Kruskal-Wallis test.

Before starting the statistical analysis, it is essential to check some conditions:

- The dependent variable is measured on an ordinal or ratio scale
- The independent variable refers to two or more categorical independent groups
- The observations are independent of each other, i.e., there is no relationship within and between groups
- The distribution of each group is similar (Laerd Statistics, 2018).

The first condition applies, that the variables to be examined are variables measured on a ratio scale, namely on a Likert scale ranging from 1 to 7. The second and third conditions also apply, that the groups within the independent variables are independent and different from each other, and the respondent appears only once in a given group. The fourth condition also applies, that the median of the examined groups has a similar distribution.

The following formula was used to determine the sample size using the formula (1):

$$n = \frac{N * Z^2 * p * (1-p)}{(N-1) * e^2 + Z^2 * p * (1-p)} \quad (1)$$

Where: N (sample size) = 628, Z= -1.96, at 95% confidence level, p (expected proportion) =50%=0.5 and e (margin of error) = 5% = 0.05. Based on the formula, appropriate conclusions can be drawn based on 239 responses. N=628 responses were collected in the research; therefore, the sample can be considered sufficient.

In the framework of this study, nonparametric statistical analysis methods were used, based on the results of the Kolmogorov–Smirnov test, which confirmed the deviation from the normal distribution. The main method, the Kruskal–Wallis test, revealed significant differences between the groups. At the same time, it should be noted that this approach limits the possibilities of assessing the direction of interrelationships and the combined influence of several factors, which will be taken into account in the further development of the research model.

The sample size not only satisfies the minimum size but also covers a wide range of firms in the logistics industry in Hungary, enhancing the data representativeness. The respondents cover a proportionate number of logistics firms of varying age groups, in addition to varying levels of employees' education, demonstrating our sample reasonably mirrors the study population characteristics (see Table 1).

Table 1: Characteristics of Examined Logistics Enterprises

Category	Subcategory	Percentage
Year of establishment	1900-1959	4.1%
	1960-1999	38.7%
	2000-2024	57.2%
Company size by employment	Micro-enterprise<10 people	21.5%
	Small enterprise <50 people	28.1%
	Medium-sized enterprise <250 employees	50.3%
The level of education of employees	<25% of the employees have a higher education degree	45.7%
	<50% of the employees have a higher education degree	35.7%
	<75% of the company's employees have a higher education degree	15.9%

Category	Subcategory	Percentage
	All employees have a higher education degree	2.7%
Leadership style	Autocratic	43.0%
	Democratic	42.2%
	Laissez-faire	14.8%
Total 100% N=628		

Note: own research, 2025

In terms of the size of the companies, 50.3% are medium-sized companies (<250 employees), 28.1% are small companies (<50 employees) and 21.5% are micro-enterprises (<10 employees). Since the key to effective knowledge management is the activity and competencies of employees, a survey was conducted to determine the highest educational level of employees working in the company. A total of four categories were created based on the highest educational level of employees. The classification of employees into categories was as follows: in 45.7% of companies, less than 25% of employees have a higher education or university degree, in 35.7% of companies, less than 50% of employees have a higher education or university degree, and in 15.9% of companies, less than 75% have a higher education or university degree. In total, in 2.7% of companies, all employees have a higher education or university degree.

43.0% of the companies surveyed have a leadership style characterized by an autocratic style, i.e., the manager/ managers exercise complete control and power, and employees' opinions are not important to them. 42.2% of leaders are characterized by a democratic style, i.e., the manager/managers involve employees in decision-making, and they need to encourage dynamic teamwork and deepen group cohesion. 14.8% of leaders are characterized by a laissez-faire style, i.e., the manager/managers control the team less and provide employees with a high degree of autonomy.

4. Results

4.1. Data Analysis

The influence of management style and employee activity on the innovative behavior of companies is a key aspect of knowledge management. Leaders who support innovation help create an enabling environment for knowledge sharing and the development of new solutions. At the same time, employee engagement in innovation processes plays an important role in increasing the company's competitiveness. These studies show that the leadership style and the activity of staff in innovation activities have different effects on the effectiveness of knowledge management.

Table 2 presents the main results demonstrating the importance of management decisions and employee engagement in innovation processes.

Table 2: The Role of Management and Employees in Innovation Behavior

Factor	Mean (Mn.)	Std. Deviation	Variance	Mode (Md.)	Percent
The importance of leadership style in logistics innovation	5.52	1.524	2.323	7	36.6%
Employee activity in logistics and distribution-related innovation	3.85	1.576	2.484	4	22.8%

Note: own research, 2025

Regarding innovation behavior, 36.6% of the management style plays an important role (Md. = 7), which is also proven by the Mean value (Mn. = 5.52). Employee involvement and innovation activity are also moderately important in the case of the companies studied (Md. = 4) and affect 22.8% of the companies. Consequently, management style and employee involvement/activity are determining factors in companies' innovation.

Table 3 presents the findings regarding the knowledge management practices of companies.

Table 3: The Knowledge Management Practices of Examined Hungarian Logistics Enterprises

Factor	Mean (Mn.)	Std. Deviation	Variance	Mode (Md.)	Percent
Successfully acquiring new knowledge.	4.63	1.572	2.472	5	22.3%
Effective development of new knowledge (e.g., for logistics, trade, or service innovation)	4.62	1.529	2.337	5	22.6%
Ability to acquire internal and external knowledge	4.70	1.502	2.257	5	25.2%
Effective experience in identifying, evaluating, and importing new information	4.68	1.487	2.211	5	24.4%
Good practices in analyzing acquired information and knowledge	4.76	1.500	2.251	5	23.2%
Integrating existing knowledge with new information	4.66	1.516	2.298	5	27.2%
Effective ability to transform existing information into new knowledge	4.62	1.547	2.392	5	26.8%
Continuous reflection on ways to better utilize knowledge	4.70	1.548	2.395	5	22.8%
Hotelling's T-Squared	*F*	*df1*	*df2*	*Sig.*	
23.065	2.851	8	618	.004	

Note: own research, 2025

The number of scale items examined is eight, and the Cronbach's alpha value is 0.926, indicating a high level of internal consistency and reliability. The results are statistically significant at Hotelling's T2 = 23.065; F = 2.851; df1 = 8; df2 = 618 ($p = 0.004 < 0.05$), suggesting a significant difference between the means of the examined variables. Among the examined logistics and distribution enterprises, 27.2% effectively integrate existing knowledge with new information, while 26.8% successfully transform existing information into new knowledge. Additionally, companies that prioritize knowledge-sharing methods demonstrate improvements in distribution performance and supply chain optimization. Furthermore, 25.2% of companies effectively acquire both external and internal knowledge, while 24.4% successfully apply their experiences to identify, evaluate, and import new information. 23.2% of enterprises possess sufficient experience to analyze acquired knowledge, whereas 22.8% continuously seek better ways to utilize knowledge. Additionally, 22.6% actively develop new knowledge for product or service innovation, and 22.3% effectively acquire new knowledge. Table 4 presents the findings regarding the knowledge-based operation of the surveyed companies.

Table 4: Results on the Knowledge-Based Operation of the Companies Studied

Factor	Mean (Mn.)	Std. Deviation	Variance	Mode (Md.)	Percent
Specialized consulting services (scientific, research, technical services)	4.63	1.572	2.472	5	22.3%
Production of new technology (technology development)	4.11	1.757	3.086	5	23.6%
Planning and implementing logistics and trade-related business development projects at national, regional, and local levels	4.04	1.831	3.354	5	23.6%
Using modern information technologies (internet, intranet, email, etc.)	4.96	1.615	2.609	7	21.8%
Sharing of goals, mission, and vision with members of the organization	4.61	1.510	2.279	4	24.2%
Periodic meetings (informing employees about new initiatives, and knowledge)	4.71	1.617	2.613	5	21.8%
Collect, categorize, and analyze suggestions from employees, customers, and suppliers	4.39	1.537	2.362	4	22.8%
Learning methods for sharing and applying knowledge	4.42	1.569	2.461	5	26.8%
Formal, informal mechanisms and projects that guarantee the sharing of best practices within the company	4.08	1.589	2.524	4	24.0%
Hotelling's T-Squared	F	df1	df2	Sig.	Hotelling's T-Squared
307.886	38.055	8	619	.000	307.886

Note: own research, 2025

The number of scale items examined is 9, and the Cronbach alpha value is 0.854, meaning the scale is sufficiently measured and reliable. The Hotellings T2=307.886; F=38.055; df1=8; df2=619 ($p=0.000<0.05$) is significant, meaning there is a significant difference between the means of the examined variables. The knowledge-based operation of the companies is manifested in 26.8% in the application of new learning methods and proportion in 24.0% in the provision of special consulting services and the application of formal and informal mechanisms and projects. 24.2% of Hungarian logistic companies share their goals, mission, and vision with their members. 23.6% of companies are interested in producing new technology, and a similar proportion are involved in planning and implementing local, regional, and national business development projects. 22.8% of companies collect, categorize, and analyze suggestions from their employees, customers, and suppliers. 21.8% of companies use modern information technologies to encourage information flow and improve employee communication.

Table 5 presents corporate practices aimed at motivating and developing employees.

Table 5: Corporate Practices Aimed at Motivating and Developing Employees

Factor	Mean (Mn.)	Std. Deviation	Variance	Mode (Md.)	Percent
Developing a reward system that enhances employees' innovative behavior and aims to increase productivity	4.07	1.677	2.813	4	21.5%
Development of a task planning and employee/team performance monitoring system	4.15	1.679	2.820	4	22.3%
Introduction of new practices and programs aimed at human resource development (e.g., education, development, training, talent management)	4.25	1.692	2.862	4	22.0%
Hotelling's T-Squared	F	df1	df2	Sig	Hotelling's T-Squared
7.308	3.648	2	626	0.027	7.308

Note: own research, 2025

The number of scale items examined is 3, and the Cronbach alpha value is 0.807, meaning that the scale is sufficiently measured and reliable. At the Hotellings T2=7.308; F=3.648; df1=2; df2=626 (p=0.027<0.05) significance level, it is significant, meaning that there is a significant difference between the means of the variables examined. 22.3% of examined logistics enterprises develop a task planning and employee/team performance system, and 22.0% of companies support new practices and programs aimed at developing human resources. 21.5% of domestic logistics companies have developed a reward system that increases employee productivity and innovation behavior.

Table 6 presents the knowledge management methods of the surveyed companies.

Table 6: Internal and External Knowledge Transfer Methods of Hungarian Logistics Enterprises

Factor		Mean (Mn.)	Std. Deviation	Variance	Mode (Md.)	Percent
External knowledge transfer	Establishing partnerships with other organizations and research institutes to gather new knowledge	4.03	1.691	2.861	4	25.3%
	Encouraging employees to join professional networks outside of companies	3.53	1.817	3.302	4	18.6%
	Employing skilled workers for new and innovative ideas	4.55	1.648	2.717	6	20.2%
	Regular participation in conferences and seminars	4.22	1.758	3.090	5	21.0%
	Consultation with experts from outside companies	4.18	1.668	2.783	4	23.6%
Internal knowledge transfer	Employee rotation for knowledge transfer	3.58	1.691	2.859	4	20.1%
	Collecting new ideas within the organization	3.92	1.826	3.336	5	22.3%
	Work meetings with employees to discuss new ideas	4.14	1.700	2.890	5	21.3%
	Rewarding employees for new ideas	4.06	1.772	3.141	4	20.5%
	Sharing best practices within the company	4.34	1.659	2.751	4	20.1%
Hotelling's T-Squared	F	df1	df2	Sig		
255.204	27.994	9	618	0.000		

Note: own research, 2025

The number of scale items examined is 10, and the Cronbach alpha value is 0.873, meaning the scale is sufficiently measured and reliable. In the case of scale items concerning external and internal knowledge transfer, the Hotellings T2=255.204; F=; df1=; df2= (p=0.000<0.05) is significant, meaning that there is a significant difference between the means of the examined variables. Regarding external knowledge transfer, 25.3% of the companies would like to establish partnerships with other organizations and research institutes to collect new knowledge, and 23.6% of companies build a network with outside experts. These partnerships not only foster innovation but also enhance distribution network efficiency, allowing companies to optimize their supply chains. 21.0% of companies attend conferences and seminars regularly, and 20.2% of examined logistics enterprises employ qualified/talented employees. 18.6% of companies encourage their employees to consult with experts from outside companies. Regarding internal knowledge transfer, 20.1% of companies rotate employees to transfer new ideas and knowledge within the organization, 22.3% of the logistics companies surveyed regularly collect new ideas within the organization, and 21.3% hold regular work meetings with employees to discuss new ideas. 20.5% of companies reward employees for their new ideas, and 20.1% of the surveyed companies share best practices within the company.

4.2. Hypothesis Testing

Below, our hypotheses based on the literature will be examined using statistical methods.

Table 7 presents the results of the H1 hypothesis test (correlation between external knowledge transfer methods and employee innovation activity).

Table 7: Hypothesis Testing

External knowledge transfer methods	Employee innovation activity	Mean rank
Partnering with external organizations and research institutes to gather new knowledge (EKT1)	1 (Not important)	328.04
	2	272.37
	3	298.71
	4	295.44
	5	338.57
	6	360.49
	7 (Absolutely important)	350.07
Encouraging employees to join networks outside the company (EKT2)	1 (Not important)	229.19
	2	250.22
	3	286.76
	4	334.51
	5	362.30
	6	338.20
	7 (Absolutely important)	422.11

External knowledge transfer methods	Employee innovation activity	Mean rank
Regular participation in conferences and seminars (EKT3)	1 (Not important)	268.58
	2	277.97
	3	311.32
	4	318.95
	5	331.40
	6	341.34
	7 (Absolutely important)	355.46
Encourage network with experts outside the company (EKT4)	1 (Not important)	278.24
	2	245.00
	3	311.95
	4	327.19
	5	341.76
	6	305.85
	7 (Absolutely important)	451.13
Employment of skilled workers (EKT5)	1 (Not important)	270.87
	2	274.70
	3	312.94
	4	299.40
	5	343.58
	6	342.89
	7 (Absolutely important)	403.41

Statistical Test	EKT1	EKT2	EKT3	EKT4	EKT5
Chi-Square	15.925	45.817	11.100	32.073	19.249
df	6	6	6	6	6
Asymp. Sig.	.014	0.000	0.085	0.000	0.004

Note: own research, 2025

In the case of the H1 hypothesis, connections between employee innovation activity and external knowledge transfer methods (EKT1; EKT2; EKT3; EKT4; EKT5) were analyzed. The Kruskal-Wallis H test shows that there is a statistically significant connection between partnering with external organizations and research institutes (EKT1) and employee innovation activity [Chi Square x^2 =15.925; df = 6], p = 0.014 < 0.05. It can be stated that companies characterized by intensive employee involvement in innovation are much more likely to establish new partnerships with other organizations and research institutes to collect new knowledge and ideas. This, in turn, contributes to more effective distribution and trade processes, ensuring better logistics operations, improved supply chain coordination, and enhanced customer service.

There is a statistically significant connection between encouraging employees to join networks (EKT2) and the innovation activity of employees [Chi Square x^2 = 45.817; df = 6], p = 0.000 < 0.05. It can be concluded that companies that are intensively characterized by the involvement of employees in innovation are encouraging their employees to join networks outside the company. There is no statistically significant relationship between participation in conferences and seminars (EKT3) and employees' innovation activity [Chi square x^2 = 11.100; df = 6], as the significance condition p = 0.085 > 0.05 does not apply. A statistically significant correlation exists between networking with experts outside the company (EKT4) and employees' innovation activity. [Chi Square x^2 =32.073; df = 6], with a significance level of p = 0.000 < 0.05. It can be conclud that companies that are intensively characterized by employee involvement in innovation fully support building relationships with professionals outside the company, while companies that are less characterized by employee involvement in innovation do not strive for such cooperation. There is a statistically significant correlation between employment of skilled worker (EKT5) and employees' innovation activity [Chi Square x^2 = 19.249; df = 6], p = 0.004 < 0.05 significance level. It can be stated that companies that actively involve employees in innovation prefer to employ qualified workers.

Overall, it can be stated that the H1 hypothesis can only be partially confirmed, in the case of the 5 EKT scale items examined, EKT3 was not confirmed, i.e. no significant correlation can be demonstrated in the companies regarding participation in conferences and seminars. Significant differences are observed in the effectiveness of external knowledge transfer methods in the examined domestic logistics companies depending on the involvement of employees in innovation processes.

Table 8 presents the results of the H2 hypothesis test.

Table 8: Hypothesis testing (correlation between internal knowledge transfer methods and employee innovation activity)

Internal knowledge transfer methods	Employee innovation activity	Mean rank
Rewarding employees for new ideas (IKT1)	1 (Not important)	230.75
	2	223.20
	3	298.28
	4	304.44
	5	366.91
	6	393.02
	7 (Absolutely important)	428.11
Employee rotation for knowledge transfer (IKT2)	1 (Not important)	234.93
	2	242.55
	3	279.12
	4	318.52
	5	352.93
	6	392.21
	7 (Absolutely important)	442.48
Collecting new ideas within the organization (IKT3)	1 (Not important)	233.45
	2	257.30
	3	291.72
	4	319.85
	5	351.48
	6	359.92
	7 (Absolutely important)	435.78

Internal knowledge transfer methods		Employee innovation activity		Mean rank	
Work meetings with employees to discuss new ideas (IKT4)		1 (Not important)		199.11	
		2		210.81	
		3		289.70	
		4		308.85	
		5		361.06	
		6		427.58	
		7 (Absolutely important)		475.91	
Sharing best practices within the company (IKT5)		1 (Not important)		227.34	
		2		224.02	
		3		277.29	
		4		295.16	
		5		379.27	
		6		418.82	
		7 (Absolutely important)		447.00	
Statistical Test	IKT1	IKT2	IKT3	IKT4	IKT5
Chi-Square	69.514	61.013	42.277	110.822	96.622
df	6	6	6	6	6
Asymp. Sig.	.000	.000	.000	.000	.000

Note: own research, 2025

In the case of the H2 hypothesis, the relationships between the innovation activity of employees and the internal knowledge transfer methods (IKT1; IKT2; IKT3; IKT4; IKT5) were examined. The table shows the development of the average rankings in terms of the intensity of the innovation activity of employees. The Kruskal-Wallis H test shows that there is a statistically significant relationship between rewarding new ideas (IKT1) and employees' innovation activity [Chi Square x^2=69.514; df=6], p=0.000<0.05. It can be stated that enterprises with intensive employee involvement in innovation are more likely to reward employees for new ideas. There is a statistically significant relationship between job rotation (IKT2) and employees' innovation activity [Chi Square x^2=61.013; df=6], p=0.000<0.05. It can be stated that companies with intensive employee involvement in innovation frequently use job rotation. Job rotation helps transfer and share knowledge within the organization. A statistically significant relationship can be demonstrated between collecting new ideas within the organization (IKT3) and employees' innovation activity [Chi Square x^2=42.277; df=6], p=0.000<0.05. The regular collection of new ideas within the organization helps organizational innovation and the flow of knowledge within the organization. There is a statistically significant relationship between workshops (IKT4) and employees' innovation activity [Chi Square x^2=110.822; df=6], p=0.000<0.05. It can be stated that companies in which employees are intensively involved in innovation often hold regular work meetings to collect new ideas, where new ideas and knowledge elements are discussed. There is a statistically significant relationship between the sharing of best practices within the organization (IKT5) and the innovation activity of employees [Chi Square x^2=96.622; df=6], p=0.000<0.05. It can be concluded that companies that involve employees in innovation consider it important to share best practices within the company.

Based on the results obtained, we accepted hypothesis H2. There are significant differences in the effectiveness of internal knowledge transfer methods in Hungarian logistics companies, depending on the innovation activity of the employees.

Table 9 presents the results of the H3 hypothesis test.

Table 9: Hypothesis testing (correlation between external knowledge transfer methods and leadership attitude)

External knowledge transfer methods		Leadership attitude		Mean rank	
Partnership with organizations and research institutes to gather new knowledge (LEKT1)		1 (Not important)		354.11	
		2		300.00	
		3		237.20	
		4		300.31	
		5		299.31	
		6		318.99	
		7 (Absolutely important)		338.27	
Encouraging employees to join networks outside the company (LEKT2)		1 (Not important)		388.83	
		2		341.76	
		3		350.62	
		4		332.94	
		5		320.29	
		6		306.86	
		7 (Absolutely important)		297.45	
Regular participation in conferences and seminars (LEKT3)		1 (Not important)		228.44	
		2		268.39	
		3		264.36	
		4		287.17	
		5		325.74	
		6		336.81	
		7 (Absolutely important)		323.16	
Encourage network with experts outside the company (LEKT4)		1 (Not important)		227.22	
		2		250.32	
		3		284.03	
		4		276,.1	
		5		318.46	
		6		333.11	
		7 (Absolutely important)		329.25	
Employment of skilled workers (LEKT5)		1 (Not important)		337.94	
		2		303.68	
		3		283.56	
		4		243.56	
		5		313.75	
		6		347.18	
		7 (Absolutely important)		328.26	
Statistical Test	LEKT1	LEKT2	LEKT3	LEKT4	LEKT5
Chi-Square	14.087	7.101	11.793	12.926	21.107
df	6	6	6	6	6
Asymp. Sig.	.029	.312	.067	.044	.002

Note: own research, 2025

In the case of the H3 hypothesis, the relationships between leadership attitude and external knowledge transfer elements (LEKT1; LEKT2; LEKT3; LEKT4; LEKT5) were examined. The table shows the development of the average rankings in terms of leadership attitude. The Kruskal-Wallis H test shows that there is a statistically significant relationship between partnership with organizations and research institutes (LEKT1) and leadership attitude [Chi Square x^2 =14.087; df=6], p=0.029<0.05. Companies for which leadership attitude is important typically try to establish new partnerships with external partners (research institutes, universities, etc.). Statistically, no significant relationship can be demonstrated between encouraging employees to join networks outside the company (LEKT2) and leadership attitude [Chi Spuare x^2=7.101; df=6], as p=0.312>0.05, and between participation in conferences and seminars (LEKT3) and leadership attitude [Chi Spuare x^2=11.793; df=6], as p=0.067>0.05. However, there is a statistically significant relationship between encouraging networks with experts (LEKT4) and leadership attitude [Chi Square x^2=12.926; df=6], p=0.044<0.05. Companies that value leadership attitude encourage their employees to network with experts outside the company. There is a statistically significant relationship between the employment skilled workforce (LEKT5) and the importance of leadership attitude [Chi Square x^2=21.107; df=6], p=0.002<0.05 significance level. In companies where leadership attitude plays a key role, there is a greater likelihood of hiring highly skilled workers, as strong leadership often correlates with strategic human resource planning and a focus on innovation capacity.

Overall, it can be stated that hypothesis H3 can only be partially accepted, in the case of the 5 LEKT scale items examined, LEKT2 and LEKT3 were not significantly confirmed. In terms of external knowledge transfer in domestic SMEs operating in the logistics sector, leadership attitude plays a role in establishing partnerships with external organizations, research institutes and experts outside the company and in employing qualified employees.

Table 10 presents the results of the H4 hypothesis test.

Table 10: Hypothesis Testing (correlation between internal knowledge transfer methods and leadership attitude)

Internal knowledge transfer methods	Leadership attitude	Mean rank
Rewarding employees for new ideas (LIKT1)	1 (Not important)	305.83
	2	296.05
	3	306.74
	4	279.83
	5	275.46
	6	335.41
	7 (Absolutely important)	336.48
Employee rotation for knowledge transfer (LIKT2)	1 (Not important)	336.28
	2	364.87
	3	326.67
	4	319.63
	5	286.34
	6	318.97
	7 (Absolutely important)	315.50
Collecting new ideas within the organization (LIKT3)	1 (Not important)	243.11
	2	396.74
	3	293.34
	4	325.01
	5	293.67
	6	324.96
	7 (Absolutely important)	313.86
Work meetings with employees to discuss new ideas (LIKT4)	1 (Not important)	233.44
	2	361.21
	3	294.83
	4	287.91
	5	286.08
	6	326.89
	7 (Absolutely important)	333.25
Sharing best practices within the company (LIKT5)	1 (Not important)	283.17
	2	285.29
	3	277.93
	4	283.21
	5	279.07
	6	335.81
	7 (Absolutely important)	340.48

Statistical Test	LIKT1	LIKT2	LIKT3	LIKT4	LIKT5
Chi-Square	13.851	4.601	8.237	11.413	16.159
df	6	6	6	6	6
Asymp. Sig.	.031	.596	.221	.076	.013

Note: own research, 2025

In the case of the H4 hypothesis, the relationships between leadership attitude and internal knowledge transfer elements (LIKT1; LIKT2; LIKT3; LIKT4; LIKT5) were examined. The table shows the development of the average rankings in terms of the importance of leadership attitude. The Kruskal-Wallis H test shows that there is a statistically significant relationship between rewarding employees for new ideas (LIKT1) and leadership attitude [Chi Square x^2=13.851; df=6], p=0.031<0.05 significance level. Companies in which leadership attitude is very important are more likely to reward employees for new ideas. There is no statistically significant relationship between the following three factors: employee rotation for knowledge transfer (LIKT2) and leadership attitude [Chi Spuare

x^2=4.601; df=6], p=0.596>0.05, collecting new ideas within the organization (LIKT3) and leadership attitude [Chi Spuare x^2=8.237; df=6], p=0.221>0.05, and work meetings with employees to discuss new ideas (LIKT4) and leadership attitude [Chi Square x^2=11.413; df=6], p=0.076>0.05. There is a statistically significant relationship between sharing best practices within the company (LIKT5) and leadership attitude [Chi Square x^2=16.159; df=6], p=0.013<0.05 significance level. Companies for which Leadership attitude is important consider sharing best practices within the company.

Overall, hypothesis H4 can only be partially accepted, in the case of the 5 LIKT scale items examined, LIKT2, LIKT3, and LIKT4 were not confirmed. In terms of internal knowledge transfer in Hungarian enterprises operating in the field of logistics, there are significant differences between the individual knowledge transfer methods.

5. Discussion

The research results obtained and those described in the literature are in many cases consistent with each other. The relationship between employee innovation activity and external knowledge transfer methods has been the subject of numerous international studies in recent years. Additionally, the findings highlight the role of knowledge-sharing practices in improving distribution efficiency, reducing operational delays, and optimizing last-mile logistics. Based on the literature, it can be concluded that the involvement of external knowledge sources has a significant impact on corporate innovation and employee creativity.

Our research also showed that connections with external organizations and the inclusion of external knowledge contribute greatly to enhancing Hungarian logistics and distribution enterprises' innovation activity and supply chain competitiveness. According to international literature, knowledge sharing within a company also has a significant impact on promoting corporate innovation. Nonaka and Takeuchi (1995) point out in their spiral model of knowledge creation that transformation processes between tacit and explicit knowledge are fundamental for innovation. Internal knowledge-transfer processes such as those found in our research (supporting new ideas from employees, workshops, sharing good practices) enable organizations to create and apply new knowledge during innovation.

According to Davenport and Prusak (1998), knowledge management practices, such as encouraging knowledge sharing and creating knowledge bases, promote innovation in organizations. The authors emphasize that effective knowledge management increases the competitiveness and innovation capacity of organizations. Smith and Hansen (2002) point out that barriers to internal knowledge transfer, such as lack of trust, hinder innovation. The authors recommend developing a knowledge-sharing culture and strengthening internal networks to promote innovation. The results of our research also support the importance of increasing employee activity in the field of innovation, and that leaders play an important role in the success of organizational innovation. The relationship between leadership attitudes and external knowledge transfer methods has a significant impact on the competitiveness of organizations. Leaders' openness and support for integrating external knowledge play a key role in organizational learning and development. Bencsik et al. (2017) have shown in their empirical study that the success of knowledge management and knowledge transfer is closely related to the attitude of leaders. In their research, they emphasized that without the support and commitment of leaders, the effective integration of external knowledge may encounter difficulties, which hinders the adaptive capacity and competitiveness of organizations. According to the results of this research, an open and supportive leadership attitude promotes the successful sharing of knowledge, which contributes to increasing the innovative capacity and competitiveness of logistic enterprises.

6. Conclusions

In this study, we examined the relationship between knowledge management methods, leadership attitudes, and employee engagement in Hungarian logistics companies.

According to the results obtained, the innovation capacity of enterprises largely depends on the effectiveness of their knowledge management methods. The aim of internal knowledge management is to create, share, and utilize knowledge within the organization, which contributes to increasing the creativity and problem-solving abilities of employees. By effectively managing internal knowledge, logistics companies can develop faster innovation processes and better utilize existing resources. External knowledge management aims to integrate and utilize knowledge sources outside the organization, which creates opportunities for the incorporation of new knowledge and technologies. External knowledge transfer includes methods such as cooperation with universities and research institutes, joining industrial clusters, and developing strategic partnerships. Access to external knowledge sources can provide a significant competitive advantage, as it allows businesses to reach new markets and adapt more quickly to technological changes and consumer demands.

Internal and external knowledge management methods complement each other, fostering continuous development and innovation for businesses. Effective internal knowledge

management enables an organization to properly integrate and utilize knowledge from external sources, while external knowledge transfer helps logistics and trade companies to renew themselves and maintain competitiveness in rapidly evolving distribution networks. Businesses that properly apply both knowledge management strategies are more likely to become innovative and sustainable growth organizations. Furthermore, our results indicate that in logistics and distribution, knowledge management through innovation not only drives innovation but also enhances supply chain efficiency. Through the use of routines of internal and external knowledge sharing, logistics firms are capable of designing their business in distribution and more effectively coping with the competitive business world, thereby improving overall trade performance and logistics.

Among the research limitations, it should be highlighted that the research was conducted in only one country (Hungary) and among small and medium-sized enterprises interested in one sector (logistics). Future research directions may include extending the research to other countries and sectors. The results obtained in this way could then be compared with the scientific results published in this study.

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