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Article

Preservation and Renewal: Examining Organizational Innovation Behavior in the Context of Sustainability, Social Responsibility, and Environmentally Conscious Management

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ABSTRACT

The concept of sustainability, social responsibility, and environmentally conscious management, as well as the organizational innovation offers numerous economic and social benefits for both employers and employees. The aim of the research was to assess the innovation behavior organizations operating in the Hungarian small and medium-sized enterprises sector (SMEs) in relation to sustainability and environmentally conscious management, with a particular focus on size, sector, leadership attitudes, styles, and the involvement and activity of employees in innovation. The aim is to explore the fundamental relationships and differences in the application of sustainability practices along these dimensions. The empirical research was conducted using a quantitative research method, through a questionnaire survey. A total of 1385 valid responses were collected. Regression analysis and Kruskal-Wallis non-parametric test were used for statistical analysis of the hypotheses. The results shows that there are significant differences between companies in terms of innovation policies and applied sustainability practices of Hungarian SMEs. Companies differ significantly in their approach to environmentally conscious management and the application of sustainable practices based on company size, on leadership style, employee involvement in innovation.

KEYWORDS: organizational innovation behavior; sustainability; environmentally conscious management; Hungary; SMEs

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INTRODUCTION

Innovation enables the maintenance of competitiveness, the creation of more sustainable jobs, and ensures long-term development. An increasing number of practical solutions are emerging that emphasize the mutual benefits of sustainability and innovation. Beyond fostering environmentally conscious consumer decisions and responsible purchasing habits, the public goal of sustainability is to promote social responsibility and to create a livable environment for everyone. Companies play a significant role in pursuing sustainability objectives, disseminating related knowledge, and developing best practices. It is of paramount importance that, at their own level, SMEs integrate the dimensions of sustainability into their operational models and strategic objectives—dimensions that encompass the economy, society, and the environment [1]. Sustainability creates resources for expanding and developing human capital, promoting environmental education and awareness, and implementing new and novel solutions and technologies that support sustainability through innovation. Nowadays, society almost expects companies to demonstrate social responsibility and environmentally conscious management. An environmentally and socially responsible company considers the interests of others and focuses on practical solutions that minimize harm [2]. Practices serving corporate social responsibility (CSR) are attracting increasing interest among executives. CSR practices contribute to ensuring that companies remain socially and environmentally responsible towards their employees, consumers, suppliers, and other stakeholders [3]. For companies, innovation can take the form of a new approach, process, or method—or even a product or service—that ensures adaptation to the market environment and provides a competitive advantage. Innovation is therefore a necessary tool for securing corporate sustainability and development [4]. Furthermore, it is a tool for attracting customers and gaining a competitive advantage [5].

The aim of the research was to explore the innovation behavior of companies operating in the Hungarian SMEs in relation to sustainability and environmentally conscious management, with particular emphasis on company size, sector, managerial attitudes, leadership styles, and the involvement and activity of employees in innovation. Our objective was to map out the environmentally conscious yet innovative solutions that SMEs employ to maintain their competitiveness and ensure sustainable operations. Our primary goal in testing the hypothesis was to analyze the factors that influence companies' innovation behavior. Secondly, we focused on exploring differences between companies in the application of sustainability practices, with particular regard to company size, sector, management style, and the degree of employee involvement. Despite the increasing importance of sustainability and social responsibility strategies both globally and at EU level, it less clear whether everyone at the organizational level has adapted or is able to make these efforts. There

may be several reasons for this, including lack of proactivity, lack of demand for conscious operation, lack of information, knowledge and resources etc. According to the European Innovation Scoreboard, Hungary ranks among moderate innovators. This ranking also influences the innovation activities of Hungarian SMEs, which is why it is important to research this topic and initiate a scientific dialogue that pushes the SMEs towards practical solutions, supporting Hungary's innovation development.

Our research focused on exploring the environmentally conscious operations of Hungarian SMEs in terms of company size, sector, management style, and employee involvement. Our goal is to highlight the fundamental relationships and differences between companies operating in the SMEs. The results of the research not only have scientific, theoretical added value, but are also informative and provide space for formulating practical suggestions and rethinking companies' strategies.

LITERATURE REVIEW

SMEs, regardless of industry sector, are the driving force of the economy. According to World Bank data, SMEs account for approximately 90% of global business organizations and more than 50% of employment worldwide [6]. Innovation enables SMEs to adapt flexibly and swiftly to future challenges and to contribute to building a sustainable future [7]. In addition, SMEs are characterized by easier decision-making processes and a strong market orientation. They are in more advantageous position than large companies in many aspects [8]. Despite the fact that most economies are comprised predominantly of SMEs, they often have limited opportunities to develop innovative solutions. As a result, the market growth of SMEs may stagnate, they may fail to gain a competitive advantage or eventually lose it—all of which can be traced back to a lack of innovation [9]. Continuous competitive pressure affects the innovative behavior of companies. Keeping up with competitors and achieving consumer satisfaction drive companies to innovate. The role of leadership in this process in important. Leaders are paying increasing attention to the application of novel solutions and entering unknown markets. An agile corporate culture is able to respond quickly to changing markets and adapt to new trends [10]. The size of the company is also important, as smaller companies can adapt to market needs more quickly and flexibly, but at the same time cannot participate in major innovation projects [11]. Large companies have more resources to support their innovation activities, maintain venture capital investments and carry out R&D activities. The innovation advantage of SMEs is mostly related to management practices, rapid adaptation and flexibility. SMEs are less formal, and due to their size, it is easier to achieve the necessary motivation to innovate. Although fundamental technological innovations can often be adapted more easily and quickly in SMEs than in larger

companies, flexibility and innovation potential generate differences across industries [12,13].

The findings of Rideg et al. [14] highlight that in Hungary, younger SMEs are more advanced in terms of innovation than firms in a more mature phase. Hungary is also among those countries where innovation-stimulating support primarily targets large corporations, educational institutions, and research organizations. Consequently, fewer opportunities remain for SMEs. Although the SMEs are likewise the driving force of the Hungarian economy, it still lags far behind more developed European countries—a disparity that extends to innovation activities as well [15]. There is a lack of support and limited financial and human resources, which constrain the innovation activities of SMEs [16]. For companies, innovation represents a necessary strategic step to adapt to industry-specific changes, secure a competitive advantage, ensure long-term growth, enhance performance, and maintain sustainable operations. Innovation contributes to improving a firm's performance and market position by introducing new products and services or innovative processes, thereby transforming internal capabilities. Organizational innovation specifically focuses on the implementation of new management methods and the restructuring of internal operations [17]. Organizational innovation can be considered a fundamental component of economic development [18]. It helps to companies adapt to the constantly changing market environment and gain a prominent market position [19]. New management methods and practices are built on encouraging new and creative solutions. This requires the introduction of new personnel development methods, the implementation of knowledge management, and corporate behavior that supports innovations [20].

Companies strive to engage in innovation activities that are guided by sound ethical practices, responsible human resource management, and a focus on the use of green technologies, thereby gaining competitive advantage and institutional legitimacy. Sustainable behavior can help expand the consumer base and enhance corporate image among other market actors. Commitment to social responsibility, continuous engagement with internal and external stakeholders, and environmentally sustainable innovation activities generate economic value [21]. Environmental awareness and innovation create new opportunities. Eco-innovation brings significant environmental benefits, whether in terms of reducing the use of natural resources, waste management, or carbon dioxide emissions. Eco-innovations are shaping the future of Europe. The economic and social aspects of the European Union are increasingly being brought into line with environmental awareness. Effective policy and government measures, as well as research and development support, can ensure that SMEs are willing to engage in eco-innovation [22]. Some SMEs often use eco-innovation, while others are less interested in environmentally friendly practices. This often depends on the industry. More advanced industries are more open to

environmentally friendly and socially responsible solutions. In the case of eco-innovation, it is worth considering establishing relationships with external actors and incorporating environmental regulations into the company [23].

Intellectual capital—such as knowledge, networks, and organization culture—enables SMEs to use their resources more efficiently and reduce their environmental footprint in the spirit of sustainable operations. It is particularly important for SMEs to seize the opportunities offered by sustainable economic solutions. The essence of open sustainability innovation lies in implementing new ideas, management practices, products, or even services that simultaneously serve economic, social, and environmental objectives, while also connecting stakeholders with one another. The key to fostering sustainability and innovative solutions lies in internal collaboration and employee involvement [24,25]. Training and involving employees in innovation processes enhance their loyalty and performance [26]. Beyond basic employee responsibilities, innovation requires a proactive attitude. In workplaces that prioritize environmentally conscious management, this proactive approach enables employees to develop and implement eco-friendly ideas. Leadership style and behavior are especially important for managing, introducing, and gaining employee acceptance of innovation [27]. Sustainable leadership supports employees' proactivity in implementing conscious environmental management and innovation initiatives [28]. An innovative managerial mindset positively influences not only performance but also sustainability efforts, helping leaders approach business opportunities creatively [29]. Leaders must foster a culture of innovation that promotes the development and implementation of environmentally and socially responsible practices [30]. The findings of Rauter et al. [31] reflect that from the perspective of innovation management, organization efficiency and sustainability are rooted in engaging both the organization's immediate stakeholders and its wider environment. Sustainability is playing an increasingly significant role in companies' operations, as reflected in environmentally conscious leadership practices, managerial and employee attitudes, corporate values, and ways of thinking. Continuous development and shifting economic and social influences bring new challenges to leadership practices. The key to adaptation and advancement lies in integrating social responsibility and environmental considerations into corporate operations [32]. Sustainable leadership aims to balance and realize economic, social, and environmental objectives. Focusing on both the present and the future, sustainable leadership takes into account the well-being and development of stakeholders, operates according to shared values, recognizes interdependence, advances leadership development, promotes innovation, encourages systems thinking and long-term orientation, and embraces the diversity of sustainable leadership practices. Sustainable leadership creates a supportive and inspiring environment within the company,

underpinned by both personal and organizational values. Leaders who embrace the idea of sustainability seek change, continuous innovation, the advancement of internal and external relationships, and actively draw attention to the importance of sustainability-oriented attitudes. At the organization level, the foundation of sustainable management rests on corporate culture, strategy, and the development of human capital. The sustainability of organization culture aims to deepen the willingness to innovate and to build trust within the organization. The sustainable nature of strategy focuses on meeting the needs of direct and indirect stakeholders, strengthening business relationships, and aligning the natural and economic environments. Behind strategic formulation lies a commitment to social welfare and environmental awareness. The sustainability of the human factor lies in a people-centered approach: fostering employee loyalty, involving them in processes, and developing their skills, all of which strengthen their trust in the organization [33,34]. Valdez Juarez et al. [35] emphasize that internal and external training of employees, development their creativity and expansion of their knowledge are important for effective innovation activity of companies.

Managerial attitude and leadership style play a crucial role in embedding the concept of sustainability and social responsibility within companies. Transformational leadership is built on fostering good relationships with employees, encouraging autonomy, skills development, mutual trust, and honesty, while green transformational leadership extends this by stimulating employees' environmental awareness. Ethical leadership is realized through the establishment of ethical connections both within and outside the organization and by striving for ethical decision-making. Responsible leadership embraces the notion of social responsibility, which is grounded in the well-being, mutual respect, trust, and commitment of leaders and subordinates alike [36–38]. According to Merín-Rodrigáñez et al. [39], an empowering leadership style of top management in innovative SMEs is effective. Employees are involved in decisions and given greater responsibility. Muenjohn et al. [40] found that leadership style is closely related toa company's ability to innovate. Creative leaders support innovations, which in turn increases employee's innovative behavior and thinking. Active leadership has a positive effect on innovation, while passive-avoidant leadership has a negative effect.

ESG (Environmental, Social, and Governance) is increasingly being emphasized in business and in the development of sustainable corporate practices. ESG enables companies to meet the expectations of the environment, the economy, and society. Environmentally conscious companies operate in a sustainable manner and respect natural resources. Socially responsible companies value fair labor practices, equality, and quality of life. Economically conscious companies are characterized by ethics, transparency, and accountability, all of which contribute to building trust [41]. According to Shmelev and Gilardi [42], the key to achieving sustainability and making the transition is to engage companies.

This requires clear regulation, leadership development, and profound transformation of business models. Through these actions, companies can respond more effectively to the challenges that threaten their sustainability. Zhu and Huang [43] found that in SMEs, transformational leadership promotes the ESG concept by focusing on employees and providing them with a harmonious and developmental environment. Transformational leadership is an appropriate strategy for embedding ESG practices within organizations and contributes to enhancing employees' willingness to innovate. Gumusluoğlu and Ilsev [44] and Paulsen et al. [45] also concluded that leadership style has a significant impact on innovation practices. Transformational, ethical, and responsible leadership styles exert a positive influence, whereas an autocratic leadership style negatively affects corporate innovation. Ur Rehman et al. [46], in their study of Pakistani SMEs, highlighted the importance of sustainable innovation management practices, which steer companies towards frugal innovation, resulting in cost efficiency. Companies' pursuit of sustainability increases the demand for frugal innovation. Sustainable leadership practices, employee involvement and empowerment, and the promotion of ethical and social responsibility can foster frugal innovation in SMEs. According to Rousselière et al. [47], the resale of waste, the saving of raw materials, and the use of renewable energy can significantly contribute to reducing costs and improving the profitability of SMEs. Zheng et al. [48] examined the complex relationship between digital technologies and sustainable practices in SMEs. Achieving carbon neutrality depends on companies' environmental strategies and the integration of digital technologies. According to Shahin et al. [49], Iranian SMEs are under increasing pressure to operate environmentally friendly and to undertake green innovation initiatives. The most of significant obstacles to green innovation are the lack of commitment and support from partners, the reluctance and limited knowledge of employees regarding green innovations, the uncertainty and lack of knowledge of customers, and the limited R&D activities. Sarango-Lalangui et al. [50], examining Ecuadorian SMEs, found a link between the pursuit of sustainability and innovation. Open innovation is particularly important, as it focuses on leveraging opportunities within companies' internal and external environments, thereby improving their innovation performance. SMEs that remain open to innovation take a significant step towards sustainability. According to Dzurov Vargová and Matušíková [51], the use of environmentally conscious solutions in the Slovak tourism sector is showing a growing trend. More and more companies are recognizing the importance of environmentally conscious and sustainable operations and the preservation of natural resources. Companies have the opportunity to reduce their ecological footprint, increase their competitiveness and attract more tourists. Filčák and Škobla [52] examined the structural challenges of decarbonization strategies in Slovakia. Decarbonization can boost companies' innovation efforts aimed

at environmental awareness, such as reducing carbon dioxide emissions, complying with increasingly stringent environmental regulations, and responding to constantly changing market demands. According to Domaracká et al. [53], Slovakia is only slightly behind the EU average in terms of the number of green businesses, and an increasing number of companies intend to derive a significant portion of their turnover from the production of environmentally friendly products and services. With regard to environmentally conscious management by SMEs, the most commonly used measures are energy conservation, water management, and waste reduction. Waste recycling and resale, the use of renewable energy sources, and the manufacture of repairable and recyclable products are less common in the environmentally friendly operations of SMEs. At the same time, Slovak SMEs are constantly striving to use their resources as efficiently as possible. New technologies are needed to improve energy efficiency and solve the problems of environmental pollution and energy consumption caused by manufacturing [54].

According to Lima et al. [55], the corporate culture and performance management of SMEs can ensure innovation and sustainability-oriented operations. Innovations are related to changes and improvements in products and processes, while sustainability practices are related to environmental dimensions. Innovation-driven SMEs proactively seek innovative solutions that take sustainability considerations into account.

MATERIALS AND METHODS

In our research, we primarily placed emphasis on secondary research in order to gain an in-depth understanding of the topic. The research followed a deductive research logic that begins with a hypothesis informed by research questions, which is then tested through empirical research, data collection and statistical analysis. In our research, we analyzed how size, sector, employee involvement, and management style influence companies' innovation behavior. We also sought to answer how companies differ in their application of sustainability practices based on size, sector, employee involvement, and management style. In our research, we interpret organizational behavior as the role of managers and employees in innovation, how they respond to sustainability practices, and how key characteristics of the company, such as size and industry, play a role in this. Based on the research questions, we formulated one main hypothesis and four supplementary hypotheses:

Hypothesis (H1). *The innovation behavior of SMEs in relation to environmentally conscious and sustainable practices depend on size, industry, employee involvement, and management style*.

Hypothesis (H2). *Companies differ in their use of sustainability practices based on their sector*.

Hypothesis (H3). *Companies differ in their application of sustainability practices based on company size*.

Hypothesis (H4). *Companies differ in the application of sustainability practices based on leadership style*.

Hypothesis (H5). *Companies differ in the application of sustainability practices based on the degree of employee involvement*.

For the primary research, we applied a quantitative research method, specifically a questionnaire survey. To ensure time efficiency and more flexible access to respondents, the questionnaire survey proved to be an effective solution. The questionnaire was distributed both in paper-based and electronic formats among company representatives who participated voluntarily in the survey. Respondents were informed about the purpose of the research, the background of the data processing, and the intention to share the research results scientifically. To maintain data security and protection, we ensured respondent anonymity and collected only a few basic pieces of information about the companies, such as the year of establishment, company size, and industry classification. The sampling method used was quota sampling within the framework of non-probability sampling, aiming to ensure a diverse sample in terms of industry classification. Data collection took place in 2024. International research most often focuses on examining organizational behavior, paying particular attention to size, sector, employee activity and involvement, and management style. Therefore, we used our own structured questionnaire to assess the innovation behavior of Hungarian SMEs. The questions can be divided into three groups. The first group of questions concerned basic company data, i.e., size, sector, and year of establishment. The second group of questions examined the role and attitude of employees and managers in innovation, as well as the innovation behavior typical of companies in general. The third group of questions concerned the frequency and importance of sustainability practices employed by companies. The questionnaire mainly contained scale-type questions, designed to encourage respondents to evaluate factors relevant to the research. Respondents indicated their answers to scale-type questions on a seven-point Likert scale, where 1 represented “of negligible importance” or “not at all characteristic”, while 7 indicated “extremely important” or “fully characteristic”. An essential aspect of scale-type questions is the determination of the Cronbach’s alpha value. Cronbach’s alpha measures internal consistency and reliability, providing information on the measurement and reliability of the scale items related to the questions. Its value ranges between 0 and 1, with a reference value of 0.7. In connection with scale-type questions, Hotelling’s T-square multivariate statistical test was also run, which shows at a significance level ($p < 0.05$) whether the means of two or more groups are significantly different from each other. The research results were presented in tables, and the statistical analyses were performed using IBM SPSS Statistics 27 [56] For the variables underlying the hypotheses, the Kolmogorov–Smirnov normality test revealed that the data did not follow a normal distribution ($p = 0.000 < 0.05$);

therefore, we applied non-parametric statistical tests to verify the hypotheses. To test the main hypothesis, was conducted a regression analysis to assess which factors influence the innovation behavior of companies. In the additional hypotheses, we examined what difference can be detected between companies in the application of sustainability practices based on each factor. Specifically, we used the Kruskal–Wallis test to test the supplementary hypotheses; this statistical test is the non-parametric equivalent of the parametric ANOVA test. The Kruskal–Wallis test allows for the ranking of all data from all groups and analyses these ranks to determine whether there are significant differences among the groups. After identifying differences between the ranks, we compared the ranks pairwise using the Mann-Whitney U test. The test helps to point out on what basis and between which groups there is a significant difference.

Data Collection

Table 1 presents some basic information about the companies that participated in the empirical research. Based on the year of establishment, we created four groups: 82.4% of the companies were founded between 1991 and 2024; 13.4% between 1961 and 1990; 2.4% between 1931 and 1960; and 1.9% between 1900 and 1930. Since the research specifically focuses on the SMEs, we categorized companies into three groups according to company size based on employment: 39.2% were medium-sized enterprises, 34.5% were small enterprises, and 26.3% were micro-enterprises. In terms of industry classification, 19.4% of the companies operate in manufacturing, 17.4% in wholesale and retail trade, 14.2% in tourism and hospitality, and 12.3% in construction. Additional sectors presented in the table appear with a share below 10%.

Table 1. Basic information about the enterprises involved in the research.

	Answer Options	Frequency	Percent
Year of establishment	between 1900–1930	26	1.9%
	between 1931–1960	35	2.4%
	between 1961–1990	183	13.3%
	between 1991–2024	1141	82.4%
Total		1385	100%
Company size by employment	Micro-enterprise <10 people	364	26.3%
	Small enterprise <50 people	478	34.5%
	Medium-sized enterprise <250 employees	543	39.2%
Total		1385	100.0%
Sector	Jurisdiction	19	1.4%
	Public administration	42	3.0%
	Health	67	4.8%
	Education	68	4.9%
	Other	87	6.4%
	Agriculture	104	7.5%
	Logistics	121	8.7%
	Building industry	170	12.3%
	Tourism and hospitality	197	14.2%
	Retail, and wholesale	241	17.4%
	Production	269	19.4%
Total		1385	100.0%

RESULTS

Table 2 presents the reliability, and the results of Hotelling's T-square test. The number of scale items is 5, the Cronbach's alpha is 0.872, which exceeds the reference value (0.7), indicating that the scale provides reliable data. The Hotelling's T^2 = 219.941 at (p = 0.000 < 0.05) significance level is significant. This means that there is a significant difference between the means of the variables examined. This means that the company representatives evaluated variables to a different extent.

Table 2. Reliability statistics.

Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**			**N of Items**
0.872	0.872			5
Hotelling's Test				
Hotelling's T^2	F	df1	df2	Sig.
219.941	54.866	5	1380	0.000

Table 3 presents the descriptive statistical analysis of the independent variables underlying the hypotheses. Among the surveyed SMEs, 21.1% (Md. = 4; Mn. = 4) moderately agreed that their company has a clear policy for assessing environmental management. Additionally, 18.2% (Md. = 4; Mn. = 3.84) similarly moderately agreed that the company provides environmental training opportunities for all employees. A significant proportion, 20.5% (Md. = 5; Mn. = 4.42), strongly agreed that their company conducts effective waste, water, and energy management activities. Furthermore, 22.2% (Md. = 4; Mn. = 4.11) reported having environmentally friendly business processes, while 18.3% (Md. = 4; Mn. = 3.87) indicated that their company has its own environmental management system and environmental practises.

Table 3. Descriptive statistics on dependent variables included in hypotheses.

SP = Sustainability Practises	**SP1**	**SP2**	**SP3**	**SP4**	**SP5**
Descriptive statistics	Clear policy for assessing environmental management	Environmental training for all employees	Waste, water and energy management	Environmentally friendly business processes	Environmental management systems and voluntary environmental practises
N Valid	1385	1385	1385	1385	1385
Missing	0	0	0	0	0
Mean	4.28	3.84	4.42	4.11	3.87
Median (Mn.)	4.00	4.00	5.00	4.00	4.00
Mode (Md.)	4	5	5	4	4
Std. Deviation	1.703	1.883	1.759	1.747	1.842
Variance	2.899	3.545	3.096	3.051	3.393
Skewness	−0.175	0.005	−0.265	−0.175	−0.032
Std. Error of Skewness	0.066	0.066	0.066	0.066	0.066
Kurtosis	−0.826	−1.089	−0.843	−0.871	−1.045
Std. Error of Kurtosis	0.131	0.131	0.131	0.131	0.131
Frequency	292	252	284	308	254
Percent	21.1%	18.2%	20.5%	22.2%	18.3%

Table 4 presents the innovation behaviour of companies. The innovation behaviour of SMEs is active in 51.8% of cases, meaning that innovation has already taken place in the past and is planned for the future as well. For 18.8% of SMEs, innovation behaviour is passive, meaning there has been no innovation so far, but it is planned in the near future. For 15.2% of SMEs, it is regressive, indicating that there has been innovation in the past but none is planned in the near future. Finally, 14.2% of SMEs exhibit indifferent innovation behaviour, meaning there has been no innovation in the past and none is planned for the future either. However, the Std. Deviation (1.107) is significant, which means that the companies show a diverse picture in terms of innovation behaviour.

Table 4. Innovation behaviour of companies.

Answer Options	Percent
Active (an innovation before and planned in the near future)	51.8%
Passive optimist (no innovation before, but planned in the near future)	18.8%
Regressive (an innovation in the past, but not planned in the near future)	15.2%
Indifferent (no innovation in the past and not planned in the near future)	14.2%
Mean	1.91
Median	1.00
Mode	1
Std. Deviation	1.107

Table 5 presents the leadership style in the companies. Although the literature review presents modern leadership strategies and styles, we believe these are less typical and widespread in the SMEs; therefore, we focused on the three classical leadership styles: autocratic, democratic, and laissez-faire. However, it is important to note that there is a lot of overlap between modern transformative leadership and democratic leadership. In 44.4% of SMEs, the democratic leadership style prevails, meaning that leaders involve employees in decision-making, encourage teamwork, and consciously build team spirit. In 36.3% of SMEs, the autocratic leadership style dominates, meaning that leaders exercise full control and authority without considering employees' opinions. In 19.3% of SMEs, the laissez-faire leadership style prevails, meaning that leaders allow employees a high degree of autonomy without direct supervision.

Table 5. Leadership style in the companies.

Answer Options	Percent
Autocratic, focuses on results and team efficiency.	36.3%
Democratic, involves team participation in decision-making.	44.4%
Laissez-faire, Hands-off approach, allowing team members to make decisions.	19.3%
Mean	1.83
Median	2.00
Mode	2
Std. Deviation	0.726

Table 6 presents the results of the regression analysis in relation to the main Hypothesis H1. Based on the regression analysis, at a significance level of $p = 0.000 < 0.05$, company size, leadership style and employee

involvement have a significant effect on the innovation behaviour of companies. In the case of company size (β = −0.146; B = −0.202) it can be stated that the smaller the company, the less active the company is in terms of innovation. In the case of leadership style (β = 0.184; B = 0.280) it can be stated that the more prominent the leadership style, the more active the companies are in terms of innovation. In the case of employee involvement (β = −0.145; B = −0.97), it can be stated that the less employees are involved, the less active the company is in terms of innovation.

No significant relationship can be demonstrated between the sector and innovation behaviour (p = 0.542 > 0.05). With this finding, the second hypothesis can be rejected. Hypothesis H1 is partially accepted, since the significance condition was not met for only one variable.

Table 6. Regression analysis.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.251	0.153	-	14.706	0.000	-	-
	Size	−0.202	0.037	−0.146	−5.482	0.000	0.950	1.052
	Sector	−0.007	0.012	−0.016	−0.611	0.542	0.996	1.004
	Leadership style	0.280	0.041	0.184	6.866	0.000	0.939	1.065
	Employee involvement	−0.097	0.018	−0.145	−5.478	0.000	0.962	1.039

Dependent Variable: Innovation behavior

Table 7 presents the test of the H3 hypothesis. There were no obstacles to conducting the hypothesis test, as all necessary conditions were met. The aim of testing hypothesis H3 was to determine to what extent the effectiveness of innovative sustainability practices applied in SMEs differs based on the company size. Differences were analysed between the innovative sustainability practises (SP1, SP2, SP3, SP4, SP5) as dependent, grouping variables and company size as the independent variable. There is a significant difference between the company size applied in SMEs and all innovative sustainability practises except one (SP3: χ^2 = 3.411, df = 2; p = 0.182), at a significance level of p = 0.000 < 0.05. This suggests, that waste, water and energy management are equally important regardless of company size. The effectiveness of innovative sustainability practises applied in the surveyed SMEs are linked to the company size to varying degrees. Comparing the rankings, it was found that, with one exception, the effective implementation of all innovative sustainability practices differs based on the company size. As a post hoc test, was used Mann-Whitney u test to detect which groups had significant differences based on sustainability practices. Since N = 1385 > N = 30, was used a Z-approximation when evaluating the statistical test. In the case of SP1, there was a significant difference between micro and small enterprises (Z = −2.035; p = 0.042), and micro and medium-sized enterprises (Z = −2.312; p = 0.021). In the case of SP2, there was a significant difference between micro and small enterprises (Z = −2.772; p = 0.006), and micro and medium-

sized enterprises (Z = −3.020; p = 0.003). In the case of SP4, there was a significant difference between micro and small enterprises (Z = −2.162; p = 0.031). In the case of SP5, there was a significant difference between micro and small enterprises (Z = −2.249; p = 0.024), and micro and medium-sized enterprises (Z = −2.386; p = 0.017). Hypothesis H3 was confirmed, meaning that there is a difference between Hungarian SMEs in terms of sustainability practices depending on the size of the company.

Table 7. Test statistics [a,b].

SP = Sustainability Practises			**Size**		**Mean Rank**
SP1: Clear policy for assessing environmental management			Micro-enterprise <10 people		649.03
			Small enterprise <50 people		705.47
			Medium-sized enterprise <250 employees		710.26
SP2: Environmental training for all employees			Micro-enterprise <10 people		634.51
			Small enterprise <50 people		709.80
			Medium-sized enterprise <250 employees		716.19
SP3: Waste, water and energy management			Micro-enterprise <10 people		660.48
			Small enterprise <50 people		698.79
			Medium-sized enterprise <250 employees		708.46
SP4: Environmentally friendly business processes			Micro-enterprise <10 people		643.65
			Small enterprise <50 people		704.29
			Medium-sized enterprise <250 employees		714.91
SP5: Environmental management systems and voluntary environmental practises			Micro-enterprise <10 people		646.14
			Small enterprise <50 people		709.07
			Medium-sized enterprise <250 employees		709.03
	SP1	SP2	SP3	SP4	SP5
Chi-Square	6.045	10.707	3.411	7.768	6.805
df	2	2	2	2	2
Asymp. Sig.	0.049	0.005	0.182	0.021	0.033

[a]. Kruskal Wallis Test; [b]. Grouping Variable: Size

Table 8 presents the test of the H4 hypothesis. There were no obstacles to conducting the hypothesis test, as all necessary conditions were met. The aim of testing hypothesis H4 was to determine to what extent the effectiveness of innovative sustainability practices applied in SMEs differs based on the leadership style. Differences were analysed between the innovative sustainability practises (SP1, SP2, SP3, SP4, SP5) as dependent, grouping variables and leadership style as the independent variable. There is a significant difference between the leadership style applied in SMEs and all innovative sustainability practises except one (SP1: χ^2 = 3.737, df = 2; p = 0.154), at a significance level of p = 0.000 < 0.05. This suggests that, regardless leadership style, it is important to follow clear guidelines for assessing environmental management. The effectiveness of innovative sustainability practises applied in the surveyed SMEs are linked to the leadership style to varying degrees. Comparing the rankings, it was found that, with one exception, the effective implementation of all innovative sustainability practices differs based on the leadership style. As a post hoc test, was used Mann-Whitney u test to detect which groups had significant differences based on sustainability practices. Since N = 1385 > N = 30, was used a Z-approximation when evaluating the statistical test. In the case of SP2, there was a significant difference between the autocratic and

democratic leadership style (Z = −3.488; p = 0.000). In the case of SP3, there was a significant difference between the autocratic and democratic leadership style (Z = −3.038; p = 0.002), and between the autocratic and laissez-faire leadership style (Z = −1.979; p = 0.048). In the case of SP4, there was a significant difference between the autocratic and democratic leadership style (Z = −2.189; p = 0.029). In the case of SP5, there was a significant difference between the autocratic and democratic leadership style (Z = −4.055; p = 0.000), and the democratic and laissez-faire leadership style (Z = −2.694; p = 0.007). Hypothesis H4 was confirmed, meaning that there is a difference between Hungarian SMEs in terms of sustainability practices depending on the leadership style.

Table 8. Test statistics [a,b].

SP = Sustainability Practises	**Leadership Style**	**Mean Rank**
SP1: Clear policy for assessing environmental management	1-Autocratic	679.01
	2-Demogratic	715.47
	3-Laissez-faire	667.59
SP2: Environmental training for all employees	1-Autocratic	647.81
	2-Demogratic	730.64
	3-Laissez-faire	691.43
SP3: Waste, water and energy management	1-Autocratic	657.85
	2-Demogratic	730.69
	3-Laisseze-faire	672.40
SP4: Environmentally friendly business processes	1-Autocratic	673.33
	2-Demogratic	725.21
	3-Laissez-faire	655.87
SP5: Environmental management systems and voluntary environmental practises	1-Autocratic	646.59
	2-Demogratic	742.83
	3-Laissez-faire	665.66

	SP1	SP2	SP3	SP4	SP5
Chi-Square	3.737	12.151	10.332	7.714	17.986
df	2	2	2	2	2
Asymp. Sig.	0.154	0.002	0.006	0.021	0.000

[a]. Kruskal Wallis Test; [b]. Grouping Variable: Leadership style

Table 9 presents employee involvement in innovation with descriptive statistics. Mean = 3.93, which indicates that the management involves employees in innovation to a moderate extent. This is also supported by the Mode and Median values. Based on the Std. Deviation (1.658), it can be said that the involvement of employees in innovation showed a varied picture in Hungarian SMEs.

Table 9. The extent of employee involvement in innovation.

Answer Options		**Percent**
Valid	1-Very low	8.7
	2	13.6
	3	16.7
	4	22.8
	5	19.7
	6	12.1
	7-Very high	6.4
	Total	100.0
Mean		3.93

Median	4.00
Mode	4
Std. Deviation	1.658
Variance	2.750

Table 10 presents the test of the H5 hypothesis. There were no obstacles to conducting the hypothesis test, as all necessary conditions were met. The aim of testing the H5 was to determine the what extent the effectiveness of innovative sustainability practices in SMEs differs based on employee involvement. Differences were analyzed between the innovative sustainability practices (SP1, SP2, SP3, SP4, SP5) as dependent, grouping variables and employee involvement as the independent variable.

There is a significant difference between all innovative sustainability practices and the intensity of employees' involvement and activity in innovation in the surveyed SMEs, at a significance level of $p = 0.000 < 0.05$. The effectiveness of innovative sustainability practices shapes the intensity of employees' involvement and activity in innovation in different ways. Significant differences can be observed between SMEs with low levels of employee involvement in innovation activities and those that strongly ensure their employees' active participation in such activities. Where employees' creativity, ideas, and willingness to act are given space, there is a higher likelihood that innovative sustainability practices will be embraced and improved. As a post hoc test, was used Mann-Whitney u test to detect which groups had significant differences based on sustainability practices. Since N = 1385 > N = 30, was used a Z-approximation when evaluating the statistical test. Each group was compared pairwise. In summary, the most significant differences were between companies with low or high levels of employee involvement in sustainability innovations. Hypothesis H5 was confirmed, meaning that there is a difference between Hungarian SMEs in terms of sustainability practices depending on the involvement of employees.

Table 10. Test statistics [a,b].

SP = Sustainability Practises	**Employee Involvement and Activity**	**Mean Rank**
SP1: Clear policy for assessing environmental management	1-Very low	524.37
	2	594.34
	3	687.37
	4	684.10
	5	767.47
	6	759.52
	7-Very high	820.13
SP2: Environmental training for all employees	1-Very low	446.78
	2	576.78
	3	631.61
	4	716.06
	5	816.94
	6	782.65
	7-Very high	797.81
SP3: Waste, water and energy management	1-Very low	482.72
	2	586.91

	3	647.32
	4	689.00
	5	778.37
	6	820.82
	7-Very high	828.75
SP4: Environmentally friendly business processes	1-Very low	519.06
	2	589.88
	3	656.91
	4	699.37
	5	772.62
	6	775.23
	7-Very high	816.10
SP5: Environmental management systems and voluntary environmental practises	1-Very low	442.75
	2	568.30
	3	660.81
	4	753.59
	5	760.10
	6	796.54
	7-Very high	760.51

	SP1	SP2	SP3	SP4	SP5
Chi-Square	57.687	111.198	91.864	65.319	97.814
df	6	6	6	6	6
Asymp. Sig.	0.000	0.000	0.000	0.000	0.000

[a]. Kruskal Wallis Test; [b]. Grouping Variable: Employee involvement and activity

DISCUSSION

In our research, we aimed to shed light on the relationships and differences between companies operating within the Hungarian SMEs in terms of applied sustainability practices, as well as company size, sector, leadership style, and employee involvement. Since we provided a large sample (N = 1385), we attach great importance to our results. With our results, we wanted to point out that there are significant gaps between companies in the field of SMEs sustainability and environmentally conscious management. The differences during the hypothesis testing are explained based on the textual feedback of the respondents.

According to the first hypothesis, the innovation behavior of Hungarian SMEs is influenced by size, management style, and employee involvement. Despite analyzing a heterogeneous sample based on sector, we found no significant correlation with innovation behavior. It is well known that companies in the SMEs are classified into three groups based on their size. We assumed that size would therefore show differences in the application of sustainability practices and innovations. We found difference between micro and medium-sized enterprises. Lee et al., Lewandowska, and Acemoglu et al. [11–13] also argued that size is a determining factor in terms of innovation activity. Both the SMEs and large companies have advantages and disadvantages in terms of managing innovations. However, the authors mentioned above do not differentiate within the SMEs. Therefore, the results of our research provide an opportunity for further scientific dialogue. According to the literature, the attitude and leadership style of SMEs' leaders play a key role in promoting innovative

sustainability practices. Our research differs in that our primary goal is to demonstrate differences in the application of sustainability innovations within the SMEs based on leadership style. In the literature, authors mostly focus on new leadership concepts in relation to innovation, such as Merín-Rodrigáñez et al. [39] on empowering leadership, Zhu and Huang [43], Maguate et al., Ningrum et al. [37,38] on transformational and ethical leadership, Ur Rehman et al. [46] on sustainable leadership. We believe that these leadership styles are based on democratic leadership. With regard to hypothesis H4, we concluded that the application of sustainability innovations varies between companies depending on their leadership style. The most pronounced difference was found between the democratic and autocratic leadership styles. Democratic and innovative leadership styles emphasize cooperation, common interests, and the importance of development; such an environment, it is much easier to pursue innovative and sustainable practices. In contrast, autocratic leadership style is less permissive, which limits the acceptance of innovative and sustainable solutions by employees. This is the reason why there are less opportunity for novel practices in these companies. For democratic leaders, it is particularly important that their innovations serve sustainability aspects, thereby protecting the environment and providing social value, all while ensuring resource-efficient operations.

Regarding hypothesis H5, we concluded that the application of sustainability innovations shows differences between companies depending on employee involvement. The largest differences we found between companies that intensively involve employee in the innovation process and those that do the least. If employees are involved in the processes affecting the company, in solving problems and in importance of innovations and suitable practices, they are more willing to adapt. The literature suggests that the success of innovations in companies' sustainability efforts depends on employee involvement. This is also supported by Phonthanukitithaworn et al., Khan et al. [24,25], Bencsik and Pangsy-Kania and Cuhadar and Rudnák [33,34]. If this does not happen, employees are less interested in adopting new practices.

According to Rubio-Andrés et al. [26] and Valdez Juarez et al. [35], the key to successful innovation is employee involvement and training. If employees are given space for creativity, ideas, and willingness to act, they are more likely to accept and further develop innovative sustainability practices. Employees noted that when they are informed, they find it easier to process innovations and adapt to them more quickly. Employees were dissatisfied in companies where management paid little or no attention to this. Employees felt that innovation was a constraint rather than a new approach with which they could identify.

Overall, this research suggests that the innovation activities of Hungarian SMEs are influenced by size, management style, and employee involvement. However, there are significant differences between companies in the application of sustainability innovations, which can also

be observed based on size, management style, and employee involvement. This is likely related to the findings of Rideg et al. [14], who found that Hungarian SMEs have more limited opportunities than larger companies. We believe that this also plays a role in the differences in innovation behavior among companies in the SMEs.

CONCLUSIONS

In our research, we examined the innovation behavior of Hungarian SMEs, with particular focus on their efforts to support sustainability. Given the substantial sample size (N = 1385), the conclusions drawn from our research carry scientific significance. The innovation behavior of Hungarian SMEs focusing on sustainability and environmentally conscious management is the result of effective cooperation between the strategic and operational levels. The implementation of sustainability-oriented innovations by management depends on the active involvement of employees. Environmentally conscious management is perceived as a shared interest and responsibility. SMEs that pay attention to innovation activities serving sustainability play an active innovator role. For these companies, it is important to create value for society and operate in a way that serves both present and future economic needs, while causing minimal harm to the environment. SMEs that are indifferent to innovation management place less emphasis on sustainability efforts as well. The dominance of an autocratic leadership style in SMEs undermines internal democracy, collective ideation, and the involvement of employees in innovation activities. SMEs that embrace democratic leadership—or even novel leadership approaches highlighted in the literature—prioritize employee well-being, motivation, and the promotion of teamwork. Democratic leadership is based on participation, transparency, and putting community interests first. Democratic leaders should consider forming partnerships and organizing joint professional forums, workshops, and training sessions on sustainability. This initiative would motivate not only management but also employees. Companies operating in the industry could also be informed about best practices, encouraging them to cooperate, develop guidelines, and create a livable and environmentally conscious economy. A leader's behavior, values, style, decisions, and communication can fundamentally shape corporate culture. In fact, the transformational leadership style is based on the democratic leadership style, the essence of which is to enable employees to do their jobs more effectively. Ultimately, strategic vision and leadership practices alone are insufficient if there are no employees who, through their proactive attitudes and collaboration with management, contribute to achieving corporate goals. Effective communication and emotional intelligence ensure effective cooperation at the strategic and operational levels, mutual understanding of each other, and the smooth operation of corporate processes.

SMEs are characterized by having fewer resources, while having great potential in the field of green innovation. Decision-makers should be advised to develop different support schemes based on the size, sector, or maturity of the enterprise. Amon other things, non-refundable subsidies, tax breaks, technical and knowledge support through consultancy and mentoring programs, as well as reducing bureaucracy could significantly improve the innovation activity of SMEs.

One of the main limitations of the research relates to the precise definition of organization innovation, as different academic sources approach the concept in varying ways. The empirical limitation of the study is associated with data collection, as organizations are often reluctant to share information related to their strategies and innovation policies, since such data may be considered business secrets. Furthermore, the objective measurement of organization innovation behavior faces challenges, as it results from a combination of multiple factors and reflects only a current snapshot due to its continuously evolving nature. A typical limitation of questionnaire surveys is data bias. Questionnaire surveys allow for large sample sizes, which means that qualitative aspects are overshadowed by quantitative aspects. Despite the large sample size, the distribution across industries is different, making it difficult to draw consistent conclusions. To explore deeper connections between companies' innovation behavior and the importance of environmentally conscious practices, interviews, focus groups, and case studies are needed. Examining the relationships between organization innovation behavior, sustainability, and CSR offers numerous research opportunities. For instance, it would be valuable to investigate how sustainability is embedded into corporate strategy, including through the implementation of ESG goals. It may also be insightful to explore which performance indicators can be used to measure companies' sustainable innovation activities, and what practical connections exist between new technologies—such as AI—and sustainability. Additionally, identifying the internal and external barriers that affect the implementation of environmentally conscious innovations would be a worthwhile research direction. Furthermore, it may be worthwhile to examine the differences and similarities between strategies and leadership styles employed by male and female in relation to sustainability practices. In terms of leadership styles, it would be worthwhile to examine the innovation behavior of organizations in relation to new leadership styles.

DATA AVAILABILITY

All data generated from the study are available in the manuscript.

AUTHOR CONTRIBUTIONS

Conceptualization, PK and VV; methodology, PK, VV; software, VV; validation, PK, VV and GG; formal analysis, VV; investigation, PK; resources, PK; data curation, PK, GG; writing—original draft preparation,

PK, VV, GG; writing—review and editing, PK, VV, GG; visualization, GG; supervision, PK; project administration, PK. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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