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Greening the Value Chain by Implementation of Environmental Practices

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Abstract:

Purpose: *The main objective of the article is to identify the pro-environmental practices of the greatest importance in the structure of the value chain.*
Methodology: *The CATI test was carried out on a sample of 200 companies. The survey was conducted on the basis of a questionnaire, and the answers were measured using the Likert scale. Analysis of the results of the study, for the purposes of the article, was carried out using the Spearman rank correlation method.*
Findings: *Analysis of the results of the study identified the environmental practices with the greatest correlation with the areas of the value chain. On this basis, the most important environmental practices were identified. In addition, it was possible to make conclusions for the different areas of the value chain activity. The main element of the conclusions is to indicate the position that eco-practices are an integral part of the greening of the value chain.*
Practical Implications: *Although it is not possible to put forward an unequivocal thesis that the indicated eco-practices allow to conclude that the value chain is ecologistized, it becomes possible to identify eco-practices of the highest importance and this leads to the conclusion that the directions of further use of pro-environmental solutions in the future are known.*
Originality/Value: *Original research.*

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JEL classification: *M21, L91, O20, Q01.*

Paper Type: *Research article.*

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1. Introduction

Today's business models take into account the ecological aspects of sustainable development in their strategy. This ecological transformation of enterprises has been going on for decades, but only now has social pressure forced companies to assess the effects of implementing pro-environmental practices. It is no longer possible to talk about "a certain fashion for ecology". Social awareness is so great that the choice of an ecological product or service has become one of the first choices, apart from the still the most important price.

While a strategic approach to greening economic activity has also become a reality, a broader view of the implementation of environmental goals in the value chain is no longer so common. The value chain as a canvas for studying the level of its greening is admittedly an orthodox approach, when we assume that today's business is moving towards networking. However, the holistic approach to greening the value chain is due to the fact that changes in business models and social requirements for mitigating the effects of negative impacts on the environment. The article considered this approach to be niche, which is why the goal is to identify the pro-environmental practices of the greatest importance in the structure of the value chain. This goal is supported by the hypothesis that the level of implementation of pro-environmental practices constitutes a green value chain.

The article presents a study carried out by the authors using the CATI (computer-assisted telephone interviewing) method on a group of 200 companies. An analysis was also presented to indicate the correlation and the strongest impact of pro-environmental practices. The authors focused on the analysis of practices in the core and support activities of industrial enterprises and those that define themselves as logistical. The authors' approach was motivated primarily by the direct relationship between shaping the value chain and supply chains.

The presented analysis has identified eco-practices with the strongest impact. It is worth pointing out, however, that today it is difficult to talk about which of the eco-practices should be implemented to determine the greening of the enterprise. On the other hand, the systemic approach used by the authors allows to indicate that a set of pro-ecological practices is important for the entire value chain, and therefore the level of greening of the value chain depends on the level of implementation of pro-environmental practices (and not only on implementation).

The considerations in the article do not exhaust the topic and do not completely solve the problem of greening enterprises and greening the value chain. The area of research in the field of greening the value chain should be considered as still open, and the considerations carried out in the article should be taken as a voice in the ongoing discussion.

2. Literature Review

Building a competitive advantage of modern enterprises is increasingly based on three pillars of sustainable development, economic, social and environmental (Gupta and Benson, 2011; Kwarteng, Dadzie, and Famiyeh, 2016; Porter and Kramer, 2019). Ecological issues are of particular importance in the face of irreversible climate changes and the pressure exerted on enterprises by various determinants. In European Union countries, particular emphasis is put on the assumptions of the European Green Deal, which set realistic goals for the transition to a zero-emission economy by 2050 (COM/2019/640 final). It is accompanied by the growing ecological awareness of consumers, and their green consumption tendency (Wu and Yang, 2018), which minimises the negative impact on the environment in the entire process of purchasing, using and disposing of products (Pagiaslis and Krontalis, 2014). By applying pro-environmental criteria in the selection of goods and services, consumers may exert pressure on companies to take pro-environmental action and implement eco-innovations (Pluta-Zaremba and Szelągowska, 2021).

Achieving these goals requires the introduction of ecological practices in the enterprises' activities, which according to the value chain (Porter, 1985) may shape basic or supporting activities. Moreover, environmental factors and activities stimulate the reconfiguration of the value chain, which is a way to achieve value improvement, i.e., the effects desired to build, and to strengthen its competitive advantage (Marzantowicz, Ocicka, and Pluta-Zaremba, 2021).

Market requirements, including social pressure, require enterprises to consciously manage resources, ecological production of goods and services, eliminate the negative impact on the natural environment, implement the demands of sustainable development and the idea of ecological business responsibility. The use of innovation and eco-practices in various spheres of the company's activity affects the overall level of greening of the enterprise, including enterprise management. From a value chain perspective, greening is critical to the environmental performance of the core business (Marzantowicz, Ocicka, and Pluta-Zaremba, 2021).

It would seem that the issue of sustainable development, and especially the issue of greening the value chain, is already widely recognized in the literature. However, when referring directly to the greening of the value chain, only the google scholar database refers to about 18k literature items. This is a lot, considering thirty years of fulfilling ecological postulates of sustainable development. Most often, however, the issues of recognizing the greening of enterprises concern, for example, in the field of limiting the effects of the crisis (Muweis, 2011), transport and its impact on the environment (Poulsen, Ponte, and Sornn-Friese, 2018; Dembińska and Marzantowicz, 2018), supply chains (De Marchi and Di Maria, 2019) and, of course, many other issues related to economic activity and its impact on the natural environment. Nevertheless, a comprehensive look is needed. Testing only selected parts of the value chain is insufficient.

Moreover, it is necessary to proceed to the assessment of the effects of the implementation of green practices by measuring their impact on the greening of the value chain.

3. Methodology

3.1 Purpose and Research Hypothesis

The study was conducted using the CATI (computer-assisted telephone interviewing) method on a research sample of 200 companies operating in the industrial and logistics sector. Small, medium and large enterprises were studied, maintaining a random selection of enterprises. Details of the selection of the sample are presented in the next section of the article. It should be mentioned that the test method allows for 100 percent maneuverability of the response.

The article set the main goal answering the question whether it is possible to indicate a catalogue of environmental practices which, according to the surveyed companies, will have the greatest impact on the greening structure of individual areas of activity in the value chain? The main objective is supported by the hypothesis in the following wording, pro-environmental practices have different impacts on the level of greening of the value chain.

3.2 Model for the Representative Sample

"Representative sampling is a type of statistical sampling that allows us to use data from a sample to make conclusions that are representative for the population from which the sample is taken" (D'Exelle, 2014). "Representative sampling is absolutely essential for quantitative methods where we want to generalise from the sample to the whole population. Representative sampling is also called probability sampling because in a representative sample, each person or family in the population has an equal chance of being selected for the sample" (Alexander and Cosgrave, 2014). Then, there is talk of an independent draw. When determining a representative sample, you can choose from a wide range of designs. For the purpose of this study, the following were used:

$$n = \frac{p(100 - p)z^2}{e^2}$$

where:
n - the required sample size,
p - the percentage occurrence of a state or condition,
e - the percentage maximum error required,
z - the value corresponding to level of confidence required.

In order to determine the representative sample, p=50%, e=7% were adopted here. The population size is 5243 enterprises. The minimum sample size to generalize the results obtained to the whole population (representative sample) is 189 entities. In the survey, 200 correctly completed questionnaires were obtained and such a number is analyzed later in the study.

3.3 Spearman Rank Correlation Coefficient

In the study of the degree of dependence between variables, the Spearman rank correlation coefficient was used. It was defined as the Pearson correlation coefficient calculated for the ranks of variables (Spearman, 1904) (rank is a number that corresponds to a place in the order of each feature). The difference is also that, unlike the Pearson coefficient, it measures any monotonous relationship, including whether the characteristics are qualitative (Rebecca ́c *et al.*, 2015). The spearman rank correlation coefficient is determined from the following formula (Zar, 2005):

$$r = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2 - 1)}$$

where d_i^2 - the difference between the ranks of the corresponding variable features.

When interpreting the results, the classification according to J. Guilford was used, where:

|r|=0 - lack of correlation
0,0<|r|≤0,1 - dim correlation
0,1<|r|≤0,3 - weak correlation
0,3<|r|≤0,5 - average correlation
0,5<|r|≤0,7 - high correlation
0,7<|r|≤0,9 - very high correlation
0,9<|r|<1,0 - almost full correlation
|r|=1 - full correlation.

3.4 Study of the Significance of the Correlation Coefficient

The significance test for the Spearman rank correlation coefficient is a test that is used to verify the hypothesis of a monotonic relationship between the studied population traits. It is based on spearman's rank correlation coefficient. For the purposes of the test, the following hypotheses were formulated:

Main hypothesis: H_0: r=0, saying that the features are not correlated (statistically significant), Alternative hypothesis: H_1: r≠0, saying that there is a correlation between features (statistically insignificant). The test statistics have the form:

$$p = \frac{r}{\sqrt{\frac{1 - r^2}{n - 2}}}$$

The statistics have a Student's t distribution at $n - 2$ degrees of freedom. Comparing the results of the statistics obtained with the assumed level of significance, $\alpha = 0{,}05$, one should decide whether to accept or reject the main hypothesis. The hypothesis H_0 should be rejected in favor of the alternative hypothesis (statistically significant) if $p \leq \alpha$. However, if $p > \alpha$ there are no grounds to reject the H_0 hypothesis (statistically insignificant).

3.5 Confidence Interval for Correlation Coefficient

The final stage of the study is the determination of confidence intervals for the correlation coefficient. This allows you to indicate the interval in which the value of the correlation coefficient for the entire population is located with a certain probability. This range is determined from the following formula (for a large sample):

$$P\left(-z_\alpha < \frac{r - \rho}{1 - r^2}\sqrt{n} < z_\alpha\right) = 1 - \alpha$$

after transformation we get the formula:

$$P\left(r - z_\alpha \frac{1 - r^2}{\sqrt{n}} < \rho < r + z_\alpha \frac{1 - r^2}{\sqrt{n}}\right) = 1 - \alpha$$

where:
ρ – correlation coefficient in the general population,
z_α – value read from the tables of normal distribution so that there is equality: $P(-z_\alpha < Z < z_\alpha) = 1 - \alpha$

The ends of the intervals are determined at the confidence factor $1 - \alpha = 0{,}95$.

Another element that was used for the purposes of the study is the confidence interval for the structure indicator. It allows you to visualize the percentage of a trait in the population. It is used for a large sample ($n > 100$), determining the structure indicator in the form of $\frac{m}{n}$, where:

m – number of items highlighted in the sample
n – sample size.

The following formula shall be used to determine the range:

$$\frac{m}{n} - u_\alpha\sqrt{\frac{\frac{m}{n}\left(1-\frac{m}{n}\right)}{n}} < p < \frac{m}{n} + u_\alpha\sqrt{\frac{\frac{m}{n}\left(1-\frac{m}{n}\right)}{n}}$$

u_α – the value of the statistics read from the distribution tables of the normal distribution for $1 - \frac{\alpha}{2}$

4. Results

Table 1 shows the obtained values of Spearman rank correlation coefficients. Those values that are statistically significant are listed.

Table 1. *Values of Spearman rank correlation coefficients for individual variables.*

zmienne	q5i1	q5i2	q5i3	q5i4	q5i5	q5i6	q6i1	q6i2	q6i3	q6i4
q8i1	-0,0458	-0,0365	0,0283	-0,0287	-0,0323	0,0229	-0,0554	-0,0511	-0,0325	**0,6745**
q8i2	-0,0240	-0,0220	0,0732	-0,1282	-0,0138	-0,0040	-0,0342	0,0402	-0,1377	**0,2014**
q8i3	-0,0450	-0,0431	0,0666	-0,0821	-0,0223	0,0140	-0,0618	-0,0637	-0,0458	**0,6472**
q8i4	-0,0273	-0,0210	0,0228	-0,0067	0,0123	0,0397	-0,0467	-0,0708	-0,0395	**0,7003**
q8i5	-0,0348	-0,0527	0,0858	-0,0865	0,0366	-0,0252	0,0124	-0,0144	0,0104	**0,5280**
q8i6	0,0067	-0,0365	**0,1537**	**-0,2221**	0,0157	-0,0879	0,0634	0,0187	-0,0933	**0,1487**
q8i7	-0,0056	-0,0378	**0,1544**	**-0,2030**	0,0222	-0,0752	0,0668	0,0200	-0,0876	**0,1469**
q8i8	-0,0998	-0,0163	0,1222	-0,0914	0,0545	-0,0753	0,0453	-0,0516	-0,0752	**0,4212**
q8i9	-0,0767	-0,0303	0,1104	-0,0750	0,0543	-0,0755	0,0638	-0,0800	-0,0446	**0,3884**
q8i10	-0,0648	-0,0728	0,1145	-0,0624	0,0593	-0,0502	0,0452	0,0112	-0,0336	**0,3951**
q9i1	**-0,1506**	**0,6536**	0,0533	-0,0826	-0,0682	0,0220	-0,0296	-0,1017	-0,1005	-0,0596
q9i2	**-0,1605**	**0,6558**	0,0761	-0,1046	-0,0682	0,0392	-0,0368	-0,0946	-0,1179	-0,0585
q9i3	**-0,1658**	**0,6259**	0,0866	-0,0867	-0,0621	0,0291	-0,0272	-0,0936	-0,0354	-0,0378
q9i4	0,0315	0,1091	0,1130	**-0,1724**	0,0213	-0,0273	0,0630	0,0053	-0,1202	-0,0519
q9i5	**-0,1412**	0,0584	0,0177	0,0216	-0,0891	0,1101	0,1230	**-0,1553**	-0,1063	0,0842
q10i1	**-0,3226**	0,1364	**0,6857**	**-0,6395**	0,0710	**-0,2161**	0,0121	0,0063	-0,0890	-0,1023
q10i2	**-0,2179**	0,1312	**0,2203**	**-0,1517**	0,0032	-0,0110	0,0142	-0,0547	**0,1396**	0,0208
q10i3	-0,0212	-0,0939	0,1334	**-0,1491**	0,0094	-0,0744	0,1305	0,0104	-0,0845	-0,0467
q10i4	-0,0042	0,0242	-0,1339	**0,1558**	-0,0132	0,0483	0,1198	0,0518	-0,0163	-0,0894
q11i1	0,1214	-0,0258	-0,0091	-0,0370	0,0351	0,0225	0,0529	0,0153	-0,1221	-0,0839
q11i2	-0,0797	-0,0223	**0,2622**	**-0,2741**	-0,0332	-0,0613	0,0687	-0,0255	-0,0429	**-0,1667**
q12i1	-0,0110	0,0508	-0,0021	-0,0214	-0,0556	-0,0689	0,0295	-0,0320	-0,0127	-0,0379
q12i2	-0,0103	0,0823	**-0,2495**	0,1233	-0,0288	0,0631	-0,0371	0,0827	-0,0266	-0,0747
q12i3	**-0,2026**	**0,1426**	**0,2440**	-0,1339	0,0278	-0,0528	0,0904	-0,0270	0,1123	-0,0778
q13i1	**0,3407**	-0,0799	**-0,6942**	**0,6290**	-0,0344	**0,1768**	0,0379	-0,1060	0,0543	0,1118
q13i2	**0,2323**	-0,0009	**-0,3326**	**0,2750**	-0,1035	0,0832	0,1224	0,0123	0,0491	-0,0543
q13i3	-0,0999	0,0419	**0,2068**	**-0,1513**	-0,0676	-0,1012	-0,0085	-0,0125	0,0554	-0,1147
q13i4	**0,3595**	-0,0104	**-0,4976**	**0,4046**	-0,0124	0,0958	0,0608	-0,0388	-0,1191	0,0006
q13i5	**0,2186**	-0,0741	**-0,4746**	**0,3839**	0,0516	0,1387	-0,0084	-0,0880	-0,0223	0,0136
q14i1	-0,0851	0,2007	**-0,1826**	**0,1984**	-0,0097	**0,1483**	0,0935	-0,0455	-0,0946	-0,0023
q14i2	**-0,2471**	0,0211	**0,5286**	**-0,5193**	0,0391	**-0,1893**	0,0653	0,0178	-0,0176	-0,0899
q14i3	-0,0355	0,0036	0,1124	**-0,1444**	-0,0753	0,0293	0,0389	-0,1261	0,0109	0,0028
q14i4	-0,0443	**0,1636**	-0,1265	**0,1500**	-0,0157	0,0920	0,0885	0,0067	-0,0421	-0,0109
q14i5	**-0,2966**	0,0532	**0,7108**	**-0,5928**	-0,0349	**-0,2439**	0,0529	-0,0146	0,0296	**-0,1522**
q14i6	**-0,1843**	-0,1024	**0,1769**	**-0,2317**	-0,0266	-0,0863	0,0401	0,0703	-0,0522	-0,0137

q15i1	**-0,2088**	0,0657	**0,4029**	**-0,4075**	0,0001	-0,0343	0,0862	-0,0285	-0,0319	-0,0444
q15i2	**-0,2037**	0,0439	**0,4096**	**-0,4202**	0,0095	-0,0455	0,0689	-0,0304	-0,0382	-0,0400
q15i3	-0,0538	-0,0536	0,0453	-0,0097	-0,0875	**0,6536**	0,0570	-0,1256	-0,0557	0,0743
q15i4	-0,0555	-0,0578	0,0475	-0,0058	-0,0932	**0,6318**	0,0536	-0,1237	-0,0592	0,0747
q15i5	**-0,2021**	-0,0659	**0,3624**	**-0,2498**	-0,0137	-0,0304	**0,1688**	-0,0579	-0,0628	0,0476
q16i1	-0,0237	-0,0501	0,0827	**-0,1628**	**0,8185**	-0,0927	0,0521	-0,0166	-0,0608	-0,0226
q16i2	0,0687	-0,0282	**0,1726**	**-0,2419**	0,0333	-0,0419	0,0690	0,0625	-0,1068	-0,0515
q16i3	-0,0974	-0,0564	0,0770	-0,0146	-0,0377	-0,0593	-0,0179	0,0389	0,0266	0,0778
q16i4	-0,0958	-0,0463	0,0557	0,0095	-0,0091	-0,0534	-0,0132	0,0423	0,0181	0,0615
q16i5	-0,0593	-0,0060	0,0912	**-0,1613**	0,0514	0,0025	0,0403	0,0414	-0,0650	-0,0068
q17i1	**-0,1972**	-0,0171	**0,2209**	**-0,2373**	-0,0089	0,0384	0,0301	0,0117	0,0120	-0,1111
q17i2	-0,0693	-0,0852	**0,2653**	**-0,2669**	-0,0104	-0,0365	0,1180	-0,0542	**0,1665**	**-0,1561**
q17i3	0,0817	0,0157	**-0,3286**	**0,2225**	0,0062	**0,2028**	-0,0504	-0,0265	-0,0196	-0,0701
q17i4	**-0,2062**	0,0062	**0,4619**	**-0,4551**	0,0600	**-0,1992**	0,0518	0,0037	-0,0387	-0,0970
q18i1	0,0724	0,0268	-0,0241	0,0112	-0,0334	0,1150	0,0055	-0,0065	-0,0465	0,0212
q18i2	**-0,2038**	**0,1453**	**0,2095**	-0,1151	-0,0031	0,0000	0,0499	-0,0683	0,1315	-0,0025
q18i3	-0,1233	0,0987	0,0221	-0,0294	0,0223	-0,0498	0,0641	-0,0471	-0,0076	-0,0025
q18i4	-0,0688	**0,1550**	-0,0617	0,0190	-0,0335	-0,0588	-0,0716	-0,1156	0,0105	0,0604
q18i5	-0,0533	0,0098	0,1277	-0,0734	-0,0393	-0,0314	0,0461	0,0209	0,0272	-0,0476
q18i6	0,0713	-0,0120	-0,0061	-0,0542	-0,0255	-0,0489	0,0165	0,0865	-0,0585	-0,0832
q18i7	0,0200	0,0095	0,0588	-0,0376	-0,0550	0,0129	-0,1172	0,0046	-0,0430	0,0231
q18i8	**0,2480**	-0,0449	**-0,4292**	**0,3311**	0,0823	0,0929	-0,0035	-0,0612	-0,0565	0,0140
q18i9	-0,0322	-0,0383	0,0111	-0,0621	-0,0314	0,0081	0,0602	0,0087	-0,1209	0,0506

Source: *Own elaboration based on the results of the CATI.*

Based on the classification of J. Guilford, pairs of variables characterized by at least a mean correlation were selected to determine the confidence intervals for the correlation coefficient. ($|r| > 0{,}3$). The following observations were made on the use of ecological practices in the core business (Table 2).

Table 2. *Confidence intervals for the correlation coefficient in the core business*

Supply logistics	
Production using secondary raw materials q10i1	$0{,}4422 < r < -0{,}1918$
Use of modes of transport such as: rail transport, sea transport, intermodal transport q13i1	$0{,}2113 < r < 0{,}4584$
Increasing the use of cargo space of means of transport q13i4	$0{,}2317 < r < 0{,}4751$
Product design and development	
Taking environmental effects into account throughout the life cycle of products and designing products to reduce them q9i1	$0{,}5657 < r < 0{,}7268$
Increasing the use of environmentally friendly materials instead of non-ecological materials through changes in the design of existing or new products q9i2	$0{,}5683 < r < 0{,}7286$
Increasing the use of recycled materials (e.g. recycled) in existing or new product designs q9i3	$0{,}5330 < r < 0{,}7039$
Production (operations)	
Production using secondary raw materials q10i1	$0{,}6040 < r < 0{,}7531$
Use of modes of transport such as: rail transport, sea transport, intermodal transport q13i1	$-0{,}7601 < r < -0{,}6142$
Use of electric vehicles q13i2	$-0{,}4511 < r < -0{,}2026$

Zwiększanie wykorzystania przestrzeni ładunkowej środków transportu q13i4	$-0{,}5957 < r < -0{,}3849$
Eco-driving driver training q13i5	$-0{,}5759 < r < -0{,}3589$
Offering everyday and durable products with longer life cycle times q14i2	$0{,}4201 < r < 0{,}6222$
Application of practices limiting situations of expiry or expiry date of use of products q14i5	$0{,}6342 < r < 0{,}7736$
Extending the warranty period to increase the number of products repaired and extend the time of use of durable goods q15i1	$0{,}2791 < r < 0{,}5135$
Increasing the repairability of products and the availability of spare parts (e.g. making technical documentation available for 7 to 10 years, creating structures that can be repaired using commonly available tools) q15i2	$0{,}2865 < r < 0{,}5194$
Offering waste equipment collection services from customers for recycling or disposal q15i5	$0{,}2348 < r < 0{,}4777$
The use of digital technologies supporting the optimization of logistics, including processes in the warehouse and transport q17i3	$-0{,}4475 < r < -0{,}1982$
The use of technologies that extend the life of finished products of the enterprise q17i4	$0{,}3447 < r < 0{,}5650$
Multi-person use of company cars q18i8	$-0{,}5365 < r < -0{,}3082$
Distribution logistics	
Production using secondary raw materials q10i1	$-0{,}7152 < r < -0{,}5490$
Use of modes of transport such as: rail transport, sea transport, intermodal transport q13i1	$0{,}5366 < r < 0{,}7065$
Increasing the use of cargo space of means of transport q13i4	$0{,}2810 < r < 0{,}5150$
Eco-driving driver training q13i5	$0{,}2583 < r < 0{,}4968$
Offering everyday and durable products with longer life cycle times q14i2	$-0{,}6143 < r < -0{,}4095$
Application of practices limiting situations of expiry or expiry date of use of products q14i5	$-0{,}6763 < r < -0{,}4942$
Extending the warranty period to increase the number of products repaired and extend the time of use of durable goods q15i1	$-0{,}5175 < r < -0{,}2842$
Increasing product repairability and spare parts availability q15i2	$-0{,}5287 < r < -0{,}2982$
The use of technologies that extend the life of finished products of the enterprise q17i4	$-0{,}5591 < r < -0{,}3370$
Multi-person use of company cars q18i8	$0{,}2009 < r < 0{,}4498$
Marketing and sales	
The company uses information about environmental initiatives as an element of building a pro-ecological image of the employer on the labor market q16i1	$0{,}7665 < r < 0{,}8598$
Service (after-sales service)	
Supporting customers in the process of using and maintaining products q15i3	$0{,}5657 < r < 0{,}7268$
Offering a customer-friendly complaint system and easy	$0{,}5399 < r < 0{,}7088$

access to the service (the obligation of the manufacturer to provide a spare part for service within 15 days) q15i4	

Source: *Own elaboration based on the results of the CATI.*

For the core business, a very high correlation was noted only in the case of the implementation of ecological practices in the production area in the case of practices limiting situations of overdue or expiry date of products ($r = 0{,}7108$) and in the area of marketing and sales, when the company uses information about environmental initiatives as an element of building a pro-ecological image of the employer on the labor market ($r = 0{,}8185$). In other cases, both for the group of companies and for all companies, an average and high correlation was noted. Confidence intervals taking into account the use of ecological practices in supporting activities are shown in Table 3.

Table 3. *Confidence intervals for the correlation coefficient in supporting activities*

Purchase and supplier management	
Use of environmental criteria in the initial assessment and selection of suppliers q8i1	$0{,}5906 < r < 0{,}7440$
Identification and sourcing of substitutes for more environmentally friendly materials q8i3	$0{,}5581 < r < 0{,}7215$
Use of environmental criteria in the periodic assessment of q8i4 suppliers	$0{,}6216 < r < 0{,}7650$
Monitoring of suppliers' environmental responsibility based on reports on their activities q8i5	$0{,}4194 < r < 0{,}6217$
Development and improvement of suppliers' green approach (e.g. supplier training, technology transfer to suppliers to reduce emissions) q8i8	$0{,}2993 < r < 0{,}5295$
Applying incentives and incentives to suppliers to implement environmental initiatives q8i9	$0{,}2632 < r < 0{,}5007$
Cooperation with suppliers in the implementation of joint environmental initiatives (e.g. in the development of product or process eco-innovation) q8i10	$0{,}2706 < r < 0{,}5066$

Source: *Own elaboration based on the results of the CATI.*

The highest correlation rates were obtained when using environmental criteria in the initial assessment and selection of suppliers – 0,6745 (high correlation) and in the periodic assessment of suppliers – 0,7003 (very high correlation). It is worth noting here the values of confidence intervals, which indicate the degree of these dependencies for all enterprises. Here, too, these relationships are characterized by a high and very high correlation.

Support activities in the areas of enterprise infrastructure, human resources management and technology development show very weak and weak correlation with the variables subject to this analysis.

5. Discussion

Regardless of the results of the study, it should be concluded that the greening of activities today is the result of the ecological transformation of enterprises. This means that after three decades of implementing the postulates of sustainable development, we can no longer talk only about the fashion for ecology. The analysis of the research results indicates that the greatest impact on the level of greening of enterprises have those environmental practices that can be implemented at low cost or completely free of charge.

However, it should be pointed out that the study itself is burdened with the so-called social pressure syndrome. It is a kind of polemic between what society expects from today's enterprises and economic reality. Social expectations regarding the level of greening are high, which is why companies often indicate the implementation of ecopractices to a greater extent than in reality.

Another interesting phenomenon in this type of research is the problem with confirming the real state. The difficulty lies in the lack of sufficient tools to verify declarative answers.

Nevertheless, the study and analysis of the results do not fully confirm the assumptions resulting from the critical analysis of the literature. The literature confirms not only the high degree of implementation of environmental practices but also the advanced level of checking the effects of this implementation. Although the analysis in the article concerns the implementation of pro-environmental practices in the area of the functioning of enterprises against the background of the value chain, however, by taking up a polemic with the results of this analysis, one can conclude and the impact of environmental practices on the overall operation of enterprises in the basic and supporting area. It is worth noting here that only in some areas and only selected environmental practices, we can talk about their impact on the greening of enterprises. However, these are not comprehensive solutions.

Greening is crucial here, as it concerns both the core and support activities in the value chain. On the basis of the results of the analysis, only the level of implementation of practices translating into the level of greening of the value chain can be determined.

However, it is not possible to say unequivocally whether the value chain has been ecologized or not. There is no zero-one rating scale here. In this respect, a verification of reality would be needed, which, as already mentioned on such a large scale (providing 100% confirmations) is impossible to perform. However, this problem should be seen as an opportunity to expand the area of research in this area, because after 30 years of implementing the postulates of sustainable development in the social, economic and ecological field, it is time to assess the effects – the space for this is still open.

6. Conclusions

The considerations carried out in the article and the analysis of the research results allow us to put forward the following main conclusion that the greatest importance for the implementation of ecological practices in the value chain, both in the group of surveyed entities and in their entire population, are:

1. with regard to product design and development, the most important elements are: taking into account environmental effects throughout the life cycle of products and designing products to reduce them, increasing the use of environmentally friendly materials (at the design stage and for new products), as well as increasing the use of recycled materials;
2. in the case of the production process, the most important are production using secondary raw materials, the use of modes of transport that generate a lower burden on the natural environment and the use of practices that limit situations of lost or expiry date of products;
3. in distribution logistics, the most important is the use of alternative modes of transport to road transport, as well as the use of secondary raw materials;
4. in marketing and sales, the most important thing is to use information about environmental initiatives as an element of building a pro-ecological image of the employer on the labor market;
5. in the field of after-sales services, it is very important to support customers in the process of using and maintaining products, as well as to offer a friendly complaint system and easy access to service;
6. with regard to purchasing and supplier management, these are: the use of environmental criteria in the initial assessment and selection of suppliers and their periodic evaluation.

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