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The Place of the Natural Environment in Activities for Social Responsibility in the Opinion of Students of Electrical Engineering

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Abstract: The concept of corporate social responsibility (CSR) permeates the curricula of various fields of study at many universities. The aim of the article is to present the assessment of the students at the Lublin University of Technology in the field of Electrical Engineering on the importance of individual dimensions of CSR, with particular emphasis on the environmental dimension. The method used in the study is a diagnostic survey conducted among students of full-time first- and second-cycle studies. The research was carried out using a questionnaire based on the four-dimensional model of CSR developed by Carroll and was extended to the environmental dimension. The tool consists of 60 statements divided into 12 groups. Each group contains five statements—one for each of the distinguished CSR components. The hierarchy of CSR dimensions in both surveyed groups is analogous (economic, legal, ethical, philanthropic, and environmental dimensions). The study groups differed, however, in their assessment of the importance of the legal and ethical dimensions. Bilateral comparisons of individual dimensions in the group of second-cycle students revealed fewer differences than in the group of first-cycle students, which proves that the links between different categories of the company's stakeholders and obligations toward them are more clearly perceived by the group of second-cycle students. The conclusions from the research make it possible to recommend universities to include in their curricula content aimed at better preparing graduates to undertake CSR activities.

Keywords: CSR; natural environment; energy industry in Poland; students of the electrical faculty; Lublin University of Technology

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1. Introduction

The energy sector has a vital role in the economy of any country. It is responsible for the well-being of the individual and entire societies. It carries out this responsibility by providing society with products and goods of importance to civilization, and through activities in social responsibility. According to common expectations, the natural environment should be treated with special care by enterprises in this sector and constitute the axis of all activities. This is due to the fact that the energy industry can operate as it has obtained social consent to use natural resources, which are the common goods of the entire society. Such social legitimization, enabling the activity of this industry and drawing profits from it, obliges it to take special care of the goods entrusted to it in the form of natural resources. To answer the question of whether the natural environment was the axis of the activities of enterprises from the energy sector in Poland, it is necessary to analyze the activities undertaken so far by these enterprises for the protection of the natural environment. It is also necessary to look for an answer to the question of what activities can be expected in the coming years when this industry will be enforced with graduates of electrical faculties entering the labor markets in the near future. To answer these questions, it is necessary to review the current activities of energy companies in the field of environmental protection, as well as to examine

what the priorities of students of electrical faculties in relation to activities for corporate social responsibility are and what importance they attach to environmental protection among individual areas of these activities.

The energy sector, providing basic civilization goods, which include access to electricity, heat, and gas, is of strategic importance in meeting the obligations related to the protection of the natural environment. Global trends in this area observed in the energy industry are worrying. A report prepared by KPMG in 2021, based on interviews with 133 CEOs of the energy industry in the oil and gas, and energy and utility sectors regarding their strategies and forecasts in a 3-year perspective, indicates that the global energy industry is facing constant uncertainty related to the climate crisis [1].

Additionally, this sector is the main source of water and air pollution, contributing to unfavorable climate change [2]. A bridge between such extreme effects of the energy sector's impact on the environment is the concept of corporate social responsibility (CSR), assuming a harmonious combination of operational efficiency with the ecological, legal, and ethical aspects of the functioning of this type of enterprise in the social space. According to global CSR standards in the energy industry, environmental issues are an important element. Emphasis is placed on reducing greenhouse gas emissions and informing the public about the implementation of environmental activities [2].

Due to the specific nature of the activity of the energy sector, the social responsibility of its representatives should be treated as the axis of their business strategies. Due to the importance of CSR in the energy sector, in 2008, the president of the Energy Regulatory Office in Poland appointed a Team for Research on the Issues of Social Responsibility of Energy Enterprises [2]. The team has developed a definition of CSR for the energy industry. In the opinion of the team, the social responsibility of the energy business is a strategy "harmoniously combining ethical and ecological aspects in business activity with its dominant attribute, i.e., efficiency that displays transparency, reliability toward customers (with regards to price calculation, quality of supplies and service etc.) and in contacts with other stakeholders (including employees, shareholders, suppliers, local community), or self-limitation of monopolistic advantage. This is the contribution of business to the implementation of the state's energy policy and a way of running a company that does not abuse its advantage over the recipient of energy, gas, or heat" [3] (p. 62). It is worth noting that the benefits of implementing the corporate social responsibility strategy of energy companies should be considered in the long term [4].

Given the general lack of empirical research in this field, with few exceptions concerning studies of engineering students, where specializations were not usually indicated [5], this research focuses on the situation in Poland aiming at the existing research gap.

It has been proven in previous studies that the perceptions of university students can serve as a valid indication of their academic and professional results in the future [6,7]. Therefore, in this research, it was assumed that the opinions of electrical faculty students on CSR could be an indicator of their future work-related conduct.

The following section of the article provides information about the state of CSR in Polish enterprises, with particular emphasis on enterprises in the energy sector, and on education for CSR in universities, with particular emphasis on technical universities. The CSR model taught to the students of electrical engineering at the Lublin University of Technology is also presented. The second section describes the methodology: the purpose of the research and hypotheses, the research group, the research tool, and the statistical methods used in the analysis of the obtained results. The third section presents and analyzes the research results. The fourth section presents a discussion of the results. Finally, the last section presents the conclusion coming out of the research.

2. The CSR Model and Its Implementation in Energy Sector Enterprises

2.1. CSR in Polish Enterprises, Focusing on the Energy Sector

The image of CSR in Polish enterprises emerging from the research is not homogeneous. Looking at companies in general, it can be observed that they underestimate the importance

of CSR, focusing mainly on achieving short-term market goals without a long-term strategic vision. This situation is presented in a study conducted by PricewaterhouseCoopers (PwC) on a sample of 287 Polish companies of various sizes (from micro to large). It shows that CSR is not a common standard of operation in Polish enterprises. Among all the surveyed companies, only the largest 100 had departments implementing CSR activities in their structure and intentionally informed the environment about those, as well as implemented codes of ethics. One of the reasons for this state of affairs is the belief that enterprises should focus on generating profits, and not observe and monitor social and environmental needs. Companies also lack experience in managing social programs. Another reason is the lack of understanding of the importance of CSR by the majority of Polish entrepreneurs and the conviction that actions for its benefit are not profitable. As a result, even though more and more people talk about CSR in Poland, only a few companies decide to implement its comprehensive strategies. Many, on the other hand, perceive CSR as an element of social commitment, often narrowed down to one-time philanthropic activities or employee volunteering [8].

A more detailed analysis of the implementation of CSR principles in Polish enterprises, including those from the energy sector, shows that they undertake a number of activities in this respect. In a study conducted in 2012 on a sample of seventy-three Polish enterprises, the level of enterprises' involvement in CSR activities was measured in three areas. In each, commitment was rated in a range from 0 to 100%. The average level of implementation of the assumption regarding the existence of clearly defined rules governing relations with stakeholders and considering social needs in activities reached a level of 81%. The degree of fulfillment of the criterion regarding social responsibility in the business strategy turned out to be lower—the average level of implementation was 67%. The criterion regarding the existence of transparent procedures for informing stakeholders about the company's financial condition, ownership structure, and corporate governance reached the highest level—an average of 85%. Enterprises from the energy industry in the presented study obtained the following results with regard to each CSR area, respectively: 77–86% and 93%. While the result of criterion 1 is lower than the average obtained by all surveyed enterprises, the results for criteria 2 and 3 are higher [9].

More recent research shows that activities aimed at building CSR by Polish enterprises are more and more abundant. This is evidenced, among others, by the reports in "Responsible business in Poland. Best practices", published annually by the Responsible Business Forum [10]. The core of each of them is a summary of CSR and sustainable development activities reported by companies. The 2020 edition included 1958 examples of good practice reported by 225 companies, including 57 SMEs, which is an increase compared to the previous year (1696–214–55, respectively). These activities fall into two groups of practices. The first group is new practices that have been reported for the first time. In the latest edition, there are 1013 of them (in the previous one—712). The second group consists of continued practices—945 initiatives in the field of CSR (983 in the previous one).

There are also more and more CSR activities among enterprises in the energy sector. This is evidenced by the analysis of CSR content posted on the websites of four leading companies in the Polish energy sector, as well as scientific literature by Bąk [4] and Jacyno [2]. The analysis of CSR activities undertaken by the leading entities in the Polish energy sector, TAURON Polska Energia S.A. (TAURON), PGE Polska Grupa Energetyczna S.A. (PGE), ENEA S.A. (ENEA), and ENERGA S.A. (ENERGA), proved that actions were taken in all four dimensions of Carroll's CSR pyramid model. Both business and support activities were undertaken in those four dimensions. The main character activities of the above-mentioned entities in the implementation of the strategy related to social responsibility is presented in Table 1.

In the direction of their strategies, these companies take actions aimed at protecting the environment, recognizing that it is a key dimension of the activity of energy companies due to the specificity of the industry. Therefore, as part of CSR, these entities undertake a number of activities aimed at minimizing the negative impact on the natural environment and promoting pro-ecological behavior. These are educational activities, including environmental education in the field of sciences and related to the power industry, as well as increasing

the production of electricity and heat from renewable sources, pursuing an active waste management policy, supporting biodiversity, protecting fauna and flora, and recultivating degraded areas. Educational activities often take the form of one-time or cyclical campaigns targeted at specific groups of recipients [11–26]. The above-mentioned examples of activities indicate high awareness of energy companies in the field of environmental protection, which influences the development of environmental policies and strategies.

Table 1. Strategy directions related to CSR of selected energy companies.

Company	Strategy Directions
TAURON	Energy security, customer orientation, ethical culture, employee involvement, environmental protection, and social and business partnerships.
PGE	Ensuring an increase in value for shareholders, energy security of customers, and stability of employment of employees, with care for the social and natural environment.
ENEA	An increase in value for shareholders, building long-term relationships with clients, growth in profitable areas, improvement of efficiency, and optimal use of the organization's potential.
ENERGA	Responsible shaping of relationships with customers, limiting the impact on the natural environment, developing distribution activities, supportive care for employees and their safety, and responsibility toward local communities.

Source: our own work based on Bąk [4] (p. 135).

2.2. Education for CSR at Universities, including Technical Ones

In recent years, academic circles have noticed interest in the idea of CSR, which is also reflected in the introduction of this issue to the study programs and curricula. Research concerning students, however, indicates that despite this, the knowledge of the assumptions and meaning of the CSR idea is still insufficient [27]. In addition to knowledge, other factors influencing the perception of the CSR idea also seem to be important, because responsibility is also associated with personal characteristics and cultural conditions [28]. Differences in the perception of the importance of CSR by students from different countries have been confirmed, among others, by research conducted by González-Rodríguez et al. [29]. They compared the perception of CSR and the level of knowledge among 1074 university students in Bulgaria, Poland, and Spain. The analysis shows that Polish students were more aware of CSR activities than Bulgarian and Spanish students. However, research conducted by Kaifi and colleagues [30] proved that the surveyed students of business universities in Poland and Croatia did not demonstrate much knowledge related to the concept of CSR and did not attach much importance to it. This may partly be due to the fact that the concept of CSR was formulated in countries with an established market economy and is oriented toward them, while Poland and Croatia do not have long and rooted traditions of a market economy [27]. At the same time, the research by Vázquez et al. [31] leads to the conclusion that, in the opinion of students, education in the field of CSR is an important duty of the university. This teaching should include both knowledge and practical involvement in specific CSR activities [32]. Economists dealing with CSR issues are also convinced that the assumptions of this concept should be disseminated not only among professionally active people, but also among future elites. This requires universal education, as well as a paradigm shift giving priority to the social paradigm over the economic one [33,34]. A positive manifestation of this trend is the inclusion of content focused on CSR in the curricula of universities, including the Lublin University of Technology.

In many countries, an emerging trend is to include ethical and social aspects of technology in engineering education. This entails a change in the existing engineering paradigms and an extension of the mental framework and a change in the system of values [35]. Only education in this form leads to the education of "complete engineer training" [36].

3. Carroll's CSR Model

The definition of CSR adopted by the Energy Regulatory Office in Poland resembles Carroll's concept. According to Carroll [37] (p. 608), "CSR involves conducting businesses in

a way that they are economically profitable, law abiding, ethical, and socially supportive". Thus, to be "socially responsible [. . .] means that profitability and obedience to the law are foremost conditions to discussing the firm's ethics and the extent to which it supports the society in which it exists with money, time and talent-related contributions" [37] (p. 604). All activities in the area of CSR should take into account each of these aspects.

In order to create an analytical structure that would encompass these four dimensions, Carroll proposed a CSR pyramid model. At its base, he placed the economic dimension that supports and makes the other three dimensions feasible. "All other business responsibilities are predicated upon the economic responsibility of the firm, because without it the others become moot considerations" [38] (p. 41). The economic dimension assumes that the main goal of the organization is producing services and goods needed by the community and generating profit for the shareholders of the enterprise. The legal dimension is the second one. It refers to the compliance of actions taken with legal standards established by governments, regulatory agencies, and other states' legislative/normative bodies. In connection with the economic dimension, this means that organizations strive toward their economic goals within the purview of the adopted law. The third dimension, the ethical dimension, involves the company's engagement to apply practices, actions, and decisions that are fair, equitable, and consistent with socially accepted moral values. Just as the legal dimension symbolizes "codified ethics", the ethical dimension mirrors society's value system, one that defines and interprets right and wrong, what is just and unfair, as well as what is approved and disallowed. The fourth dimension, philanthropic, concerns treating organizations as good corporate citizens. Society expects organizations to devote some of their financial resources to humanitarian programs. Thanks to the implementation of such programs, organizations can play a part in the enhancement of the quality of life of the community in which they function and, in a broader sense, the well-being of the entire society [38].

Placing the presented dimensions on the axis organization—society, Carroll states that the economic and legal dimension is required by society, the ethical dimension is expected, and the philanthropic dimension is desirable [38,39].

Carroll's model does not take into account the environmental dimension, which is vital for the energy industry. Therefore, it seems reasonable that in relation to enterprises from the energy industry, which legitimately draws from natural resources with social consent, environmental issues should be clearly emphasized, constituting an additional dimension in the CSR structure model. Due to the importance of the natural environment in the activities of energy companies, it was decided that its place should be following the economic dimension [40,41].

The CSR pyramid model by Carroll supplemented with an environmental dimension is presented in Figure 1.

Figure 1. The proposed CSR pyramid model is based on the model by Carroll and supplemented with an environmental dimension. Source: our own model based on Carroll [38,42].

4. Materials and Methods

The implementation of CSR principles in enterprises from the energy sector is not possible without education focused on this goal. At the Lublin University of Technology in the field of electrical engineering, CSR issues are included in the study program in the form of separate subjects (e.g., economic aspects of environmental protection, electricity quality, and the environmental impact of RES systems). These issues are also included in the curricula of major subjects.

4.1. Research Aim and Hypotheses

The aim of the research is to determine the hierarchy of CSR dimensions and assess their importance in the group of students of the first- and second-cycle studies of electrical engineering at the Lublin University of Technology. Based on the extended CSR pyramid model, the following research hypotheses were put forward:

H1. *The hierarchy of CSR dimensions in the group of first- and second-cycle students does not differ. Students, regardless of the current level of study, went through a similar process of socialization based on the same values. They also went through a similar process of primary and secondary education. This results in similar preferences related to the perception of the role of economy, law, ethics, philanthropy, and environmental protection in individual and social life.*

H2. *First- and second-cycle students differ in their assessment of the importance of individual CSR dimensions. This diversity results from the fact that second-cycle students have already achieved more learning outcomes related to the preparation for the profession of an electrical engineer.*

4.2. Research Group

The research was carried out among students of full-time first- and second-cycle engineering studies at the Lublin University of Technology (Bachelor of Engineering, BE; and Master of Engineering, ME degrees, respectively). First-cycle studies last seven semesters and second-cycle studies last three semesters. At the time of the research (May 2022), 232 people were studying in the first-cycle studies and 132 people were studying in the second-cycle studies. Each exercise group was visited by a representative of the research team, who informed the students about the purpose of the research, the method of providing answers, and the fully voluntary nature of the research. Then, the printed questionnaires were distributed to all participants who agreed to participate in the research. A total of 225 questionnaires were received, of which 218 were correctly completed and qualified for further analysis (Table 2).

Table 2. Characteristics of the research respondents.

Study Cycle	Number	Percentage
First	138	63.3
Second	80	36.7
Total	218	100

Source: our own work based on research results.

4.3. Research Tool

There is no environmental dimension in the original structure of Carroll's CSR pyramid. To determine its importance and indicate its place in the structure, Carroll's CSR model was introduced and extended to this dimension (Figure 1). Additionally, environmental questions were added to the research tool originally built around economic, ethical, legal, and philanthropic dimensions.

The research was carried out using a questionnaire based on the four-dimensional CSR model by Carroll [38,42] extended to the environmental dimension. When constructing the research tool (questionnaire survey), as inspiration served the first tool created on the basis of this model [43] whose usefulness and validity were also confirmed in other

studies in USA [44,45]. Other tools based on the same model and used to study students in Brazil [46,47] and Poland [28] also served as inspiration. The tool consists of 60 statements divided equally into 12 groups. Thus, the importance of each CSR dimension is assessed on the basis of 12 statements. Statements regarding the economic dimension focus on activities that ensure the company is productive and profitable. In assessing the importance of the environmental dimension, the company's activities aimed at protecting the environment, including introducing environmentally friendly technologies, reducing environmental risk, or supporting projects aiding environmental quality, were taken into account. The importance of the legal dimension was determined on the basis of the importance of the respondents to act in accordance with the provisions of economic and environmental law. Statements relating to the ethical dimension concern ethical standards in business activity, creating programs for this purpose, even if the situation or behavior is not specifically regulated by law, e.g., monitoring and counteracting unethical behavior in the organization, compliance with the principles of the company's code of ethics, or advertising their own products without resorting to manipulation. Statements used to assess the importance of the philanthropic dimension concerned activities undertaken by the company for the benefit of society (cooperation with non-governmental organizations to solve current social problems, allocating part of the profit to the promotion of cultural activities, financing social projects to eliminate poverty, etc.). Each group contains five statements—one for each of the distinguished CSR components. The scale of constant sums was applied in order to evaluate the statements in a given group [48]. The respondents were requested to divide a fixed sum of twelve points among the five statements, which is how the relative importance of particular statements was determined. The questionnaire also included a record of gender and cycle of study (degree). Before the actual research, the tool was tested several times on a small group of respondents. Its quality was also assessed by experts—researchers from the university's unit.

4.4. Selection and Application of Statistical Methods

Checking the reliability of five scales corresponding to the individual dimensions of CSR was the first step in the analysis of the collected data. Cronbach's alpha coefficients were calculated for this purpose. In the next step, the means for each of the CSR dimensions were calculated, in total and separately for first- and second-cycle students. For this purpose, data were aggregated for each CSR dimension (by summing the points assigned to the particular statements in a given dimension). On this basis, the composition of the CSR pyramid was established in both groups, and the significance of differences in the assessment of individual dimensions was checked (Student's *t*-test). Then, using Student's *t*-test for samples independent of the variables, the significance of differences in the assessment of the importance of the dimensions constituting individual aspects in Carroll's pyramid was checked in each group.

The null hypothesis, that the compared pairs of means do not differ statistically significantly, against the alternative hypothesis, assuming that the observed differences are statistically significant, was tested. By carrying out the *t*-test, the assumption of homogeneity of variance (Levene's test) was also checked. If the condition was not met, a *t*-test was performed with a separate assessment of variance (Cochran–Cox test). On this basis, the construction of the CSR pyramid was established for first- and second-cycle students. A significance level of $p < 0.05$ was assumed for all statistical analyzes. The calculations were made using the STATISTICA TIBCO statistical package.

The value of Cronbach's alpha coefficients for individual scales is in the range of 0.7–0.8; only in the ethical dimension it is 0.6. Lower values of Cronbach's alpha coefficient for the ethical dimension were also observed in other studies based on Carroll's model [28,46,47], which is largely due to the fact that it saturates the entire pyramid and penetrates other dimensions [49]. This penetration was confirmed as well by the factor analysis, where statements concerning the ethical dimension also appeared in other factors. The same analysis also confirmed the legitimacy of distinguishing five factors.

5. Research Results

5.1. Composition of the CSR Pyramid in the Surveyed Groups of Students

The respondents from both groups considered generating profit (economic dimension) as the most important obligation of the company. The legal and ethical dimensions (similar assessments) are placed as the next layers of the pyramid, followed by the philanthropic dimension. Students of both first- and second-cycle studies considered the environmental dimension to be the least important (Table 3).

Table 3. Means and hierarchy of CSR dimensions in the group of first- and second-cycle students.

Dimensions	First-Cycle Students		Second-Cycle Students		*t*	df	*p*
	Mean	Hierarchy	Mean	Hierarchy			
Economic	37.63	1	35.26	1	1.717	211	0.0875
Environmental	20.49	5	19.09	5	1.106	213	0.2700
Legal	31.09	2	33.54	2	−2.317	209	0.0215 *
Ethical	29.49	3	32.11	3	−2.680	211	0.0079 *
Philanthropic	23.28	4	21.58	4	1.681	210	0.0942

Source: our own work based on research results. * statistically significant differences.

The composition of the CSR pyramid is the same. When comparing the two groups, differences in the assessment of the importance of the legal and ethical dimensions were noticed. Both dimensions are rated higher by second-cycle students.

In order to recreate the structure of the CSR pyramid more accurately, in each group (first- and second-cycle students) the significance of differences in the assessment of individual dimensions was also checked by making bilateral comparisons of each dimension with each other (Table 4).

In the group of first-cycle students, the differences in the assessment of the importance of individual CSR dimensions are statistically significant, apart from the assessment of the legal and ethical dimensions (Table 4). As a consequence, the arrangement of individual layers in this group takes the shape of a pyramid (Figure 1), only slightly flattened (no differences in the assessment of legal and ethical dimensions). In the group of second-cycle students, no statistically significant differences were observed in the assessment of economic and legal, as well as legal and ethical dimensions (Table 4). In that case, the individual CSR dimensions also form a pyramid, but it is even more flattened.

Table 4. The value of the *t*-test compared to the variable for two-tailed comparisons in the group of first- and second-cycle students.

Dimensions	First-Cycle Students			Second-Cycle Students		
	t	df	*p*	*t*	df	*p*
Economic vs. Environmental	13.790	266	0.0000 *	12.662	158	0.0000 *
Economic vs. Legal	5.877	263	0.0000 *	1.353	157	0.1779
Economic vs. Ethical	7.333	263	0.0000 *	2.715	158	0.0074*
Economic vs. Philanthropic	13.289	263	0.0000 *	10.662	158	0.0000 *
Environmental vs. Legal	−10.072	265	0.0000 *	−11.967	157	0.0000 *
Environmental vs. Ethical	−8.562	266	0.0000 *	−11.909	158	0.0000 *
Environmental vs. Philanthropic	−2.738	265	0.0066 *	−2.033	158	0.0438 *
Legal vs. Ethical	1.764	263	0.0789	1.324	157	0.1876
Legal vs. Philanthropic	8.979	262	0.0000 *	9.853	157	0.0000 *
Ethical vs. Philanthropic	7.139	263	0.0000 *	9.571	158	0.0000 *

Source: our own work based on research results. * statistically significant differences.

5.2. Differences in the Assessment of Individual Dimensions of the Csr Pyramid between First- and Second-Cycle Students

Based on Table 3, it was established that the hierarchy of CSR dimensions in both groups is the same. It was also found that the respondents differ in the assessment of the legal and ethical dimensions. In order to deepen this analysis and discover more detailed differences, the assessment of students of first- and second-cycle studies regarding individual statements included in a given dimension was also compared. Table 5 shows statistically significant differences.

Table 5. Differences between first- and second-cycle students regarding the assessment of statements included in the CSR dimensions.

Statements	Mean		*t*	df	*p*
	First-Cycle	Second-Cycle			
Economic					
Using more efficient technologies	3.56	3.06	2.480	216	0.0139
Applying the principles of economic efficiency as a criterion for job evaluation	2.93	2.41	2.110	216	0.0360
Environmental					
Developing organizational systems limiting environmental risk	2.04	1.64	2145	214	0.0330
Legal					
Executing court decisions and orders promptly	2.48	3.03	−2.554	216	0.0114
Implementing a pricing policy that guarantees compliance with the law	2.32	2.74	−2.442	216	0.0154
Obeying the law relating to the rules of competition in the market	2.37	2.81	−2.462	214	0.0146
Ethical					
Monitoring for preventing unethical behavior in the organization	2.33	2.72	−2.134	216	0.0340
Avoiding unfair sales practices	2.10	2.60	−2.409	213	0.0169
Operating in the market according to the principles of fair competition	2.23	2.83	−3.306	214	0.0011

Source: our own work based on research results.

The assessment of each of the CSR dimensions was examined on the basis of twelve statements; however, only in the assessment of nine of them were statistically significant differences between the study groups observed. Students of first-cycle studies gave a higher rating to two statements included in the economic dimension. They were concerned with investing in new, more efficient technologies and using the economic criterion as the most important criterion in job evaluation. In the environmental dimension, first-cycle students rated the need to develop organizational systems aimed at reducing environmental risk higher. Second-cycle students rated the legal dimension higher. In particular, this applies to the belief that it is necessary to comply with the law regarding the rules of competition in the market, and also in the field of shaping the pricing policy and immediate execution of court decisions and orders. The same group rated the ethical dimension higher. Statistically significant differences concerning the importance attached by the respondents to operating on the market in accordance with the principles of fair competition, avoiding unfair sales practices, as well as monitoring and counteracting unethical behavior in the organization. No statistically significant differences between the groups were observed in the assessment of the statements making up the philanthropic dimension.

6. Discussion and Directions of Future Research

Since the energy industry obtains raw materials for production from the natural environment, assuming its duty of special care not to exploit these resources beyond measure, it was decided to extend Carroll's CSR model to the environmental dimension.

Based on the extended model, research among first- and second-cycle students in the field of electrical engineering was conducted. The layout of the extended CSR pyramid in both groups turned out to be identical, which confirms H 1. The economic dimension was rated the highest, followed by the legal, ethical, and philanthropic dimensions, and the environmental dimension was rated the lowest. Although the hierarchy of layers in the CSR pyramid in the group of first- and second-cycle students was the same, they differed in the assessment of the ethical and legal dimensions, which means that H2 was only partially confirmed. Second-cycle students rated both dimensions higher. Differences in the assessment of individual statements were also observed. In the legal and ethical dimensions there were three differences each, in the economic dimension there were two, and in the environmental dimension there was one. This indicates that second-cycle students to a greater extent achieved the assumed learning outcomes specified in the Polish Qualifications Framework for levels 6 and 7, which include, among others, knowledge of the legal and ethical conditions of various types of professional activity, as well as readiness to perform responsible professional roles, in particular including compliance with the rules of professional ethics [50].

Bilateral comparisons of individual CSR dimensions in the group of first-cycle students indicate no differences between the assessment of the legal and ethical dimensions, and in the group of second-cycle students, no differences apply to the assessment of economic and legal, as well as legal and ethical, dimensions. This partial flattening of the CSR pyramid may result from the fact that second-cycle students, who have achieved learning outcomes related to economic, legal, and ethical issues to a greater extent, also see the links between these spheres to a greater extent. The results concerning first-cycle students may indicate insufficient recognition of the links between various categories of company stakeholders and obligations toward them, and the lack of an integrated approach to CSR.

The obtained results prove the need for broader education in the field of CSR, as the current education levels seem to be insufficient. Knowledge and competencies in the field of economics, law, or ethics should run throughout the entire cycle of education, permeating its content related to strictly professional issues. This means a change in the pedagogical approach to teaching in the field of sustainable development [51], of which CSR is a derivative. At the same time, only one in four countries analyzes learning outcomes to reform curricula [52]. Therefore, changing this state of affairs seems to be an important task for entities responsible for education, which should refer to The Principles for Responsible Management Education (PRME) in their curricula, and especially to Principle 4, which states that "We will engage in conceptual and empirical research that advances our understanding about the role, dynamics, and impact of corporations in the creation of sustainable social, environmental and economic value" [53], and teach reporting on economic, environmental and social aspects of the operation of energy sector enterprises (GRI Universal Standards and GRI Sector Standards) [54]. The accreditation of curricula is also conducive to improving the quality of education. In the case of the fields of study conducted at technical universities in Poland, accreditation is carried out by the Accreditation Commission of Universities of Technology (KAUT), which grants the European quality certificate European Accreditation of Engineering Programs (EUR-ACE®®), awarded as part of the European Network for Accreditation of Engineering procedure Education (ENAEE).

The indicated lack of differences also suggests that, at least partially, more suited than the pyramid is the Venn diagram, as suggested in later works by Carroll [39], or the dynamic CSR model developed by Da Silva and colleagues, the so-called spinner [55]. It should be recognized that CSR is the sum of individual "responsibilities" [49], so both the original model of the CSR pyramid and later models are useful in the research. The overlapping of individual areas of CSR and their dynamic nature also lead to questions about the motives

of CSR at the level of individuals and enterprises. Such research, also carried out in relation to students, has great practical value, as it allows us to predict the potential threats related to the symbolic understanding and undertaking of CSR activities [56].

When Carroll created the CSR model, the perception of the environment as an important resource was not common [57]. Currently, awareness of the need for rational use of environmental resources is more common both at the individual and institutional levels. This justifies the extension of the original CSR model to include the environmental dimension, thanks to which it is possible to diagnose the actual state as well as to shape social awareness in the area of CSR. In this context, an important area of future research is also the assessment of the approach to the environment in the time of an energy crisis. It may lead to different remedial strategies on the one hand, including more conscious, sustainable, and rational disposal of environmental resources, and on the other hand, a retreat from the sustainable use of these resources in favor of available but environmentally devastating energy sources.

7. Conclusions

Technical universities educate engineers who are the creators of technology and through their products shape the living conditions of societies in economic and environmental terms. As the research results show, students of electrical engineering at the Lublin University of Technology rank the environmental aspect of CSR the lowest, which means that they do not have sufficient knowledge about the importance of the planet's climate problems and are not sufficiently sensitive to them. As a consequence, they are not prepared to take action to protect the environment, which is a key resource for the energy industry. Hence, there is a greater need to change the teaching paradigm and include environmental needs in curricula, which requires curricula to refer to PRME, and especially to Principle 4. It is also advisable to accredit curricula in accordance with the standards of national and international accrediting organizations. Educating engineers who are willing and able to act in a socially responsible manner is a challenge for universities.

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