RESEARCH ARTICLE

Examination of marketing mix performance in relation to sustainable development of the Poland's confectionery industry

Pawel Tadeusz Kazibudzki[1☯]*, **Tomasz Witold Trojanowski**[2☯]

1 Faculty of Economics and Management, Opole University of Technology, Opole, Republic of Poland,
2 Department of Management, Jan Kochanowski University in Kielce, Kielce, Republic of Poland

☯ These authors contributed equally to this work.
* p.kazibudzki@po.edu.pl, poczta@gmail.com
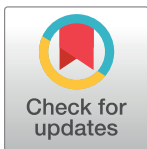
Abstract

The conventional concept of marketing mix does not take into account the idea of sustainable development. The basic objective of this examination is to analyze and evaluate the performance of selected marketing mix elements from the perspective of the Poland's confectionery industry's sustainable development. The questionnaire survey was designed for this purpose. The purpose of the research questions was to evaluate a degree of development for selected elements of marketing mix from the perspective of sustainable development of the Poland's confectionery industry. Thus, a novel development ratio based on the distance from exemplary performance was proposed. Next, aseminal approach to pairwise comparisons technique was applied for the importance evaluation of each survey question in order to provide a weighted average Mean Development Ratio ($MdeR$) for each element of marketing mix. In this process the seminal methodology for pairwise comparisons was applied i.e. a non-heuristic approach to pairwise comparisons technique with verifiable accuracy and reliability. In consequence, assuming that all elements of marketing mix have some designated importance in the process of sustainable development, a total weighted average $MdeR$ for performance of all elements of marketing mix was computed and evaluated. Noticeably, the total weighted average $MdeR$ for performance of all elements of marketing mix cannot be considered as satisfactory from the perspective of sustainable development of the Poland's confectionery industry.

Introduction

Excessive exploitation of natural resources, consumption of fuels, energy and water, increased waste generation and harmful substances, together with the progressing growth of the world's population—contribute to irreversible degradation of the natural environment and deterioration of societies' life quality [1]. Environmental degradation has a negative impact on the health condition of modern societies, and also reduces the chances of future generations' development. Food industry enterprises also take part in this interference as they are perceived

as not very innovative [2], unlike enterprises operating in other sectors such as the automotive or IT industry. To meet existing environmental and social problems, more attention should be focused on the concept of sustainable development [3]. By promoting pro-ecological and pro-social lifestyle, including consumer behavior, various types of environmental and social organizations aim to educate contemporary societies in this area [4,5]. The concept of sustainable development influences the business philosophy of business entities behavior, shaping their actions in the area of management and marketing.

Responsible marketing activities have an important role in reducing the emerging problems caused by the business operations of food industry enterprises. Marketing is primarily associated with sales and activities encouraging customers to buy various types of goods and services. For this reason, marketing is at odds with the concept of sustainable development [6,7]. Marketing mix was also criticized. The conventional concept of marketing mix does not take into account the idea of sustainable development, apart from social and environmental aspects. The classic marketing mix has been criticized e.g.Goi [8] or Glavas and Mish [9]. Möller [10] and Popovic [11] also joined the group of critics. A marketing composition consisting of four elements represents the interests of the producer rather than the buyer i.e. the consumer of the product. The opposite of conventional marketing, including marketing mix [12,13] is sustainable marketing [14,15] which is a sub-area of sustainable management. The essence of sustainable marketing is not only achieving food companies' economic goals, but also environmental and social goals [16]. An important role in responsible marketing policy of food industry enterprises is therefore the concept of sustainable marketing mix reflecting product, price, distribution (place), and promotion mix. The use of marketing mix instruments supporting sustainable development by food industry enterprises is particularly important because production processes significantly affect the state of the natural environment, thus contributing to the emergence of environmental and social problems. Sustainable marketing mix assumes the introduction of food products onto the market that will properly meet the needs and desires of buyers with minimal impact on the natural environment.

The purpose of the article is to examine and determine the forms and ways of implementing marketing instruments into the field of sustainable marketing mix for Poland's confectionery industry. In addition to the purpose of the study, the research hypothesis was also evaluated. The hypothesis was worded in the following way: Marketing activities in the field of individual marketing mix instruments, undertaken by enterprises operating in the confectionery industry are simply conventional, which in consequence entails that these enterprises do not implement a marketing mix based on the principles of sustainable development.

The data was obtained from the authors' own primary surveys, for the years 2017–2018, and its elaboration was supported by *Microsoft Excel Software*. The data was also examined within *QSP Multi Criteria Decision Support Tool* [17] aiding a seminal methodology for pairwise comparisons of Tomashevskii&Tomashevskii [18]. The article is organized as follows: After the introduction (Section 1), research methodology and research effects are discussed (Section 2). First, the survey's concept and the examination method are outlined and their design is explained (Subsection 1), then survey's results are presented and their fundamental input to the examination process is designated (Subsection 2). Then the examination's seminal method is described and its outcome delivered, analyzed and evaluated (Subsection 3). Discussion (Section 3) follows Section 2 and is devoted to the review of pertinent literature, and the partial and total examination results of the research paper. The article is closed by conclusions (Section 4) which summarize the examination efforts with final remarks.

Research methodology and effects

Methodology outline

Following the basic objective of this research i.e. to analyze and evaluate the performance of marketing mix elements from the perspective of sustainable development of the confectionery industry, an anonymous questionnaire survey was designed and submitted to 74 randomly selected companies operating within the Poland's confectionery industry. Thirty-three questions were asked in the questionnaire which anonymously examined performance of four basic marketing mix elements (product, price, place, and promotion mix) from the perspective of sustainable development. The survey questionnaire—S1 Table, contained closed questions concerning the particular company's approach towards sustainable marketing mix issues. Questions arose as a result of a brainstorming conducted by 9 experts. Work on the final form of the questions included in the research questionnaire was preceded by a pilot study phase when the face and content validity of the questionnaire were examined. The pilot study was a kind of sample before the actual research, which is particularly recommended to be carried out due to the selection of research techniques and tools [19,20]. The pilot study aimed to verify the meaning and clarity of the questions and confirm the agreement of the researcher's intentions with respect to the answers given as well to verify the reliability (stability) and homogeneity (internal consistency) of the questionnaire [11,20,21]. As a result of the research, some questions and answer options were clarified. It has also been suggested to provide a more concise statement on how to respond. After the modification, the questionnaire took its final form. The questionnaire occurred to be stable with correlation coefficient $r \geq 0.70$. Also, typically used during scale development with items that have several response options coefficient alpha was higher than 0.70 what indicates good reliability of the questionnaire [19,20,22].

The objective of the research questions was to examine the degree of development for all elements of a marketing mix in relation to the confectionery industry sustainable development. For that purpose it was decided to apply the *Development Ratio(deR)* based on the distance from exemplary performance i.e. the gradient method [23–26]. The ratio detailed construction and its description is presented in the section "Survey's Concept and Results". This ratio constitutes the measure of marketing mix elements performance which was diagnosed with the application of the questioning technique. Each question was evaluated on the basis of Likert's seven degrees scale [27] which is a common technique for the measurement of attitudes in social research [22,28,29]. Of course it can be discussed why seven degrees scale was applied, why not five or eleven degrees scale. There are different views on this matter [30]. However, taking into consideration the objective of this research and the limited channel capacity of humans [31–33], Likert's seven degrees scale was considered here as the optimal. On the basis of respondents evaluations, the development ratios for all questioned areas of marketing mix elements were calculated. Then, their importance was weighted. In order to precisely establish the weights values, the pairwise comparison method was used in its novel form [17,18].

Basically, two kinds of measurement techniques can be distinguished for this purpose i.e. the relative measurement technique and the absolute measurement one. In the case of a large number of alternatives, the latter technique is often utilized [33–35], which is often also called the rating approach. This approach consists of defining *intensities* of achievement or preference for criterion or criteria in a model. These *intensities* are used in place of alternatives in the process of their evaluation in the first stage. For example, instead of using pairwise comparisons of relative preference for specific alternatives with respect to some criterion [36], one can compare the relative preference of a nonspecific alternative that completely fulfills that criterion to some other alternative that fulfills that criterion only partially. Such pairwise

comparisons result in measures of preference for the *intensities* which possess the ratio-scale property. Then, in the second stage, each alternative (in this research, every single development ratio) is evaluated through its intensity in relation to each criterion (in this research there is only one, the same criterion for each element of sustainable marketing mix which is 'the performance').

In the survey, there are totally 33 alternatives (development ratios established on the basis of survey's questions answers) diagnosing the performance of four elements of the sustainable marketing mix i.e. sustainable: product, price, place, and promotion mix. Thus, weights for 12 development ratios needed to be established for the performance evaluation of the sustainable product, weights for 6 development ratios needed to be established for the performance evaluation of the sustainable price, weights for 10 development ratios needed to be established for the performance evaluation of the sustainable distribution, and weights for 5 development ratios needed to be established for the performance evaluation of the sustainable promotion mix. For this purpose the rating approach was applied. Five intensities for pairwise comparisons were proposed i.e. extreme, high, moderate, slight, and tiny. Again, it can be disputed why as many as five intensities were proposed. However, taking into consideration the objective of the pairwise evaluation, the possible errors in this process, and the limited channel capacity of humans [31–33], this particular number of intensities was considered here as the optimal. All the necessary computations were processed in the *QSP Multi Criteria Decision Support Tool* [17] aiding a seminal methodology for pairwise comparisons [18]. The objective of the approach was firstly, to evaluate the importance of each survey's question in order to provide a weighted average Mean Development Ratio *(MdeR)* for each element of a sustainable marketing mix i.e. sustainable product–$waMdeR^{(pt)}$, sustainable price–$waMdeR^{(pc)}$, sustainable distribution (place)–$waMdeR^{(pl)}$, and sustainable promotion mix–$waMdeR^{(pr)}$; and secondly, to compute and evaluate a total weighted average *MdeR* for performance of all elements of a marketing mix i.e. *waMdeR(t)*. The full description of the process and its results is presented in the section "Examination's Method and Outcome".

Survey's concept and results

The confectionery industry, apart from the meat, vegetable and fruit industry, clearly affects the condition of natural environment [37–39]. The main ecological threats arising in the production of confectionery include the significant use of water in production processes and the associated waste water emissions, generating product waste with particular emphasis on organic waste, emission of harmful substances into the atmosphere, including dusts, gases and odors, energy consumption, as well as noise emitted by machines and devices. Reference should also be made to the impact of confectionery consumption on human health. The vast majority of confectionery products contain sugar, which is one of the main causes of diabetes. Excessive and uncontrolled consumption of sugar found in sweets leads to other diseases, i.e. overweight, obesity and cardiovascular diseases. Other serious hazards arising from high sugar consumption include the formation of some types of cancer, e.g. pancreas. Eating sweets is closely related to dental health. Dental caries and premature tooth loss are more often observed among children eating sweets several times a day than those who rarely consume these products. In addition to sugar content, confectionery products also contain large amounts of fat as well as saturated fatty acids and acids in a trans configuration. The consumption of fat and trans fatty acids conduce the development of heart disease, cardiovascular disease, atherosclerosis, diabetes, obesity, cancer, as well as impaired function of the immune system [40–46].

Thus, the subjects of the research are enterprises recognized by the Polish Classification of Business Activity as PKD 10.72.Z (the production of rusks and biscuits, the production of

conserved pastry articles and cakes) and PKD 10.82.Z (the production of cacao, chocolate and confectionery). It was found that the Polish Central Statistical Bureau's database REGON lists a few hundred of such businesses. However, the REGON database is not fully trustworthy as it has a declarative nature i.e. first of all, many companies registered in the REGON database could already have liquidated their business activity, or could have temporarily suspended their business activity; and secondly, they could have declared a few areas of their business activity (just in case) what does not entail they operate in all of them. It is why the authors decided to examine the issue from different sources of information. Two other more credible databases were taken into consideration i.e. the Central Record and Information about Business Activity (CEIDG database) and the Domestic Judiciary Register (KRS database). Furthermore, some additional unpublished data of the Polish Central Statistical Bureau concerning the Polish confectionery industry was taken into consideration as well. It was established that there are 223 enterprises in Poland which constitute the core of Poland's confectionery industry.

It should be emphasized that the confectionery industry in Poland is diversified i.e. companies operating in it differ from the perspective of their production profile, their market position and market potential. Among firms operating in the industry, one can distinguish companies which should be described as global organizations e.g. Mondelēz International Inc., Nestle, Mars, and Ferrero Corporations, as well small and medium sized domestic family businesses. Noticeable disproportion and spread among analyzed organizations can be justified by different goals set up by particular companies. Large foreign and domestic corporations that offer a dozen or tens of diversified products, focus mainly on sales increase and securing the best market share and market position. On the other hand, smaller businesses focus on the composition of healthy, exceptional and distinguished products.

Due to limited financial resources for the project, it was decided to examine only a part of the population. In the case of dependent sampling, and designated level of significance and accuracy of the results, the minimal size for the sample is calculated on the basis of the following Eq (1).

$$n \geq \frac{N\mu_{\alpha/2}^2}{4(N-1)d^2 + \mu_{\alpha/2}^2} \tag{1}$$

Thus, for assumed level of significance $\alpha = 0.1$ that designates $\mu_{\alpha/2} = 1.645$, and assumed level of accuracy $d \leq 0.08$ which guaranties ±8% of error margin that can be considered as the relatively decent level of credibility for an estimate, and taking into account the size of target population i.e. $N = 223$, we have $n \geq 72$. In the research, the randomly drawn sample of $n = 74$ companies operating in the confectionery industry in Poland was examined. Its structure present Tables 1–5.

Table 1. Legal forms of examined companies.

Legal form of the business	Number of firms	Percent of firms
Public limited company	2	2.7%
Limited liability company	33	44.5%
Limited partnership	1	1.4%
General partnership	25	33.8%
Sole proprietorship	13	17.6%

Table 2. Number of employees.

0–49		50–249		250 and more	
No. of firms	Percent	No. of firms	Percent	No. of firms	Percent
12	16.2%	42	56.8%	20	27%

https://doi.org/10.1371/journal.pone.0240893.t002

Table 3. Position of the respondent.

Managerial position		Non-managerial position	
No. of respondents	Percent of respondents	No. of respondents	Percent of respondents
50	67.6%	24	32.4%

https://doi.org/10.1371/journal.pone.0240893.t003

Table 4. Respondents' professional experience (period of service in years).

5 or less		6–10		11–20		21–30	
Number	Percent	Number	Percent	Number	Percent	Number	Percent
27	36.5%	22	29.7%	22	29.7%	3	4.1%

https://doi.org/10.1371/journal.pone.0240893.t004

Following the basic objective of this research i.e. to analyze and evaluate the performance of marketing mix elements from the perspective of sustainable development of the Poland's confectionery industry, a questionnaire survey was designed and submitted to 74 randomly selected companies operating within confectionery industry in Poland. Thirty-three questions were asked in the questionnaire which examined performance of four basic marketing mix elements (product, price, place, and promotion mix) from the perspective of sustainable development. The exemplary survey's questionnaire is attached to this research paper as S1 Table. The set of data gathered during the survey is also enclosed to this research—S2–S4 Tables.

The objective of the research questions was to examine the degree of development for all elements of a marketing mix from the perspective of the Poland's confectionery industry sustainable development. For that purpose it was decided to apply a development ratio based on

Table 5. Provinces where the businesses operate.

Province	Number of firms	Percent of firms
Lower Silesia	7	9.5%
Podlasie	5	6.8%
Pomeranian	1	1.4%
Silesia	11	14.8%
Greater Poland	9	12.1%
Kuyavian-Pomeranian	5	6.8%
Lublin	4	5.3%
Lubusz	2	2.7%
Lodz	6	8.1%
Lesser Poland	7	9.5%
Mazovian	11	14.8%
Opole	3	4.1%
Subcarpathian	3	4.1%

https://doi.org/10.1371/journal.pone.0240893.t005

the distance from exemplary performance i.e. the gradient method [23–26]. The ratio construction can be described as follows.

Assumed that the evaluated object X_i is denoted by the vector $X_i = (x_{i1}, x_{i2}, x_{i3}, \ldots, x_{in})$ where $x, i, n \in N$. The exemplar i.e. the object described by variables which are considered as desired, is denoted by the vector $\hat{X}_i = (\hat{x}_{i1}, \hat{x}_{i2}, \hat{x}_{i3}, \ldots, \hat{x}_{in})$ where $\hat{x}, i, n \in N$, and the anti-exemplar, i.e. the object described by variables which are considered as undesired, is denoted by the vector $\tilde{X}_i = (\tilde{x}_{i1}, \tilde{x}_{i2}, \tilde{x}_{i3}, \ldots, \tilde{x}_{in})$ where $\tilde{x}, i, n \in N$. Then, the development ratio (deR_{ik}) can be defined in a form of the following Eq 2.

$$deR_{ik} = \frac{x_{ik} - \tilde{x}_{ik}}{\hat{x}_{ik} - \tilde{x}_{ik}} \tag{2}$$

where $k \in \{1, 2, 3, \ldots, n\}$, the numerator designates Euclidian distance of the examined object's element from its anti-exemplary value, and the denominator designates Euclidian distance of the element's exemplary value from its anti-exemplary value. In this research $x_{ik} \in \{0, 1, 2, 3, 4, 5, 6\}$, $\hat{x}_{ik} = 6$, and $\tilde{x}_{ik} = 0$.

Noticeably, $deR_{ik} \in [0,1]$, and the closer it is to unity, the higher is the development degree of the evaluated element in the particular object. In this research, mean development ratios were applied Eq (3) which exemplary calculations are explained in details when survey results are presented later on in this section.

$$MdeR_i = \frac{1}{n} \sum_{k=1}^{n} deR_{ik} \tag{3}$$

where n denotes the total number of answers collected in the survey i.e. $n = 74$.

Basically, performance of four fundamental elements of marketing mix was examined: product, price, place (distribution), and promotion mix from the perspective of their performance in relation to sustainable development. Each element of the marketing mix was evaluated from the perspective of a few areas. Each area was represented by a particular question asked of respondents. The survey comprised in total $i = 33$ questions which examined entire marketing mix performance from the perspective of the sustainable development concept. All questions were elaborated by a group of nine experts who also evaluated each question from the perspective of its total contribution to the problem (details of this evaluation will be presented later in this research in its section entitled *Examination's Method and Outcome*). The experts were appointed on the basis of their experience from nine deliberately selected successful businesses operating in the territory of Poland (Table 6 presents the experts characteristics).

Answers in the questionnaire (S1 Table) were designed and coded in the seven degrees version of Likert's scale [27] which guaranties quite decent accuracy of judgments. Tables 7–10 present the result of the survey together with examined areas (Q_i) evaluations reflected by their mean development ratios $MdeR_i$. Answers' characteristics in Tables 7–10 are presented in alternant squares, shaded and not shaded. There are four numbers in each square. The upper left corner in each square informs of the number of particular answers for the particular question that relates to the examined area (Q_i). The upper right corner in each square provides a percentage share of particular answers for the particular question in the total number of answers i.e. $n = 74$. The lower left corner in each square provides a code for the particular answer in this research $x_{ik} \in \{0, 1, 2, 3, 4, 5, 6\}$. The lower right corner in each square presents a product of the answer's code and a number of particular answers for the particular question. In this research then, the quotient of the products' sum for the particular question and the maximal value for that sum i.e. $n \cdot \hat{x}_{ik} = 74 \cdot 6 = 444$, provides the $MdeR_i$ value.

Table 6. Experts' characteristics.

No	Legal form of the business	Firm's employment	Province of firm's activity	Expert's business experience	Expert's status
1	Limited partnership	50–249	Silesian	16 years	Entrepreneur-manager
2	Sole proprietorship	50–249	Silesian	20 years	Entrepreneur-manager
3	Limited liability company	250 ≤	Silesian	17 years	Manager
4	Public limited company	250 ≤	Mazovian	21 years	Manager
5	Civil law partnership	0–49	Silesian	19 years	Entrepreneur-manager
6	Limited liability company	50–249	Silesian	24 years	Manager
7	Limited liability company	250 ≤	Lesser Poland	19 years	Manager
8	Public limited company	250 ≤	Lesser Poland	23 years	Manager
9	Limited liability company	250 ≤	Lesser Poland	17 years	Manager

https://doi.org/10.1371/journal.pone.0240893.t006

Examination's method and outcome

This examination does not involve any medical research involving human subjects, including research on identifiable human material and data. The consent to the research participation was declared remotely and obtained in the electronic form together with the survey output which was recorded. The survey questionnaire was anonymous thus obtained data was analyzed also anonymously.

Table 7. Product in the sustainable development perspective.

Q_i^*	Answers' characteristics														$MdeR_i$
Q_1	2	2.7%	11	14.9%	16	21.6%	1	1.4%	26	35.1%	16	21.6%	2	2.7%	242/444 ≈ 0.545
	0	0	1	11	2	32	3	3	4	104	5	80	6	12	
Q_2	2	2.7%	2	2.7%	3	4.1%	0	0%	21	28.2%	42	56.9%	4	5.4%	326/444 ≈ 0.734
	0	0	1	2	2	6	3	0	4	84	5	210	6	24	
Q_3	2	2.7%	12	16.2%	9	12.2%	1	1.4%	19	25.6%	30	40.5%	1	1.4%	265/444 ≈ 0.597
	0	0	1	12	2	18	3	3	4	76	5	150	6	6	
Q_4	19	25.6%	30	40.5%	17	23%	4	5.4%	1	1.4%	2	2.7%	1	1.4%	96/444 ≈ 0.216
	0	0	1	30	2	34	3	12	4	4	5	10	6	6	
Q_5	5	6,8%	33	44.5%	17	23%	2	2.7%	10	13.5%	5	6.8%	2	2.7%	150/444 ≈ 0.338
	0	0	1	33	2	34	3	6	4	40	5	25	6	12	
Q_6	11	14.9%	27	36.4%	18	24.3%	3	4.1%	10	13.5%	3	4.1%	2	2.7%	139/444 ≈ 0.313
	0	0	1	27	2	36	3	9	4	40	5	15	6	12	
Q_7	21	28.2%	37	50%	9	12.2%	2	2.7%	3	4.1%	1	1.4%	1	1.4%	84/444 ≈ 0.189
	0	0	1	37	2	18	3	6	4	12	5	5	6	6	
Q_8	2	2.7%	5	6.8%	7	9.5%	1	1.4%	18	24.3%	35	47.2%	6	8.1%	305/444 ≈ 0.687
	0	0	1	5	2	14	3	3	4	72	5	175	6	36	
Q_9	2	2.7%	11	14.9%	16	21.6%	1	1.4%	19	25.6%	20	27%	5	6.8%	252/444 ≈ 0.568
	0	0	1	11	2	32	3	3	4	76	5	100	6	30	
Q_{10}	1	1.4%	2	2.7%	0	0%	2	2.7%	31	41.9%	35	47.2%	3	4.1%	325/444 ≈ 0.732
	0	0	1	2	2	0	3	6	4	124	5	175	6	18	
Q_{11}	1	1.4%	0	0%	0	0%	0	0%	10	13.5%	45	60.8%	18	24.3%	373/444 ≈ 0.84
	0	0	1	0	2	0	3	0	4	40	5	225	6	108	
Q_{12}	4	5.4%	3	4.1%	7	9.5%	0	0%	43	58.1%	13	17.5%	4	5.4%	278/444 ≈ 0.626
	0	0	1	3	2	14	3	0	4	172	5	65	6	24	

*Question's numbers relate to question numbers in S1 Table which also contains their essence.

https://doi.org/10.1371/journal.pone.0240893.t007

Table 8. Distribution in the sustainable development perspective.

Q_i^*	Answers' characteristics														$MdeR_i$
Q19	13	17.6%	39	52.6%	19	25.7%	2	2.7%	1	1.4%	0	0%	0	0%	87/444
	0	0	1	39	2	38	3	6	4	4	5	0	6	0	≈ 0.196
Q20	3	4.1%	22	29.7%	18	24.3%	2	2.7%	18	24.3%	10	13.5%	1	1.4%	192/444
	0	0	1	22	2	36	3	6	4	72	5	50	6	6	≈ 0.432
Q21	3	4.1%	24	32.3%	13	17.5%	3	4.1%	23	31.1%	7	9.5%	1	1.4%	192/444
	0	0	1	24	2	26	3	9	4	92	5	35	6	6	≈ 0.432
Q22	0	0%	0	0%	0	0%	2	2.7%	15	20.3%	45	60.8%	12	16.2%	363/444
	0	0	1	0	2	0	3	6	4	60	5	225	6	72	≈ 0.818
Q23	0	0%	0	0%	2	2.7%	0	0%	9	12.2%	49	66.2%	14	18.9%	369/444
	0	0	1	0	2	4	3	0	4	36	5	245	6	84	≈ 0.831
Q24	0	0%	1	1.4%	3	4.1%	0	0%	24	32.3%	41	55.4%	5	6.8%	338/444
	0	0	1	1	2	6	3	0	4	96	5	205	6	30	≈ 0.761
Q25	0	%	4	5.4%	12	16.2%	0	0%	35	47.3%	19	25.7%	4	5.4%	287/444
	0	0	1	4	2	24	3	0	4	140	5	95	6	24	≈ 0.646
Q26	1	1.4%	1	1.4%	4	5.4%	4	5.4%	28	37.8%	29	39.1%	7	9.5%	320/444
	0	0	1	1	2	8	3	12	4	112	5	145	6	42	≈ 0.721
Q27	1	1.4%	24	32.3%	11	14.9%	1	1.4%	22	29.7%	12	16.2%	3	4.1%	215/444
	0	0	1	24	2	22	3	3	4	88	5	60	6	18	≈ 0.484
Q28	40	54%	28	37.8%	3	4.1%	2	2.7%	1	1.4%	0	0%	0	0%	44/444
	0	0	1	28	2	6	3	6	4	4	5	0	6	0	≈ 0.099

*Questions' number relate to question numbers in S1 Table which also contains their essence.

https://doi.org/10.1371/journal.pone.0240893.t008

Overwhelming scientific evidence indicates that the unaided human mind is simply not capable of simultaneous analysis of many different, competing factors and then synthesize the results for the purpose of making a rational conclusion. There is experimental evidence i.e. psychological [31] including the well-known Miller study [32] which put forth the notion that humans are not capable of dealing accurately with more than about seven (±2) things at a

Table 9. Price in the sustainable development perspective.

Q_i^*	Answers' characteristics														$MdeR_i$
Q13	0	0%	0	0%	0	0%	0	0%	3	4.1%	31	41.9%	4	5.4%	191/444
	0	0	1	0	2	0	3	0	4	12	5	155	6	24	≈ 0.43
Q14	0	0%	2	2.7%	1	1.4%	0	0%	9	12.2%	51	68.8%	11	14.9%	361/444
	0	0	1	2	2	2	3	0	4	36	5	255	6	66	≈ 0.813
Q15	2	2.7%	4	5.4%	10	13.5%	1	1.4%	36	48.6%	19	25.7%	2	2.7%	278/444
	0	0	1	4	2	20	3	3	4	144	5	95	6	12	≈ 0.626
Q16	15	20.3%	44	59.3%	7	9.5%	0	0%	5	6.8%	2	2.7%	1	1.4%	94/444
	0	0	1	44	2	14	3	0	4	20	5	10	6	6	≈ 0.212
Q17	16	21.6%	48	64.8%	4	5.4%	0	0%	3	4.1%	2	2.7%	1	1.4%	84/444
	0	0	1	48	2	8	3	0	4	12	5	10	6	6	≈ 0.189
Q18	57	77%	13	17.6%	2	2.7%	2	2.7%	0	0%	0	0%	0	0%	23/444
	0	0	1	13	2	4	3	6	4	0	5	0	6	0	≈ 0.052

*Question's numbers relate to question numbers in S1 Table which also contains their essence.

https://doi.org/10.1371/journal.pone.0240893.t009

Table 10. Promotion mix in the sustainable development perspective.

Q_i^*	Answers' characteristics														MdeR$_i$
Q$_{29}$	0	0%	6	8.1%	4	5.4%	6	8.1%	39	52.7%	16	21.6%	3	4.1%	286/444
	0	0	1	6	2	8	3	18	4	156	5	80	6	18	≈ 0.644
Q$_{30}$	9	12.2%	43	57.9%	13	17.6%	5	6.8%	2	2.7%	1	1.4%	1	1.4%	103/444
	0	0	1	43	2	26	3	15	4	8	5	5	6	6	≈ 0.232
Q$_{31}$	16	21.6%	41	55.3%	8	10.8%	3	4.1%	4	5.4%	1	1.4%	1	1.4%	93/444
	0	0	1	41	2	16	3	9	4	16	5	5	6	6	≈ 0.209
Q$_{32}$	24	32.3%	39	52.7%	4	5.4%	3	4.1%	1	1.4%	2	2.7%	1	1.4%	76/444
	0	0	1	39	2	8	3	9	4	4	5	10	6	6	≈ 0.171
Q$_{33}$	22	29.7%	27	36.5%	14	18.8%	3	4.1%	6	8.1%	1	1.4%	1	1.4%	99/444
	0	0	1	27	2	28	3	9	4	24	5	5	6	6	≈ 0.223

*Questions' numbers relate to question numbers in S1 Table which also contains their essence.

time. Taking into consideration that there are 33 areas of examination in this research, it was decided to apply a technique that empower humans in such situations.

Various examination methods involve either examining and studying some phenomenon from the perspective of its various properties, or studying some phenomenon in relation to other similar phenomena and relating them by making comparisons, and then synthesizing findings and drawing conclusions. The latter method leads directly to the method that involves judgments (relative or absolute) regarding a phenomenon. Because humans can make much better relative than absolute judgments [47–49] a pairwise comparisons method was proposed in order to facilitate the process of relative judgments.

The pairwise comparisons method dates back to the beginning of the 20th century and was firstly applied by Thurstone [47] and its first scientific applications can be found in Fechner [50]. However, the method itself is much older and its idea goes back to Ramon Lull who lived in the end of the 13th century. It is claimed [51] that its popularity comes from an influential paper of Marquis de Condorcet [52] who used this method in the election process where voters rank candidates based on their preference. It has been developed and perfected since then in many papers e.g. [53], however its very recent development [18] deserves special attention, thus, to the best knowledge of the authors, it finds its first time ever real problem application.

The objective of the approach was firstly, to evaluate the importance of each survey's question in order to provide a weighted average *MdeR* for each element of a marketing mix i.e. product–*waMdeR*$^{(pt)}$, price–*waMdeR*$^{(pc)}$, distribution (place)–*waMdeR*$^{(pl)}$, and promotion mix–*waMdeR*$^{(pr)}$; and secondly, under the assumption that all elements of a marketing mix are equally important in the process of sustainable development, to compute and evaluate a total weighted average *MdeR* for performance of all elements of a marketing mix i.e. *waMdeR(t)*.

The importance of particular elements was established with the application of the *QSP Multi Criteria Decision Support Tool* [17] aiding a seminal methodology for pairwise comparisons i.e. a non-heuristic approach to pairwise comparisons technique with verifiable accuracy and reliability [18] which for brevity will not be discussed here. Firstly, importance of all the questions was examined from the perspective of their impact on performance of the particular element of marketing mix. Due to a high number of elements, it was done indirectly through intensities which importance was firstly examined in the *QSP Multi Criteria Decision Support Tool* [17].

Table 11. Alternative's weights and mean errors.

Rank	Alternative (intensity)	Weight ± *absolute [relative]* error = Actual weight
1	Extreme	0.283 ± 0.016[± 5.65%] = [0.267–0.298]
2	High	0.236 ± 0.009[± 3.81%] = [0.227–0.244]
3	Moderate	0.191 ± 0.010[± 5.24%] = [0.180–0.201]
4	Slight	0.161 ± 0.006[± 3.73%] = [0.155–0.167]
5	Tiny	0.129 ± 0.008[± 6.20%] = [0.121–0.137]

The group of experts, whose characteristics are shown in Table 6, evaluated, in pairwise mode, the importance of the following intensities: extreme, high, moderate, slight, and tiny. The questions which the group of experts analyzed were stated as follows: "Taking into consideration the sustainable marketing mix perspective, how much more its particular element's performance evaluation would be affected by the '*e.g. extremely*' significant question in comparison to the '*e.g. moderately*' significant question". Preferences of the group towards those intensities were established on the basis of the experts individual judgments which were geometrically averaged [54] and processed in the *QSP Multi Criteria Decision Support Tool* [17]. It was decided that, among other available scales [55], the flatten numerical preference scale would be applied during the judgment process which comprises of numbers—and their reciprocals—from one (equivalent to the verbal judgment—'equally preferred') to two (equivalent to the verbal judgment—'extremely preferred')–Eq 4:

$$\Im(s) = \begin{cases} f(s) + 1 & s \geq 0, \\ \dfrac{1}{1 - f(s)} & s < 0, \end{cases} \tag{4}$$

where: $f(s) = 0.125s$ for $s \in \{-8, \ldots, 8\} \wedge s \in I$.

The above proposed scale was found to be more appropriate from the perspective of possible estimation errors of intensities weights [56]. The outcome of the entire examination is presented below—Tables 11–13 and Fig 1.

Due to evaluation of intensities relations, evaluation of each survey's question importance became possible. Thus, the importance of each question was evaluated from the perspective of its impact on performance of the particular element of marketing mix. The directive which the group of experts obtained in this stage of evaluation was stated as follows: "Please provide the

Table 12. Ranking probabilities of compared alternatives.

Compared alternatives	Extreme > High	High > Moderate	Moderate > Slight	Slight > Tiny
Ranking probability	100.0%	100.0%	100.0%	100.0%

Table 13. Relative reciprocal weights for compared intensities.

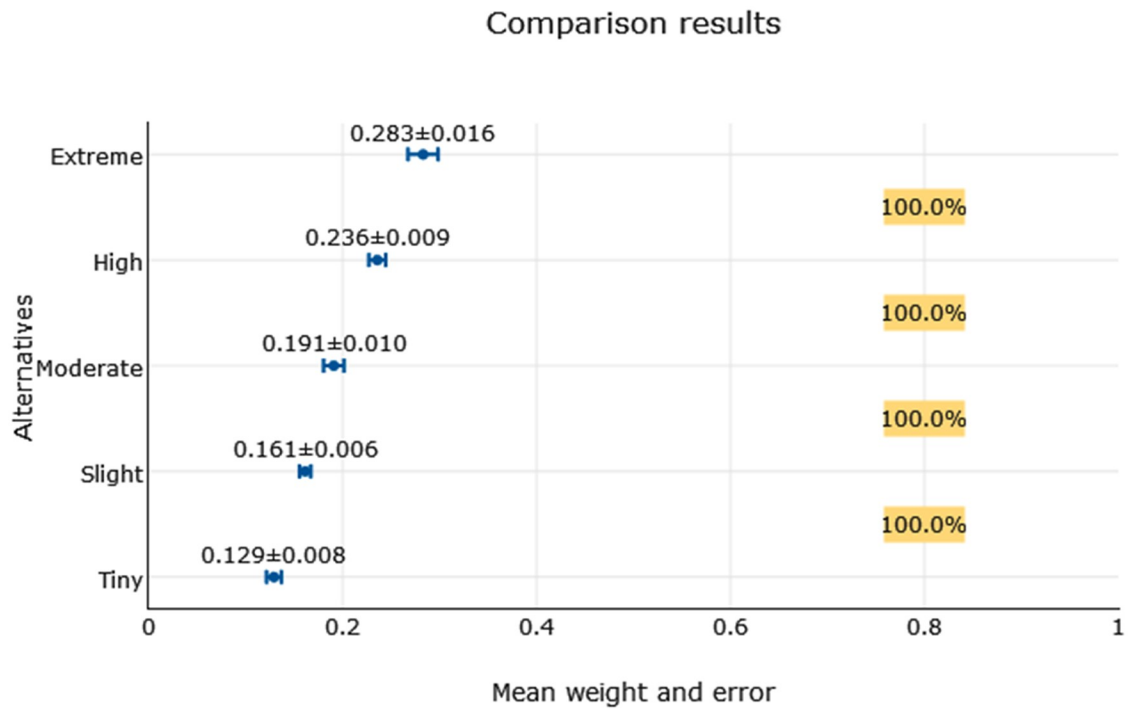|	Extreme	High	Moderate	Slight	Tiny
Extreme	**1.000**	1.250	1.560	1.750	2.0
High	0.800	**1.000**	1.310	1.450	1.810
Moderate	0.641	0.763	**1.000**	1.250	1.560
Slight	0.571	0.690	0.800	**1.000**	1.310
Tiny	0.500	0.552	0.641	0.763	**1.000**

Comparison results

Fig 1. Intensities (alternatives) comparison results with their mean weight and absolute error.

significance for the given question from the perspective of its impact on the particular element of the sustainable marketing mix performance evaluation. Please apply for this purpose the following intensities: extreme, high, moderate, slight, and tiny. In this way calculation of $waMdeR^{(pt)}$, $waMdeR^{(pc)}$, $waMdeR^{(pl)}$, and $waMdeR^{(pr)}$ also became possible. The following Tables 14–17 present the outcome of this examination.

Table 14. Input for $waMdeR^{(pt)}$ calculation.

Q_i^*	$MdeR_i$	Importance (*weight*)			$waMdeR_i$[2]x[4]
		Verbal	numerical [w_i]	[#]rE_i[±]	
[1]	[2]	[3]	[4]	[5]	[6]
Q_1	0.545	extreme	0.283	5.65%	0.154235
Q_2	0.734	high	0.236	3.81%	0.173224
Q_3	0.597	high	0.236	3.81%	0.140892
Q_4	0.216	moderate	0.191	5.24%	0.041256
Q_5	0.338	high	0.236	3.81%	0.079768
Q_6	0.313	high	0.236	3.81%	0.073868
Q_7	0.189	moderate	0.191	5.24%	0.036099
Q_8	0.687	extreme	0.283	5.65%	0.194421
Q_9	0.568	extreme	0.283	5.65%	0.160744
Q_{10}	0.732	moderate	0.191	5.24%	0.139812
Q_{11}	0.840	moderate	0.191	5.24%	0.160440
Q_{12}	0.626	slight	0.161	3.73%	0.119566
SUM:			2.718	56.88%	1.474325
$waMdeR^{(pt)}$ = 1.474325/2.718 = 0.5424				[$]$MrE$ = 4.74%	

Table 15. Input for *waMdeR*$^{(pc)}$ calculation.

Q_i^*	MdeR$_i$	Importance (*weight*)			waMdeR$_i$[2]x[4]
		verbal	numerical [w$_i$]	$^{(\#)}$rE$_i$[±]	
[1]	[2]	[3]	[4]	[5]	[6]
Q$_{13}$	0.430	moderate	0.191	5.24%	0.082130
Q$_{14}$	0.813	moderate	0.191	5.24%	0.155283
Q$_{15}$	0.626	high	0.236	3.81%	0.147736
Q$_{16}$	0.212	extreme	0.283	5.65%	0.059996
Q$_{17}$	0.189	extreme	0.283	5.65%	0.053487
Q$_{18}$	0.052	extreme	0.283	5.65%	0.014716
	SUM:		1.467	31.24%	0.513348
	waMdeR$^{(pc)}$ = 0.513348/1.467 = 0.3499			$^{(\$)}$MrE = 5.207%	

Table 16. Input for *waMdeR*$^{(pl)}$ calculation.

Q_i^*	MdeR$_i$	Importance (*weight*)			waMdeR$_i$[2]x[4]
		verbal	numerical [w$_i$]	$^{(\#)}$rE$_i$[±]	
[1]	[2]	[3]	[4]	[5]	[6]
Q$_{19}$	0.196	extreme	0.283	5.65%	0.055468
Q$_{20}$	0.432	extreme	0.283	5.65%	0.122256
Q$_{21}$	0.432	extreme	0.283	5.65%	0.122256
Q$_{22}$	0.818	high	0.236	3.81%	0.193048
Q$_{23}$	0.831	high	0.236	3.81%	0.196116
Q$_{24}$	0.761	moderate	0.191	5.24%	0.145351
Q$_{25}$	0.646	moderate	0.191	5.24%	0.123386
Q$_{26}$	0.721	slight	0.161	3.73%	0.116081
Q$_{27}$	0.484	slight	0.161	3.73%	0.077924
Q$_{28}$	0.099	high	0.236	3.81%	0.023364
	SUM:		2.261	46.32%	1.17525
	waMdeR$^{(pl)}$ = 1.17535/2.261 = 0.5198			$^{(\$)}$MrE = 4.632%	

Table 17. Input for *waMdeR*$^{(pr)}$ calculation.

Q_i^*	MdeR$_i$	Importance (*weight*)			waMdeR$_i$[2]x[4]
		verbal	numerical [w$_i$]	$^{(\#)}$rE$_i$[±]	
[1]	[2]	[3]	[4]	[5]	[6]
Q$_{29}$	0.644	high	0.236	3.81%	0.151984
Q$_{30}$	0.232	high	0.236	3.81%	0.054752
Q$_{31}$	0.209	extreme	0.283	5.65%	0.059147
Q$_{32}$	0.171	high	0.236	3.81%	0.040356
Q$_{33}$	0.223	extreme	0.283	5.65%	0.063109
	SUM:		1.274	22.73%	0.369348
	waMdeR$^{(pr)}$ = 0.369348/1.274 = 0.2899			$^{(\$)}$MrE = 4.546%	

where:

$^{(\#)}$rE$_i$ denotes a relative error of ith question's weight [w_i];

$^{(\$)}$ MrE denotes the arithmetic mean of relative errors of all weights; and Q$_i^*$ denotes a question's number which relates to question numbers in S1 Table thatalso contains their essence.

Product is the most important element of marketing mix, which is the starting point for defining the other elements of the marketing mix. Manufacturing confectionery products and their consumption affect the natural environment and society. Thus, the questionnaire questions concerned the production area and the impact of this process on the natural environment (seven questions) and the effects of the consumption of confectionery products, which has a significant impact on the health condition of societies (five questions). In order to obtain in-depth information in both, the environmental and social area, the authors found it appropriate to formulate totally twelve questions.

The second element in terms of the importance of impact on sustainable development is distribution. The distribution of confectionery products is, first and foremost, a nuisance to the environment and to a lesser extent to societies. Exhaust and soot emissions, noise, traffic congestion, road traffic jams, pavement damage, road accidents and nuisance for urban and rural residents living near highways are the main problems of unsustainable product distribution. The formulated ten questions allowed the authors of the article to obtain satisfactory information on the distribution of confectionery products.

The number of six questions related to price concerns considering the costs associated with the negative impact of the production and consumption of confectionery products by the confectionery industry. Questions concerning price were intended to provide information as to whether the price reflects all costs—the costs of extracting raw materials, energy, transport and storage, the costs of contributing to global warming and climate change. The six questions asked in the questionnaire allowed the authors to obtain satisfactory information within this area to a exhausting extent.

The last element of the marketing mix is promotion. Promotional messages considered as sustainable should have features that were included by the authors of the article in five questions. Promotional messages do not have a direct negative impact on the natural environment and society. The authors' intention was to examine whether the promotional content provided was in line with the idea of sustainable development and whether it promoted the concept. Such features of promotional messages as transparency, ecological education or information on the activity of enterprises for environmental protection and improvement of the quality of life of societies bear the features of sustainable promotion.

Due to the different number of questions applied to individual elements of the sustainable marketing mix, and thus the importance (weight) of particular marketing mix elements, it was decided to assign weights to individual elements of the marketing mix proportionally to the number of questions. Under this assumption i.e. that all elements of marketing mix have some designated importance in the process of sustainable development, computation of *waMdeR(t)* is presented in Table 18.

Noticeably the total weighted average *MdeR* for performance of all marketing mix elements i.e. *waMdeR(t)* cannot be considered as satisfactory from the perspective of sustainable

Table 18. Input for *waMdeR(t)* calculation.

Element of marketing mix	Importance (*weight*)	waMdeR[i]	MrE[i]
Product	12/33	0.5424	4.740%
Price	6/33	0.3499	5.207%
Distribution	10/33	0.5198	4.632%
Promotion mix	5/33	0.2899	4.546%
waMdeR(t) = 0.4623		*MrE(t) = 4.78125%	

*_**MrE(t)** denotes the arithmetic mean of mean relative errors for *waMdeR[i]*.

development of the confectionery industry, especially for a developed country like Poland. It should be underlined that this ratio is burdened with estimation error. However, taking into account that the assumed level of accuracy $d \leq 0.08$ for the survey assumes less than plus minus eight percent of relative error margin, and the arithmetic mean of mean relative errors for $waMdeR^{(i)}$ i.e. $MrE(t) = 4.78\%$, the total mean relative estimation error for this examination ($TMeE$) should not exceed 13.164%, accurately $TMeE<0.1316375$. Thus, the following estimation interval for this examination can be presented as $0.401444 \leq waMdeR(t) \leq 0.523156$. Then, the best situation $waMdeR(t) \approx 0.5232$, still presents a rather poor sustainable marketing mix performance in relation to sustainable development of the Poland's confectionery industry. Noticeably, the ultimate value of $waMdeR(t)$ depends significantly on the assumed importance of considered elements of the sustainable marketing mix.

As the examination fundamentally is based on qualitative data obtained from survey's questionnaire which quantifies it through the elaborated methodology it was decided to support the above presented research outcome with a compact case-based quantitative analysis of sustainable performance for a few selected international companies also operating on Poland's market.

Thus, the percentage values of the achieved effects from the implementation of sustainable activities in the area of confectionery production are presented below in Table 19. Those values concern the period of the last two years i.e. 2018–2019, and come from official reports published on the websites of companies [37–39,57–60].

The first analyzed factor is the reduction of CO2 emissions in the production activities of enterprises. The emissions reduction ranges from 3.5% for Mars to 40% for Ferrero. The presented values are characterized by a large range. In other enterprises, the reduction of CO2 emissions in production processes ranges from 14–15% to 25–34%. In this case, the presented values are at a similar level. Note the performance of Nestle—34% and Ferrero at 40%, which are significant figures compared to the rest of the companies.

Another important factor taken into account in the sustainable production activities of selected companies is the use of water in production processes. The implemented pro-environmental measures allow to reduce water consumption from 10% in companies such as Mondelez and Lindt, up to 20% in Mars and 35% in Nestle. The indicated values are at a similar level and do not differ significantly from each other.

In the confectionery production processes, in addition to CO2 emissions and water consumption, occurs also production of manufacturing waste. The data for selected business units indicates that the level of reduction of production waste ranges from 20% to 96%. There is a quite big discrepancy here. Mondelez declares a waste reduction of 20%, Lindt 50%, Cemoi Chocolatier 90%, and Nestle 96% waste reduction, which should be emphasized. This is a very

Table 19. Effects in percentage points of the implementation of sustainable activities in selected companies of the confectionery industry for 2018–2019.

Firm's Name	Mondelez	Ferrero	Mars	Lindt	Cemoi Chocolatier	Nestle	Maspex
Reduction of CO2 emissions from production activities	15	40	3.5	14	–	34	25
Water consumption reduction	10	–	20	10	–	35	–
Reducing the amount of waste in production process	20	–	–	50	90	96	–
Own production of electricity from renewable sources	–	18	–	39	30	–	15
The use of packaging made fully or partially of recycled raw materials	90	100	90	90	78	87	97
Sugar reduction	1	–	–	–	20	5	–
Palm oil reduction	1	–	–	–	90	15	–

Source: [37–39,57–60].

https://doi.org/10.1371/journal.pone.0240893.t019

good result that allows us to conclude that Nestle strives to completely eliminate production waste accompanying the confectionery production processes.

The fourth factor that takes into account sustainable production activities in the confectionery industry is obtaining electricity from renewable sources. The achieved values range from 15–18% (Maspex/Ferrero) to 30–39% (Cemoi Chocolatier/Lindt). None of the analyzed enterprises exceeded the level of 50% of obtaining electricity from renewable sources used in production processes. This means that companies in the confectionery industry mainly use energy obtained from fossil fuels, which leaves the so-called carbon footprint.

A serious problem in the production activities of the confectionery industry and, more broadly, the food industry is the issue of packaging. For this reason, enterprises undertake activities aimed at minimizing the negative impact of packaging on the natural environment. Such an activityis the use of packaging made of fully or partially recycled raw materials. The obtained data jump to a high level of these activities, ranging from 78% to 100% of the used packaging from recycled raw materials. The use of packaging at the level of 100% was declared by Ferrero, the result was 97% by Maspex, 90% by Mondelez, Mars, Lindt, 87% by Nestle and 78% by Cemoi Chocolatier.

In addition to environmental issues, the sustainable production activities of the confectionery industry also include social issues, including the impact of confectionery consumption on health. The main ingredient used in the production of confectionery products is sugar. The available data shows that the reduction of sugar in products ranges from 5% for Nestle to 20% for Cemoi Chocolatier.

Another negative ingredient used in the production of confectionery products is palm oil. The reduction of palm oil at Cemoi Chocolatier is as much as 90%, while Nestle declares only 15% unit reduction of palm oil in its confectionery products, while at Mondelez, the reduction of sugar and oil is merely1%.

Discussion

It is claimed by various scientists and researchers [61–66] that there has been a growing interest in corporate social responsibility (CSR) and sustainable marketing, including sustainable marketing mixin the last decade. However, the literature research carried out by the authors of this article indicates a scarcity of research concerning sustainable marketing. Only a few books [2,12,67–72] and a few relatively recent research papers [16,73–77] devoted to this concept can be recognized herein. The modest scientific achievements in the field of sustainable marketing and sustainable marketing mix are not the result of downplaying or disregarding this area of knowledge. The reasons for this situation should be seen in the fact that sustainable marketing, which includes sustainable marketing mix, is a new and emerging area of science that requires further supplementation and improvement through both theoretical and empirical research. The poor state of knowledge indicates the emergence of research problems that require identification and analysis. When reviewing the literature in terms of sustainable marketing mix of the food and drinkindustry, one should recognize the impact of Rudawska's publication [78]. The study presents an analysis of the concept of sustainable marketing forthe food and drink industry enterprises in six European countries using the extended formula from 4P to 5P including employees.

Sustainable marketing mix of consumption industry enterprises includes four instruments of marketing impact on customers—sustainable product, price, distribution and promotion mix. Appropriate management of marketing mix tools by managers of consumption industry enterprises is aimed at ensuring not only economic benefits, but also environmental and social goals. Taking into account triple bottom line values [9,12,79] by an organization means real

building of financial, natural and social capital based on the concept of sustainable development [80]. However, researchers' observations show that triple bottom line is not a universally dominant business model in manufacturing companies [16,81–83].

The main tool in the strategy of sustainable marketing mix of consumption industry enterprises is the product. The essence of a sustainable product is determined by Fuller [72]. The author claims that the sustainable product has ecological features that were created thanks to decisions on the method of production, use of materials from which the product was made, mode of operation, time of operation, distribution, usage and the possibility of product withdrawal in the final life cycle. The author also describes the sustainable product as *green product*. Martin and Schouten [67] believe that a sustainable product requires responsibility on the part of the company. They say that the term 'sustainable' depends on how the product is managed through its understanding, controlling and communicating of its environmental effects, its lifetime health and safety i.e. from the moment of its manufacturing to discarding or reusing it.

Leitner [70] presents his position on the nature of sustainable products. He believes that a sustainable product is burdening the environment to a lesser extent. Leitner points out that sustainable products that take into account social aspects and customers' needs will better meet the expectations of buyers than conventional offers. Kadirov [71] claims that from the point of view of original system thinking, existing marketing concepts appear to be insufficient. The author points out that many marketing concepts develop alternative frameworks in trading systems. An example of such a system that creates sustainable products is the sale of hybrid cars. Such activities provide an alternative basis for redefining the basic macro marketing problems that should be particularly useful for system designers and decision makers. Belz and Peattie [68,69] also express their view on the essence of a sustainable product. According to them, these are goods that meet the needs of customers and significantly improve social and environmental performance throughout the entire product life cycle compared to conventional or competitive offers. Peattie [83] presents a similar interpretation of a sustainable product.

Sustainable products provide customers satisfaction with their purchase and consumption. Satisfying needs by purchasing a specific consumption product is not just about taste. The buyer who is not indifferent to social aspects, including the impact of consumption on human health, also pays attention to the product's raw material composition, in particular to ingredients and substances affecting his health [1].

The dual concentration of the product covering environmental and social aspects is also important. Food production is accompanied by environmentally burdensome manufacturing processes, distribution of finished products to final destinations, packaging, and possible disposal and recycling options. In addition to the ecological factors indicated, the buyer of the product is not indifferent to social problems that could be associated with food production [84]. Sustainable consumption productsarecharacterized by social properties, such as decent working conditions where the product was produced, a policy of purchasing raw materials for production, and/or a remuneration system for employees. Therefore, double concentration covers the environmental and social values of sustainable products. Food industry companies must constantly provide customers with coherent values and benefits, both ecological and social, which they receive by purchasing said products. This is associated with continuous improvement of the product offer so that it is attractive and strengthens customers in the belief that the products they buy are manufactured with a sense of environment responsibility and are not a cause of social problems. Buyers expect ethical behavior, good quality, safe and healthy products, ecological packaging, reliable information and fair advertising, clear complaint procedures, and response to social needs [85,86].

Continuous improvement of the product offer leads to an increase in the company's market competitiveness. In addition to attractive product prices, innovation, good quality or easy availability at the point of sale, the manufacturer's openness to the environmental and social aspects of offered products will undoubtedly be contributing attributes in achieving competitive advantage. Emphasizing the importance of conducting sustainable production and commercial activities will certainly contribute to achieving planned economic goals [85]. Examination in this paper indicates that importance of conducting sustainable production from the perspective of the Poland's confectionery industry is merely slightly above the middle of the scale from zero to one i.e. 0.5424 with relative error ±13.12%.

An important element in assessing marketing mix ventures in relation to the sustainable development of the consumption industry is the aspect of food prices. Sustainable product pricing is not an easy task, because the price of the product should not only include the manufacturer's revenues and financial outlays incurred in the production of said goods, but also should take into account the environmental and social costs associated with production, sale and disposal of expired or damaged food products. In addition, the difficulty in setting sustainable prices is compounded by the belief that sustainable products must cost more because their production and sales involve environmental and social aspects, which entails additional investments [87]. Consumer objections to higher prices for sustainable products are not fully justified. Buyers of food products objecting to the inclusion of environmental and social costs in the price of the product show an egoistic attitude, considering only their own benefits- in this case financial—forgetting about future generations and their opportunities for development. Martin and Schouten [67] argue that balanced price takes full account of the costs of production and marketing, not only in economic terms, but also in environmental and social terms, ensuring consumer benefit and profit for the producer.

For many consumers of food products, sustainability is a secondary factor and is not taken into account when shopping. In most confectionery companies, product pricing strategies are created for the customers and focused on providing them with financial benefits. Therefore, social and ecological aspects play a small role in the product pricing process. Such actions are particularly visible when the seller is facing the need in maintaining a relatively large market with high and strong competition. The issue of setting sustainable prices for confectionery products raises controversy and is the subject of discussions undertaken by marketing managers and consumers. Usually, higher prices of sustainable confectionery products are also a serious obstacle to the full implementation of sustainable economic activity by confectionery enterprises. Higher prices for sustainable products limit demand which conflicts with the economic interests of food producers. Despite opposition and unfavorable opinions of most consumer groups, efforts should be made to increase interest and accept prices for sustainable products [76]. However, examination in this paper indicates that Poland, as a developed country, cannot be perceived as a good example of marketing mix performance from the perspective of price as one of its elements in the sustainable development of the food industry as represented by Poland's confectionery industry. The examination indicates that this area positions itself below the middle of a scale from zero to one, at a level of 0.3499 with relative error of ±13.63%.

Distribution, as another element of marketing mix, plays a very important role in sustainable marketing activity of consumption industry enterprises. The main task of sustainable distribution of food products is to effectively deliver products desired by buyers to agreed places at the right time, while maintaining product integrity in terms of quality. The essence of sustainable distribution is therefore ecological and social aspects relating to infrastructure, with particular emphasis on activities such as transport and storage [88]. Consumption industry companies have a wide range of instruments at their disposal to implement the concept of

sustainable food distribution. One of the main activities in this area is the selection of sustainable means of transport. Hybrid, electric or hydrogen powered vehicles are considered environmentally friendly and do not cause serious damage to nature. However, the use of these means of transport is not a commonly used practice among food producers in the country under study. The main means of transport are both passenger and heavy motor vehicles powered by liquid fuels such as gasoline and diesel.

Distribution activities focused on sustainable development, regardless of the means of transport used, should assume that the selection of routes will shorten delivery time, which translates into reduction of fuel consumption, thus reducingdelivery cost of consumption products and prices for product purchases in a shop. One way of reducing the negative impact of distribution on the environment is to shorten the distance that the product travels by creating local supply chains. Before a manufactured food product reaches its final recipients, it passes through a complex network of interconnected intermediary links. These cells are grouped in various combinations that form distribution channels [89].

Sustainable distribution of consumption products requires a change in the approach to environmental protection and participants' social attitudesinvolved in distribution processes. Already at the management level, there is a need to change the way of thinking about the essence of distribution in a sustainable aspect. Sustainable distribution, in addition to efficiently delivering products desired by buyers to agreed places at the right time while maintaining product integrity in terms of quality, takes into account ecological and social aspects. One of the ways ofcontributing to sustainable distribution activities is to limit to a necessary minimum the intermediaries involved in delivering the product. Too many intermediaries contribute to the price of the product and expose the product to damage when passing it on to the next intermediary. Means of transport should be modern and interfere with the natural environment as little as possible. Hybrid or electric vehicles do not cause emissions to the atmosphere and are environmentally friendly. The social and ecological sensitivity of people involved in the movement of goods is also important for distribution processes [77,90]. Examination in this paper indicates that importance of conducting sustainable distribution from the perspective of the Poland's confectionery industry is slightly above the middle of the scale from zero to one i.e. 0.5198 with relative error of ±13%.

Sustainable promotion mix is the fourth instrument of sustainable marketing mix which includes advertising, direct marketing, sales promotion, personal promotion and public relations. Sustainable promotion mix should support a company's activities focused on sustainable development. Activating the sale of food products through the use of mix promotion should take into account the triple bottom line values i.e. it should be focused on social, environmental and economic goals. Peattie [83] notes that effective communication is not just a matter of sending positive news about eco-activities. It requires involvement in a dialogue regardinga company's activities and the environment. Fuller [72] associates sustainable marketing promotion mix with marketing communication that serves as information support for various pollution prevention and resource recovery strategies.

The use of sustainable mix promotion by consumption industry companies provides food producers with extensive opportunities to communicate with market participants. Promotional messages addressed to buyers of food products are usually designed to inform and persuade customers to buy, and also fulfill the function of reminding of the manufacturer's offer. The content transmitted in sustainable promotional messages calls for the purchase of pro-ecological and pro-social products, informs the potential buyer about the sustainable nature of the enterprise itself, and also shapes the image of the organization as a friendly and caring company. Promotional messages transmitted through sustainable promotion mix take the

form of appeals. It is claimed [68,69] that every marketing message has an appeal that tries to get recipients to respond. The authors indicate three types of appeals:

- rotational appeal, which may, for example, concern organic food by presenting it as healthier, with low calorie level, making it more economical for the consumer;

- an emotional appeal that seeks to create an emotional bond with the consumer;

- a moral appeal regarding the human sense of right and wrong.

A similar view on advertising appeals is expressed by Martin and Schouten [67] which distinguish rational, emotional and hybrid appeals resulting from a combination of rational and emotional advertising appeals. Activating sales through a sustainable mix promotion can contribute to more sustainable behavior not only of the consumption industry enterprises, but also of the food buyers themselves. Sustainable enterprise communication focused on selling products not only takes into account the financial aspects of an organization, but also considers environmental and social factors first [82,84,85,87,89–91]. Examination in this paper indicates that this element of marketing mix takes the lowest performance rank in the perspective of sustainable development of the Poland's confectionery industry. The research shows that this area must be evaluated as poorly performed, with its intensity on a scale from zero to one, on the level 0.2899 with relative error of ±12.91%.

At best, the total weighted average mean development ratio for performance of all elements of marketing mix i.e. $waMdeR(t) \approx 0.5232$ presents a rather poor marketing mix performance in relation to sustainable development of the Poland's confectionery industry as a representative of the Polish food market. On the other hand, the analysis of the state of knowledge clearly indicates that more and more space is devoted to the issues of sustainable marketing mix. Issues related to the important area of sustainable marketing mix of food products are particularly important due to their impact on the four components of the marketing composition on the natural environment and society.

Conclusions

As a result of the researchconcerning the actual situation on thefood market, as well as the study of the literature on the subject and the analysis with evaluation of empirical research within Poland's confectionery industry, the objective of the research in this paper has been achieved.

Theoretical considerations, conclusions and analysis of research results contained in the research paper do not fully solve the subject matter. Therefore, the search for new and creative solutions aimed at reconciling the economic development of food industry enterprises as well as other economic entities with ecological and social values remains an open issue [92–94]. Sustainable marketing mix, as one of the elements of sustainable marketing, is in the developmental phase and requires further scientific exploration and work aimed at improving its procedures [15,95].

The article is addressed to practitioners and theoreticians dealing with the issues of sustainable marketing, with particular emphasis on sustainable marketing mix. The paper focuses on both theoretical and practical areas of consumption products marketing mix based on the principles of sustainable development. In accordance with the adopted research objective, the research hypothesis was formulated and evaluated. The empirical research conducted within enterprises of the confectionery industry confirmed the research hypothesis. The study may serve as support for food industry enterprises and manufacturing enterprises operating in other sectors of the economy in pursuit of set economic, environmental and social goals.

Supporting information

S1 Table. The Questionnaire's template.
(PDF)

S2 Table. Database Q_1-Q_{12}. Q_i denotes question's number which relates to question numbers in S1 Table that also contains their essence.
(PDF)

S3 Table. Database Q_{13}-Q_{18}& Q_{29}-Q_{33}. Q_i denotes question's number which relates to question numbers in S1 Table that also contains their essence.
(PDF)

S4 Table. Database Q_{19}-Q_{28}. Q_i denotes question's number which relates to question numbers in S1 Table that also contains their essence.
(PDF)

Acknowledgments

Author Contributions

Conceptualization: Pawel Tadeusz Kazibudzki, Tomasz Witold Trojanowski.

Data curation: Tomasz Witold Trojanowski.

Formal analysis: Pawel Tadeusz Kazibudzki, Tomasz Witold Trojanowski.

Investigation: Pawel Tadeusz Kazibudzki.

Methodology: Pawel Tadeusz Kazibudzki, Tomasz Witold Trojanowski.

Resources: Tomasz Witold Trojanowski.

Writing – original draft: Pawel Tadeusz Kazibudzki, Tomasz Witold Trojanowski.

Writing – review & editing: Pawel Tadeusz Kazibudzki.

References

1. Govindan K. Sustainable consumption and production in the food supply chain: A conceptual framework. Int J Prod Econ. 2018; 195: 419–431. Available: https://ideas.repec.org/a/eee/proeco/v195y2018icp419-431.html.

2. Martinez MG. Open Innovation in the Food and Beverage Industry. Elsevier; 2013.

3. Komiyama H, Takeuchi K. Sustainability science: building a new discipline. Sustain Sci. 2006; 1: 1–6. https://doi.org/10.1007/s11625-006-0007-4

4. Ottman JA. The new rules of green marketing: strategies, tools, and inspiration for sustainable branding. San Francisco, California: Berrett-Koehler Publishers, Inc; 2011.

5. Pape J, Rau H, Fahy F, Davies A. Developing Policies and Instruments for Sustainable Household Consumption: Irish Experiences and Futures. J Consum Policy. 2011; 34: 25–42. https://doi.org/10.1007/s10603-010-9151-4

6. Oreskes N, Conway EM. Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming. A&C Black; 2011.

7. Heath MTP, Chatzidakis A. 'Blame it on marketing': consumers' views on unsustainable consumption. Int J Consum Stud. 2012; 36: 656–667. https://doi.org/10.1111/j.1470-6431.2011.01043.x

8. Goi CL. A Review of Marketing Mix: 4Ps or More? Int J Mark Stud. 2009; 1: 1–14. https://doi.org/10.5539/ijms.v1n1p2

9. Glavas A, Mish J. Resources and Capabilities of Triple Bottom Line Firms: Going Over Old or Breaking New Ground? J Bus Ethics. 2015; 127: 623–642. https://doi.org/10.1007/s10551-014-2067-1

10. Möller K. The Marketing Mix Revisited: Towards the 21st Century Marketing by E. Constantinides. J Mark Manag. 2006; 22: 439–450. https://doi.org/10.1362/026725706776861181

11. Popovic D. Modelling the marketing of high-tech start-ups. J Target Meas Anal Mark. 2006; 14: 260–276. https://doi.org/10.1057/palgrave.jt.5740186

12. Emery B. Sustainable marketing. Harlow: Pearson; 2012.

13. Choi Y, Jin J. Is the Web Marketing Mix Sustainable in China? The Mediation Effect of Dynamic Trust. Sustainability. 2015; 7: 13610–13630. https://doi.org/10.3390/su71013610

14. Hunt SD. Sustainable marketing, equity, and economic growth: a resource-advantage, economic freedom approach. J Acad Mark Sci. 2011; 39: 7–20. https://doi.org/10.1007/s11747-010-0196-3

15. Lim WM. A blueprint for sustainability marketing: Defining its conceptual boundaries for progress. Mark Theory. 2016; 16: 232–249. https://doi.org/10.1177/1470593115609796

16. Kemper JA, Hall CM, Ballantine PW. Marketing and Sustainability: Business as Usual or Changing Worldviews? Sustainability. 2019; 11: 780. https://doi.org/10.3390/su11030780

17. Expert Tool. 2019 [cited 27 Feb 2020]. http://qsp.decisiontool.net/.

18. Tomashevskii I, Tomashevskii D. A non-heuristic multicriteria decision-making method with verifiable accuracy and reliability. J Oper Res Soc. 2019; 0: 1–15. https://doi.org/10.1080/01605682.2019.1650621

19. Allen MJ, joint author Yen Wendy M. Introduction to measurement theory. Monterey, Calif Brooks/Cole Pub. Co; 1979. https://trove.nla.gov.au/work/8605201.

20. Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. Niger Postgrad Med J. 2015; 22: 195–201. https://doi.org/10.4103/1117-1936.173959 PMID: 26776330

21. Litwin M. How to Measure Survey Reliability and Validity. Thousand Oaks, California; 2020. https://doi.org/10.4135/9781483348957

22. Allen IE, Seaman CA. Likert scales and data analyses. Qual Prog. 2007; 40: 64–65.

23. Carré F, Girard MC. Quantitative mapping of soil types based on regression kriging of taxonomic distances with landform and land cover attributes. Geoderma. 2002; 110: 241–263. https://doi.org/10.1016/S0016-7061(02)00233-1

24. Izsak C, Price ARG. Measuring b-diversity using a taxonomic similarity index, and its relation to spatial scale. Mar Ecol Prog Ser. 2001; 215: 69–77. https://doi.org/10.3354/meps215069

25. Jarzyna MA, Jetz W. Taxonomic and functional diversity change is scale dependent. Nat Commun. 2018; 9: 1–8.

26. Hao M, Ganeshaiah KN, Zhang C, Zhao X, von Gadow K. Discriminating among forest communities based on taxonomic, phylogenetic and trait distances. For Ecol Manag. 2019; 440: 40–47. https://doi.org/10.1016/j.foreco.2019.03.006

27. Likert R. A technique for the measurement of attitudes. Arch Psychol. 1932; 22: 5–55.

28. Brown JD. Using surveys in language programs. Cambridge: Cambridge University Press; 2001. https://trove.nla.gov.au/version/43978589.

29. Jamieson S. Likert scales: how to (ab)use them. Med Educ. 2004; 38: 1217–1218. https://doi.org/10.1111/j.1365-2929.2004.02012.x PMID: 15566531

30. Wu H, Leung S-O. Can Likert Scales be Treated as Interval Scales?—A Simulation Study. J Soc Serv Res. 2017; 43: 527–532. https://doi.org/10.1080/01488376.2017.1329775

31. Martin J. Design of man-computer dialogues. Englewood Cliffs: Prentice-Hall; 1973.

32. Miller GA. The magical number seven plus or minus two: some limits on our capacity for processing information. Psychol Rev. 1956; 63: 81–97. https://doi.org/10.1037/h0043158 PMID: 13310704

33. Dyer RF, Forman EH. An analytic approach to marketing decisions. Englewood Cliffs: Prentice-Hall; 1991.

34. Dyer JS. Remarks on the Analytic Hierarchy Process. Manag Sci. 1990; 36: 249–258. https://doi.org/10.1287/mnsc.36.3.249

35. Forman EH, Gass SI. The Analytic Hierarchy Process: An Exposition. Oper Res. 2001; 49: 469–486. Available: https://www.jstor.org/stable/3088581.

36. Fan T, Xue DQ. Sustainable Development of Cultural Industry in Shaanxi Province of Northwest China: A SWOT and AHP Analysis. Sustainability. 2018; 10: 2830. https://doi.org/10.3390/su10082830

37. 2018 CSR Report. The CEMOI Group; 2019 pp. 1–23. https://group.cemoi.com/wp-content/uploads/sites/7/2019/07/Cemoi-rapport-RSE-2018-GB-web.pdf.

38. 2018 Impact Report. Mondelez International, Snacking Made Right; 2019 pp. 1–46. https://www.mondelezinternational.com/~/media/MondelezCorporate/uploads/downloads/2018_Impact_Progress_Report.pdf.

39. Sustainability Report 2019. Lindt & Spruengli; 2020 pp. 1–61. https://www.lindt-spruengli.com/fileadmin/user_upload/corporate/user_upload/Sustainably/Lindt___Spruengli_Sustainability_Report_2019_EN_website.pdf.

40. Larsson SC, Bergkvist L, Wolk A. Consumption of sugar and sugar-sweetened foods and the risk of pancreatic cancer in a prospective study. Am J Clin Nutr. 2006; 84: 1171–1176. https://doi.org/10.1093/ajcn/84.5.1171 PMID: 17093171

41. Kłosiewicz-Latoszek L, Cybulska B. Cukier a ryzyko otyłości, cukrzycy i chorób sercowo-naczyniowych. 2011; 92: 181–186.

42. FDI policy statement on dietary free sugars and dental caries: Adopted by the FDI General Assembly: 24 September 2015, Bangkok, Thailand. IDJ Int Dent J. 2016; 66: 9–10. https://doi.org/10.1111/idj.12232 PMID: 26803942

43. World Health Organization, Nutrition for Health and Development. Guideline: sugars intake for adults and children. World Health Organization; 2015. file:///C:/Users/Admin/AppData/Local/Temp/9789241549028_eng-3.pdf.

44. Cichosz G, Czeczot H. Kwasy tłuszczowe izomerii trans w diecie człowieka. Bromatol Chem Toksykol. 2012; 45: 181–190. http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.agro-aa39dcf5-5cac-4eb4-9ef1-656d66ae17d7.

45. van Erp-baart M-A, Couet C, Cuadrado C, Kafatos A, Stanley J, van Poppel G. TransFatty Acids in Bakery Products from 14 European Countries: the TRANSFAIR Study. J Food Compos Anal. 1998; 11: 161–169. https://doi.org/10.1006/jfca.1998.0571

46. B A, J K. Potrzeba regulacji zawartości izomerów trans kwasów tłuszczowych w żywności. Żywność Nauka Technol Jakość. 2007;14: 5–14. http://agro.icm.edu.pl/agro/element/bwmeta1.element.agro-3e49847b-8f6f-44a3-8588-a71357a4d02a.

47. Thurstone LL. A law of comparative judgment. Psychol Rev. 1927; 34: 273–286. https://doi.org/10.1037/h0070288

48. Saaty TL. Decision making for leaders: the analytic hierarchy process for decisions in a complex world. Pittsburgh, Pa.: RWS Publ.; 2001.

49. Saaty TL. Relative measurement and its generalization in decision making why pairwise comparisons are central in mathematics for the measurement of intangible factors the analytic hierarchy/network process. RACSAM—Rev Real Acad Cienc Exactas Fis Nat Ser Mat. 2008; 102: 251–318. https://doi.org/10.1007/BF03191825

50. Fechner GT. Elemente der psychophysik. Leipzig: Breitkopf und Härtel; 1860. http://books.google.com/books?id=FDEFAQAAIAAJ.

51. Tomashevskii IL. Eigenvector ranking method as a measuring tool: Formulas for errors. Eur J Oper Res. 2015; 240: 774–780. https://doi.org/10.1016/j.ejor.2014.07.050

52. Condorcet J-A-N de C (1743–1794; marquis de) A du texte. Essai sur l'application de l'analyse à la probabilité des décisions rendues à la pluralité des voix ([Reprod.])/par M. le marquis de Condorcet,…1785. https://gallica.bnf.fr/ark:/12148/bpt6k417181.

53. Orbán-Mihálykó É, Mihálykó C, Koltay L. A generalization of the Thurstone method for multiple choice and incomplete paired comparisons. Cent Eur J Oper Res. 2019; 27: 133–159. https://doi.org/10.1007/s10100-017-0495-6

54. Kazibudzki PT, Křupka J. Pairwise judgments consistency impact on quality of multi-criteria group decision-making with AHP[S1]. EM Ekon Manag. 2019; 22: 195–212. https://doi.org/10.15240/tul/001/2019-4-013

55. Dong Y, Xu Y, Li H, Dai M. A comparative study of the numerical scales and the prioritization methods in AHP. Eur J Oper Res. 2008; 186: 229–242. https://doi.org/10.1016/j.ejor.2007.01.044

56. Starczewski T. Remarks on the impact of the adopted scale on the priority estimation quality. J Appl Math Comput Mech. 2017; 16: 105–116. https://doi.org/10.17512/jamcm.2017.3.10

57. MARS—Sustainable in a Generation Plan. MARS; 2020 pp. 1–3. https://gateway.mars.com/m/26d993548d6c3678/original/Mars-SIGP_Scorecard.pdf.

58. Maspex Wadowice Group—juices, nectars, drinks, pasta and instant products. [cited 24 Sep 2020]. https://en.maspex.com/csr,care-for-natural-environment-and-companys-ecological-activities,7.html.

59. Wspólne wartości by tworzyć wartość. Grupa Ferrero; 2019 pp. 1–123. https://s3-eu-west-1. amazonaws.com/ferrero-static/globalcms/documenti/3804.pdf.

60. Creating Shared Value and meeting our commitments. Nestlé. Enhancing quality of life and contributing to a healthier future. Nestle; 2020 pp. 1–58. https://www.nestle.com/sites/default/files/2020-03/ creating-shared-value-report-2019-en.pdf.

61. Pomering A. Communicating CSR Through Corporate Image Advertising. In: Diehl S, Karmasin M, Mueller B, Terlutter R, Weder F, editors. Handbook of Integrated CSR Communication. Cham: Springer International Publishing; 2017. pp. 171–190. https://doi.org/10.1007/978-3-319-44700-1_10

62. Pomering A. Marketing for sustainability: Extending the conceptualisation of the marketing mix to drive value for individuals and society at large. Australas Mark J AMJ. 2017; 25: 157–165. https://doi.org/10. 1016/j.ausmj.2017.04.011

63. Pomering A, Johnson LW. Advertising corporate social responsibility initiatives to communicate corporate image. Corp Commun Int J. 2009; 14: 420–439. https://doi.org/10.1108/13563280910998763

64. Pomering A, Johnson LW. Building Sustainability into Services Marketing: Expanding Decision-Making from a Mix to a Matrix. Sustainability. 2018; 10: 2992. https://doi.org/10.3390/su10092992

65. Amin-Chaudhry A, Pomering A, Johnson LW. Incorporating the Concepts of Sharing-In and Sharing-Out in CSR: Australian Consumers' Perspective. Sustainability. 2019; 11: 2586. https://doi.org/10. 3390/su11092586

66. Noble G, Pomering A, Johnson L. W. Gender and message appeal: their influence in a pro-environmental social advertising context. J Soc Mark. 2014; 4: 4–21. https://doi.org/10.1108/JSOCM-12-2012-0049

67. Diane Martin, John Schouten. Sustainable marketing. Upper Saddle River, N.J.: Prentice Hall; 2012.

68. Belz F-M, Peattie K. Sustainability marketing a global perspective. Hoboken (NJ): John Wiley and Sons; 2010.

69. Peattie K, Belz F-M. Sustainability marketing—An innovative conception of marketing. Mark Rev St Gallen. 2010; 27: 8–15. https://doi.org/10.1007/s11621-010-0085-7

70. Leitner KE. Balanced Sustainability Marketing How a Fish Processor Deals with the Shortage of a Natural Resource. Saarbrücken: Südwestdeutscher Verlag für Hochschulschriften; 2012. http://nbn-resolving.de/urn:nbn:de:101:1-201204021972.

71. Kadirov D. Sustainability of marketing systems: systeming interpretation of hybrid car manufacturer and consumer communications. Doctoral, University of Waikato. 2008. https://hdl.handle.net/10289/2546.

72. Fuller DA. Sustainable marketing: Managerial—ecological issues. Thousand Oaks, Calif.: SAGE; 1999.

73. Jones P, Clarke-Hill C, Comfort D, Hillier D. Marketing and sustainability. Mark Intell Plan. 2008; 26: 123–130. https://doi.org/10.1108/02634500810860584

74. Jianu I, Ţurlea C, Guşatu I. The Reporting and Sustainable Business Marketing. Sustainability. 2016; 8: 23. https://doi.org/10.3390/su8010023

75. Solér C. Conceptualizing Sustainably Produced Food for Promotional Purposes: A Sustainable Marketing Approach. Sustainability. 2012; 4: 294–340. https://doi.org/10.3390/su4030294

76. Garnett T. Food sustainability: problems, perspectives and solutions. Proc Nutr Soc. 2013; 72: 29–39. https://doi.org/10.1017/S0029665112002947 PMID: 23336559

77. Todorovic V, Maslaric M, Bojic S, Jokic M, Mircetic D, Nikolicic S. Solutions for More Sustainable Distribution in the Short Food Supply Chains. Sustainability. 2018; 10: 3481. https://doi.org/10.3390/ su10103481

78. Rudawska E. The Sustainable Marketing Concept in European SMEs Insights from the Food and Drink Industry. 2018. https://www.emeraldinsight.com/doi/book/10.1108/9781787540385.

79. Muñoz-Pascual L, Curado C, Galende J. The Triple Bottom Line on Sustainable Product Innovation Performance in SMEs: A Mixed Methods Approach. Sustainability. 2019; 11: 1689. https://doi.org/10. 3390/su11061689

80. Kennedy EB, Marting TA. Biomimicry: Streamlining the Front End of Innovation for Environmentally Sustainable Products. Res-Technol Manag. 2016; 59: 40–48. https://doi.org/10.1080/08956308.2016. 1185342

81. Hall J, Wagner M. Integrating Sustainability into Firms' Processes: Performance Effects and the Moderating Role of Business Models and Innovation. Bus Strategy Environ. 2012; 21: 183–196. https://doi. org/10.1002/bse.728

82. Burlingame B. Grand Challenges in Nutrition and Environmental Sustainability. Front Nutr. 2014; 1. https://doi.org/10.3389/fnut.2014.00003 PMID: 25988107

83. Peattie K. Environmental marketing management: meeting the green challenge. Place of publication not identified: Pearson Education Print on Demand Edition; 2010.

84. Caputo P, Ducoli C, Clementi M. Strategies and Tools for Eco-Efficient Local Food Supply Scenarios. Sustainability. 2014; 6: 631–651. https://doi.org/10.3390/su6020631

85. Becot F, Conner D, Nelson A, Buckwalter E, Erickson D. Institutional Demand for Locally-Grown Food in Vermont: Marketing Implications for Producers and Distributors. J Food Distrib Res. 2014; 45: 1–19. https://doi.org/10.22004/ag.econ.186927

86. Lang T, Heasman M. Food wars: the global battle for mouths, minds and markets. Second edition. London; New York: Routledge Taylor & Francis Group: Earthscan from Routledge; 2016.

87. Alvandi S, Li W, Schönemann M, Kara S, Herrmann C. Economic and environmental value stream map (E2VSM) simulation for multi-product manufacturing systems. Int J Sustain Eng. 2016; 9: 354–362. https://doi.org/10.1080/19397038.2016.1161095

88. Gallo A, Accorsi R, Baruffaldi G, Manzini R. Designing Sustainable Cold Chains for Long-Range Food Distribution: Energy-Effective Corridors on the Silk Road Belt. Sustainability. 2017; 9: 2044. https://doi.org/10.3390/su9112044

89. Engelseth P. Developing Exchange in Short Local Foods Supply Chains. Int J Food Syst Dyn. 2016; 7: 229–242. https://doi.org/10.18461/ijfsd.v7i3.734

90. Derqui B, Fayos T, Fernandez V. Towards a More Sustainable Food Supply Chain: Opening up Invisible Waste in Food Service. Sustainability. 2016; 8: 693. https://doi.org/10.3390/su8070693

91. Marsden T. Sustainable food systems: building a new paradigm. 2014.

92. Berger-Walliser G, Scott I. Redefining Corporate Social Responsibility in an Era of Globalization and Regulatory Hardening. Am Bus Law J. 2018; 55: 167–218. https://doi.org/10.1111/ablj.12119

93. Woodford M. Inflation Targeting and Financial Stability. National Bureau of Economic Research, Inc; 2012 Apr. Report No.: 17967. https://econpapers.repec.org/paper/nbrnberwo/17967.htm.

94. Lewis R, Levy DE. Predicting a National Acid Rain Policy. In: Golden BL, Wasil EA, Harker PT, editors. The Analytic Hierarchy Process: Applications and Studies. Berlin, Heidelberg: Springer Berlin Heidelberg; 1989. pp. 155–170. https://doi.org/10.1007/978-3-642-50244-6_10

95. Schaltegger S, Hansen EG, Lüdeke-Freund F. Business Models for Sustainability: Origins, Present Research, and Future Avenues. Organ Environ. 2015; 29: 3–10. https://doi.org/10.1177/1086026615599806