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**Sustainable Business Practices: A New Model for Evaluating Firms within Specific
Industries**

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Sustainable Business Practices: A New Model for Evaluating Firms within Specific Industries

Sustainability and Sustainable Value have been prominent words in business for at least the last five to ten years. A standard dictionary defines sustainability as the “ability to be maintained at a certain rate or level.” Sustainable Value integrates the economic, environmental, and social dimension of sustainability. The Financial Times Lexicon (2021) goes on to say that business sustainability requires firms to adhere to the principles of sustainable development. According to the World Commission on Environment and Development (1987), sustainable development is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). So, for industrial development to be sustainable, it must address important issues at the macro level, such as: economic efficiency (innovation, prosperity, productivity), social equity (poverty, community, health and wellness, human rights), and environmental accountability (climate change, land use, biodiversity). As noted in “The Accounting Profession and Sustainability,” Barry Melancon supports the idea that there are various definitions of sustainability depending on one’s point of view (Melancon, 2017).

As corporations, governments, universities, and other entities come to the realization and understanding that “sustainability” and “sustainable value” are not the current “business inoculations” but enduring concepts, the old proverb, “Necessity is the mother of invention,” comes to the forefront. The driving force for new technologies and inventions to deal with the issues associated with sustainability is a recognized need. Some of the solutions may result in new businesses. The literature of the last two years is replete with examples; a few of the 2019 references will be mentioned herein.

Bomgarder (2019) reported that “food companies sustainability goals hinge on helping farmers improve soil health” (Bomgarder, 2019). Our categories 16, “Land Management,” and 17, “Sustainable Agriculture”, uncovered a broad array of related activities in the Food and Beverage Companies that were studied (Table II).

Technology is honing in on Green House Gases to reduce carbon dioxide (CO₂) and methane (CH₄) emissions by (1) capturing and using CO₂ as a feedstock in place of oil (Bourzac, 2019), (2) heating methane reformers (devices to convert methane to other useful chemicals) with electricity instead of the traditional combustion method (Bourzac, 2019), and (3) capturing carbon from carbon dioxide and methane before being emitted to the atmosphere, as well as extracting these from the atmosphere (Johnson, 2019). Our category 10, “Emissions Reduction” uncovered substantial activity across the spectrum of companies that were studied.

It was reported by Close Loop Partners that at last, firms possessed the technology to treat and convert plastics into renewed raw materials. The investment management firm points out that the renewed raw materials could result in business of \$120 billion annually (Peplow, 2019). In this regard, our categories 2, “Recycled Materials,” and 8, “Sustainable Packaging,” were rich in activities for the sample of firms. Another example of business growth stems from China’s ban on the importation of scrap wastepaper and plastic, which is driving investment in

U.S. plants that process recyclables (Esch, 2019). This shift away from China has resulted in abundant, low-cost paper scrap for paper mills and opportunities for plastic and metal recycling as well. Clearly, technology solutions for sustainability problems are not enough, rather it will be the emergence of profitable businesses based on the technologies that will be the enduring answer.

The authors' definition of Sustainable Development/Sustainability (which the authors use interchangeably) is the definition used in the Global Reporting Initiative (GRI) standards; namely, Sustainable Development/Sustainability is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability encompasses three dimensions: Economic, Environmental, and Social and refers to broader environmental and societal interests, rather than to the interests of specific organizations. The purpose of this paper is to examine sustainability in a business context and for this reason the authors have adopted a definition of business sustainability found in the Financial Times Lexicon (2021). It defines business sustainability as representing resiliency over time – businesses that can survive shocks because they are intimately connected to healthy economic, social and environmental systems (Financial Times Lexicon, 2021). These businesses create economic value and contribute to healthy ecosystems and strong communities.

In this article, the authors explore the status of sustainability efforts in the chemical, pharmaceutical, and food and beverage industries towards achieving sustainable value. We also separately assessed the performance of these industries within the categories of supply chain and ethics. Our backgrounds form the basis for our interest in the topic. One of us (GAM) is a Certified Sustainable Value Professional (CSVP) of the Rhode Island Society of Certified Public Accounts (RISCPA), while another (CJC) is a Certified Quality Engineer (CQE) of the American Society for Quality and a veteran of the industry, and a third (VJC) has extensive retail food experience. Based on an analysis of 94 Canadian reports from 2008, the authors found 585 different indicators. Thirty-one of the 94 reports included indicators explicitly identified as Global Reporting Initiatives (GRI) indicators (Roca & Searcy, 2012). Others found that, for the 31 chemical firms the authors studied, those firms with the more developed reporting and environmental activities were associated with poorer environmental compliance and greater toxic spills or releases (Delmas & Blass, 2010). This suggests that the metrics used to assess performance may either not be adequate or the trade-offs in making the assessments may lack transparency. The foregoing illustrates the challenge in comparing companies or even industries.

Purpose

The purpose of this paper is to present, and then use, a new and broadly applicable model to evaluate a firm's performance, and thus commitment to, achieving results in three specific areas related to sustainable development: (1) economic efficiency, (innovation, prosperity, and productivity), (2) social equity (poverty, community health and wellness, and human rights), and (3) environmental accountability (climate change, land use, and biodiversity). To accomplish this objective, the authors have developed a unique model with the following elements: (1) an extensive list of categories which encompass most, if not all, of the activities that firms engage in to promote sustainable development (See Table II), (2) a category ratings rubric, which ranks projects within each category (See Table I), and (3) a method for assigning a "score" to specific

firms within an industry. This research is intended to determine how individual firms within an industry compare to each other in terms of their commitment to sustainable development, as well as how the three industries studied compare to one another. To our knowledge, no such similar model to evaluate individual firm performance in the area of sustainability exists.

Methodology

The authors chose to start with three industries, with which we have a relatively high degree of familiarity. In future research, other industries will be examined using this same model. In addition, the authors examine whether higher firm score (indicating greater commitment to sustainability) is correlated with higher firm revenue. The authors believe that the unique ideas presented in this paper can be used by other researchers as a standard method to examine sustainable development in areas that interest them – government agencies, nonprofits, local municipalities, etc. The approach to the research was to select at least twenty (20) firms within each industry. In chemicals we selected 31 firms; in pharmaceuticals 28 firms; and in food and beverage 20 firms that had published their 2017 performance in 2018 (Fusaro, 2018). Then we identified the firms' publicly stated sustainability programs and/or projects that were available from the Corporate Social Responsibility Reports (CSR), websites, and other reports, annual reports, Sustainability Reports and website information. (These reports and websites are available upon request). The firms' efforts were rated according to the rubric shown in Table I. These efforts were categorized as shown in Table II, where, as mentioned in the "Purpose" paragraph, an extensive list of categories, which encompass most, if not all, of the activities that firms engage in to promote sustainable development. The authors use Environmental, Social and Governance (ESG) factors to evaluate companies on how far advanced they are with sustainability. How we created our unique rubric and use it to calculate a firm's score is discussed in this methodology section of the paper (*vide infra*). Individual firms, as well as investors, can use the results we present to guide investment decisions. Thus, we have a three-fold purpose. Firms can use our results to remain viable by being flexible and adaptable to dynamic and constantly changing environmental conditions. Researchers can use our results to categorize and rate the sustainable business practices of firms within industries that they chose to study. Investors can use our results to make portfolio investment decisions as they weigh the impact of sustainable business practices on a firm's financial performance.

Individual firm Sustainability Ratings were calculated based on the values in Table II by summing the values of a firm's A, B, C, and D efforts, where A = 4 points, B = 3 points, C = 2 points, and D = 1 point. The outcomes were compiled along with the revenue of each firm and were sorted to arrange the data from the highest sustainability rating to the lowest, which permits one to see if there is a relationship between the 2017 sustainability rating and the 2017 number of sustainability activities or financial performance in terms of revenue. Supply Chain and Supply Chain Management are important strategic areas of operations management and significantly affect a firm's sustainability and hence, its sustainable value. In view of the foregoing, the authors examined the supply chain component of each firm's sustainability program to see if it was being broadly addressed [Table II, Sustainability Category 18]. Another question arises, namely, are the three industries and the member companies acting ethically? The authors addressed this question by sorting the sustainability categories shown in Table II into two additional tables. One contains those sustainability categories that one would expect companies

to have significant efforts, as these are areas of financial savings, performance improvements, and high public visibility; and another, in which the ethical and moral sustainability efforts are emphasized because, as Kassel (2017) states, "...social, ethical and environmental issues [are becoming] prominent in the national dialogue [and] the investment strategy known as sustainable investing continues to grow."

Table I. Category Ratings Rubric

- Excellent [A] – Projects in this category are expected to have a short-term (3 – 5 years) impact* on both the community and the environment as well as the company.
- Good [B]– Projects in this category are expected to have an intermediate range (5 – 8 years) impact* on both the community and the environment as well as the company.
- Fair[C] – Projects in this category are expected to have a long-term (8 – 10 years) impact* on both the community and the environment as well as the company.
- Minor [D]– Projects in this category are beyond the strategic planning horizon for almost all companies and it is possible that they may never happen because of events such as acquisitions, divestitures, bankruptcy, etc.

*By "Impact," the authors mean that the project contributes to the improvement of one or more of the following: water quality, air quality, reduction of fossil fuel energy usage, consumer health, product safety, supply chain efficiencies, land usage, human rights, diversity and inclusion, among others.

Table II. Sustainability Categories

1. Renewable Energy (Solar, Wind, and Co-Generation) [A]
2. Recycled Materials [A]
3. Organically Grown Products [B]
4. Non-GMO Certifications [D]
5. Zero Waste/Waste Reduction [B]
6. Reducing Obesity [C]
7. Human Rights – Diversity and Inclusion [B]
8. Sustainable Packaging [A]
9. Water Use Reduction and/or Water Quality Improvement [A]
10. Emissions Reduction [A]
11. Consumer Health [B]
12. Workplace Initiatives [B]
13. Protecting Natural Resources [A]
14. Ingredients Labelling Transparency [C]
15. Responsible Marketing [B]
16. Land Management [A]
17. Sustainable Agriculture [A]
18. Sustainable Sourcing [A]
19. Animal Care/Animal Husbandry [A]
20. Product Safety and Security [A]

- 21. Sustainable Product Design and Development [A]
- 22. Impact on Local, National and/or Global Community [C]

Results and Discussion

Tables III A, III B, and III C present the calculated scores based on firms' sustainability activities using the categories ratings rubric (Table I) and the calculation described in the Methodology section. Sustainability ratings were plotted against sustainability activities in Figure 1, showing that there is a strong relationship between the number of activities and sustainability score (hereafter call Score); despite the range of point values for the 22 sustainability categories, as described in the Methodology section.

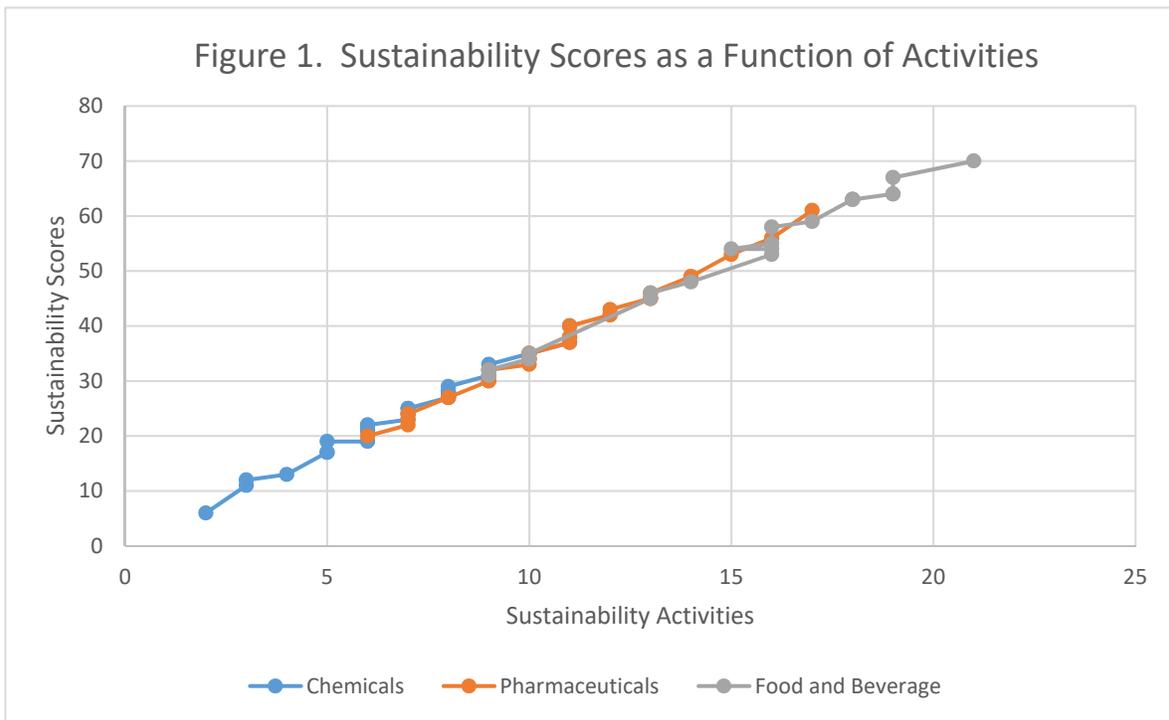


Table III. 2017 Sustainability Overall Sustainability Score, Activities, and Revenues**Table III A. Chemicals Industry**

Company Name	Score	No of Activities	Revenues (\$US M)
Bayer	40	11	\$10,823
E.I. DuPont de Nemours and Company	40	11	\$17,281
Exxon Mobil	38	11	\$28,694
The Linde Group	37	11	\$16,938
Lyondell Basell	33	9	\$28,319
Reliance Industries	32	9	\$17,555
Sinopec	31	9	\$55,323
Mitsubishi Chemical Holdings	29	8	\$26,422
Chevron Phillips Chemical	28	8	\$9,063
SK Innovation Company	28	8	\$8,272
Covestro	27	8	\$15,977
LG Chemicals	27	8	\$23,217
SABIC	27	8	\$37,620
Shin-Etsu Chemical	27	8	\$12,858
AkzoNobel	25	7	\$16,471
Royal Dutch Shell	25	7	\$13,435
BASF	24	7	\$69,195
Formosa Plastics Corporation	24	7	\$32,118
Air Liquide	23	7	\$22,617
Braskem	22	6	\$15,437
Yara International	22	6	\$11,347
Evonik Industries	21	6	\$16,294
Toray Industries	21	6	\$16,903
Dow Chemical Company	19	6	\$62,484
PPG Industries	19	5	\$14,750
Praxair	17	5	\$11,437
Solvay S.A.	17	5	\$12,308
INEOS	13	4	\$34,635
Mitsui Chemical	12	3	\$11,851
Sumitomo Chemical	11	3	\$14,572
Lotte Chemical	6	2	\$14,060

Table III B. Pharmaceuticals Industry

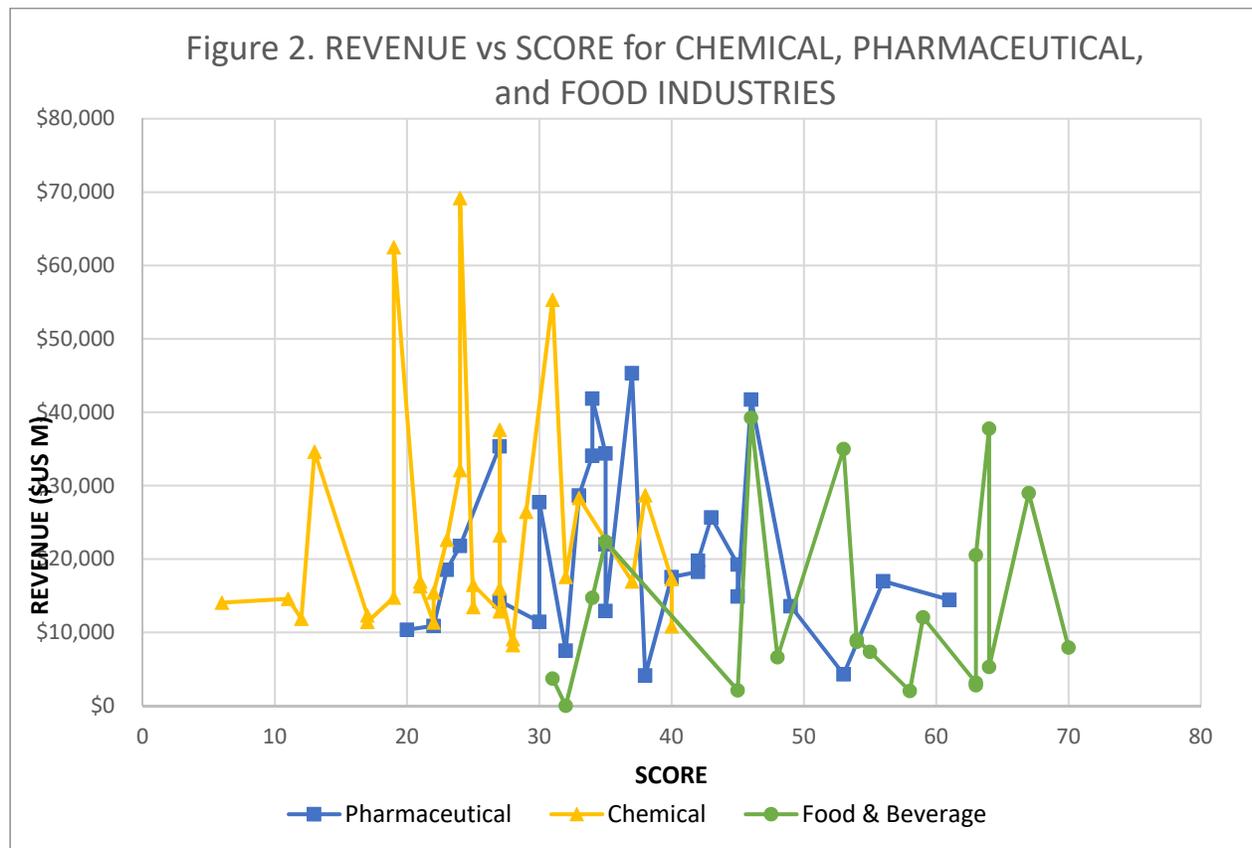
Company Name	Score	No. of Activities	Revenues (\$US M)
Shire	61	17	\$14,449
Novo Nordisk	56	16	\$16,971
Abbott Labs	53	15	\$4,287
Takeda	49	14	\$13,577
Roche	46	13	\$41,732
Allergan	45	13	\$14,906
Bristol-Myers Squibb	45	13	\$19,258
Gilead Sciences	43	12	\$25,662
AstroZeneca	42	12	\$19,782
Teva Pharmaceuticals	42	12	\$18,261
Bayer	40	11	\$17,544
Sun Pharma	38	11	\$4,147
Pfizer	37	11	\$45,345
Celgene	35	10	\$12,928
CR Pharmaceuticals	35	10	\$22,007
Johnson and Johnson	35	10	\$34,397
Novartis	34	10	\$41,875
Sanofi	34	10	\$34,078
Glaxo Smith Kline	33	10	\$28,668
CSL	32	9	\$7,522
AbbVie	30	9	\$27,743
Mylan	30	9	\$11,454
Boehringer Ingelheim	27	8	\$14,262
Merck	27	8	\$35,370
Amgen	24	7	\$21,795
Eli Lilly	23	7	\$18,532
Astellas Pharma	22	7	\$10,888
Biogen	20	6	\$10,355

Table III C. Food and Beverage Industry

Company Name	Score	No. of Activities	Revenues (\$US M)
Conagra	70	21	\$7,938
Nestle	67	19	\$28,991
Campbell	64	19	\$5,292
Tyson	64	19	\$37,760
Kraft Heinz	63	18	\$20,543
Maple Leaf	63	18	\$2,805
Pinnacle	63	18	\$3,144
General Mills	59	17	\$12,046
McCormick	58	16	\$2,024
Smucker	55	16	\$7,357
Cargill	54	15	\$9,000
Kellogg	54	16	\$8,710
Mars	53	16	\$35,000
Hershey	48	14	\$6,621
PepsiCo	46	13	\$39,237
Hood	45	13	\$2,100
Starbucks	35	10	\$22,387
Coca-Cola	34	10	\$14,727
Hodgson	32	9	N/A
Unilever	31	9	\$3,700

Tables III A, III B, and III C also display the overall sustainability score in descending order versus the revenue of each firm for the Chemical, Pharmaceutical, and Food and Beverage industries, respectively. Figure 2 displays revenue versus score and clearly illustrates that there doesn't appear to be a relationship between the two variables. It was anticipated that the higher scores would be associated with higher revenues, as these firms have more funds to deploy for sustainability activities. However, not all of a firm's revenue is attributable to sustainability projects. Further research will attempt to determine what portion of revenue is related to sustainability activities, although firms are not likely to disclose such information. If this data is secured, we may find a relationship between score and revenue. The authors note that others have attempted to assess financial performance associated with sustainable activities. For example, Briere et al. (2017) examined mutual fund performance as related to social responsibility, using the mutual funds as a surrogate for individual corporations.

The results show that the most engaged industry, in terms of the number of activities pursued, is the Food and Beverage Industry with a range from 9 to 21 activities per company spread over 20 companies. On the other hand, the Pharmaceutical Industry ranged from 6 to 17 per company spread over 28 companies, and the Chemical Industry from 1 to 11 activities per company spread over 31 companies. The authors suggest that the Food and Beverage leads the three industries because of its interface with end user consumers, as well as its distribution channels (retail outlets, distributors, and brokers). The Pharmaceutical Industry has a similar exposure, except to a lesser degree, because the end user is not as influential as the intermediary, which is the medical profession. The Chemical Industry on the other hand is virtually remote from the end user.



The results for category 18, “Sustainable Sourcing” (Tables IVA and IVB – Statistical Analysis), shows that the food industry firms were all involved in supply chain activities. However, only two-thirds of the pharmaceutical firms and slightly more than one-third of the chemical firms participated. The results for chemical and pharmaceutical firms were both surprisingly low and disappointing.

Industry	% of Firms Addressing Supply Chain
Chemicals	12/31 = 38.71%
Pharmaceuticals	19/28 = 67.86%
Food and Beverage	20/20 = 100%

Food vs Pharma					
Sustainability	Category Title [Rating]	Food		Pharma	p-value
18	Sustainable Sourcing [A]	1	>	0.678571429	0.000135337
Average Score		4	>	2.714285714	0.000243406
N		20		28	
Food vs Chemical					
Sustainability	Category Title [Rating]	Food		Chemical	p-value
18	Sustainable Sourcing [A]	4	>	1.548387097	3.99292E-12
Average Score		20		31	
N		20		31	
Pharma vs Chemical					
Sustainability	Category Title [Rating]	Pharma		Chemical	p-value
18	Sustainable Sourcing [A]	0.678571429	>	0.387096774	0.009500935
Average Score		2.714285714	>	1.548387097	0.008293005
N		28		31	

Result Food > Pharma > Chemical

The sustainability activities that one would expect firms to pursue, but are not contributions to ethical sustainability, are listed in Table VA. All of the firms across the three industries were active in these activities, as shown in Table VB. When the same firms were assessed for participation in ethical sustainability activities, shown in Table VI, the authors found 100% participation in some activities, Table VIIA. However, there wasn't uniform participation across the ethical categories. In the case of category 3 "Organically Grown Products" and category 4 "Non-GMO Certifications", there was only one and three food companies respectively. There was no chemical company and no pharmaceutical company involved, which one might expect from these two industries, but disappointing for the food industry. Non-genetically Modified Organisms (Non-GMO) has been a mantra of a segment of vocal consumers and has resulted in curbing the broader use of genetically modified organisms in products for human consumption. This has been at the expense of producing safer raw materials, crops resistant to diseases that would increase

crop outputs, and lowering costs to the consumer; thus, enabling more people to be fed. The consumers' lack of scientific knowledge combined with fear of products with genetically modified components have been the driving force of the non-GMO movement without any consideration of the genetic modification that nature conducts or that humans have conducted for centuries, such as cheeses, wines, rice plants (Nobel prize work!). In the case of category 6, "Reducing Obesity", it was disappointing to find there was only one pharmaceutical company, no chemical companies, and only two food companies active in this all-important category that impacts human health (diabetes, cardiovascular disease, and cancers). Obesity is in the domain of all three of the industries in this study. The ultimate users in consumer products are the food and pharmaceutical industries. However, the producers of chemical structures that either positively or negatively affect obesity fall to the chemical and pharmaceutical industries. The chemical industry may produce an entire compound that controls or encourages obesity, or an intermediate that is used by the pharmaceutical industry with other compounds to produce a new compound that controls obesity by limiting or stimulating satiety. The pharmaceutical and, depending on the situation, the food industries have the task of ensuring efficacy and safety of the compounds for human consumption. The food industry has the task of safety and efficacy when consumer products are constructed from wholly natural raw materials, many of which stimulate consumption with a few that limit consumption. For category 16 "Land Management" and category 17 "Sustainable Agriculture", the participation results are what one would expect by industry. Overall, food companies had more ethical activities than pharmaceutical companies, which in turn, had more such activities than chemical companies, shown in Table VIIB.

Table VA. Expected Focus of Companies for Sustainable Practices: Non-Ethical

Sustainability Category Number	Category Title [Rating]
1	Renewable Energy[A]
2	Recycled Materials [A]
5	Zero Waste/Waste Reduction [B]
8	Sustainable Packaging [A]
9	Water Use Reduction [A]
10	Emission Reduction [A]
14	Ingredients Labelling Transparency [C]
15	Responsible Marketing [B]
18	Sustainable Sourcing [A]
20	Product Safety and Security [A]

Table VB. Statistical Analysis of Firm's Expected (Non-Ethical) Focus				
<u>Food vs Pharma</u>				
-	Food		Pharma	p-value
Average Score	28.35	>	19.5	1.25764E-06
Activities	7.8		6.071428571	
N	20		28	
<u>Food vs Chemical</u>				
-	Food		Chemical	p-value
Average Score	28.35	>	12.32258065	0
activates	7.8		3.193548387	
N	20		31	
<u>Pharma vs Chemical</u>				
-	Pharma		Chemical	p-value
Average Score	19.5	>	12.32258065	0
activities	6.071428571		3.193548387	
N	28		31	

Result Food > Pharma > Chemical

Table VI. Ethically and Morally Important Sustainable Practices

Sustainability Category Number	Category Title [Rating]
3	Organically Grown Products [B]
4	Non-GMO Certifications [D]
6	Reducing Obesity [C]
7	Human Rights-Diversity and Inclusion [B]
11	Consumer Health [B]
12	Workplace Initiatives [B]
13	Protecting Natural Resources [A]
16	Land Management [A]
17	Sustainable Agriculture [A]
19	Animal Care/Animal Husbandry [A]
21	Sustainable Product Design and Development [A]
22	Impact on Local, National and/or Global Community [C]

Table VIIA. Percentage of Firms Judged to be Acting Ethically as per Table VII Categories	
Industry	% of Firms Judged to be Acting Ethically
Chemicals	31/31 = 100%
Pharmaceuticals	28/28 = 100%
Food and Beverage	20/20 = 100%

Table VIIB. Statistical Analysis of Ethical and Moral Behavior				
<u>Food vs Pharma</u>				
-	Food		Pharma	p-value
Average Score	24.55	>	17.57142857	7.12059E-05
Activities	7.5		5.892857143	
N	20		28	
<u>Food vs Chemical</u>				
-	Food		Chemical	p-value
Average Score	24.55	>	12.35483871	1.0548E-10
Activities	7.5		4.032258065	
N	20		31	
<u>Pharma vs Chemical</u>				
-	Pharma		Chemical	p-value
Average Score	17.57142857	>	12.35483871	7.01141E-05
Activities	5.892857143		4.032258065	
N	28		31	

Result Food > Pharma > Chemical

There were some clear similarities and differences among the three industries. It was found that all of the firms were involved in some of the 22 sustainability activities. There was some commonality in certain categories across all three industries, but not in others. The average sustainability scores were 24.7 for Chemical Industry, 37.1 for the Pharmaceutical Industry, and 52.9 for the Food Industry, demonstrating the Food Industry as the leader, with the Pharmaceutical and Chemical industries lagging behind. This finding may be a consequence of consumer pressure on Food and Pharmaceuticals to “be active in sustainability”, which the chemical industry does not face to the same extent. It is not surprising that the Chemical Industry

has decided that the management of commercial chemicals needs to be significantly improved and become a key sustainability goal (Hogue, 2020). In fact, the problems for the Chemical Industry are staggering in view of the recent report that the number of chemicals and mixtures of chemicals in commerce exceed 220,000 with over 100,000 other materials that lack clear identification (Pelley, 2020).

It is encouraging to the authors that a large number of corporations are changing the purpose of their firms from a shareholder focus to a broader context that embraces the components of sustainability, as the authors have defined above (Business Roundtable, 2019; Fitzgerald, 2019). Also, Kiron et. al. (2021) predicted, based on a 2012 survey, that many corporations would be increasing their commitments to sustainability initiatives, expecting to profit from these activities. This suggests to the authors that there is a good chance that, in the next 5 to 10 years, corporations will engage in successful sustainability projects (Kiron, 2021).

Conclusion

All of the firms that were studied across the three industries participated in sustainability activities.

The authors found that all of the firms were acting ethically.

It was also found that supply chain sustainable activities were not in the forefront of the list of activities for the chemical industry, better in the pharmaceutical industry, but both lagged the leadership of the Food industry.

The Chemical Industry needs to increase its supply chain sustainability efforts before it negatively affects the Food and Pharmaceutical Industries, as these depend on the Chemical Industry for preservatives, substrates, intermediates, sanitizing agents, special ingredients, components of packaging materials, and many other chemicals.

Future Research

The authors plan to expand the scope of the research to include several other industries and make comparisons among these, as well as to the three industries in this paper. The Steel, Aluminum, and Packaging Materials Industries are of particular interest at this time.

The research is tedious/time consuming as there isn't one focal point for companies to report their sustainability programs, results, and future plans. This results in dispersal of the information in Corporate Social Responsibility Reports, annual reports, Sustainability Reports and websites, and United Nations Sustainability Reports information. The authors recommend that it would be globally beneficial for agreement on one focal point and format for this important strategic information.

Our goals will include: (1) Providing impactful information to our subject corporations, (2) Helping other corporations to develop new sustainability programs, and (3) Determining the extent to which sustainable value programs increase firm value.

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