Sustainability Practices: An Empirical Study of Indian Pharmaceutical Industry

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Abstract:
In today's scenario it is demand of time to ensure the strategic balance between economic growth, environmental safety and social well-being. Till now a large number of research papers have been published with an understanding about environmental impact of different industries at global level to achieve sustainability. Needless to say, that planning to achieve sustainability without addressing environmental issues in any organization is meaningless. Among oil, chemical, bulk chemical and pharmaceutical industry, manufacturing of pharmaceutical industry are complex in nature and associated with high waste generation i.e. high E-factor in the range of 25-100 Kg/Kg product. Though the products from pharmaceutical industry in India have significant contribution for social well-being and hold an important place in economic development. This paper explores what Indian pharmaceutical organizations consider about sustainability and related practices thus highlights an immediate need to address environmental implications of pharmaceutical manufacturing in context to India to achieve overall sustainability.

1.INTRODUCTION

It is noticeable that Indian pharmaceutical companies are capitalizing on export opportunities in regulated and semi regulated markets with no doubts on their social responsibility. At the same time addressing social and environmental impacts of Indian pharmaceutical industry to achieve sustainability with economic growth is unavoidable. Findings of a joint research report of GRI focal point India and Thought Arbitrage Research Institute (GIZ India, 2014), shows that there is no single preferred sustainability reporting format in India as yet. Further findings of Goyal, (2014) shows that the disclosure index on environmental practices considering clean technology, energy consumption, environmental management etc. for Indian Pharmaceutical Industry was only 22.0, while the

highest disclosure was from Oil and Gas industry at 41.42 followed by Cement industry at 40.28 (Where Industry-wise disclosure index is calculated by dividing total scores attained by all the companies related to particular sector with the total maximum score that can be attain). Thus environmental reporting is one of the strongest ways to achieve sustainability as it explores the avenues for improvement.Supported by Li et al., (2016), where he concluded that understanding about sustainability and TBL (environmental, economical and social aspects) related practices is helpful for chemists and strategists to choose best approaches for product designing and route selection during pharmaceutical product development phase. It harmonizes implementation of sustainability practices in pharmaceutical industry and helps to reduce

environmental implications.

As a part of ongoing research work the future scope of this study lies in implementation of sustainability practices in pharmaceutical industry by considering impact of its manufacturing on TBL. This will be helpful for managers and strategists of pharmaceutical organizations to meet the new and unforeseen regulatory challenges and to overcome with the global problems relating to environmental issues, economic development and social wellbeing.

2. Objectives of the study

To integrate sustainability into short term and long term business objectives of pharmaceutical organization, this study has been presented with the following objectives:

➢ To get an impression of Indian pharmaceutical industry about sustainability in presentscenario.

➢ To identify sustainability measures and to assess their present status among Indian pharmaceutical organizations.

➢ To make suggestions for accelerating initiatives related to sustainabilitypractices

➢ To achieve these objectives, the detailed methodology has been discussed in the next section.

2. Literaturereview

Sustainability requires environmental and social responsiveness infuses strategy at corporate and business unit level to get economic advantage (Shrivastava et.al., 1995 & Chaturvedi et. al., 2017). With an increased breadth and depth sustainability and related activity of major pharmaceutical companies has always been on the radar careen since last two decades, Esteban, (2008). Jennifer et al., (2010), highlighted that although pharmaceutical industry corporations have started participating in sustainability but through a variety of voluntary initiatives. This leads to adoptability in sustainability

related practices and its reporting which still vary greatly in nature and this does not necessarily make one corporation better than another. KPMG International survey of corporate responsibility reporting, (Batra and Singh, 201), states that sustainability programs can be achieved by adopting new environmentally and socially conscious sustainability approaches to get economic advantages by enhanced profitability. The report further emphasizes on regulatory implementation, social consideration, innovation in R & D, and process optimization as a key drivers to achieve sustainability. In chemical and pharmaceutical industry, sustainability is concerned about creating long-term stakeholders value and derived from social, environmental and economic factors (Peukert et. al., 2010). Survey done by World Resource Institute conclude that the integration of environmental consideration into core business decision making improves environmental performance and save money on long term business (Perera et. al., 2013)

.Integration of sustainability practices with environmental consideration during product designing phase ensures high quality sustainable practices balancing with social and economic advantages (Thijssens et. al.,2016)

Research done by Raman, (2006), indicate that Indian pharmaceutical industry merely discloses about measures related to environmental protection and energy conservation and were least popular in their annual reports, while social reporting also indicated a wide variation in terms of its content and theme. Despite the fact that sustainability reporting is growing in India, there is no uniformity in its nature and kind of content related to environment, economic and social aspects (Goel, 2010).

Mitra, (2012) explored that practices related to environment and its reporting in India is still in its infancy and sustainability practices and its reporting in India is more of a voluntary rather than

mandatoryactivity.

GIZ India and TARI revealed in their joint research report of 2012 that continual changes in the global environment are now becoming a new business challenge around the world. To address this issue, companies have to integrate environmental issues with its social and economic aspect. Accordingly, Indian pharmaceutical corporations have to build capacity for implementing sustainability practices and their reporting.

In India, pharmaceutical sector was the ones who had not disclosed as much as the other sectors had (Jose et.al, 2013). The trends in sustainability disclosures is based on different formats and showed a skewed distribution (Batra & Singh, 2014). A range of assessment tools exist (Rodríguez et al., 2016) to evaluate sustainability of chemical and pharmaceutical products and processes, focusing on environmental, economic and social aspects for long term business advantages (Cefic, 2012).

Goyal (2014) also highlighted that the consideration of environmental issues is very important to achieve sustainability but non-availability of a standard framework to act through a variety of practices to achieve sustainability in pharmaceutical industry is a big challenge.

Kiron et al. (2013) and Radomaska (2015) claimed in their research that despite its applicability and advantages, sustainability is still in its infancy to be combined with strategic management.

3. Summary

According to reviewed literature it seems that there is a need to explore sustainability-related practices and related disclosure in the Indian pharmaceutical industry as the most important priority. Since no standard sustainability framework is available, there is a need to develop a long-range sustainability vision and its integration with strategic goals is highlighted. To achieve sustainability, consideration

of Triple Bottom Line (TBL) along with presence of key drivers plays an important role. Thus to address sustainability issue in Indian pharmaceutical industry it is important to understand how and what individual Indian pharmaceutical organizations are thinking of and what they are considering as best practices to achieve sustainability.

4 Methodology

The aim of this study is to assess industrial sustainability that analysis how Indian pharmaceutical industry are considering sustainability and what they think about implementation of related practices, TBL and other key drivers to achieve sustainability. Since the aim of the study is to assess sustainability in pharmaceutical industry and not to assess whether they are publishing the sustainability report or not. Thus methodology of this research work has three main stages as shown in figure 1below.
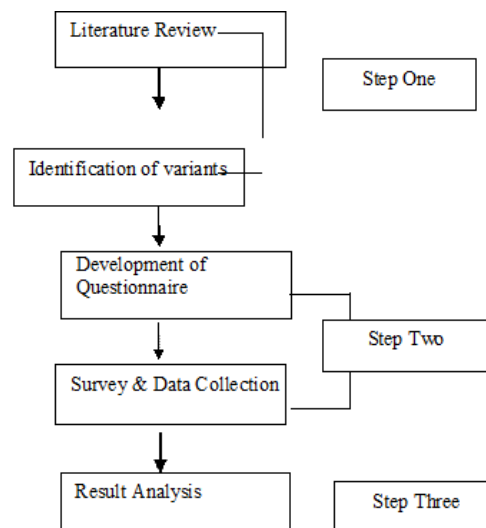

Figure 1: Research Methodology (Source Flynn et al., 1990)

Derived from literature review, the first stage includes identification and selection of indicators contributing to achieving sustainability, TBL and acts as key drivers and discussed in section 4.1. In the second stage questionnaire development, survey among Indian pharmaceutical organizations, data

collection has been done and discussed in detail in the section 4.2. Finally in the third stage, analysis of the results has been done to assess sustainability and related practices in Indian pharmaceutical industry and has been discussed in section 4.3 and section 5.

4.1 Identification of indicators andfactors

After literature review this section starts with identification of initial indicators measuring sustainability, TBL and key drivers to achieve sustainability in Indian pharmaceutical industry. Initially 39 indicators were identified as shown in table 1 and comprise of five factors measuring sustainability by considering environmental aspects, economic growth, social aspects and key drivers.

Table 1: Initial indicators measuring sustainability, TBL & pertaining to key drivers

Factors	Indicators	Source of Reviewed Article
1. Sustainability	Awareness & understanding of sustainability concept	Peukert & Sahr, (2010), Mitra, (2012)
	Involvement of management	Peukert & Sahr, (2010), Mitra, (2012), Lozano, et al., (2016)
	Improve supportive functions	Mitra, (2012), Lozano, et al., (2016)
	External environment to achieve sustainability	Lozano, et. al., (2016)
	code of conduct for supplier	Peukert & Sahr, (2010), GRI (2011),
	internal sustainability policy	Peukert & Sahr, (2010), Lozano, et al., (2016),
	Internal motivation and external stimuli	Mitra, (2012), Lozano, et al., (2016),
	External pressure	Lozano, et al., (2016),
	Impact on stakeholders	Lozano, et al., (2016),
	Influence on R & D practices	Lozano, et al., (2016),
	Increase transparency	Peukert & Sahr, (2010), Lozano, et al., (2016)
	Setting benchmark for other companies	Peukert & Sahr, (2010), GRI (2011), Lozano, et al., (2016),
	Impact on manufacturing cost	Watson, (2012)
	Improvement in Organizational performance	Lozano, et al., (2016),
	R & D during Design phase	GRI (2000-2011), Agar et al., (2014),

	Understanding of environmental aspect	GRI guide lines (2000-2011), Agar et al., (2014)
	Incorporation of concept in vision and mission	Peukert & Sahr, (2010)
	Environmental impact as functional requirement	Peukert & Sahr, (2010), Mitra, (2012), GRI (2000-2011), Sihvonen & Partanen (2016)
2. Environmental Aspects	Material impact on environment	European Environment Agencies Technical report, series 1725-2237, (2010), GRI (2000-2011),Watson (2012), Agar, et al., (2014)
	Identification of hot spots	Wesley et al., (2014)
	Energy consumption and CO_2 emission	GRI (2000-2011), Watson (2012),
	Consideration of GHG emission	GRI (2000-2011),
	Consider Biodegradable materials	Watson, (2012), GRI (2000-2011),
	Waste reduction(zero landfill)	Watson, (2012), GRI (2011),
	Use of recyclable product	Paul et al., (2000), GRI (2011)
		Peukert and Sahr, (2010), Watson, (2012)
3. Economic Aspects	Certified supplier	Watson, (2012), Peric et.al., (2012), GRI, (2011)
	Investment to reduce energy and resource consumption	GRI (2000-2011), Watson, (2012),
	Use of recyclable packaging material	GRI (2000-2011), Watson, (2012)
	Environmental aspect & financial performance	Peukert & Sahr, (2010), GRI guide lines (2000-2011),
		Peukert & Sahr, (2010),
4. Social Aspects	Consideration of Health and Safety issues	Peukert & Sahr, (2010),
	Incorporation of education and training of employees	Peukert & Sahr, (2010), Lozano, et al., (2016),
	Transparency in organizational policies	Peukert & Sahr, (2010), Lozano, et al., (2016),
	Provide opportunities for employees	Peukert & Sahr, (2010), Mitra, (2012), Lozano, et al., (2016)

	Ensures employees participations	GRI (2000-2011), Peukert & Sahr, (2010), Mitra, (2012), Lozano, et al., (2016)
		Gonzalez et al., (2011), GRI, (2011),
5. Key Drivers	Global initiative	Peukert & Sahr, (2010),
	Government initiatives	GRI (2000-2011), European Environment Agencies Technical report series 1725-2237, (2010),
	Research and Development facility	Peukert & Sahr, (2010), Gonzalez, et al., (2011), Watson, (2012), Agar, et al., (2014),
	Policies for green project implementation	Peukert & Sahr, (2010),
	Use of Life cycle assessment and Other metrics	Gonzalez, et al., (2011), Watson, (2012), Agar, et al., (2014),

4.2 Conducting Survey of the Indian PharmaceuticalIndustry

The initial indicators as shown in table 1 were validated through a survey of Indian pharmaceutical companies. A web-based survey was conducted among 2147 Indian pharmaceutical companies. The companies selected were among the National Pharmaceutical Pricing Authority (NPPA) listed companies. For this purpose convenient, random and snowball sampling technique has been chosen. With continuous efforts, following up and request reminders, finally 393 (18.30 %) usable responses were considered for further analysis. This response rate found to be similar in line with other such studies carried out in the Indian context. It is worth mentioning few of such studies here; latest among them with their corresponding response-rate being Gopal & Thakkar (2015) with 16.2 % and Krishnan & Poulose (2016) with 13.31 % respectively. A five point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to rate the perspective and importance of the indicators. The mean importance value ranged from 3.53 to 4.53 as shown in Table2.

Table 2: Indicators and their mean importance value

Indicators	Mean	Std. Deviation
Awareness & understanding of sustainability concept	**4.53**	**0.670**
Involvement of management	4.38	0.648
Improve supportive functions	4.08	0.689
External environment to achieve sustainability	3.88	0.746
code of conduct for supplier	3.71	0.709
internal sustainability policy	3.98	0.683
Internal motivation and external stimuli	3.90	0.811

External pressure	4.11	0.707
Impact on stakeholders	3.59	0.865
Influence on R & D practices	3.76	0.886
Increase transparency	4.25	0.646
Setting benchmark for other companies	4.11	0.702
Impact on manufacturing cost	4.09	0.610
Improvement in Organizational performance	3.93	0.718
R & D during Design phase	**4.39**	**0.688**
Understanding of environmental aspect	3.95	0.794
Incorporation of concept in vision and mission	**3.60**	**0.770**
Environmental impact as functional requirement	**3.69**	**0.817**
Material impact on environment	3.90	0.811
Identification of hot spots	**4.39**	**0.688**
CO_2 emission due to energy consumption	**3.60**	**0.770**
Consideration of GHG emission	**3.69**	**0.817**
Consideration of Biodegradable materials	**4.53**	**0.670**
Waste reduction(zero landfill)	4.38	0.648
Use of recyclable product	4.08	0.689
Certified supplier	4.02	0.606
Investment to reduce energy and resource consumption	4.31	0.643
Use of recyclable packaging material	3.68	0.721
Environmental aspect & financial performance	3.99	0.763
Consideration of Health and Safety issues	4.37	0.610
Incorporation of education and training of employees	4.28	0.797
Transparency in organizational policies	4.07	0.695
Provide opportunities for employees	3.96	0.630
Ensures employees participations	**3.53**	**0.872**
Global initiative	4.22	0.716
Government initiatives	3.68	0.721
Research and Development facility	3.94	0.752
Policies for green project implementation	4.04	0.740
Use of Life cycle assessment and Other metrics	4.23	0.657

The mean and standard deviation values indicate that to achieve sustainability, awareness of the concept and use of biodegradable material while considering environmental aspects are regarded as most important indicator to achieve sustainability with a mean importance valueof 4.53 representing 90.6 % importance. This is followed by R & D during product and process designing phase, identification of hot spots with the same mean importance value of 4.39, while involvement of top management and waste reduction has the same mean importance value of 4.38. These results show that these aspects are emphasized more as compared to others in the surveyed Indian pharmaceutical organizations. On the other hand employee participation, CO_2 emission, incorporation of concept in vision and mission statement has been regarded as least important indicators with an

average mean importance value of 3.60 followed by employee participation in organizations decision process with mean importance value of 3.53. This clearly depicts that the extent of these activities within the surveyed organizations is relatively less as compared to other activities. The next section checks the item-wise internal consistency pertaining to all five factors (Factors as shown in table1).

4.3 Measuring Reliability of SustainabilityIndicators

In a broad sense, sustainability is a concept that relies on its three pillars i.e. environmental aspects, economic aspects and consideration of social dimensions (GRI, (2011), Zain et al., (2014), Radomska, (2015), Nappi et al, (2015)). Thus, indicators pertaining to environmental aspects, economic aspects and social aspects along with presence of key drivers have been considered as independent variables while sustainability which relies on these aspects is modeled as a dependent variable.

SPSS statistical tool was used for analysis of data pertaining to this research. After getting mean importance values for the entire indicators set, reliability test was performed to check internal consistency of these indicators. Twenty-nine indicators were found suitable for furtheranalysis.Theseindicatorsexceededtheminimu macceptableCronbach'salphavaluei.e.0.70 (Hair et.al., 2006 and Teh et. al., 2009). For this research study the observed Cronbach's alpha value ranges in 0.701 - 0.774 which shows strong internal consistency between various indicators and factors as shown in table 3.

Table 3: Cronbach's alpha value of indicators pertaining to related factors

Variables	Nature of variables	No. of Indicators (sr. no. in questionnaire)	Cronbach's alpha
Sustainability	Dependent	1-18	0.774
Environmental Aspects	Independent	19-25	0.701
Economic Aspects	Independent	26-29	0.726
Social Aspect	Independent	30-34	0.747
Key Drivers	Independent	35-39	0.744

4.4 FactorLoading

After obtaining Cronbach's alpha value more than the acceptable value i.e. > 0.70 as mentioned in table 3, the factor loading test was performed. This test is performed to check if there is further grouping of initially observed indicators that exist. Through factor loading analysis, it becomes easy to understand and the approach better explains how much the indicators are contributing to a particular factor. Thus, factor loading analysis was done to group the scale indicators consisting of sustainability, TBL and key drivers, thereby confirming the original factorization. The results have been tabulated in table 4 below.

Table 4: Varimax Factor Rotated Component Matrix

	Component							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Proper understanding of concept	0.757							
Involvement of management	0.777							
Incorporation of the concept in the vision and mission statement	0.560							
Internal motivations	0.540							
Consideration of environmental impacts as functional requirement	0.480							
Organization has code of conduct for suppliers		0.746						
Organization has internal Sustainability policy		0.554						
It Influence Research and Development facilities		0.452						
Transparency policy		0.665						
Overall performance.		0.492						
Through formal management			0.888					
During product Design Phase			0.737					
Uses Biodegradable materials				0.831				
Ensures zero landfill				0.750				
Use of recyclable material				0.631				
Consideration of impact of material					0.565			
Identification of hot spots					0.678			
Energy consumption and CO_2 emissions					0.731			
Consider Green House Gas (GHG) emissions				0.548				
Invest to minimize energy and resource consumption					0.769			

in the production							
Use recyclable packaging materials					0.790		
Consider procurement practices and its financial implications					0.850		
Education and training of employees						0.895	
Transparency in policies						0.895	
Globally driven initiatives							0.616
Government initiative							0.711
Research and Development facility							0.768
Policies for green projects implementation							0.704
Use of LCA and other metrics							0.716

Hair et. al., (2006), suggested that the items with factor loading value greater than 0.4 must be considered for further analysis. Since all the observed values in table 4 range from 0.452 to 0.895, this shows strong loading on its original factors and thus have been considered for further analysis. It is interesting to note that the indicators consisting of sustainability have been loaded on three different factors, indictors consisting of environmental aspects are loaded on two factors while there is no further factor loading that has been observed in the case of economic aspect, social aspects and indicators pertaining to key drivers (Table 4). These new factors have been named as sustainability awareness, sustainability planning and sustainability implementation and measuring sustainability respectively while factors constructed from environmental aspects have been named as material impact and process optimization. All other factors i.e. economic aspects, social aspects and key drivers remain same with their original names. Since

sustainability was focused upon as a focal point in all business units, in the next step through descriptive analysis, it is being observed that how sustainability, TBL and key drivers are manifested in the Indian pharmaceutical industry. For the purpose of this study all sampled pharmaceutical organizations are assumed to be categorized into four different groups. Organizations having no. of employees up to 50 are assumed to be small organizations, those having employees above 50 up to 500 are assumed to be medium organizations, organizations having no. of employees above 500 up to 2000 are assumed to be big organizations while organizations having no. of employees more than2000are assumed to be large pharmaceutical organizations. The information was collected from web-based survey as mentioned in section 4.2. Next, in section 5 and its subsections, analysis of one way ANOVA and post hoc test has been done. This analysis is helpful in understanding the present scenario of sustainability and is helpful for managers

and strategists to explore sustainability by considering TBL and key drivers in context of the Indian pharmaceuticalindustry.

5 RESULTS

Identification of indicators pertaining to sustainability, TBL and key drivers has been done in the first stage of research, as reported in section 4. Furthermore, degree of effectiveness of identified indicators has been calculated from mean importance value and is mentioned in table 2, wherein the lowest value was obtained in the case of employee participation which shows that this aspect is given less importance than the others. After checking internal consistency of indictors, their factor loading test was performed to ensure loading of all indicators on its original factors. Results of factor loading test, as discussed in section 4.4, shows that all indicators were loaded on eight factors instead of five as initially chosen.

5.1 ComparativeAnalysis

Once indicators' loading on their original factors had been identified, the next step was to perform a detailed comparative analysis which has been discussed in this section. The detailed comparative analysis was performed with an intention to explore the understanding and adoptability of sustainability, TBL and key drivers among assumed pharmaceutical organizations of different sizes. From table 5 below, results of descriptive statistical analysis show that the constructs representing dependent variables and named as sustainability awareness and sustainability planning have given high average weight of 4.16 and 4.127 respectively. This shows that sustainability awareness and planning to achieve it has been considered as a focal point across all the Indian pharmaceutical organizations irrespective of their size. Sustainability implementation has been given

comparatively low average weight of 3.774 in totality among all respondent Indian pharmaceutical organizations. Since implementation of any concept is purely a strategic approach, therefore it can be interpreted that the respondent, while responding on company's behalf, may have been keeping it in view and this may have resulted in comparatively lower average weight. The same result shows thatthesustainabilityconcepthasitsownacceptanceacrossallthepharmaceuticalorganizations while at the same time it is being accepted that it can be achieved by spreading it across all the organizations irrespective of their size.

While considering environmental aspects, impact of material has been found to be a major concern among all the organizations and it has been given an average weight of 4.332 followed by process optimization with an average weight of 3.896. This is a clear indication to look afresh on traditional ways of manufacturing to consider and use greener materials and to optimize processes to reduce the environmental burden. Since organizations are aware about corporate social responsibility and they might be considering and linking it as a part of sustainability achievement, this resulted in responding with an average total statistical weight of 4.173 across all the organizations. Sustainability is associated with its integration with day to day activities with a proper management of economic and financial aspects and under direct control and supervision of top management thus it was responded with an average weight of 3.994 in totality among all the pharmaceutical organizations. It is quite interesting to observe that all responding organizations consider regulatory initiatives, time management, innovation in R&D, availability of standard guidelines etc. as a key driver to achieve sustainability and this resulted in an average weight of 4.021 and was considered almost with an equal importance by all Indian pharmaceuticalorganizations.

Table 5: Descriptive statistics of sustainability practicesDescriptive

	N	Mean	Std. Deviation	Std. Error
Sustainability Awareness	393	4.161	0.477	0.024
Sustainability Planning	393	4.127.	0.453	0.023
Sustainability Implementation	393	3.774	0.670	0.034
Material Impact	393	4.332	0.515	0.026
Process Optimization	393	3.896	0.509	0.026
Economic Aspects	393	3.994	0.572	0.029
Social Aspects	393	4.173	0.668	0.034
Key Drivers	393	4.021	0.505	0.026

5.2 Analysis of Variance

Descriptive analysis of section 5.1 showcases the understanding of the sustainability concept and the construct of social, economic and environmental aspects in Indian pharmaceutical industry to achieve sustainability where different sizes of organizations exist with differentbusiness models. It is interesting to know about organizations' quest to embrace the sustainability concept despite the difference that exists in their knowledge about the subject and reflects in their efforts while considering social, economic and environmental aspects of sustainability. Further to the present understanding of descriptive analysis, analysis of variance, ANOVA was done to check whether the existing differences are significant or not among assumed groups of Indian pharmaceutical organizations. Table 6 represents the results of ANOVA modeled and performed in SPSS. This test specifies significant differences among different groups of pharmaceutical organizations in their opinion about sustainability and practices related to social, economic and environmental aspects and related to key drivers while implementing sustainability. Analyzing results from table 6, it is surprising to note that the acceptance about sustainability awareness has significant differences among different groups of pharmaceutical organizations in

India, with the p-value (sig.) of 0.00 which is less than 0.05; in case of sustainability planning with p-value of 0.000 there is a significant difference existing among Indian pharmaceutical organizations. A p- value of 0.085 from table 6 indicates that there is no significant difference that exists among different groups of Indian pharmaceutical organizations, in terms of sustainability implementation. Similarly in the case of considering social aspects for achieving sustainability in pharmaceutical industry, there is no significant difference that exists among different groups of pharmaceutical organizations with p-value of 0.385. It indicates that consideration of social aspects for achieving sustainability is somehow widely accepted across the group of pharmaceutical organizations or it may seem as a part of organization's corporate social responsibility which is widely acceptable and in action in one form or the other.

While looking at the environmental aspect, considering material impact and process optimization, there seems to be differences of opinion. Results of ANOVA indicate that there is significant difference of feeing among differently sized groups of pharmaceutical organizations. Noting a p-value of 0.00 respectively in the case of material impact and process optimization practices, such results reflect significant difference among

them. However a p-value of 0.000 related to economic aspects further depicts that there is indeed a significant difference that exists among different Indian pharmaceutical organizations. Contribution of key drivers to achieving sustainability has significance in difference in opinion among different

groups of pharmaceutical organizations with p-value of 0.001.Itmight be considered appropriate in the context of Indian pharmaceutical organizations, where regulatory establishment still needs to be strengthened enough.

Table 6: ANOVA (differences in variables for different groups of pharmaceutical organizations)

	Sum of Squares		F	Significance
	Between Groups	Within Groups		
Sustainability Awareness	4.738	84.299	7.287	0.000
Sustainability Planning	5.761	74.768	9.991	0.000
Sustainability Implementation	2.976	173.368	2.226	0.085
Material impact	7.578	96.404	10.192	0.000
Process Optimization	4.115	97.732	5.460	0.001
Economic Aspects	5.363	122.719	5.667	0.001
Social Aspects	1.360	173.374	1.017	0.385
Key Drivers	3.902	95.999	5.270	0.001

5.3 Multiple comparison (post hoc) analysis

ResultsofdescriptiveanalysisandANOVAhavebeendiscussedindetailinsection5.1and

5.2respectively. Based on results, we may summarize that there is a statistically significant difference that exists among assumed groups of Indian pharmaceutical organizations. These differences are related to acceptance and understanding of factors representing sustainability, triple bottom line and key drivers. As a next step, a multiple comparison analysis i.e. post hoc analysis was performed to check whether the assumed pharmaceutical organizations differed from each other while considering individual factors. It is being observed from table 7 below that statistically significant mean differences about sustainability awareness exists between small and medium group of Indian pharmaceutical organizations with p-value of 0.038 at a significance level of 0.05 while there is

no statistically significant mean difference that exists between big and large group of Indian pharmaceutical organizations. These findings are enough to depict that in view of achieving sustainability there is an utmost need to explore sustainability awareness among and across Indian pharmaceutical organizations irrespective of their size and market share. Further, output of table 7 indicates that sustainability planning is the other important factor with statistically no significant difference among small and big to large pharmaceutical organizations with p-value of 0.106 and 0.459 except between small and medium size of pharmaceutical organizations where p values is < 0.05 which shows existence of difference about understanding and importance of sustainability planningis statistically significant. One reason can be that the adoption of sustainability-related practices and its implementation is still voluntary and emphasized less than other market oriented activities. This indicates that planning to achieve

sustainability is vital, unavoidable and plays an important role in achieving sustainability in pharmaceutical organizations. Interestingly, sustainability implementation with its great importance and concern of higher authority also has statistically no significant mean difference between different group of pharmaceutical organizations with p-value of 0.099, 0.082 and 0.220 respectively. Thus top management must take it in its consideration to implement sustainability strategically and in practicality. Results show acceptance and importance of sustainability concept that can be achieved by making a firm aware about it with proper planning and strategically implementing ofit.

Considering impact of materials; there is a statistically significant mean difference that exists between small to medium and from big to large organizations. The reason exists for the same logic that the organizations are looking for better technology to get maximum output with respect to commercialization of their products rather than looking for environment-friendly products and processes. On the other hand, developing organizations are still copying and following only those traditional ways of working used by leading industrial organizations.

Another important construct of environmental aspect is process optimization which may contribute enough to lower environmental burden and is reported to have statistically significant mean difference between small and medium and big pharmaceutical organization with p-values of 0.007 and 0.021. This may be attributed to economic consequences for optimizing existing process. The p-values of 0.646, 0.554 and 0.053 at 0.05 significant level show that consideration of economic aspects has no statistically significant mean difference between different groups of

pharmaceutical organizations. Thus, they seem to understand that achievement of sustainability is associated with its economic consequences. Interestingly, social aspects, which have always been considered in the agenda of organizations in one or in other form, have been considered and this is getting reflected in the results of the present study as well. Results from table 7 with a p-value of 0.483 between small and medium pharmaceutical organization, 0.790 between small and big pharmaceutical organizations and 0.746 between small and large pharmaceutical organizations, indicates that there is no statistically significant mean difference existent between the groups of organizations. Thus, we may conclude that all Indian pharmaceutical organizations are having some consensus that achieving sustainability and its social aspects has its own importance and these aspects are closely associated with eachother.

Analysis of post hoc test with p-values of 0.737 and 0.148 reveals that there is no statistically significant mean difference that exists between small-group and medium and big organizations while considering existence of key drivers to achieve sustainability. On the other hand, a p-value of 0.041, which is less than 0.05 shows that there is a significant difference between small and large pharmaceutical organizations regarding consideration of key drivers to achieve sustainability. The reason could be that the most of the large organizations may have their own willingness to do the things voluntarily. Another reason could be that implementing sustainability and related practices are more of strategic and voluntary approach rather than regulatory consequences. The situation indicates significance of existence of key drivers and their mandatory implementation in pharmaceutical industry.

Table 7

Post-hoc analysis among different groups of pharmaceutical companies

<table>
<tr><th colspan="9">Multiple Comparisons</th></tr>
<tr>
<th></th><th></th>
<th>(I) No. of Employees in the Organization</th>
<th>(J) No. of Employees in the Organization</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th colspan="2">95% Confidence Interval</th>
</tr>
<tr>
<th></th><th></th><th></th><th></th><th></th><th></th><th></th>
<th>Lower Bound</th><th>Upper Bound</th>
</tr>
<tr><td rowspan="6">Sustainability Awareness</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>.54516*</td><td>.18860</td><td>.038</td><td>.0186</td><td>.9918</td></tr>
<tr><td>Group C</td><td>.32091</td><td>.17818</td><td>.426</td><td>-.1888</td><td>.7306</td></tr>
<tr><td>Group D</td><td>.07161</td><td>.18518</td><td>.931</td><td>-.3662</td><td>.5894</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.22426*</td><td>.07350</td><td>.008</td><td>-.4239</td><td>-.0446</td></tr>
<tr><td>Group D</td><td>-.47052*</td><td>.08913</td><td>.000</td><td>-.6235</td><td>-.1635</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.25926</td><td>.06422</td><td>.065</td><td>-.3250</td><td>.0065</td></tr>
<tr><td rowspan="6">Sustainablity Planning</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>.69022*</td><td>.17762</td><td>.001</td><td>.2049</td><td>1.1215</td></tr>
<tr><td>Group C</td><td>.44144</td><td>.16781</td><td>.106</td><td>-.0515</td><td>.8144</td></tr>
<tr><td>Group D</td><td>.28382</td><td>.17440</td><td>.459</td><td>-.1942</td><td>.7058</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.25278*</td><td>.06922</td><td>.000</td><td>-.4604</td><td>-.1032</td></tr>
<tr><td>Group D</td><td>-.39732*</td><td>.08394</td><td>.000</td><td>-.6240</td><td>-.1908</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.14462</td><td>.06049</td><td>.163</td><td>-.2817</td><td>.0304</td></tr>
<tr><td rowspan="6">Sustainability Implementation</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>.55221</td><td>.27046</td><td>.099</td><td>-.0747</td><td>1.3209</td></tr>
<tr><td>Group C</td><td>.51897</td><td>.25553</td><td>.082</td><td>-.0503</td><td>1.2683</td></tr>
<tr><td>Group D</td><td>.38092</td><td>.26556</td><td>.220</td><td>-.1742</td><td>1.1962</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.05413</td><td>.10540</td><td>.999</td><td>-.2861</td><td>.2578</td></tr>
<tr><td>Group D</td><td>-.22301</td><td>.12782</td><td>.817</td><td>-.4419</td><td>.2177</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.17798</td><td>.09210</td><td>.712</td><td>-.3356</td><td>.1397</td></tr>
<tr><td rowspan="6">Material Impact</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>.62296*</td><td>.20168</td><td>.005</td><td>.1576</td><td>1.1983</td></tr>
<tr><td>Group C</td><td>.27552</td><td>.19055</td><td>.181</td><td>-.1061</td><td>.8772</td></tr>
<tr><td>Group D</td><td>.16640</td><td>.19803</td><td>.777</td><td>-.3226</td><td>.6994</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.35356*</td><td>.07860</td><td>.001</td><td>-.4952</td><td>-.0897</td></tr>
<tr><td>Group D</td><td>-.46475*</td><td>.09532</td><td>.000</td><td>-.7355</td><td>-.2436</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.11713*</td><td>.06868</td><td>.022</td><td>-.3743</td><td>-.0199</td></tr>
<tr><td rowspan="6">Process Optimization</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>.73626*</td><td>.20307</td><td>.007</td><td>.1387</td><td>1.1866</td></tr>
<tr><td>Group C</td><td>.60361*</td><td>.19186</td><td>.021</td><td>.0613</td><td>1.0513</td></tr>
<tr><td>Group D</td><td>.39780</td><td>.19939</td><td>.192</td><td>-.1167</td><td>.9123</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.13631</td><td>.07914</td><td>.536</td><td>-.3105</td><td>.0979</td></tr>
<tr><td>Group D</td><td>-.34080*</td><td>.09597</td><td>.031</td><td>-.5124</td><td>-.0172</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.21385</td><td>.06915</td><td>.102</td><td>-.3369</td><td>.0199</td></tr>
<tr><td rowspan="6">Economic Aspects</td><td rowspan="6">Tukey HSD</td><td rowspan="3">Group A</td><td>Group B</td><td>-.25538</td><td>.22755</td><td>.646</td><td>-.8535</td><td>.3207</td></tr>
<tr><td>Group C</td><td>-.30262</td><td>.21499</td><td>.554</td><td>-.8375</td><td>.2719</td></tr>
<tr><td>Group D</td><td>-.70231</td><td>.22343</td><td>.053</td><td>-1.1488</td><td>.0042</td></tr>
<tr><td rowspan="2">Group B</td><td>Group C</td><td>-.05643</td><td>.08868</td><td>.998</td><td>-.2452</td><td>.2124</td></tr>
<tr><td>Group D</td><td>-.45593*</td><td>.10754</td><td>.024</td><td>-.5834</td><td>-.0284</td></tr>
<tr><td>Group C</td><td>Group D</td><td>-.40949*</td><td>.07749</td><td>.001</td><td>-.4894</td><td>-.0896</td></tr>
<tr><td>Social Aspects</td><td>Tukey</td><td>Group A</td><td>Group B</td><td>.39604</td><td>.27047</td><td>.483</td><td>-.3118</td><td>1.0839</td></tr>
</table>

		(I) No. of Employees in the Organization	(J) No. of Employees in the Organization	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
	HSD		Group C	.22697	.25553	.790	-.4224	.8963
			Group D	.25733	.26557	.746	-.4182	.9522
		Group B	Group C	-.17905	.10540	.491	-.4210	.1229
			Group D	-.14699	.12783	.788	-.4488	.2108
		Group C	Group D	.03007	.09211	.988	-.2076	.2677
Key Drivers	Tukey HSD	Group A	Group B	-.53547	.20126	.737	-.7248	.3138
			Group C	-.39355	.19015	.148	-.8942	.0871
			Group D	-.53328*	.19761	.041	-1.0352	-.0154
		Group B	Group C	-.18807	.07843	.058	-.4004	.0043
			Group D	-.32440*	.09512	.005	-.5652	-.0744
		Group C	Group D	-.14272	.06854	.286	-.2986	.0551

*. The mean difference is significant at the 0.05 level.

NOTE: Group A= 0-500 employees, Group B = 501- 1000 employees, Group C = 1001-1500 employees & Group D = > 1500 employees

6. Conclusions

This paper presented a summarized result of the descriptive analysis of factors like sustainability awareness, sustainability planning, sustainability implementation, material impact, process optimization, economic aspects, social aspects and key drivers among assumed groups of Indian pharmaceutical organizations. This paper attempted to showcase and put light on understanding of sustainability-related concepts in the Indian pharmaceutical industry and highlight the level of consideration of social, economic and environmental aspects among assumed groups of pharmaceutical organizations. Outcome of this preliminary research-effort reveals that Indian pharmaceutical industry accepts that achieving sustainability is the demand and need of the hour and considers it as an important performance criterion. It is worth mentioning here that to achieve sustainability in the pharmaceutical industry in India, awareness about the concept and its

related practices in the individual organizations with proper planning and strategic implementation is desirable. Several initiatives such as environmental consideration by looking on materials impact, use of biodegradable material to lower the environmental burden along with identification of hot spots have emerged as an important practice to achievesustainability.

A comprehensive factor-wise descriptive analysis was carried out that found out that all the surveyed pharmaceutical organizations accept that awareness of sustainability as a concept and planning to implement related practices is a major construct to achieve the same. Respondents had assigned their high concern to material impact and optimization of the whole manufacturing process in view to lower environmental burden and to increases the per kilogram yield.

Though Indian pharmaceutical organizations are enjoying their robust market growth and are willing to achieve sustainability, the results of statistical analysis

indicate that this industry may have little apprehensions on economic concerns while considering adoption of sustainability- related practices.

There is no question regarding the social responsibility of pharmaceutical organizations. Almost all kinds of pharmaceutical organizations are championing the cause through their corporate social responsibility initiatives, also being aware about its consequences for the market place. This may be the reason behind the organizations showing no existence of statistically significantdifferences among them, while responding on consideration of social aspects in achieving sustainability.

Although the outcome of the study results are mixed while considering social, economic and environmental aspects among an assumed group of pharmaceutical organizations, there is no difference of opinion in their willingness to embrace sustainability and to achieve it through various industrial practices. Their willingness to adopt sustainability may result in enhancing their competitiveness with more transparency, as has been observed in Rodríguez et al.,2016.

It is understood that the existence of key drivers in the form of global and legislative initiatives, regulatory compliances, innovation in R & D activity, etc. have their own role and advantages. Thus implementing sustainability through a strategic approach will lead to value-addition for the Indian pharmaceutical industry.

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