THE CORRELATION BETWEEN SUSTAINABLE PERFORMANCE MEASURES AND ORGANIZATIONAL SUSTAINABILITY IN THE BRAZILIAN CONTEXT

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Abstract

Over the past few years, issues of sustainability are gaining greater prominence among organizations and their stakeholders around the world and with it the effective measurement of environmental performance has been a challenge for sustainable transition. The purpose of the article is to analyse, through the the perception of market experts and researchers, what sustainable performance measures have stronger positive correlation to achieve organizational sustainability in order to help employees in making decisions that reduce the consumption of resources and that create value throughout its chain. The research is of an exploratory and descriptive nature, with qualitative and quantitative method and has a deductive logic. It aims to help professionals and academics who want to start the measurement and continuous improvement of economic, environmental, social, governance and technical performance of their organizations. Finally, the analyzes allow direct efforts to sustainable measures considered most important, allowing the transition of the organization for sustainability.

Key Words: Performance measurement, Organizational sustainability, Sustainable performance, Sustainable development. Correlation,

Classification JEL: C12, C83, Q01, Q56

1. Introduction

Historically, the concept of sustainable development emerged in the 1987 report from the UN World Commission on Environment and Development, in a document entitled Our Common Future, it requires that a development be achieved "which meets the needs of the present generation without compromising the ability of future generations to meet their needs" [1].

The rapid depletion of natural resources and concerns about the disparity of wealth and organizational social responsibility have made sustainability be increasingly important for research and business practices [2]**.** The adoption of sustainable principles brings benefits that go beyond the environmental and social areas, generating also improves on the economic value of the organization [3]. As [4], the 21st century paradigm is to make organizations can relate differently to the environment in which they coexist.

In the current context, among the challenges for an organization to become sustainable, we have: meet the needs of stakeholders [5], achieve triple bottom line in an integrated manner [6] and an effective environmental performance measurement [7]. A crucial aspect to accomplish this task is to use and adequate definition of environmental performance indicators. For [8]. there are various methods and tools for the assessment of sustainable performance in organizational level. From this, designing reliable measures to quantify this performance, considering the variety of factors on the subject, it is essential for the decision-making process of the stakeholders and business management [9].

The article aims to analyse, through the experts' perception, what sustainable performance measures have stronger positive correlation to achieve organizational sustainability. Also, it seeks to compare the existing theory of sustainable measures highlighted in the literature with the practice of the current Brazilian market. Thus, the correlation of the measures aimed to see which variables are most related and thus propose sustainable guidelines with the intention of directing future efforts to achieve sustainability.

2. Background

In this article, we present some of the main sustainable measures (table no. 1) classified according to the technical, economic, environmental, social and governance dimensions [10].

Table 1 **Sustainable performance measures**

Code	Dimension	Sustainable performance measures	[11]	[3]	[10].	[12].	[13.	[14].	[15.	[9]	[16]	[17]	[18]	[19]
Q1	Economical	Cost performance										●		●
Q2	Economical	Environmental and social performance (Eco-efficiency)										●		
Q3	Social	Inter-firm collaborative capabilities										●		
Q4	Social	Intra-firm collaborative capabilities										●		
Q5	Environmental	Environmental protection					●							
Q6	Social	Employee satisfaction		●	●		●				●			
Q7	Social	Supplier relations					●							
Q8	Governance	Corporate reputation									●			
Q9	Governance	Environmental logistics policy				●								
Q10	Technical	Quality management					●							
Q11	Social	Social benefits, medical-legal					●							
Q12	Technical	Customer satisfaction					●							
Q13	Social	Balancing professional and family life					●							
Q14	Governance	Transparency in information					●	●						
Q15	Environmental	Green Marketing											●	
Q16	Environmental	Environmental Policy	●											
Q17	Governance	Investor Relations						●						
Q18	Social	Representation and dialogue with employees					●							
Q19	Governance	Code of conduct								●				
Q20	Governance	Corporate Governance						●		●				
Q21	Technical	Labor practice indicators								●				
Q22	Governance	Human capital development			●									
Q23	Social	Support of social setting					●	●						
Q24	Environmental	Energy conservation											●	●
Q25	Social	Sustainable working condition		●					●					
Q26	Environmental	Carbon foot print reduction		●					●					
Q27	Environmental	Reduction in amount of energy use							●					
Q28	Environmental	Reduction of air pollution							●					
Q29	Environmental	Waste management							●				●	●
Q30	Environmental	Reduction in amount of resource used		●					●					●
Q31	Environmental	Sources of recyclable raw material		●					●					

According to [20]. many organizations have developed performance evaluation system to help measure their sustainability performance. As [3], each performance indicator set is best suited to a given context or universe of analysis, and must consider the firm, the sector study, company size, the proximity of sensitive consumer markets to environmental issues, external regulations and also the organization's corporate culture.

3. Materials and Method

Was used qualitative method through literature review of the major sustainable measures and quantitative method through the statistical analysis of survey data. The first step consisted in the literature review in order to find the major sustainable performance measures. From this review of indicators and a documentary analysis of sustainable reports was possible to find the sustainable performance measures that would be assessed by organizations. Then, the application of a survey with a random sample of 30 experts active in the area of managing in order to check which measures of sustainability are most important to the organizations.

In order to organize the questionnaire in a logical and better understand, it was divided into "profile of the participants", in which was sought to understand the main characteristics of respondents and "perceived importance of sustainability measures" where alternative issues were structured according to a 5-point Likert scale in order to measure the degree of importance with the following options: 1 (very little), 2 (little), 3 (moderately) 4 (very) and 5 (very much).

The analysis was performed through the use of Excel and the software Minitab 17. The statistical analysis: descriptive, through mode analysis and inferential analysis through the Kolmogorov – Smirnov (K-S) for normality test, the Cronbach's alpha to analyze internal reliability and the Spearman's correlation between measures and its dimensions, which is the most appropriate for non-parametric data, because the coefficient measures the intensity of the relationship between variables, using only the order of observations instead of the observed value [21].

K-S test was chosen because it is applicable to any sample size. The test was conducted using the sustainable measures and observes the maximum absolute difference between the cumulative distribution function, which is assumed for the data as Normal and the distribution function of the observed data. The difference is compared with a critical value for a given level of significance. The statistic test is given by equation (1):

$$D = \text{Max} |Dt(X)\ Do(X)| \qquad (1)$$

Where: Dt(X) = theoretical cumulative distribution; D(X) = observed cumulative distribution.

We used the K-S test, evaluating the following assumptions: the data follow a normal distribution (H_0) or the data does not follow a normal distribution (H_1). The critical D (n = 30 α = 0.05) = 0.24.

The alpha coefficient was presented by Lee J. Cronbach in 1951 and measures the correlation between responses to a questionnaire by profile analysis of the answers given by respondents. The coefficient is calculated from the variance of the individual items and the variance of the sum of items of each evaluator using the following equation (2):

$$\alpha = \left(\frac{k}{k-1}\right) \times \left(1 - \frac{\sum_{i=1}^{k} s_i^2}{s_i^2}\right) \qquad (2)$$

Where: k is the number of questionnaire items; s^2_i corresponds to variance of each item; s^2_t total variance corresponding to the questionnaire, determined as the sum of all the variances.

Besides that, the Spearman coefficient (ρ) varies between -1 and 1 and is calculated by equation (3):

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n^3 - n} \qquad (3)$$

Where: n is the number of pairs (x_i, y_i); Di = (positions of xi among the values of x) - (positions of y_i among the values of y); if the positions of x are exactly equal to the points of y, then all d_i will be zero and ρ will be 1;

5. Results and Discussion

Firstly, is featured the profile of respondents in the researched sample (table no. 2).

Table 2 **Profile of the respondents**

Variables	Sample (N=30)	Percentage
Age		
<18	0	0.0%
18-30	5	16.7%
31-40	4	13.3%
41-50	7	23.3%
51-60	9	30.0%
61-70	5	16.7%
Education		
Incomplete College Education	0	0.0%
Complete college education	7	23.3%
Specialization or Extension	6	20.0%
Master's Degree	14	46.7%
Doctoral Degree	2	6.7%
Post-Doctoral	1	3.3%
Engagement time in Sustainability		

None	2	6.7%
Less than 1 year	3	10.0%
1 to 3 years	7	23.3%
4 to 6 years	6	20.0%
7 to 10 years	4	13.3%
Over 10 years	8	26.7%
Sector		
Public	14	46.7%
Private	14	46.7%
Academic	2	6.7%
Size of Organization		
Micro, Small and Medium	9	34.6%
Large	17	65.4%
Organization adopts Sustainable Measures		
Yes	26	86.7%
No	4	13.3%

It was noticed that over 50% of the sample have at least a master's degree, more than 40% of the sample had at least seven years of involvement with the subject. With respect to organizations, more than 60% of the sample works in large firms, most of it was composed of public or private companies and more than 80% states to adopt sustainable measures.

The radar chart (fig. no. 1) shows from the mode analysis which sustainable performance measures have greater importance for organizations.

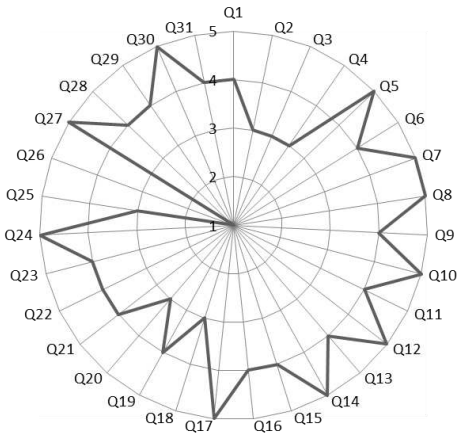

Figure 1 **Mode results: degree of importance of sustainable performance measures**

The mode analyses descrive that the most important measures for sustainable organizations are: Transparency of Information, Environmental Protection, Energy Conservation, Quality Management, Amount of Energy Reduced, Amount of Resources Reduced, Supplier Relationships, Organizational Reputation, Customer Satisfaction, and Investor Relations.

Then the non-parametric tests results of normality and internal reliability are observed (table no. 3).

Table 3 **Results of non-parametric tests**

Measures	K-S test		Cronbach's alpha
	Statistic	p-value	
Q1	0,231	<0,01	0,9683
Q2	0,179	0,02	0,9676
Q3	0,186	<0,01	0,9686
Q4	0,217	<0,01	0,9681
Q5	0,29	<0,01	0,9677
Q6	0,244	<0,01	0,968
Q7	0,229	<0,01	0,9678
Q8	0,258	<0,01	0,9686
Q9	0,211	<0,01	0,9676
Q10	0,211	<0,01	0,9679
Q11	0,277	<0,01	0,9675
Q12	0,251	<0,01	0,9685
Q13	0,231	<0,01	0,9682
Q14	0,179	0,02	0,9675
Q15	0,186	<0,01	0,9678
Q16	0,217	<0,01	0,9675

Q17	0,29	<0,01	0,9693
Q18	0,244	<0,01	0,9674
Q19	0,229	<0,01	0,968
Q20	0,258	<0,01	0,9682
Q21	0,211	<0,01	0,9685
Q22	0,211	<0,01	0,9682
Q23	0,277	<0,01	0,9679
Q24	0,251	<0,01	0,9676
Q25	0,192	<0,01	0,9675
Q26	0,194	<0,01	0,9688
Q27	0,199	<0,01	0,9682
Q28	0,25	<0,01	0,9681
Q29	0,257	<0,01	0,9683
Q30	0,184	<0,01	0,9675
Q31	0,252	<0,01	0,9678

The value of Cronbach's alpha per measure were all greater than 0.9 and the alpha value of the entire set was 0.969, which shows high reliability [22].By normality test it was noticed that there was no statistical significance between the K-S values of the variables of the test and the comparison of the p-value measures less than 0.01 it was possible to verify that the data are not normally distributed. Also, as critical D measures are less than the observed D measures (values calculated in K-S test), H_0 is rejected.

In order to analyze the Spearman correlation between the performance measures, firstly was evaluated the relationship between the Dimensions of the measures (table no. 4). As the data did not present a normal distribution, we used the Median (Md) of the measures for the characterization of the dimensions, since it is considered a robust or resistant position measurement, aiming at representing the position of the data, resisting any outliers.

Table 4 **Correlation between the dimensions of sustainable performance measures**

Dimensions	Social	Environmental	Economical	Governance	Technical	Sustainability
Social	1					
Environmental	**0.7059****	1				
Economical	0.5316**	0.6169**	1			
Governance	0.6872**	0.6276**	0.6258**	1		
Technical	0.6085**	0.5175**	0.4771**	**0.7644****	1	
Sustainability	**0.8655****	**0.8617****	0.6529**	**0.841****	**0.7504****	1

*p<0,05; **p<0,01

By the p-value analysis, the null hypothesis at the 1% level of significance was rejected, and it was possible to verify that the Social and Environmental dimensions (ρ = 0.7059). And the Technical and Governance dimensions (ρ = 0.7644) show a strong correlation with organizational sustainability, with the Social dimension being the highest correlation with sustainability (ρ = 0.8655).

Then, was calculated the correlation between the sustainable measures (table no. 5). It can be seen that in the Environmental dimension there is a strong correlation between the measures: Carbon foot print reduction and Reduction of air pollution (ρ = 0.8242); Carbon foot print reduction and Waste management (ρ = 0.7015); Energy conservation and Reduction in amount of energy use (ρ = 0.9205); Energy Conservation and Reduction in amount of resources use (ρ = 0.7576); Energy conservation and Sources of recyclable raw material (ρ = 0.7142); Green Marketing and Environmental Policy (ρ = 0.7492). In the Governance dimension there is a strong correlation between the measures: Code of conduct and Corporate Reputation (ρ = 0.7071); Code of conduct and Corporate Governance (ρ = 0.7212; Environmental logistics policy and Transparency in information (ρ = 0.7170). In the Social dimension there is a strong correlation between the measures: Balancing professional and family life and Sustainable working condition (ρ = 0.7280); Balancing professional and family life and Representation and dialogue with employees (ρ = 0.7177); Balancing professional and family life and Inter-firm collaborative capabilities (ρ = 0.7617). In the Technical dimension there is a strong correlation between the measures: Quality management and Customer satisfaction (ρ = 0.7381).

In addition, there is a strong correlation between measures of different dimensions such as Technical-Governance: Labor practice Indicators and Code of Conduct (ρ = 0.7462); Environmental-Governance: Environmental Policy and Code of Conduct (ρ = 0.7474); Economical-Governance: Eco-efficiency and Environmental Logistics Policy (ρ = 0.7856).

Thus, it is perceived that as organizational sustainability is a multidimensional concept all dimensions must be evaluated in an integrated way. It is up to the organization to measure its performance in relation to the most important measures considered, taking into account which of these have stronger relationships in order to investing the right resources, avoiding waste and promoting integrated management for long-term sustainable development.

Table 5 **Correlation between sustainable performance measures**

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
Q2	0,332																														
Q3	0,269	0,442																													
Q4	0,448	0,513	0,674																												
Q5	0,319	0,645	0,387	0,315																											
Q6	0,143	0,499	0,497	0,424	**0,779**																										
Q7	0,430	0,483	0,633	0,562	0,463	0,514																									
Q8	0,535	0,306	0,283	0,368	0,458	0,491	0,419																								
Q9	0,340	**0,786**	0,614	0,699	0,561	0,488	0,555	0,360																							
Q10	0,502	0,338	0,482	0,606	0,346	0,502	0,644	0,556	0,409																						
Q11	0,342	0,593	0,369	0,604	0,574	0,571	0,391	0,289	0,600	0,486																					
Q12	0,518	0,150	0,419	0,402	0,342	0,390	0,569	0,573	0,307	**0,738**	0,326																				
Q13	0,237	0,505	**0,762**	0,615	0,331	0,567	0,607	0,215	0,521	0,518	0,554	0,396																			
Q14	0,643	0,597	0,529	**0,715**	0,399	0,296	0,530	0,397	**0,717**	0,602	0,609	0,548	0,487																		
Q15	0,377	0,629	0,287	0,362	0,641	0,460	0,552	0,486	0,537	0,606	0,415	0,530	0,353	0,613																	
Q16	0,467	0,686	0,371	0,551	**0,751**	0,626	0,416	0,593	0,696	0,553	0,560	0,347	0,285	0,674	**0,749**																
Q17	0,487	0,382	0,175	0,139	0,507	0,510	0,529	0,519	0,248	0,354	0,278	0,361	0,224	0,343	0,516	0,558															
Q18	0,270	0,603	**0,804**	0,610	0,575	0,650	0,638	0,307	0,696	0,540	0,675	0,451	**0,718**	0,597	0,465	0,535	0,407														
Q19	0,452	0,444	0,411	0,436	0,619	0,598	0,377	**0,707**	0,497	0,605	0,474	0,532	0,397	0,622	0,626	**0,747**	0,443	0,467													
Q20	0,461	0,396	0,559	0,443	0,462	0,374	0,570	0,503	0,454	0,589	0,382	0,584	0,426	0,617	0,578	0,483	0,364	0,486	**0,721**												
Q21	0,180	0,376	0,569	0,479	0,497	0,593	0,283	0,505	0,397	0,439	0,465	0,325	0,574	0,429	0,448	0,525	0,255	0,598	**0,746**	0,533											
Q22	0,207	0,500	0,564	0,568	0,403	0,456	0,639	0,274	0,434	0,531	0,612	0,267	0,696	0,480	0,407	0,363	0,213	0,594	0,369	0,470	0,601										
Q23	0,203	0,570	0,437	0,417	0,605	0,653	0,405	0,337	0,461	0,422	0,644	0,261	0,653	0,330	0,531	0,546	0,421	0,631	0,473	0,307	0,668	0,690									
Q24	0,428	0,529	0,407	0,583	0,432	0,302	0,461	0,243	0,482	0,503	0,652	0,444	0,505	0,668	0,564	0,500	0,335	0,609	0,401	0,394	0,529	0,635	0,641								
Q25	0,432	0,589	0,579	0,582	0,493	0,553	0,607	0,154	0,547	0,428	**0,705**	0,382	**0,728**	0,656	0,392	0,434	0,437	0,685	0,466	0,528	0,510	0,632	0,547	0,591							
Q26	0,241	0,611	0,309	0,358	0,440	0,384	0,328	0,018	0,425	0,265	0,568	0,161	0,448	0,385	0,439	0,362	0,380	0,539	0,176	0,242	0,248	0,268	0,435	0,554	0,602						
Q27	0,356	0,399	0,294	0,560	0,386	0,282	0,411	0,179	0,442	0,448	0,615	0,493	0,456	0,603	0,491	0,400	0,240	0,463	0,335	0,325	0,381	0,506	0,519	**0,921**	0,533	0,538					
Q28	0,271	0,643	0,352	0,500	0,512	0,514	0,512	0,102	0,591	0,319	0,659	0,297	0,558	0,461	0,457	0,440	0,509	0,635	0,214	0,167	0,230	0,367	0,581	0,581	0,697	**0,824**	0,604				
Q29	0,276	0,523	0,395	0,556	0,474	0,401	0,507	0,204	0,514	0,487	0,416	0,259	0,334	0,425	0,516	0,523	0,353	0,451	0,334	0,443	0,332	0,326	0,275	0,518	0,482	**0,702**	0,498	0,595			
Q30	0,511	0,426	0,465	0,576	0,485	0,412	0,547	0,196	0,478	0,392	**0,712**	0,454	0,582	0,559	0,344	0,382	0,409	0,557	0,373	0,501	0,400	0,568	0,604	**0,758**	**0,779**	0,579	**0,784**	0,679	0,526		
Q31	0,557	0,511	0,364	0,551	0,537	0,299	0,393	0,334	0,485	0,343	**0,712**	0,305	0,396	0,652	0,547	0,553	0,382	0,556	0,469	0,561	0,456	0,522	0,561	**0,714**	0,564	0,468	0,592	0,463	0,400	0,691	

5. Conclusions

Thus, the organization that seeks to embrace sustainability in their business must allow direct efforts at sustainable performance measures which were considered of higher degree of positive correlation with organizational sustainability, making possible the Organization's transition to sustainable development. There should be greater concern about the more prominent organizational sustainability measures.

It was observed that the performance of one dimension can directly impact the performance of another dimension if there is a strong correlation. Thus, the improvement of the performance of social measures can impact an improvement of environmental measures and the same can occur between the Technical and Governance dimensions

It is expected that the results will be of interest to practitioners and academics, because these analyzes can be useful as benchmarking of sustainability between different sectors and organizations. Also, it is observed that organizational sustainability is increasingly being part of the agenda of many organizations and industries, in view of the pressures of its stakeholders to achieve economic development in parallel with social and environmental development. This work also helps to understand the perceptions and expectations of stakeholders.

It is believed that the use of organizational performance measurement systems can enable managers to control their own performance and evaluate employee performance effectively and efficiently, benchmark organizations and assist them in developing future operations and strategies.

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