

EMPIRICAL STUDY ON THE INDICATORS OF SUSTAINABLE PERFORMANCE –THE SUSTAINABILITY BALANCED SCORECARD, EFFECT OF STRATEGIC ORGANIZATIONAL CHANGE

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Abstract

The sustainable organizational change has an ever increasing importance, leading to the rethinking of the management and systems of performance measurement and monitoring within the companies. As a reaction to current economic phenomena, in the first section of this work we tried to bring out the need for using the couple Balanced Scorecard - Corporate Social Responsibility by companies. Thus, companies involved in sustainable actions must grant a great importance to the impact of environmental, social and economic factors in providing added value, informing the interested parties and reflecting the reporting of sustainable performance. As a consequence, in the second part of the work we present the Sustainability Balanced Scorecard for the implementation of efficient strategies which cumulate the economic, social and environmental aspects as integrating system for sustainable performance and as a new challenge for organizational change. The key performance indicators included in the Sustainability Balanced Scorecard are quantified by the indicators of sustainable development, based on which the empirical research described in the third section of the work was achieved. Through the quantitative analysis of the economic and ecological indicators (Gross Domestic Product per capita, respective, Environmental Performance Index) in correlation with the social indicator (Global Competitive Index), we conclude that the implementation of green strategies by companies leads to sustainable economic growth.

Keywords: sustainability, organizational change, Sustainability Balanced Scorecard, performance indicators, competitiveness

JEL Classification: D60, O12, Q56

Introduction

Economic, social and environmental changes around the world enhanced by the global crisis have, become, in an increasing manner, the target of discussions and concerns of

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international organizations, governments, investors and corporations in relation to the growth of corporate responsibility and sustainability.

In the last three decades, sustainability and corporate social responsibility show an ever-growing increase in importance in the research on business and organization stimulating the need for responsibility of the organizations that are looking for ways to measure and manage their interactions in the field (Gray, 2007). Corporate social responsibility is seen as an intelligent investment, bringing benefits both to the company, and to the entire community. Improving the relationship with the community (clients, suppliers, authorities), influencing the target audience, positioning the company on a superior step in society, good reputation for the company, client loyalty towards the company and its products, motivating the employees and building excellence in business granting a real competitive leverage are important contributions of corporate social responsibility. Social responsibility is essential for the long term prosperity of companies and sheds light on the human dimension of business, representing a vital connection with society, in general, and with the community where the business is located, in particular. (Dinu, 2011).

The concept of sustainability must be analyzed and understood together with other notions in relation with the role and responsibilities of an organization and its performance. In this context a conceptual trans-disciplinary framework is needed for a multi-dimensional understanding of the role and responsibilities of a corporate company (Caraiani, et al., 2010b). The sustainable actions of corporations involve granting an increasing importance to the environmental, social and economic factors, which should bring an increased value and information for the stakeholders and which is reflected through the reporting to sustainable performance.

The increase in competitiveness and the development of an economy based on knowledge with an emphasis on the improvement of the energetic efficiency and the use of alternative bio-regenerating resources, the protection and improvement of the quality of the environment, the improvement of the living standards, the development and a more efficient usage of the human capital through social promotions are relevant requirements for a sustainable development.

The researches in the specialized literature have tried to stimulate the evolving thinking on sustainability. Samimi, et al. (2011) performs an empirical study on the relationship between human development and environmental performance by using a regression model in panel. The conclusions support a positive relationship between the two indicators for the case study countries, the human development significantly influencing the environmental performance. A distinction is made between the developed and the developing countries, the latter needing more attention from the public and more support from the international bodies (Samimi, et al., 2011). Cimpoeu, et al. (2011) also proves a positive relationship between the environment and economic development.

At the present sustainability reporting is voluntary and achieved either separately, or in relation with the annual reporting of the companies. Empirical studies published in reference to the relation between the social aspects and the environment presented by the companies and the instruments for profit measurement, if any, prove to be insignificant (Lungu, et al., 2011). Hubbard (2009) concludes with a synthesis of the present practices of reporting sustainability resources presented by the researchers and notes that the sustainability reports most of the times are not integrated with the conventional economic

reports. These reports tend to focus on the positive aspects and detailed results and are oriented more towards management needs and less towards the needs of other interested parties involved in this process, focusing more on testing the concepts and theories than on supporting the managers and also focusing on the environment problems and less on social problems (Hubbard, 2009).

On an instrumental and strategic level, the companies have the control over the implementation of the policies concerning green strategies. However, the main impediment resides in the lack of integration of the economic, social and environmental performance improvement programs. Therefore, the use of the Balanced Scorecard (BSC) methodology for the integration of the social and environmental management in the general management of a company becomes a sustainability catalyst. Many specialists tackled the issue of the Sustainability Balanced Scorecard (SBSC) in their research (Radcliffe, 1999; Bieker, et al., 2001a; Bieker, et al., 2001b; Bieker, et al., 2001c; Dyllick și Schaltegger, 2001; Epstein și Wisner, 2001; Epstein și Roy, 2001; Orssatto, et al., 2001, quoted by Figge, 2002) discussing methodologies for corporate sustainability management directed towards value with Balanced Scorecard. These lead to the integration of the three pillars of sustainability in a unitary management system (Figge, 2002).

In order to answer the hypothesis proposed in this research on the relation between social, economic and environmental performance a multiple regression model was used. This model combines the three aspects of performance proving its functionality on the basis of the positive relation between them. Based on this model, we tested the influence that the independent variable of the Gross Domestic Product per capita (GDPC) and the Environmental Performance Index (EPI) have on the Global Competitiveness Index (GCI) on a worldwide level.

In practice, public and private agencies of environmental management use environmental indicators to summarize and assess the ecological processes (environmental performance, the allocation of restoration efforts and the establishment of the benchmarks of social and environmental criteria). Yale Center for Environmental Law and Policy (YCELP) and the Center for International Earth Science Information Network (CIESIN) at Columbia University in collaboration with the World Economic Forum and Joint Research Centre of the European Commission have elaborated and calculated the Environmental Performance Index as a response to information technology developments and data-driven decisions that have transformed every corner of society, from the business environment to the green environment. EPI includes a set of environmental indicators, which are calculated for the problematic areas and which should become factors of great interest in political decisions in every country (Cimpoeru, et al., 2011).

The work is organized as follows: a short introduction, followed by notions on the concept of sustainable development and SBSC as integrating system for the sustainable performance. Then we will present the methodology for research with reference to the data collection process, the research method and we present the framework of the research hypothesis. Further on, there will be a section that makes reference to the results of the empirical study, obtained based on the analysis of the correlations between synthetic factors of organizational change (GDPC and EPI) and the social performance (GCI), and then, based on the empirical researches, we conclude that the main factor for a sustainable economy is the Sustainability Balanced Scorecard.

1. Sustainability – the link between economic, social and environmental performances

The term „sustainable development” or „sustainability” first appeared when the objective of public order recorded advances for a continual economic growth (Ahmad, et al., 2011). The UN report, known as Brundtland Report defined the sustainable development as „ways of progress which should satisfy the needs and aspirations of the present generation without compromising the possibility for the future generations to satisfy their needs” (WCED, 1987, p. 43). From the point of view of the companies, sustainability must be understood as „the capacity to act in an unitary fashion through the renewal of the assets, the creation and delivery of products and services that answer to the expectations of the present society, the attraction of successive generations, the contribution to a sustainable environment, winning the trust and support of the clients, shareholders and of the community in which the entity performs its activity” (Caraiani, et al., 2010b, p. 80).

The governments, civil society, scholars, communities, companies and international associations must get involved in formulating and implementing solid environmental development and protection policies, together with the relevant research, the education, educating, raising awareness and changing social values as stipulated in the Earth Charter for supporting the sustainable development actions (Ahmad, et al., 2011).

Bansal (2005) presents three principles of sustainable development as a mandatory, but not sufficient condition for its achievement. The principle of ecologic integrity ensures that the human activities do not lead to the erosion of the earth, air or water resources. The growth of population combined with excessive consumption, the continuous pollution and the exhaustion of the natural resources threaten the integrity of the environment (WCED, 1987). The principle of social equity ensures that all the members of the society have equal access to the resources and opportunities. The principle of economic prosperity promotes a reasonable standard of life through the productive capacity of organizations and individuals in society and implies the manufacture and delivery of goods and services which will help raising the standard of living in the world. Economic development can become sustainable only if those three principles are simultaneously complied (Bansal, 2005).

The companies are considered the heart of economic growth by generating added value. Most of the population in every country works in these companies, and, willingly or not, their actions do not always have benefic effects on the environment. As a consequence, acknowledging these aspects places an emphasis on rethinking the strategies which should allow them to compete on different markets, to evaluate the social and environmental impact generated by their activities and to quickly and efficiently adapt to the changes in the environment in which they operate.

The concept of sustainable performance is promoted as a communication instrument between the main factors involved in the general social, economic and environmental balance on different complexity levels of the informational fields. As the need for sustainable practices in the business becomes clearer, sustainability reporting offers real values to those who have the responsibility of evaluating the current financial position of the companies and anticipating their future performances (Caraiani, et al., 2009).

Sustainable performance is equal with the reunion of the three dimensions of performance: the economic, the social and the environmental one. *The economic performance* contains all the aspects of the economic interactions of the organization, including the traditional indicators used in financial accounting, but also intangible elements which do not usually

show up in financial situations. *The environmental performance* refers to the impact of the organizations over the natural resources, including the ecosystems, earth, air and water. The activity of most of the organizations that present social and environmental reporting is certified by the environment management standards, such ISO 14001. The social dimension of sustainable development refers to the impact of the entity impact on the social systems in which it operates. *The social performance* can be measured through analyzing the impact of the organizations on the stakeholders on a local, national and global level. Social performance indicators can influence the intangible assets of the organization, such as human capital and reputation (Caraiani, et al., 2010b).

2. The Sustainability Balanced Scorecard – integrating system of sustainable performance

The maximization of profit does not represent the main objective of companies. These have started to move towards obtaining sustainable performance which, including the social and environment needs, contributes to the ongoing character of the activity. On an ever increasing basis, performance is measured next to the financial indicators, with the help of non-financial indicators which should mirror the aspects regarding safety, environment and the employees of the entity. Safety, society and the global performance, conformity, risk management, governance or performance evaluation are approached through the new management systems which the entities are implementing now as a basis for responsible reporting, for creating both current information and indexes for the future (Caraiani, et al., 2010a).

Companies have started to react and rethink the organizational change using modern management tools. Although social and environment management is not always directed towards the economic success of the company (Figge, 2002), many researches and scholars try to raise awareness among high level managers that sustainability must be seen as a primordial necessity of humankind. The company's orientation towards sustainability acknowledges its responsibilities towards different interested parties and adopts the activities, methods and tools which allow the improvement of the social and environmental performance. (Perrini and Tencati, 2006). In short term programs, aspects of risk improvement, the application of new control standards of activities and management integrity can be included, while in long term programs the improvement of risk management activities and of performance quality is intended (Lungu, et al., 2012).

Research in accountancy tried to obtain and evaluate both the leadership measures and also new forms of organizational responsibility through the perspective of accounting systems, which supports the possibilities of representing and communicating, transmitting official information in the interactions of the organizations with society and its physical environment (Gray, 2007).

Johnson and Kaplan (1987, quoted by Elijido-Ten, 2010) debated the critic concerning “the rise and fall of management accounting” and proposed more contemporary concepts for management accounting, including the systems for measuring the multi-perspective strategic performance (SPMS). In 1992 they introduced the most common model of SPMS, today known as Balanced Scorecard (BSC). Their model of BSC promotes translating the organizational mission and strategies into objectives (Rey-Marston and Neely, 2010).

BSC is based on the theory of interested parties, which connects the specific interests of all the parties involved in the company: employees, stakeholders, clients, suppliers, regulation organisms, local communities and explains the organizational performance according to their expectancies (Hubbard, 2009).

Performance measurement and objectives develop from targets established in each of the four perspectives: financial, client, internal processes and development and growth (Elijido-Ten, 2010). A well defined strategy represents the basis of the key performance factors which have the highest influence on the achievement of the basic strategic objectives (measured with result indicators) identified for all perspectives. The goal of BSC is to formulate a hierarchical system of strategic objectives for all four perspectives, derived from the business strategy and aligned with the financial perspective (Figge, 2002; Elijido-Ten, 2010).

Performance measurement involves setting the objectives for each perspective and the specific key performance indicators for achieving these objectives. The balance is considered the main principle which characterizes BSC and the four perspectives must be taken into consideration simultaneously for ensuring performance and success on a long term (Dumitrana and Caraiani, 2010).

Specific indicators developed depending on the corporate information needs permanently monitor the performance tendencies of an organization. Their number and types must be defined depending on real corporate needs and support the decisional process management (Perrini and Tencati, 2006).

Balanced Scorecard is a complex performance model and much more than a set of distinctive indicators, grouped in four perspectives. The causality relations between the performance objectives are represented by strategic maps (Kaplan and Norton, 2004). Companies develop a social and environmental impact perspective and use such tools as BSC in an extended form, connected with their business strategy (Jones, 2011). Sustainability Balanced Scorecard helps overcoming the deficiencies of the social and environmental management systems' conventional approaches.

In specialized literature three ways of developing SBSC were determined, such as: (1) through the incorporation of the sustainability measures in the initial framework of the four BSC perspectives; (2) adding a fifth "sustainability" or "social and environmental" perspective to the BSC or (3) developing a scorecard for distinct sustainability (Figge, 2002).

Regardless of the method used, the extension from BSC to SBSC must represent a privileged way for allowing a global steering of performance; the key to success in achieving this resides in a well defined strategy and the choice of the indicators. The choice option is at the discretion of the company, the choice varying from the industry sector in which they operate, the size of the company and its specific. SBSC should include results indicators – a posteriori, which are designed to determine whether strategic objectives have been achieved and leading indicators – a priori, performance generators which allow pinpointing the ways for achieving the objectives (Dumitrana and Caraiani, 2010). It is notable the fact that these indicators are connected by intra-perspective and inter-perspective cause and effect chains, the result indicators from a certain perspective can become action indicators from another.

Unlike the environmental performance indicators, social performance indicators are not easy to quantify and can be divided into two categories (Maas and Bouma, 2004, quoted Castro and Chousa, 2006): internal indicators, such as education and training, safety and healthcare, employees retention, satisfaction level, and external indicators such as sponsors, voluntary action, social investments and the involvement of the interested parties. Both categories can influence corporate performance (Castro and Chousa, 2006).

The modality presented in this case study is introducing the sustainability measures in the four BSC standard perspectives as can be seen in figure no. 1 and table no. 1. The strategically relevant social and environmental aspects are integrated in the four perspectives through basic strategic elements for which the objectives were set, the result indicators and action indicators were selected (Kaplan and Norton, 2001). Environmental/social aspects, thus, become a part of the conventional BSC and are integrated automatically in its cause and effect connections and hieratically oriented towards financial perspective and successful conversion of the business strategy (Figge, 2002).

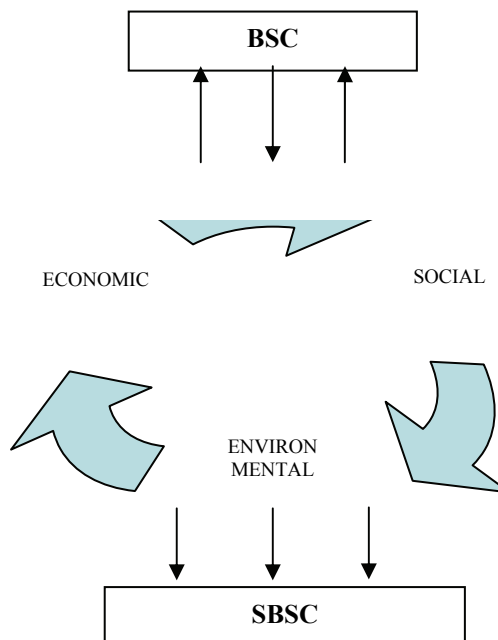


Figure no. 1: Transform the conventional BSC in SBSC

In our opinion, the introduction of the social and environmental aspects into the four perspectives of the conventional BSC is better perceived by all the interested parties involved, at a strategically level and at an operational level. (Figge, 2002) argues that adopting SBSC with the sustainability scorecard should be decided only after the first two versions were achieved for standard BSC.

Sustainable performance management needs a reporting framework which connects social management to the environment and the competitive business strategy of the company and which integrates social and environmental information in the sustainable corporate reports.

The reconsideration of the relations between SBSC, as a strategic management instrument and reporting the sustainable performance facilitates this aspect (Lungu, et al., 2011).

The strategic concerning the sustainable development adopted by companies must ensure an internal environment favorable to the maintenance of the competitive level and development, by improving labor conditions and increasing the living standard in a favorable external environment, by involving the company in actions concerning the community welfare, the development of a system of local and zonal partnerships for the purpose of creating a stimulating business climate, based on the congruence of the joint interest objectives and the increase of competitiveness as an essential qualitative condition on the long term (Miron, et al., 2011).

Table no. 1: General model of SBSC

Financial Perspective		Internal processes' perspective	
Standard BSC	Sales growth	Productivity	Standard BSC
	Cost-effective sales	Working force turnover	
	Cost-effective assets	Medium production per unity	
	Cost-effective capital	Working capital/ sales	
		Use of capacities	
Social	The frequency of loss caused by wasted time	Education and training	Social
	Sponsorship	Suppliers' social performance	
	Community relations	Reliability of the supply	
Environmental	Working license	Accidental leakages	Environmental
	Reputation	CO2/Nitrogen emissions	
	Brand value	Used energy/ unity	
CUSTOMER PERSPECTIVE		LEARNING AND GROWING PERSPECTIVE	
Standard BSC	Market share	New products developed	Standard BSC
	No. of new clients	Penetrating new markets	
	Product rate of return	R& D expenses/ sales	
	Damages	Training spending/sells	
	Order time cycle	Investments/ active total	
Social	Reliability of the delivery	Receptivity	Social
	General satisfaction of the client	Philanthropic investments/ income or profit Voluntary actions of the employees	
Environmental	Attracting the clients by promoting "green" politics	Innovation	Environmental
	Key materials used/ unit Product quality	Wastewater reusing	

Source: Adapted by Hubbard, 2009; Hsu și Liu, 2010

Since there is a strong connection between the macro-economy and the micro-economy, the variables measured at a microeconomic level are to be found at a macroeconomic level too, only determined at a general level. Implementing SBSC in the companies' management leads to success, competitiveness and the effects of this are mirrored in the key indicators of sustainable performance. Thus, the companies' optimum results determine the general progress of the sustainable economy.

3. Research methodology and data bases

The aim of this paper is the correlation of macroeconomic vision about the three pillars of sustainable development: economic performance – represented by GDP per capita; environmental performance represented by the environmental performance index EPI and the reflection of this liaisons in the global competitiveness index GCI, which is associated with social performance. The research is justified by the impact of determining factors over the social development required for economic progress and sustainable prosperity of the countries around the world.

We introduce a hypothesis: *The size of social performance in X country is correlated positively with the synthetic factors of sustainable organizational changes (economic performance and environmental performance measured at macroeconomic level for the respective country).*

We present a comparative analysis using a statistical-econometric methodology. Parameters statistics that measure the symmetry, the normality of the distribution, the correlation between different statistical data are obtained by regression function. Processing dates for the analyzed indicators are calculated by running Eviews software.

Considering the concepts presented, we can develop a multiple regression model that highlights the dependencies between GCI and its influence factors in 116 countries.

In the economic opinion, the model remains a usual instrument for solving certain general problems, and the modeling represents either a set of means for discovering the real nature of the problems of the economic theory, or a simplified image of the relationships between the economic variables, close to the structural-anatomical representation of the economic processes (defining the variables) and the physiological description (relationships, limitations, operating mechanisms). The statistical model reveals supplementary the phase character of the model concept, respective, as a link in an integrated learning process, being itself composed from the hypothesis, the schematic representation of a process (phenomenon), statistical testing of the formulated hypotheses on the reality and starting over the process in a general theory. The econometric model is represented as an aggregation of the mathematical, economical and statistical models, opening the horizon of multidisciplinary collaborations (Săvoiu, et al., 2011).

The series of data necessary for estimating the values of the model are cross-sectional data for 2010 (data collected at one point for a number of statistical units), collected as follows: global competitiveness index (variable marked with by GCI), GDP per capita (variable marked with GDPC) and environmental performance index (variable marked with EPI).

3.1. Indicators of sustainability

The United Nations Conference on Environmental and Development held in Rio de Janeiro in 1992 highlighted the goal of sustainable development indicators, used to collect, process and use the information to make better decisions, to smarter direct political options, measuring progress and monitoring feedback mechanisms (Agenda 21, Chapter 40, as quoted by Ramos and Caeiro, 2010).

Studies from the specialized literature have addressed different types of indicators for evaluating sustainable performance or its three aspects – economic, social and environmental (e.g. indicators of National Accounts - gross domestic product (GDP), GDP per capita, the Dow Jones Sustainability Index, Environmental Performance Index (EPI), the Climate Change Performance Index (CCPI), the Human Development Index (HDI), the Global Competitiveness Index (GCI), etc.).

GCI measures the national competitiveness, defined as a set of institutions, policies and factors that determine the level of country's productivity, and the level of productivity in its turn determines the level of sustainable prosperity that can be reached by an economy. The 12 critical factors called *competitiveness pillars* according to which GCI is determined are: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training of human resources, market efficiency, labor market efficiency, financial market development, technological training, market sizing, business sophistication and innovation. These factors are grouped in three categories – basic factors, efficiency growth factors and innovation factors, based on which the index is being calculated. The values of the index are situated between 1 and 7 and can be found in the Global Competitiveness Report prepared by the World Economic Forum Center. The report identifies a series of advantages, and also impediments to the national growth, thus offering a unique comparative evaluation instrument for the public and private sectors and also for the academic environment and the civil society. The report is available on the website of the World Economic Forum.

(http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2010-11.pdf).

GDP per capita is the gross domestic product divided by the average population per year. GDP is the sum of gross value added of all resident producers in the economy, plus any product taxes and minus any subsidies which are not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The international comparisons are ensured by the statistics of the World Bank on its website

(<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>). The values are expressed in thousands of U.S. dollars (the imported data were divided by 1000).

Although both indicators expressed, in theory, productivity, in our study we differentiate the GDP per capita as a strictly economic measure, while the broad sphere of GCI focuses it as social measure. Productivity leads to economic wellbeing, but welfare is only part of the total welfare (education, health, culture, security, etc.).

EPI measures the environmental performance of a country's policies and classifies 163 countries on the basis of 25 performance indicators organized into ten categories of policies. These indicators offer aggregate information, expressed in a governmental scale,

of the way in which countries reach the established environmental policy objectives. EPI was based on a team of expert researchers of Yale University for identifying the most adequate indicators in each category of policies and in some cases for assisting with data processing, making a real collaboration effort with the science world (Cimpoeru, et al., 2011).

EPI is focused on two very important environmental objectives: mitigating environmental stress factors for the human health and promoting the strengthening of eco-systems together with a healthy management of the natural resources. In order to make the 25 indicators compatible, each measure was converted to a proximity-to-target measure with a range from 0 to 100. The values of the indicator can be accessed on the website <http://epi2010.yale.edu/>.

3.2. Research method

Based on the quantitative data, we have developed a multiple regression model which highlights the existing dependencies between the global competitiveness index GCI (the dependent variable) and two macroeconomic performance indicators, GDPC and EPI as independent variables. The regression model has the following form:

$$y_i = a + b * x_i + c * z_i, \quad i = 1, \dots, n$$

where:

y_i is GCI, at the level of 2010;

x_i is GDP per capita, at the level of 2010;

z_i represents EPI in the year 2010;

a, b, c are the regression model parameters;

n is the number of countries considered in the analysis.

We have tested our study hypothesis by applying the multiple regression model on a database comprising 116 countries grouped in alphabetical order, for which I have found values for all three variables considered in the study.

3.3. Descriptive Analysis of data series

In the descriptive analysis we follow the indicators relating to the general distributions of characteristics: minimum value, maximum value, amplitude, arithmetic mean, standard deviation, asymmetry coefficient (Skewness) and the flattening coefficient (Kurtosis). The Skewness indicator is a statistical parameter that measures the lack of symmetry. The value of this indicator close to 0 indicates the existence of a normal distribution of the analyzed data series. Significantly different values from 0 (positive or negative) reflect the degree of distancing from the normal distribution. The Kurtosis indicator measured if the elements of a series are closer or more distanced from the normal distribution. Its high value indicates that the data has a distinct peak compared to the average.

We can say that for GCI and EPI data series, the indicators shown by *Histogram and Stats* show a normal distribution, and for GDPC it is notable the lack of normal distribution of this data series, that suggest a wider range of values (table no. 2).

Table no. 2: Statistical indicators of data series

	GCI	GDPC	EPI
Mean	4.140086	13.29840	60.22500
Median	4.065000	4.586350	60.75000
Maximum	5.630000	108.9210	93.50000
Minimum	2.730000	0.192100	33.70000
Std. Dev.	0.649269	19.06695	12.03165
Skewness	0.416586	2.271143	0.114811
Kurtosis	2.582398	8.991967	2.742172

The graph (figure no. 2) shows that all three series have a linear trend, which suggests that once GCI increases or decreases, GDPC and EPI have the same trend.

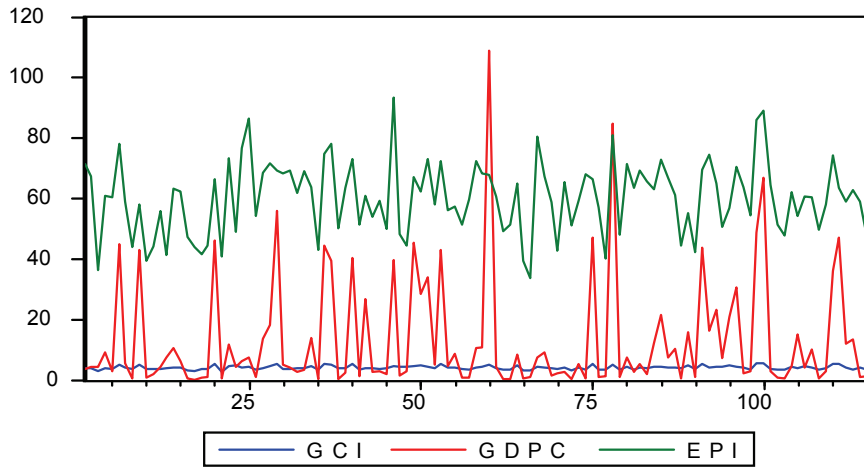


Figure no. 2: Series of date GCI, GDPC and EPI

Whereas, in reality, the dependence between the dependent variable GCI and the independent variables GDPC and EPI is stochastic, and only three factors have been taken into account in determining the GCI (although the dependencies are more numerous), the econometric model is given by:

$$y_i = a + b \cdot x_i + c \cdot z_i + \varepsilon_i, i = 1, \dots, n$$

where ε is the error of significance (specification), which is a random variable (stochastic) that has some probabilistic properties, given the inaccurate relations between the variables.

The deterministic relationship between the three data series expresses the dependence between the dependent variable GCI and the independent variables GDPC and EPI (figure no. 3).

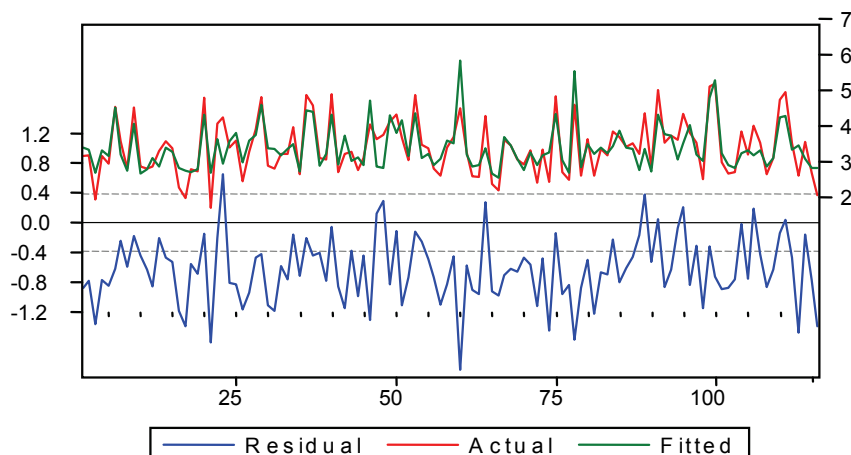


Figure no. 3: The actual, adjusted values of the series GCI series and residues series

Estimating the parameters through the method of least squares (OLS) for the proposed model, the relationship between the dependent variable - global competitiveness index (GCI) and the independent variables - domestic product per capita (GDPC) and the environmental performance index (EPI), we obtain the following form for the regression equation (table no. 3):

$$GCI=2.8270+0.0199*GDPC+0.0174*EPI$$

Table no. 3: The results of the estimation of parameters of regression model

Dependent Variable: GCI				
Method: Least Squares				
Date: 01/22/12 Time: 21:37				
Sample: 1 116				
Included observations: 116				
GCI=C(1)+C(2)*GDPC+C(3)*EPI				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.827055	0.203791	13.87235	0.0000
C(2)	0.019925	0.002264	8.800614	0.0000
C(3)	0.017402	0.003588	4.850336	0.0000
R-squared	0.658920	Mean dependent var.		4.140086
Adjusted R-squared	0.652883	S.D. dependent var.		0.649269
S.E. of regression	0.382527	Akaike info criterion		0.941488
Sum squared resid.	16.53497	Schwarz criterion		1.012702
Log likelihood	-51.60633	Durbin-Watson stat		2.044731

The determination ratio (0.6589) shows that the influence of the independent variables GDPC and EPI over the dependent variable GCI is 65.89%. The adjusted determination ratio (0.6528) expresses the quality of the variables included in the model.

3.4. The testing of econometric model

3.4.1. Testing the meaning of the model parameters.

The probabilities associated with the t-Student test for independent variables coefficient are below the threshold 1% for GDPC, EPI and the free term, so it rejects the null hypothesis that the slope of regression is insignificantly different from 0, these exogenous variables have a significant influence on the dependent variable GCI.

We are testing the significance of parameters of the regression model by the Wald test (table no. 4). It is noted that the associated probabilities are 0.0, Fisher and Hi-square values are very high, so the parameters are significantly different from 0.

Table no. 4: Wald Test

Wald Test:			
Equation: GCI			
Statistical test	Value	df	Probability
F-statistic	104728.5	(1.113)	0.0000
Chi-square	104728.5	1	0.0000
Null Hypothesis Summary:			
Normalized Restriction (= 0)	Value	Std. Err.	
-1 + C(2) + C(3)	-0.962673	0.002975	

3.4.2. Testing multi-co-linearity

In order to test the presence of the co-linearity phenomenon, we will apply the Klein criterion. In the correlation matrix for the variables of the regression model (table no. 5) we note that the correlation ratio between the two explanatory variables is less than the ratio of determination (0.5631 < 0.6589). We conclude that the co-linearity phenomenon is not present, so the two explanatory variables are properly introduced in the model.

Table no. 5: Correlation matrix of the model variables

Variables	GCI	GDPC	EPI
GCI	1.000000	0.766753	0.652029
GDPC	0.766753	1.000000	0.563197
EPI	0.652029	0.563197	1.000000

3.4.3. Testing the formulated hypotheses in defining the regression model - testing errors of self correlation

We apply the Durbin-Watson test for testing errors of self correlation, for which we have defined two hypotheses:

$H_0: \rho = 0$, there is no self correlation at residue series level

$H_1: \rho \neq 0$, the residue series presents self correlation of the first degree

The inferior, respective, superior limits for the DW statistics ($\alpha = 0.01$, $k = 2$) are 1.5, respectively 1.58. We calculate $d_u < DW < 4 - d_l$ and get $1.58 < 2.0447 < 2.50$. It results that the null hypothesis is accepted, so there is no significant linear correlation of the first degree at residue series level.

3.4.4. Testing the residuals variance

The residuals variance is explicated of the White test. Heteroskedasticity, the lack of equal dispersions, was verified by analyzing the determination coefficient ($R^2 = 31.02$). The value obtained is higher than the one existed in table, result that there is no heteroskedasticity between the model errors (table no. 6).

Table no. 6: White Test

<i>White Heteroskedasticity Test:</i>				
<i>F-statistic</i>	10.13201	<i>Probability</i>	0.000000	
<i>Obs*R-squared</i>	31.02563	<i>Probability</i>	0.000003	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 01/29/2012				
Sample: 1 116				
Included observations: 116				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.136288	0.344800	0.395266	0.6934
GDPC	-0.002530	0.002670	-0.947786	0.3453
GDPC^2	0.000109	3.11E-05	3.515915	0.0006
EPI	0.003393	0.011481	0.295487	0.7682
EPI^2	-5.92E-05	9.43E-05	-0.627418	0.5317
R-squared	0.267462	Mean dependent var	0.142543	
Adjusted R-squared	0.241065	S.D. dependent var	0.216785	
S.E. of regression	0.188856	Akaike info criterion	-0.453517	
Sum squared resid	3.958991	Schwarz criterion	-0.334828	
Log likelihood	31.30398	F-statistic	10.13201	
Durbin-Watson stat	2.060510	Prob(F-statistic)	0.000000	

3.5. Results and discussions

The obtained results confirm the hypothesis stated in the research and we interpret the regression equation thus: if GDCP *increases* by \$ 1,000 (these series date were divided by 1,000), then GCI increases by 0.0199; if EPI increase by 1 then GCI *increases* by 0.0174. Economic and ecologic growth in correlation with the increase in competitiveness generates a sustainable economy. The nucleus of economy being the company, we affirm that if the former utilizes sustainable strategies in order to overcome the social, economic and environmental impact of the activity performs, and in order to ensure profitability, then SBSC becomes the key to strategic organizational change.

The determination ratio (R-squared) has a sufficiently high value, almost 65.89% from the GCI variation is explained by the variation of GDCP and EPI factors. The adjustable determination ratio (0.6528) shows the quality of the variables used in the model. The statistical link between the endogenous variable and the exogenous variables is good, which shows that the variables are properly chosen in the model.

The analysis of the regression model presented cannot be considered complete without mentioning the fact that a significant value of the free term means that the factors which have not been included in the model affect the value of GCI. The value of the free term reveals that the variables which were not included in the econometric model have, as a whole, a positive effect on the evolution of GCI.

The validity of this model can be sustained on account of the low values of probability, the value of standard errors and the applied statistical tests.

In order to perform a forecast of the GCI variable, we resized the data series using a sample of observations from 1 to 110, from the observation 111 considering forecast (figure no. 4). The forecast is sufficiently accurate, because the root mean squared error is low (0.3707) taking into account that the analyzed sample is quite large, and the Theil coefficient is less than 1 (0.2872). The positive relationship between the components of the studied model is strengthened by this forecast and it is useful in discovering and following the evolution of an indicator in a given context.

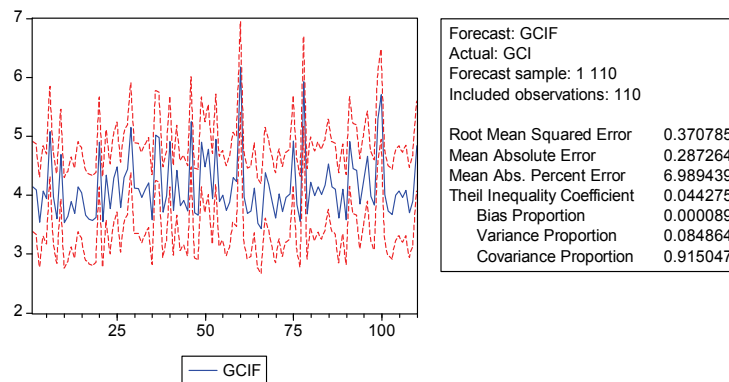


Figure no. 4: Forecast for GCI variable based on the current values

Conclusions

Our research claims that the countries which take into account the social and environmental aspects in their economic and governmental policies are more competitive and more innovative than the others. They have access to a range of information before the others and are better prepared to face the unforeseen aspects which may negatively impact on people's lives.

The results of the empirical study, performed by estimating the parameters of the multiple regression model, using the least squares method, reflects the positive influence of GDPC and EPI on GCI. This model combines the social, economic and environmental aspects in a positive relationship and offers a direction towards strategic organizational change to all the interested parties, leading to economic, social and environmental welfare.

A cleaner environment and a solid economic base ensures the fundamentals of human development – health, education, culture, security, and their simultaneous action guided by sustainable development principles will ensure the generation of tomorrow that we of today have acted wisely in obtaining performance.

The model is functional for companies, too, because their performances set the pace of economy, their objective being to create long-term value. A sustainability-oriented company is fully aware of its responsibilities towards the various interested parties. The adoption of an integrated system of management which include the aspects of sustainable performance like SBSC can only confirm that the preoccupation of a company for overall performance will be reflected in the sustainable performance of a country. Companies do not have to fear that the adoption of a system oriented towards sustainability will necessarily result in higher costs, if the strategy is well defined, monitored and measures by a high performance management system, but they can be sure that they will achieve long term benefits.

Our research proves the existence of a positive relation between the indexes for sustainable performance, which is so useful at macroeconomic level, and also at microeconomic level, because the integration of economic, social and environmental aspects on the long term in business strategies will help companies to maintain their global competitiveness, and, implicitly, the sustainable economy. Building a balanced SBSC model using a given frameworks will determine managers to think strategically in developing the sustainable organizational change. Moreover, including social and environmental indicators in the BSC is an answer to the current economic requirements. Just as macroeconomic indexes, such as GDPC, EPI and GCI are instruments which have proven their usefulness in time for measuring sustainable performance, similarly SBSC is the main instrument for measuring the sustainable performance of companies.

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