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SUSTAINABLE VALUE IN MEASURING OF CORPORATE SUSTAINABILITY: APPROACHES AND THEIR EVALUATION¹

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Abstract. The ultimate goal of an enterprise is value creation (Rappaport, 1986; Mills and Weinstein, 2000; Jensen, 2001) and it has a great importance for its owners (i.e. shareholders). The concept that is currently coming to the forefront, however, is that of sustainable value. The present paper deals with the definition and evaluation of basic points of departure, approaches and selected tools that lead to measuring corporate sustainability. The last section presents a theoretical basis of measuring corporate sustainability based on sustainable value, which will be the basis and starting point for primary research in selected industries.

Keywords: sustainable development, corporate performance measurement systems, sustainable value, integrated sustainability reporting, SVA

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1. Introduction

At the present time strongly affected by growing concern about the long-term successful operation of companies, one of the impacts of the recent economic crisis is the growing interest of domestic and foreign research teams in the words like sustainability, effectiveness, performance and their measurement in connection with sustainable value and sustainable success (Mills and Weinstein 2000; Jensen 2001; Veleva and Ellenbecker 2001; Sikdar 2003; Figge and Hahn 2004a,b, 2005, 2007; Searcy *et al.* 2005; Labuschagne *et al.* 2005; Hart and Milstein 2003; Böhringer and Jochem 2006; Van Passel *et al.* 2007, 2010; Holler 2009; Kuosmanen, T. and Kuosmanen, N. 2009; Hubbard 2009; Kocmanová *et al.* 2010, 2011, 2012a,b; Mondelaers *et al.* 2010, 2011; Grybaitė 2011; Tvaronavičienė and Grybaitė 2012; Bardy and Massaro 2012; Babčický 2013; Liesen *et al.* 2013; Laužikas, Mokšėckienė 2013; Wahl, Prause 2013; Mačiulis, Tvaronavičienė 2013; Vosylius *et al.* 2013;

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Tvaronavičienė 2014; Wahl 2014; Dzemyda, Raudeliūnienė 2014; Peker *et al.* 2014; Raudeliūnienė *et al.* 2014; Tvaronavičienė *et al.* 2014; Vasiliūnaitė 2014).

As found by a recent study, 93 per cent of company directors believe that the issue of sustainability will be crucial for the success of their companies.² The ultimate goal of each enterprise is value creation (Rapport 1986; Mills and Weinstein 2000; Jensen 2001) and it has a great importance for its owners (i.e. shareholders) but a contemporary enterprise can essentially be looked at as being a network consisting of a large number of mutual relationships between individuals and groups (stakeholders) that affect the way the enterprise is managed and how its behaviour is affected as well and, in turn, are influenced by the company's behaviour (Freeman 1984; Donaldson and Preston 1995; Post *et al.* 2002). In more depth, Post *et al.* (2002) emphasize that the capacity of the enterprise to generate sustainable wealth over time is determined by its relationships with other interested parties (stakeholders) that become critically important for the enterprise at a particular time or on certain fundamental issues or problems for the enterprise. From this perspective, all these mutual relationships between the enterprise and its stakeholders become strategic for the enterprise long-term success and survival, and the measuring of corporate success cannot be limited to value creation for only one group of its stakeholders, i.e. the shareholders (Šimberová 2010; Perrini and Tencati 2006; Clarkson 1995). It also supports the idea that companies should operate in a socially responsible manner, and that the impact of the company for each of the stakeholders is taken into account, including the ways in which the engagement of the stakeholders can support the creation of sustainable value from the long-term point of view. **The main purpose of this paper** is to perform a critical analysis of expert resources and to define and evaluate basic assumptions, approaches and selected tools that are the basis of the corporate sustainability measurement systems in connection with the concept of sustainable value. **The scientific aim** is to establish, on the basis of this analysis, a suitable theoretical framework for measuring corporate sustainability based on sustainable value, which will be the starting point for the creation of the theoretical premise for primary research in selected industries. **Material and methods:** Content analysis is based on an extensive literature search with a special emphasis on the areas of development and of theoretical starting points of corporate performance measurement systems that subsequently lead to an integrated approach in reporting and measuring of the so-called sustainable value and then, purposefully, on certain selected models for measuring sustainable value (e.g. EVA, MVA, SVA, SVAPPAS) that are currently used in the context of an integrated approach in reporting, but also criticized by many authors. We set out from the already established assumption that current models suffer from certain limitations especially in the selection and the number of factors, in not respecting the complex dependencies between individual factors and in the explanatory power, which does not reflect the current reality. In the first part, we assess the development and framework bases of contemporary corporate performance measurement systems including key authors and initiating institutions in terms of their development, methods, with an emphasis on the contribution to sustainable value measurement. In the next part, we clarify the concepts of sustainable development, efficiency, effectiveness, performance, sustainable value, and we describe in some detail the corporate sustainability measurement system based on sustainable value. In the ensuing discussion, we analyze the strengths and weaknesses of individual approaches and of selected instruments for sustainable value measurement, and in the last part of the paper we present, based on the conducted analysis and a discussion, relevant conclusions, which will serve as a basis for the conceptual starting points of our further research. **General conclusions** ensuing from our content analysis of expert sources are as follows: first – from the point of view of a successful construction and use of a system of corporate sustainability measurement and evaluation, the key issue is the linking of the financial and non-financial indicators to the ultimate goal, which currently seems to be sustainable value and sustainable success; second – the key issue in the creation of all corporate measurement and evaluation systems is the choice of appropriate key indicators and corresponding metrics, which are influenced by the theoretical basis of the systems selected for corporate sustainability measurement, as well as by the region, the industry and, e.g., the size of the enterprise; third – only a small number of initiatives in the field of corporate sustainability measurement has an integrating character and includes all three dimensions, i.e. environmental, economic and social, in the measurement system. The key activity in this area seems to be integrated sustainability reporting which opens the door for enterprises to competitive advantage based on the principle of sustainable value and sustainability.

² Lacy, P., Cooper, T., Hayward, R., and Neuberger, L., "A New Era of Sustainability," U.N. Global Compact and Accenture, June 2010.

2. Development and Evaluation of Corporate Performance Measurement Systems (CPMS) from the sustainable value perspective

In the last few years, we have witnessed various attempts to streamline corporate operations that fall within long-term common priority targets of enterprises, and to increase their performance. The incompleteness of financial indicators' information value has long been telling us that systems based on exact financial indicators are insufficient, although we cannot deny their fundamental analytical information value in the form of, e.g., an easy comparison, which is partly due to the availability of resources (such as annual reports, published financial results, balance sheets, profit and loss statements, cash flow statements, etc.) and partly to the fact that their construction is based on accounting standards and allows comparisons with identical indicators from the past (and also between companies and countries). An analysis of current practice and theory shows that some phenomena cannot be expressed solely by financial indicators, although they do ultimately participate in, and have influence on, the final financial results (e.g. in the terms of their connection with corporate governance, decision making and management of the company). Contemporary performance measurement systems promote division of performance evaluation approaches by means of both financial and non-financial indicators (Ittner *et al.* 2003; Synek *et al.* 2009; Marinič 2008). Recent years have seen a major growth in the development of corporate performance measurement systems which has been caused by turbulences and changes in the environment. Over the last 25 years, we have thus been able to trace changes in the basic theoretical premises of these measurement systems (CPMS), from the shareholder theory to the sustainability theories, which are mainly based on theoretical premises of the stakeholder theory. Table 1 below reflects that development and gives a general evaluation of individual theoretical approaches and tools including key authors, with regard to sustainable value. The original approach based on the shareholder theory whose principal centre of interest was value for that particular key group was gradually extended to also include other interest groups in the late 1990s that, according to some authors (Freeman 1984; Post *et al.* 2002; Brown and Faser 2006; Steurer 2006; Hubbard 2009), also participate in the creation of value for shareholders, and the stakeholder approach, which assesses corporate success based on the benefits for all stakeholders of the enterprise. Balanced Scorecard (BSC) is another performance measurement system (Kaplan and Norton 1992) based on the stakeholder theory, but some authors (e.g. Mooraj *et al.* 1999) have noted that it does not include the employee, supplier and social perspectives in performance measurements, although generally speaking it is in fact a tool for the measurement of external and internal economic values. For instance Figge *et al.* (2002) argues against the recommendations of Kaplan and Norton (1992) to establish only a total of 14 -16 metrics for BSC, according to them the system should respond more flexibly to individual cases and effects. This approach did not find practical application, no causal connectedness between factors was developed, and no consistent way was found how to incorporate other new corporate performance measurement metrics that would be linked to environmental responsibility or social relationships. Another stream of thought was associated with social responsibility, the foundation of which is mainly the control over the impact the enterprise has on the environment and the society, also called corporate social sustainability (Bowen 1953; Elkington 1997). This approach is associated with the concept of "sustainable development", which represents the idea of equal influence in corporate goals on three areas, i.e. on the environmental, social and economic issues (the triple bottom line or TBL). In practice then, as a reflection of new currents, we can identify changes related to reporting "Global Fortune 250", where the percentage of enterprises adding the so-called voluntary environmental, social and sustainability reports to their financial reports increased from 35% in 1999 to 52% in 2005 (Holler 2009: 26–27). In the early stages, enterprises viewed this development more as a necessity (something that must be done because it is mandatory) but later there was a growing awareness and understanding that it might be useful as a part of competitive advantage. In this context, a large number of studies were conducted and subsequently papers published on the search for, and construction of, suitable indicators to measure corporate sustainability (Buritt *et al.* 2002; Kocmanová *et al.* 2010, 2011, 2012a, b; Hřebíček *et al.* 2011a, b) or combinations of sustainability measurement indices (WEF 2002-2014; Elias 2003; Böhringer and Jochem 2006; Whitford and Wong 2009; Babcicky 2013; Bardy and Massaro 2012). As early as in 2001, the European Commission published recommendations for integrating sustainability premises into corporate annual reports (European Commission 2001). The result of this initiative and the general response to sustainable performance reporting was that enterprises published their "sustainability" reports either as separate

documents or as part of their annual reports (Jones *et al.* 2005; O’Dwyer and Owen 2005; Amran and Haniffa 2011), but this ostensibly encouraging trend was limited mostly to a few large concerns. These reports become public documents of the enterprises and subsequently provide a picture about their position on, and activities in, the economic, environmental and social issues to their internal as well as external stakeholders (WBCSD 2002). In the academic understanding, “sustainability” reporting is synonymous with social reporting, corporate social and environmental reporting (CSER) or environmental reporting, which carries the same meaning in that it is in fact a report on social responsibility of the enterprise towards its stakeholders (Stiller and Daub 2007).

Table 1. Development of Corporate Performance Measurement Systems, Tools, Changes and Sources: towards to the sustainability value perspective

Theory	Tool	Changes of approach	Sources
Shareholder Theory		The perspective uses shareholder return to measure overall firm performance.	Porter 1980
Stakeholder Theory		Its perspective of corporate performance incorporates shareholders value, but recognizes that shareholders are just one group of stakeholders.	Freeman 1984; Reich 1968; Post <i>et al.</i> 2002; Brown and Faser 2006; Steurer 2006
	Balanced Scorecard	The internal process is becoming dominant for measuring performance.	Kaplan and Norton 1992;
		The original model does not incorporate employee, supplier or community perspectives on firm performance.	Mooraj <i>et al.</i> 1999; Bieker and Gminder 2001
		Measures should be integrated and linked via cause and effect (not just the 14-16 performance measures of original BSC).	Figge <i>et al.</i> 2002
Corporate sustainability	The Triple Bottom Line (TBL)	Groundswell of public opinion that firms were responsible for more than just creating economic value. TBL adds social and environmental measures of performance to the economic measures.	Elkington 1997
	Sustainability Reporting	Sustainable development embodies three inextricably connected principles: environmental integrity, social equity and economic prosperity. Performance in one area has effects on the other two areas.	WCED 1987, Bowen 1953; Elkington 1997
		At the organizational level, a sustainable business has been defined as one that ‘meets the needs of its stakeholders without compromising its ability also to meet their needs in the future’. (Sustainability- something that has to be done because it is law).	Hockerts 1999; Bansal 2002
		The organizations follow an evolutionary path in their attitudes and behaviours- from compliance to competitive advantage.	Hart 1995; Florida 1996
		SustainAbility Framework, developed by an international consulting firm.	IFC Sustainability Framework 2012
		Eco-Management and Audit Scheme (EMAS) Global Reporting Initiative (GRI), developed by a United Nations affiliate organization.	GRI 2002; GRI 2004; GRI 2006; GRI 2013; Bardy and Massaro 2012;
		Environmental Sustainability Index (ESI), developed by the World Economic Forum., which includes socio-economic, environmental and institutional dimensions- evaluation and measurement of sustainability on a country scale- cross-national analysis	WEF (2000-2014), Whitford and Wong 2009; Babcicky 2013; Esty 2006
		Dow Jones Sustainability Global World Index	Elias 2003

Environmental Management Systems (EMSs), based on ISO.	Gonzales- Benito, J. and Gonzales- Benito, O. 2005; ISO 14 000, 26 000; ISO Advisory Group on
Corporate Social Responsibility (CSR).	
The Sustainable Balanced Scorecard (SBSC).	Drews 2010; Weber 2010
Corporate Social and Environmental reporting (CSER), based on the three theoretical perspectives: legitimacy, stakeholder and political economy.	Figge <i>et al.</i> 2002; Hubbard 2009; Yongvanich and Guthrie 2006; Stiller and Daub 2007; Bennett and James 1999; Amran and Haniffa 2011
Organizational Sustainable Performance Index (OSPI) - (four-quadrant BSC and add social and environmental indicators to create a six-component SBSC).	
Environmental, Social and Corporate Governance Indicators (ESG), KPIs, SERS	Hubbard 2009
Integrated Sustainability Reporting (initiative of many worlds' bodies, which should integrated financial and nonfinancial results of the company into one Integrated Reporting, which should include SVA and EVA),	Buritt <i>et al.</i> 2002; Kocmanová <i>et al.</i> 2010, 2011, 2012; Hřebíček <i>et al.</i> 2011a, b
	EC 2001; IIRC 2013; GRI 2006; WBCSD 2000, 2003; IFAC 2012, Willis 2003; Fonseca <i>et al.</i> 2012

Source: adapted and processed from Perrini and Tencati 2006; Hubbard 2009; Holler 2009; Amran and Haniffa 2011; Kocmanová *et al.* 2012 a; Dočekalová *et al.* 2011; Babčický 2013

3. Sustainable development and selected models (methods) of sustainable value measurement

In connection with the term of enterprise sustainability measurement, it is worth noting that phenomena such as *efficiency*, *effectiveness* and *corporate performance* are nowadays among the basic characteristics of enterprises related mainly to sustainable development as an important megatrend of our time. This ensures the incorporation of both financial and non-financial aspects into their measurements. From the enterprise point of view at present, a commitment to sustainability means higher value, i.e. competitive advantage.

The relationship between the efficiency and effectiveness is shown in Fig 1.

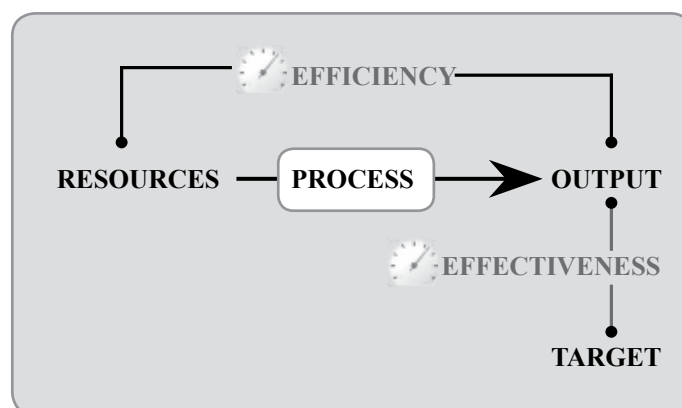


Fig.1. Effectiveness vs. efficiency

Source: CBSolution.net: Connective business solutions. Effectiveness vs. efficiency (2011)

“Effectiveness indicators measure how much your targets were reached. They relate actual to expected values. ... Efficiency indicators include traditional financial ratios (profitability, turnover ...), but non-monetary efficiency measures are today recognized as a key factor to track cause-effect of business decisions.” (CBSolution.net: Connective business solutions. Effectiveness vs. efficiency 2011).

As mentioned above, the term sustainability is associated with every activity of human society on the planet Earth. The basis of its significance can be traced to the definition of the phrase *sustainable development* presented in 1987 by Gro Harlem Brundtland in the Report of the World Commission on Environment and Development (WCED) of the United Nations (UN) entitled *Our Common Future*: “*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*”³

Sustainability means to promote the present-day economic growth while protecting the environment and natural resources with respect to the future. Sustainability must be global in character but it is at the same time necessary to reflect local and regional conditions. It is important to harmonize not only the environmental, social and economic issues and corporate governance (CG) principles but also the levels of different countries. It is apparent that sustainability concerns all activities on the planet Earth. It is necessary to monitor the values of a large number of indicators that are relevant for the principles of achieving sustainability (more detail in e.g. Moldan 2012). Different metrics have been developed and different data have been used to evaluate (sustainable) corporate performance. Compared with the past, when they were purely financial in character, there is now a growing need to also include data of non-financial character, specifically for the need of development towards sustainability. In this context, current economic theory and practice pay considerable attention to the concept of *value*, which can be approached from various angles and related to other phenomena. *Models of value measurement, value estimates*, etc. are constructed.

There is a European standard NF EN 12973 of 2000 which defines the *value management* and presents concepts associated with value, such as *value analysis, value comparison*, etc. Value increases with the decreasing number of resources or increasing satisfaction of needs. Value management of enterprises strives to maximize progress in achieving goals while minimizing the resources (more detail in Czech Standards Institute, Czech Technical Standard 2000). Value management is associated with concepts such as *customer value, value planning, value analysis, product value strategy*, etc. (more detail in Šimeček 2009: 10–12).

4. Market Added Value, Economic Added Value

Let us briefly mention at least two important and widely used values of financial nature, whose construction (introduction) in an enterprise and the monitoring of its performance play an important role: The financial indicator *Economic Value Added* (EVA) (Bartulec 2011: 24) is used to determine the company value, design compensation purposes, for interconnecting the strategic and the operations management of companies. Its construction at the end of the last century was an important moment in corporate theory and practice.

The calculation of EVA on the basis of economic profit is as follows (Chvátalová *et al.* 2010: 31):

$$EVA = NOPAT - C \cdot WACC \quad (1)$$

$$NOPAT = EBIT \cdot (1 - t) \quad (2)$$

where: *NOPAT* = Net Operating Profit After Taxes, *C* = Invested Capital; *WACC* = Weighted Average Costs of Capital, *EBIT* = Earnings before Interest, *t* = Tax Rate.

Market Value Added (MVA) is specifically aimed at measuring market value. According to the Management Mania (2011-2013), *MVA* “*measures the difference between enterprise market value and value of the capital invested. It expresses the wealth of the owners (shareholders). The calculation is possible in two versions: ex*

³ CENIA, Czech Environmental Information Agency. *Sustainable Development* Available from: [http://www.cenia.cz/_C12571B20041E945.nsf/\\$pid/MZPMSFHV0HSB](http://www.cenia.cz/_C12571B20041E945.nsf/$pid/MZPMSFHV0HSB). [25 October 2013].

ante: MVA = Present value of future results according to EVA; ex post: MVA = Market value of the enterprise – Total paid-in capital. “

Although the numerical calculations of these values (EVA and MVA) are not trivial, they can be easily calculated at the time of widespread utilization of information and communication technologies and even some advanced mathematical methods, e.g. the neural network model, can be used for the purpose. There are many computer systems that contain built-in procedures (e.g. MATLAB, Maple etc.). Since approximately the turn of the millennium, the scientists have adopted a new approach to measuring value - in particular with regard to sustainability. Highly acclaimed European specialists Frank Figge and Tobias Hahn work on the development of models to measure an important characteristic, the so-called *Sustainable Value Added* (SVA). In their paper, Figge and Hahn (2004b: 173) present their new ideas: “...a new approach to measure corporate contributions to sustainability...” and say that: “...it is more promising to develop sustainable measures based on opportunity costs...” and also that: “...Sustainable Value Added considers simultaneously economic, environmental and social aspects... Because substitutability of different forms of capital is disputed, for the assessment of corporate contributions to sustainability we need additional information about eco- and social effectiveness, i.e. on the absolute degree of the use of environmental and social resources by companies.” In a later paper, Figge and Hahn (2005: 47) say:

“We develop and apply a valuation methodology to calculate the cost of sustainability capital, and, eventually, sustainable value creation of companies.” They went on to specify their basic idea of taking into account the economic capital, but also other forms of capital: *“Our methodology borrows the idea from financial economics that the return on capital has to cover the cost of capital. Capital costs are determined as opportunity costs, that is, the forgone returns that would have been created by alternative investments...”* They applied this methodology in the British Petroleum. The Sustainable Value Added calculation they performed in five steps (see formula 3) using economic output of company, economic output of benchmark, resources of company, resources of benchmark (more detail in Figge and Hahn 2005: 47).

Van Passel (2008: 26) discussed: *“...an outline of the possibilities and limitations of value-oriented methods to assess farm sustainability...”* Van Passel states (in Figge and Hahn 2004 a, b; 2005) that: *“This approach has been developed outside the agricultural sector and already applied to major companies (e.g. BMW, Shell). Recently the approach has also been tested and used for the agricultural sector.”* Care of course must be taken to choose relevant resources that influence sustainable development in agriculture. Choosing the appropriate, suitable and available indicators specific for agriculture takes a long time, and large number of resources needs to be tapped that discuss ambiguity of assumptions, development dynamics in developing methods for measuring sustainable value. Furthermore, Van Passel (2008: 28) points out that: *“...an interesting way is to use good performing farms as examples for the sector as a whole. Sustainable farms may be used as a mirror for future farms. Therefore, it is essential to develop and use methods to identify sustainable farms. The approach could help decision makers to identify farms that best suit policy objectives. It also provides information to what extent resource use can be improved conditional on the current technology.”*

In their paper, Mondelaers *et al.* (2011) summarize the outputs of the three-year EU SVAPPAS Project (FP6 STREP EU-project SVAPPAS (Sustainable Value Analysis of Policy and Performance in the Agricultural Sector)). They point out that sustainability in agriculture is a constant problem, and also that various methods have been developed, but few of them are used in practice for policy evaluation because the most of them are only burden oriented. The Sustainable Value (SV) method by Figge and Hahn (2004a) was critically analysed and extended by four modifications for the agricultural sector. Mondelaers *et al.* (2011: 9) define the objective of this project as follows: *“The objective of the 2007... was to test, elaborate and apply this new method in the agricultural context. Another goal of the project was to evaluate the suitability of EU Farm Accountancy Data Network (FADN) data for SV analysis. This project brought Figge and Hahn, the original developers of the SV method, together with a multidisciplinary group of agricultural and ecological economists.”*

Four modifications for the agricultural sector:

- First of them is based on the idea: *The original SV method does not take the underlying production functions into account when calculating the benchmark productivities. This criticism is formulated and described by Kuosmanen, T. and Kuosmanen, N. (2009). Incorporating production functions is one of the modifications to the original method. This modification ensures that the value creating potential of one resource is dependent on the other resources. The formulae originate from Mondelaers et al. (2010: 12–13).*
- Second of them is based on idea: *“The modified method now allows for alternative benchmarks. ... One of the suggested alternative weighting schemes is based upon the firm’s marginal productivities, or shadow prices.”* This suggestion draws on the work of Kuosmanen, T. and Kuosmanen, N. (2009) and Mondelaers et al. (2010).
- Third of them is based on the idea: *“... therefore proposes incorporating sustainability thresholds on capital use.”* This proposal is supported by (Mondelaers 2010; Merante et al. 2010).
- Fourth of them is coming with the assume: *“... that all companies involved are exposed to the same degree of risk”* (Figge and Hahn 2007). This assumption can be relaxed by calculating risk-adjusted opportunity costs, i.e. opportunity costs that have the same level of risk as the company that is being evaluated.

Figge and Hahn (2007) have developed a methodological framework that has (in adapted form) been tested and applied by Van der Vennet et al. (2010) in an assessment of the sustainability of Flemish pig production.

In their paper, Mondelaers et al. (2011: 13–14) also noted that *“The SV method can be used both for policy assessment and policy design.”* And *“By changing the weighting of the different firms in the benchmark, it is easy to switch between the private investor’s view, the manager’s view and the policymaker’s view.”*

Timo and Natalia Kuosmanen (2009) analyzed the procedure in the Figge-Hahn’s (FH) construction of the Sustainable Value in their paper *“How not to measure sustainable value (and how one might)”*. These authors criticize in the Figge-Hahn’s methodology (Figge and Hahn 2004a,b; 2005) that the estimator for opportunity costs which is based on poorly realizable assumptions. Kuosmanen, T. and Kuosmanen, N. (2009: 235–236) say: *“... we do not criticize the theoretical concept of SV...”*, they appreciate: *“... the idea of valuing resources based on their opportunity cost. However, one must sharply distinguish the theoretical object of interest (the estimand) and the computational rule (the estimator).”* They think that: *“Unfortunately, FH do not draw this distinction, but present their SV estimator as a definition that leaves no room for error.”*

Let us consider the formula below, which is a mathematical expression for the calculation of the estimator of sustainable value by Figge and Hahn (including the possible formal modification) as shown on pages 236–237 in (Kuosmanen, T. and Kuosmanen, N. 2009):

$$\widetilde{SV}_i^{FH} = \frac{1}{R} \sum_{r=1}^R \left(\frac{y_i}{x_{ir}} - \frac{y^*}{x_r^*} \right) x_{ir} = y_i - \frac{1}{R} \sum_{r=1}^R \left(\left(\frac{y^*}{x_r^*} \right) x_{ir} \right) \quad (3)$$

where $\frac{y^*}{x_r^*}$ can be understood as eco-efficiency of the benchmark (benchmark: the added value y^* and the resource x_1^*, \dots, x_r^*), analogously $\frac{y_i}{x_{i1}}, \dots, \frac{y_i}{x_{iR}}$ for i^{th} firm’s eco-efficiency.

Kuosmanen, T. and Kuosmanen, N. (2009: 236–242) point out that:

- *“The benchmark” could represent the aggregate economic output (i.e., GDP) and the resource use of the economy as a whole (as Figge and Hahn 2004 b. suggest), or it could represent the average output and resource use of the sector (e.g., Van Passel et al. 2007).”*
- *“... drawing a sharp distinction between the conceptual idea and the operational estimator. ... In particular, the production function is assumed to be linear, with specific coefficients determined by the “benchmark”. Linearity is a very strong assumption, implying perfect substitutability of all resources, which directly violates the principle of strong sustainability.”*

Kuosmanen, T. and Kuosmanen, N. (2009) introduce the possibility of some econometric approaches to the estimation with evidence of statistical foundation. Using the Monte Carlo method they are compared the true

and the estimated values for sustainable value in the case of the Figge and Hahn's (FH) estimator and in the case of using ordinary least squares (OLS) estimator and they point out better results for the estimator in the second case (their approach). They tested FH vs. OLS approach (using empirical data sample of 65 European manufacturing firms in 2001–2003 of ADVANCE Project - ADVANCE-project⁴ 2008, Hahn *et al.* 2007) and in their opinion the FH estimator has not sufficiently explanatory power.

Figge and Hahn (2009) expressed the criticism against Kuosmanen, T. and Kuosmanen, N. (2009) by identifying: "...three conceptual misfits: a mismatch in the perspective of the analysis, a misspecification of opportunity costs and the irrelevance of production functions. Ultimately, Kuosmanen and Kuosmanen's train of thought rests entirely within the realm of productive efficiency analysis, where as Sustainable Value builds on the foundations of financial economics and consequently adopts a macro rather than a firm perspective." Sustainable Value and its measurement by a benchmark approach is often discussed topic mainly on professional field. For example, Ang and Van Passel (2010: 2303) responded to the debate Kuosmanen and Kuosmanen (2009) Figge and Hahn (2009) as follows: "...the debate is very confusing because the original Sustainable Value approach presents two largely incompatible objectives. ... If one intends to present the overall resource efficiency of the firm from the investor's viewpoint, we recommend the original benchmarking methodology. If one on the other hand aspires to create a prescriptive tool setting up some sort of reallocation scheme, we advocate implementation of the productive efficiency theory." They call on more consideration of the system for the selection of resources, the inclusion of the value chain political analysis.

Ang and Van Passel (2012) in their paper discuss problems: "...on weak sustainability versus strong sustainability (the substitutability of human-made capital for natural capital)". Sustainable value and its measurement are under development. For example, Liesen *et al.* (2013: 175) present a new strategic tool for the company top management - Net Present Sustainable Value: "The concept of 'net present sustainable value' is introduced as a new strategic tool for sustainable investment appraisal, which extends the traditional net present value approach to include resources other than capital."

5. Discussion

As we have already mentioned, the ultimate goal of the enterprise is value creation and it is of great importance not only for its owners (shareholders) because many other interested parties are also involved in value creation. They form a network consisting of a large number of inter-relations between individuals and groups (stakeholders) that affect the way the enterprise is managed and also how its behaviour is influenced, which ultimately may also affect its sustainability. It is generally known that many other more or less successful attempts to implement various new management approaches aiming to increase corporate performance failed to meet the expectations placed on them, especially because the goals that they defined were not conceived comprehensively, were unclear etc., but most importantly they failed because they did not to connect the factors determining value creation - value creation accelerators (i.e. value drivers) with the ultimate goal of the enterprise. Measurement based on the construction of financial indicators is hampered by several serious shortcomings related to the information value of those indicators (Marinič 2008; Wöhe 1998 in Marinič 2008; Higgins 1997 in Marinič 2008):

- despite high information value of financial indicators and their possible widespread application through the apparatus of mathematical and statistical methods, a simple algorithm cannot describe the complex reality of business practice;
- the very construction of indicators based on the mathematical and statistical apparatus struggles with the problem of the informative value of the source data (exact figures are directed towards past events that have already ended) - named as deficiencies of the database;
- interpretation of indicator and outcomes is prone to problems with respect to factual explanations, these are called methodological shortcomings, a major role is also played by subjectivity in interpretation;

⁴ From ADVANCE Project (full version at <http://www.advance-project.org/>): "The ADVANCE survey assesses the value created by 65 European companies from the manufacturing sector through their environmental performance. ADVANCE uses the Sustainable Value approach which enables sustainable performance to be measured in monetary terms." More in (ADVANCE-project 2008).

According to Marinič (2008: 28) these shortcomings undermine efforts to construct key performance indicators, the so-called Value Driver Tree, which is created by breaking down those indicators into lower level sub-indicators, and which, by means of factor analysis, should help identify key drivers of corporate performance.

Financial indicators, on the other hand, have also some advantages:

- the speed and low cost at which they can be acquired and processed owing to the availability of the data;
- another advantage is that their construction is based on financial standards allowing easy comparison with identical indicators from the past, both within the company, among companies and internationally.

The concept that is currently coming to the foreground in the context of corporate sustainability measurement systems is that of sustainable value because company sustainability depends on its measurement (Holler 2009). Although economic indicators are necessary, they are not sufficient to generate sustainable value. Shortcomings in their application can be eliminated by the application of non-financial indicators, which can be used to both define and measure also non-financial goals.

Disadvantages of non-financial (non-economic) indicators include (Marinič 2008):

- they are not based on accounting standards;
- the main disadvantage is the cost issue and the time factor;
- they are acquired by various methods and with disparate denominators (time, quantity...), which renders inter-company comparisons problematic

The advantages of non-financial indicators, on the other hand, include (Marinič 2008):

- the ability to express the proportion of intellectual property, the so-called intangible assets, in the overall result of the company's activities and in creation of added value;
- connection with the long-term strategy and long-term business objectives;
- the ability to define and predict factors influencing the overall success of the enterprise;
- the ability to characterize the basic aspects of the company's value chain;
- they are future oriented;
- the ability to define the main factors influencing the development of targeted financial indicators;
- greater sensitivity to changes in the external environment, which means that they can improve management control processes if applied correctly and rapidly;
- the ability to anticipate the consequences and implications that are usually measured by exact financial indicators;

Figge and Hahn (2004b) are considered pioneers of the method of measuring sustainable value published in their paper in *Ecol.Econ.* Figge (2005) deals with problems related to the issue of value posed by the environmental management, one of key questions being how environmental management can participate in creating a sustainable corporate value. They look for management approaches that are focused at creating values, also called value-based management. The aim is to identify factors called value drivers. Freeman *et al.* (1973) and McIntyre and Thornton (1974, 1978) refer to the relationship between environmental performance and economic performance as environment efficiency, Schaltegger and Sturm (1990) as ecological efficiency, and, more recently, Schmidhein and World Business Council for Sustainable Development (2002) and WBCSD (2000) call it eco-efficiency. According to Figge (2001) and Figge and Hahn (2004a), only companies that provide for an adequate return on economic, environmental and social resources are able to generate sustainable value. Figge and Hahn (2004a) and Figge (2005) set out from Rapport's stakeholder value theory (1986), which was dominant at that time, and extended it to include an approach whereby value-based management can be based on option value. By comparing value drivers of the two approaches, they produced a matrix based on two dimensions, i.e. risk and opportunity costs. In their paper "Creating sustainable value", Hart and Milstein (2003) sought to clarify the relationship between sustainable development and the creation of sustainable value at a company level. According to them a company is sustainable if it contributes to sustainable development by simultaneously producing economic, social and environmental benefits, the so-called triple bottom line. To

achieve company sustainability, most companies try to reconcile that with the aim of increasing shareholder value. Only few of them practice the integrating orientation measuring the environmental, economic and social dimensions (Singh *et al.* 2009, Veleva and Ellenbecker 2001; Labuschagne *et al.* 2005). An analysis of several sustainability initiatives undertaken by Singh *et al.* (2009) showed that although different frameworks exist, their main objective in a majority of cases is the environmental dimension. Cruz and Boehe (2008) proposed an approach in their research called “sustainable global value chain”, in which they argue that sustainability is a part of the “global value chains”. Three main themes emerged that can be considered as problems associated with the proposed concept, which the authors called the “sustainable global value chain”. They are the bargaining power between the players in the chains, the differentiation strategy of the global value chain, and cooperation in building global value chain awareness. According to Van Passel *et al.* (2007) the sustainable value approach refers particularly to the efficiency in using the capital of the company (at a micro level) and the efficiency of the benchmark (at a macro level).

Measuring sustainability from the sustainable value perspective seems to be an important trend that promises the so-called sustainable success to companies. The analysis of this topic contributed several interesting ideas to ongoing discussion relating to the following areas: first, although there exist many different sustainability measurement initiatives, only a few of them are based on integrative approach of all three sustainability dimensions, i.e. environmental, economic and social (Singh *et al.* 2009; Veleva and Ellenbecker 2001; Labuschagne *et al.* 2005).

Conclusions

From the point of view of a successful construction and utilization of the system for measuring and evaluating corporate performance, the key issue is the interconnection between financial and non-financial indicators and the ultimate goal, based on its understanding of the principles of their mutual causality (the key question is how close that interconnection is and how it works). When creating systems for corporate measurement and evaluation, it is most important to select appropriate key performance indicators and corresponding metrics. The aim has recently been to construct key performance factors, the so-called Values Driver Tree, which is created by breaking down exact financial and non-financial indicators into lower level sub-indicators and, by means of factor analysis, to define individual influences that affect value creation and in this way to identify key elements of corporate performance. These indicators, as shown for example by Marinič (2008: 31) must meet the following requirements:

- meaningfulness, non-ambiguity, explanatory power;
- a high degree of information and data integrity;
- applicability to feedback and subsequent corrections; and
- effective interconnection between strategic goals and value creation accelerators.

Fulfilling these requirements also appears to be one of the crucial issues for their selection, which is one of key questions of contemporary research. In accordance with our findings, sustainable value that leads to sustainable success of the enterprise will in future be the ultimate goal. Our theoretical analysis and partly also the results of our already conducted research point to the most convenient way, a model, for measuring that value. They indicate that sustainable value needs to be measured comprehensively using sustainability indicators, the so-called sustainable strategy, that is directed at a unified “sustainable reporting.” During our project Construction of Methods for Multifactor Assessment of Company Complex Performance in Selected Sectors, we met with many phenomena and relationships concerning sustainable value measurement. We believe that methods for sustainable value measurement should be developed in a very careful and sensitive manner not only for different industries but also with regard to geographical and historical conditions. The methods should be open to allow for a flexible and timely response to changes and technological advances in the industry, or to new uses of information and communication technologies. In order to mainly achieve better compatibility of developments monitoring in the industry and, in fact, in the whole economic system of the country, etc., corporate governance factors should be integrated to the set of environmental, social and economic indicators.

In our previous research, we came across many facts which are closely linked with sustainability and the value chain. We consider the original concept of sustainable value measurement model according to Figge and Hahn (2004 a,b) as very successful and inspiring because it is based on a sophisticated yet clear and simple idea, although we are aware that particular models for sustainable value measurement can be modified – according to, e.g., the industry, measurement conditions, time horizon, geographical conditions, etc. This has a significant influence on the choice of the model's input factors. Corporate governance factors play an increasingly important role because we believe that they should participate in determining sustainable value. Similarly, we also wonder whether the final summing up and averaging of the ascertained partial values is ideal for our purposes. E.g., we pursue the idea of whether the numerical differences in partial resources have the same primary weight relative to the determination of the final sustainable value. In this step, we see room for modifications and other uses of the original idea for the construction of a model for sustainable value measurement. Realistically achievable sources should also be set for benchmarking.

Another critical area for measurement seems to be interconnection between economic and non-economic indicators (social, environmental and corporate governance) and the ultimate goal. This interconnection requires that causal relationships be defined as well as frameworks and ways of functioning derived from them. Still another problem is how close those interconnections and bonds are, and the question of understanding their operation. In our previous research and through the analysis of other expert sources, we verified that the dependency and closeness of individual indicators can be determined not only by classical statistical methods (such as regression and correlation analysis, statistical tests of outlying data, multivariate statistics, etc.) but also by non-statistical methods (such as methods based on the fuzzy set theory, methods of formal mathematical logic, expert systems, neural networks, etc.). When creating systems for measurement and evaluation of sustainable corporate value, the selection of indicators and metrics corresponding to them is of key importance.

From the preceding analyses, a number of other conclusions relating to sustainable corporate value measurement systems and the key models used can be drawn:

With regards to reporting:

- At present, there are several ways of thinking about the theory of the firm, each of which has different implications for corporate performance reporting (Hubbard 2009; Hahn and Kühnen 2013)
- Practical cases most frequently concern “high-performing” companies, whose business strategies are being scrutinized and others try to emulate them; but to be able to determine the value of such a strategy, we would have to be able to measure the “height” of that performance
- Orientation towards integrated sustainable reporting is supported by the activity of important institutions that deal with sustainable development (Hahn and Kühnen 2013)
- Voluntariness of reporting is related to the size of companies, voluntary reports are mostly submitted by large companies.
- Although there has been an increase in the number of companies that submit social and environmental reports, the quality of those published reports has not improved and “there is little evidence of progress in the integration of social and environmental impacts into management decisions” (Ipstein 2004: 1).
- If sustainability is to become a reality, it is necessary that that concept is taken into account in decision-making at every level of the society (Agenda 21 1992).
- In the corporate setting, this means an integration of sustainability aspects (economic, social and environmental) into the current system of corporate performance measurement (Searcy *et al.* 2005).
- In most cases, sustainability reports have little relevance to everyday reality of a company (Dowse 2005). This difference when sustainability indicators are administered separately from business management systems (Bieker and Gminder 2001; Figge *et al.* 2002) is one of the biggest challenges. If companies want to simultaneously achieve an improvement in their economic, social and environmental performance, a lack of integration will prove to be a major obstacle ... without such integration, there will be no sustainability management (Figge *et al.* 2002: 2).

Regarding measurement and indicators

- Although there are several initiatives for sustainability measurement, only a few of them are inclusively orientated to the measurement of environmental, economic and social dimensions (Singh *et al.* 2009; Veleva and Ellenbecker 2001; Labuschagne *et al.* 2005). An analysis of several sustainability initiatives undertaken (Singh *et al.* 2009) showed that although different frameworks exist, their main objective in most cases is the environmental dimension.
- There is no consensus regarding sustainable development indicators for sustainability measurement (Sikdar 2003; Searcy *et al.* 2005; Wang 2005), which represents a major obstacle to implementing sustainable development strategies (Veleva and Ellenbecker 2001) and increasingly initiates the need to “define a common methodological standards and a set of indicators” (Warhurst 2002: 40). Even though it might, on the other hand, lead to distortions in the measuring system (e.g. problems in comparing regions, industries, companies, etc.), as pointed out by, *inter alia*, Adams and Frost (2008).
- One option that has been developed by some academics and practitioners in an effort to solve this reporting problem is to incorporate sustainable development measures into the organization's performance measurement system (PMS), as suggested by Figge *et al.* (2002); Hubbard (2006); Bieker and Gminder (2001). It is a suitable approach as sustainability will be managed together with traditional measures and will be reinforced by the benefits of an already effective PMS in that it helps, e.g., clarify the corporate strategy; it communicates strategy of the entire organization; defines the objectives and sets targets for business units, project teams and employees; motivates and monitors employees, and managers guide their activities; it informs employees, managers and shareholders about the efficiency and effectiveness of activities, and about strategy and probability of success of future operations.
- Although there are many different approaches to sustainable corporate performance measurement offering a number of sustainability indicators, Veleva and Ellenbecker (2001) argue that there exist no frameworks for the assessment of manufacturing process sustainability. Callens and Tyteca (1999) developed indicators based on the concept of cost-benefit analysis and a concept based on principles of production efficiency.

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