FINANCIAL RESOURCE ALLOCATION IN A PROJECT PORTFOLIO: ANALYSING THE NECESSITY TO INTEGRATE SUSTAINABILITY INTO RESOURCE ALLOCATION

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Abstract

Resource allocation in a project portfolio is a complex decision-making process that is influenced by multiple and very often conflicting objectives. Furthermore, companies are coming under strong social pressure to integrate elements of sustainability into their decision-making process, which makes this process even more complex. Nowadays, the concept of sustainability is widely applied by many companies through their mission statement and strategy. It is also one of the most popular research fields for scholars. Despite the fact that sustainability is considered one of the most important challenges of our time, the integration of sustainability into project or project portfolio management (especially in resource allocation) is not fully recognised. This paper presents a literature-based analysis of the use of the sustainability concept in project management and therefore makes suggestions on how to integrate sustainability into resource allocation in a project portfolio.

Keywords: resource allocation, project portfolio, project management, project portfolio management, sustainability, composite sustainability index

JEL classification: G11, M21, L21, O22

1. INTRODUCTION

At present, both sustainability and project management are important and expected to become even more important in the future. The relationship between project management and sustainability is rapidly gaining interest from both practitioners and scholars. Silvius (2014) reported 250 publications and studies on this topic (compared to 85 publications in 2012 (Silvius *et al.*, 2012, p. 1). However, this research field is relatively new and unexplored (Martens and Carvalho, 2013, p. 111, Brook and Pagnanelli, 2014, p. 59, Daneshpour, 2015, p. 321).

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Sustainability is one of the most important issues that need to be taken into account in decision-making process at different levels of project-oriented organization (Daneshpour, 2015, p. 321). It has to be an integrated part of a project and project portfolio to support and achieve the objectives of organization (Sanchez, 2015, Hope and Moehler, 2014, p. 358, Tufinio et al., 2013, p. 91).

The Association for Project Management suggested that the discipline of project management is ideally placed to deal with these issues (APM, 2006). However, current standards for project management fail to seriously address the sustainability issues, or equip project managers with the tools necessary for them to integrate sustainability into project management and operation (Eid, 2011, Silvius and Schipper, 2010, Ebbesen and Hope, 2013; Hope and Moehler, 2014, p. 359).

Today there is an increasing understanding of the need to develop methods, tools and techniques to integrate sustainability criteria into the management of projects, as well as a growing need of knowledge and concepts how to adopt sustainability in project management (Ebbesen and Hope, 2013, p. 1, Brook and Pagnanelli, 2014, p. 61, Fernández-Sánchez and Rodríguez-López, 2010, p. 1194, Martens and Carvalho, 2013, p. 112, Tufinio et al., 2013, p. 91, Silvius and Schipper, 2014, p. 40).

The aim of this paper is to present a literature-based analysis about the use of the sustainability concept in project management and to introduce a potential area for the integration of sustainability in project portfolio management.

The paper is structured into sections. Section 2 (The concept of sustainability) provides a brief overview of the concept of sustainability. Section 3 (Relationship between sustainability and project management) discusses the literature on project management and sustainability in order to understand how sustainability is integrated into project management. Section 4 (Sustainability-oriented resource allocation) describes a framework for sustainability-oriented financial resource allocation in a project portfolio. Finally, Section 5 (Application of the framework) demonstrates the applicability of the proposed framework.

2. THE CONCEPT OF SUSTAINABILITY

A literature review reveals that there is no agreed definition of sustainability. Sustainability in the context of sustainable development is defined by the World Commission on Environment and Development (WCED) as "the kind of development that meets the needs of the present without compromising the ability of future generations to meet their needs". This definition contains two concepts – the concept of needs, in particular the essential needs of the world's poor, to which priority should be given, and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs (Brundtland, 1987). It emphasizes the aspect of future orientation as a basic element of sustainability. This care for the future implies a wise use of natural resources and other aspects regarding the environmental footprint. However, sustainability requires not just an environmental "green" perspective, but also the social one (Silvius et al., 2012, p. 1054). According to Ebbesen and Hope (2013), this definition is primarily theoretical or conceptual and does not seek to offer solutions to the problem of how to reconcile the principle of sustainable development with the fundamental aim of business (and, some degree, projects) to generate profit.

A broader concept of sustainability is based on the integration of three dimensions, namely social, environmental and economic, constituting the sustainability tripod, known as Triple-Bottom Line (Elkington, 1997).
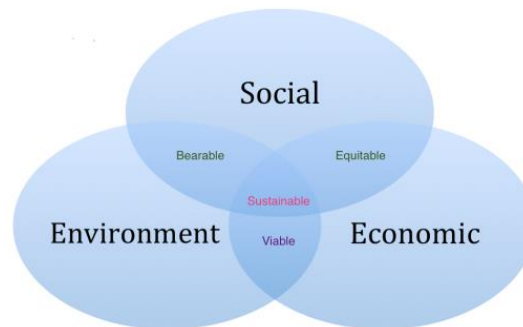
Source: *Elkington, 1997*
Figure no. 1 – The Triple-P concept of sustainability

Drawing on this, Dyllick and Hockerts (2002) identified three key elements of corporate sustainability:

-   Integrating economic, ecological and social aspects in a "triple-bottom line";
-   Integrating short-term and long-term aspects;
-   Consuming the income rather than the capital.

In their analysis of the aspects of sustainable development in the business environment, Rutkauskas and Lapinskaitė (2012) distinguished several contradictory views, for instance, Davidson (2011) maintained that the essence of the definition is so obscure that it becomes meaningless. According to Lindsey (2001), this definition is so loose that it is not practically applicable, the concept is of such general nature that anybody can accept it. However, it should be borne in mind that it is one of the most frequently quoted definitions and has become the axis of deeper, more conceptual definitions.

Despite contradictory views, sustainability principles reflecting the Brundtland definition are steadily incorporated into strategic and activity plans of companies (Davidson, 2011). Moreover, a growing tendency to adopt this well-known truth in business has not only shaped the concept of sustainable development – it was defined by Galbreath (2009) as business strategy aimed at creating long-term value for stakeholders, including opportunities and managing economic, environmental and social development-related risk – but also led to the concept of corporate sustainable development which over the last decades became the subject of numerous research studies, while scholars provided different and varying perspectives (Chow and Chen, 2012).

3. RELATIONSHIP BETWEEN SUSTAINABILITY AND PROJECT MANAGEMENT

While there are plenty of sources on project management (project portfolio management) or sustainability itself, there are relatively few authors that linked sustainability with project management (Tufinio *et al.*, 2013, p. 92, Martens and Carvalho, 2013, p. 111). This relation involves many concepts depending of the approach adopted by

the research team (Tufinio *et al.*, 2013, p. 92). This section discusses the literature on project management and sustainability in order to understand how sustainability is integrated into project management.

Tom Taylor, (former) chairman of the Association for Project Management, was one of the first to suggest that the project management community familiarize themselves with the issue of sustainability, recognising that more should be done to contribute to a more sustainable society (APM, 2006). In some of the first publications on sustainability and project management, Labuschagne and Brent (2005) related the principles of sustainable development to project life cycle management in the manufacturing industry. They described three goals for sustainable development (i.e. social equity, economic efficiency, and environmental performance) in various project life cycle management problems.

Project management approaches and instruments were put together in toolboxes and handbooks to manage sustainability projects. Project sustainability checks have been developed for specific project types such as facility and infrastructure projects (American Council of Engineering Companies, 2009). Studies of appraising sustainability in projects have been reported for construction projects (Edum-Fotwe and Price, 2009). Gareis *et al.* (2009) developed a model to address relationships between sustainable development and project management. The model comprises sustainable development principles and project management objects. A Maturity Model for integrating sustainability in project management was developed by Silvius and Schipper (2010). The model assesses the level (i.e. business process, business model, and product and services delivered by the project) on which different aspects of sustainability are considered in the project. A Sustainability Checklist (this tool was developed at the 2010 IMPA Expert Seminar "Survival and Sustainability as Challenges for Project) was one of the basis for developing this Maturity Model.

A more academic approach to sustainability in projects was taken by Oehlmann (2011). She developed the "Sustainable Footprint Methodology" to analyse and determine the relevant social, environmental and economic impacts of a project. The framework confronts the life cycle of a project, consisting of three phases: project pre-phase, project execution and operation of the asset (Silvius and Schipper, 2014, p. 45).

The problem of selecting the best portfolio with respect to the organizational strategy that includes sustainable goals was considered by Vandaele and Decouttere (2013). The authors developed a data envelopment analysis (DEA) model with the aim of supporting strategic Research and Development portfolio management. The authors proposed to use development costs, investment costs, and technical risk as inputs for DEA, and performance indicators, such as market size, competition, sales potential, profit ability or technical probability of success, as outputs for DEA. Sanchez (2015) developed a framework to help ensure that organization is working on the right projects to implement its business strategy and satisfy stakeholders' demands. The author believes that this conceptual framework has a good potential for integrating sustainability and project management in operational terms. Khalili-Damghani and Tavana (2014) proposed a comprehensive framework for sustainable strategic project selection problem.

The consideration of sustainability is gaining prominence in the field of project management. There is an increasing understanding of the need to develop methods, tools and techniques to integrate sustainability criteria into the management of projects (Ebbesen and Hope, 2013, p. 1). Silvius and Tharp (2013) concluded that "the relationship between sustainability and project management is […] picking up momentum".

4. SUSTAINABILITY-ORIENTED RESOURCE ALLOCATION

Since sustainability is one of the most important current issues, it is obvious that this new element must be incorporated in one way or another into decision-making process when resources are allocated in a project portfolio.

This section describes a framework for sustainability-oriented resource allocation in a project portfolio (Figure 2).

Source: created by authors
Figure no. 2 – Framework for sustainability-oriented financial resource allocation

The proposed framework consists of two modules. The first module of the framework is concerned with the integration of the sustainability into the strategic planning process. The sustainability criteria (economic, social and environmental) are considered an essential

component of strategic planning. The output of the first module is a set of projects that support the strategic goals. The second module of the framework is designed to deliver a project portfolio where resources are allocated taking into account not only financial criteria but also sustainability. Sustainability-oriented financial resource allocation in a project portfolio takes into consideration the economic, social and environmental dimensions of a project.

Financial analysis is performed to assess project efficiency on the basis of expected cash flows. The analysis of scientific literature showed that in order to assess project efficiency most of the authors apply the following indicators: return on investments (ROI), payback period (PB), accounting rate of return (ARR), net present value (NPV), internal rate of return (IRR), profitability index (PI), and modified internal rate of return (MIRR).

Risk analysis is divided into two complementary parts: qualitative and quantitative. Qualitative analysis is performed using various experimental methods. It identifies any and all risk and uncertainty factors as well as their importance for the project. The task of quantitative analysis is to assess the effect of deviations of risk factors on project efficiency in a quantitative manner.

Sustainability analysis is aimed at assessing the sustainability of a project. The literature analysis of the use of the sustainability concept in project portfolio management revealed that there are no efforts to assess the sustainability of a project when making decisions regarding project selection and resource allocation.

Over the past decades a plethora of methodologies and tools were developed to perform sustainability assessment studies, focusing on different scopes (i.e. different pillars) and scales (i.e. micro, meso and macro) (Cinelli *et al.*, 2014, p. 139). Taking into account the fact that sustainability indicators and composite index are used to assess different aspects of sustainability (Ness *et al.*, 2007, Kemmler and Spreng, 2007, Bohringer and Jochem, 2007, Singh *et al.*, 2007, Ugwu and Haupt, 2007, Fernández-Sánchez and Rodríguez-López, 2010, Kocmanova and Simberova, 2013, Kocmanova and Docekalova, 2012, Zhou *et al.*, 2012, Manzini *et al.*, 2011, Singh *et al.*, 2012, O'Ryan and Pereira, 2015), we decided to use a composite sustainability index for assessing the sustainability of a project (CSIP). Therefore, we present a scheme for the calculation of a composite sustainability index of a project.

Various methodologies exist to construct composite indicators (CIs). Nardo *et al.*, 2008 described a framework for the construction of a composite, which includes the selection of relevant indicators and data, imputation of missing data, normalization of the selected indicators, weighting and aggregation. Cherchye *et al.* (2007) used DEA in their construction with the aim of neutralizing the recurring sources of criticism about CIs. The application of this method makes it possible to skip the normalization stage. Hatefi and Torabi (2010) proposed a common weight MCDA-DEA approach for constructing CIs. Zhou *et al.* (2010) developed a multiplicative optimization approach for constructing CIs, using the weighted product (WP) method.

The scheme for the calculation of a composite sustainability index of a project is divided into several steps which are presented in Figure 3.

The first step covers identification and selection of sustainability indicators which are suitable for a project in a particular industry. Then the indicators are grouped into economic, social and environmental. After sustainability indicators are selected and grouped, the weight of each indicator has to be determined. Since indicators may be expressed in different units, normalization is necessary. The final step is aggregation of indicators.
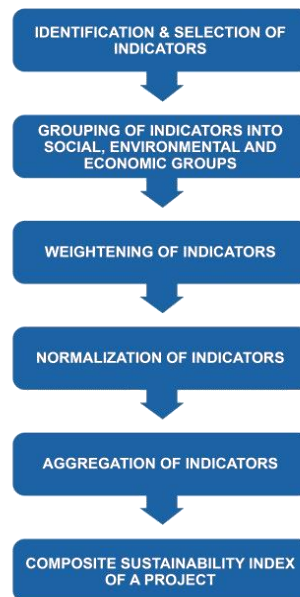
Source: created by authors
Figure no. 3 – Scheme for the calculation of a composite sustainability index of a project

It should be noted that we encounter a problem when assessing the sustainability of a new project that the project concerned does not have tendency. Therefore, a baseline (the simplest reference point) should be used. Baselines are starting points for measuring change from a certain state or date (Ten Brink, 2007). They are a common practice and broadly accepted in such fields as medicine, economics, environmental quality, climate change or education (Moldan *et al.*, 2012, p. 7).

Once financial, risk and sustainability analyses are performed, it should be decided which criteria (financial or non-financial) are given priority by a decision-maker prior to any allocation of financial resources in a project portfolio. For instance, a simple weighting function (using a weight λ) is needed that expresses preference (e.g. the sustainability) of a decision-maker (Peylo, 2012, p. 36).

5. APPLICATION OF THE FRAMEWORK

Since the aim of our paper is to show how sustainability can be integrated into project portfolio management (more specifically, financial resource allocation), this section demonstrates the applicability of the second module of the proposed framework. We do not look into the first module but just make an assumption that all projects meet sustainability-oriented strategic objectives, whereas the second module of the framework is tested on ten actual construction projects.

An efficient two-dimensional portfolio (return-risk) is traditionally described as a portfolio that provides the least risk for a given return, or the greatest return for a given level of risk (Kancerevicius, 2009). A range of literature has covered extensively the concept of

optimal portfolio (Markowitz, 1952, Tobin, 1958, Merton, 1972, Sharpe, 1994), so this subject will not be covered in this paper. It is sufficient to understand that the return and standard deviations obtained from screening can be extended to the development of an optimal portfolio (Siew, 2015). Therefore, we also propose to use project returns and standard deviation as measures of profitability and risk when building a project portfolio.

Based on Markowitz's theory, the expected return of a portfolio is calculated as the product of the return on a security and its probability (Filipavicius and Kazlauskas, 2015):

$$E(R_p) = \sum_{i=1}^{n} R_i P_i, \tag{1}$$

where:
R_i = return on a security;
P_i = probability for return on a security.

However, in practice, a simple formula is used to calculate the total return on a security because the assessment of the expected return on a security is rather complicated (Mangram, 2013). On the assumption that an investor gains from the buy-sell spread, the return on a security can be calculated as the average of daily, weekly, monthly or annual returns (Haugen, 2001):

$$\bar{R} = \frac{1}{n} \sum_{i=1}^{n} \frac{V_1 - V_0}{V_o}, \tag{2}$$

where:
V_1 = selling price of a security;
V_0 = buying price of a security.

Based on the second formula, and on the assumption that the project return is the difference between profits and investments, the return of a project portfolio will be calculated as the average of project returns in different scenarios (in the absence of historical data):

$$\bar{R} = \frac{1}{n} \sum_{i=1}^{n} \frac{P - I}{I}, \tag{3}$$

where:
P = project profits;
I = project investments.

The degree of risk of a project is expressed by standard deviation. Standard deviation shows the average deviation of the return of a project from the mean of the sample in terms of the same measures. A standard deviation is calculated by using the following formula:

$$\sigma = \sqrt{\sum_{i=1}^{n} (R_i - \bar{R})^2}, \tag{4}$$

where:
R_i = project's return in scenario i;
$\bar{R}$ = project's average return.

When allocating resources, it is important to understand how the uncertainties of different projects interact. In financial markets, the key determinant of the risk of a portfolio is the extent to which the returns vary either together or in the opposite direction. Risk depends on the correlation between returns on different securities in the portfolio. We do not take into consideration the correlation between projects in this paper as projects implemented by a particular company are, for the most part, closely interrelated.

In this study, beyond return and risk, we consider an additional objective, i.e. sustainability. For the integration of sustainability into portfolio theory several approaches are possible (Peylo, 2012). The first option would be to combine the concept of sustainability and portfolio theory by first selecting a suitable set of projects using sustainability criteria and afterwards applying a portfolio optimisation to find an efficient portfolio. As a second alternative, the portfolio optimisation could be applied first and then a certain degree of sustainability of the portfolio could be used. A third alternative is the integration of sustainability as an additional criterion into a new three-objective portfolio optimisation.

As already mentioned in Section 4, we use a composite sustainability index to assess the sustainability of a project. It is calculated using the following formula:

$$CSIP = \sum_{i=1}^{m} \omega_i I_i,$$ (5)

where:
$CSIP$ = composite sustainability index of a project;
ω_i = weight of sustainability indicator i;
I_i = normalised value of sustainability indicator i.

We formulated the portfolio selection as a three-objective optimisation problem so as to find tradeoffs between return, risk and sustainability:
1) The maximisation of the return of the portfolio;
2) The minimisation of the standard deviation of the portfolio;
3) The maximisation of a sustainability index of the portfolio.

Goals:

$$\begin{cases} max\ R_p \\ min\ \sigma_p \\ max\ I_p \end{cases}$$ (6)

where:

$$R_p = \sum_{i=1}^{n} w_i \bar{R}_i,$$ (7)

$$\sigma_p = \sum_{i=1}^{n} w_i \sigma_i,$$ (8)

$$I_p = \sum_{i=1}^{n} w_i CSIP_i,$$ (9)

where:

R_p = return of the portfolio;
$\bar{R}_i$ = average return of project i;
σ_p = standard deviation of the portfolio;
σ_i = standard deviation of a project i;
I_p = sustainability index of the portfolio;
$CSIP_i$ = composite sustainability index of a project i
w_i = fraction of the portfolio invested in a project i

Constrains:

$$\sum w_i = 1.$$

The weight of individual projects may not exceed 20%.

The proposed model for ten construction projects, using Excel Solver tool, was computed under different scenarios. A weight λ was used to express preference (e.g. sustainability) of a decision maker. First of all, a project portfolio is constructed taking into account only return and risk (financial portfolio, λ=1). Then a portfolio is constructed taking into account not only return and risk but also project sustainability, by giving equal weight to financial and sustainability criteria (balanced portfolio, λ=0.5). Finally, the best possible sustainable portfolio is constructed (λ=0). The results of the study are presented in Tables 1 and 2.

Table no. 1 – Comparison of portfolios

	Financial portfolio	Balanced portfolio	Sustainable portfolio
	λ=1	λ=0.5	λ=0
Return, %	50.21%	46.80%	46.20%
Risk, %	4.86%	4.54%	4.48%
Sustainability, %	52.80%	67.20%	67.80%

Source: prepared by authors

Table no. 2 – Portfolio structure

	Financial portfolio	Balanced portfolio	Sustainable portfolio
Projects	λ=1	λ=0.5	λ=0
P1	20%	20%	20%
P2			20%
P3	20%	20%	20%
P4	20%		
P5		20%	20%
P6			
P7	20%		
P8			
P9	20%	20%	20%
P10		20%	

Source: prepared by authors

As should have been expected, the incorporation of sustainability changes the structure of a portfolio and values of different criteria. Nevertheless, the incorporation of sustainability in the case at hand has moderately affected financial indicators of the portfolio

(i.e. return and standard deviation). These results do not conflict with recent research (Utz *et al.*, 2014, Trenado *et al.*, 2014). It is clear that this result heavily depends on the empirical characteristics of the case under study.

6. CONCLUSIONS

The literature analysis revealed that sustainability is defined in many different ways. In spite of this fact, most authors agree on the three pillars of sustainability, namely social, environmental and economic.

The concept of sustainability has also been linked to project management. And today there is an increasing understanding of the need to develop methods, tools and techniques to integrate sustainability criteria into project management.

This study presents an original contribution by proposing a means of integrating sustainability into project portfolio management. We proposed a framework for sustainability-oriented financial resource allocation in a project portfolio, which consists of two modules. The first module is concerned with the integration of the sustainability into the strategic planning process, whereas the second one is designed to deliver a project portfolio where resources are allocated taking into account not only financial criteria but also sustainability. We also proposed to assess the sustainability of a business project using a composite sustainability index. Based on the review of existing literature, this has not been attempted.

The empirical testing of the model showed that the incorporation of sustainability into the process of constructing a project portfolio causes moderate changes in the structure of the portfolio and the values of different criteria. In principle, these findings are not contrary to previous research.

However, this study has some limitations. Firstly, in order to select the best portfolio option the interaction between projects should be taken into account. Secondly, in order to ensure the optimised use of resources, scheduling would need to be done. Thirdly, the risk assessment should take into account only negative deviations as higher returns are always desirable. Lastly, the portfolio was constructed with the limitation that the weight of individual projects may not exceed 20%. Any change of this limitation may affect both the structure of the portfolio and the values of criteria; therefore, a greater number of scenarios should be evaluated.

Despite all shortcomings, we believe that the understanding of this study should enable companies to execute right (sustainable) projects, which could make a contribution to the sustainable development of organizations and thereby increase their competitive advantage.

References

American Council of Engineering Companies, 2009. Sustainable project management for facilities and infrastructure systems. from http://www.cpe.vt.edu/proman/

Association for Project Management, 2006. APM Supports Sustainability Outlooks. from http://www.apm.org.uk/page.asp?categoryID=4

Bohringer, C., and Jochem, P., 2007. Measuring the immeasurable - A survey of sustainability indices. *Ecological Economics, 63*(1), 1-8. DOI: http://dx.doi.org/10.1016/j.ecolecon.2007.03.008

Brook, J. W., and Pagnanelli, F., 2014. Integrating sustainability into innovation project portfolio management - A strategic perspective. *Journal of Engineering and Technology Management, 34*, 46-62. DOI: http://dx.doi.org/10.1016/j.jengtecman.2013.11.004

Brundtland, G. H., 1987. Report of the World Commission on environment and development: "our common future": United Nations.

Cherchye, L., Moesen, W., Rogge, N., and Puyenbroeck, T. V., 2007. An Introduction to "benefit of the doubt" composite indicators. *Social Indicators Research, 82*(1), 111-145. DOI: http://dx.doi.org/10.1007/s11205-006-9029-7

Chow, W., and Chen, Y., 2012. Corporate sustainable development: Testing a new scale based on the mainland Chinese context. *Journal of Business Ethics, 105*(4), 519-533. DOI: http://dx.doi.org/10.1007/s10551-011-0983-x

Cinelli, M., Coles, S. R., and Kirwan, K., 2014. Analysis of the potentials of multi criteria decision analysis methods to conduct sustainability assessment. *Ecological Indicators, 46*, 138-148. DOI: http://dx.doi.org/10.1016/j.ecolind.2014.06.011

Daneshpour, H., 2015. Integrating Sustainability into Management of Project. *International Journal of Environmental Science and Development, 6*(4), 321-325. DOI: http://dx.doi.org/10.7763/IJESD.2015.V6.611

Davidson, K. M., 2011. Reporting systems for sustainability: What are they measuring? *Social Indicators Research, 100*(2), 351-365. DOI: http://dx.doi.org/10.1007/s11205-010-9634-3

Dyllick, T., and Hockerts, K., 2002. Beyond the business case for corporate sustainability. *Business Strategy and the Environment, 11*(2), 130-141. DOI: http://dx.doi.org/10.1002/bse.323

Ebbesen, J., and Hope, A. J., 2013. Re-imagining the Iron Triangle: Embedding Sustainability into Project Constrains. *PM World Journal, 2*(3), 1-13.

Edum-Fotwe, F., and Price, A., 2009. A social ontology for appraising sustainability of construction projects and developments. *International Journal of Project Management, 27*(4), 313-322. DOI: http://dx.doi.org/10.1016/j.ijproman.2008.04.003

Eid, M., 2011. Integrating Sustainable Development into Project Management Processes. http://www.pmi.org/~/media/PDF/Surveys/pp_eid.ashx

Elkington, J., 1997. *Cannibals with Forks: Triple Bottom Line of 21st Century Business*. Oxford: Capstone Publishing.

Fernández-Sánchez, G., and Rodríguez-López, F., 2010. A methodology to identify sustainability indicators in construction project management - Application to infrastructure projects in Spain. *Ecological Indicators, 10*(6), 1193-1201. DOI: http://dx.doi.org/10.1016/j.ecolind.2010.04.009

Filipavicius, V., and Kazlauskas, L., 2015. *Optimalaus investiciju portfelio teoriniai aspektai.* Paper presented at the 18th Conference for Junior Researchers "Science- Future of Lithuania", Vilnius, Lithuania.

Galbreath, J., 2009. Addressing sustainability: a strategy development framework. *International Journal of Sustainable Strategic Management, 1*(3), 303-319. DOI: http://dx.doi.org/10.1504/IJSSM.2009.026284

Gareis, R., Heumann, M., and Martinuzzi, A., 2009. *Relating sustainable development and project management*. Berlin: IRNOP IX.

Hatefi, S. M., and Torabi, S. A., 2010. A common weight MCDA-DEA approach to construct composite indicators. *Ecological Economics, 70*(1), 114-120. DOI: http://dx.doi.org/10.1016/j.ecolecon.2010.08.014

Haugen, R. A., 2001. *Modern investment theory* (5 ed.): Prentice Hall.

Hope, A. J., and Moehler, R., 2014. Balancing projects with society and environment: A project, programme and portfolio approach. *Procedia: Social and Behavioral Sciences, 119*, 358-367. DOI: http://dx.doi.org/10.1016/j.sbspro.2014.03.041

Kancerevicius, G., 2009. *Finansai ir investicijos*. Kaunas: Smaltija.

Kemmler, A., and Spreng, D., 2007. Energy indicators for tracking sustainability in developing countries. *Energy Policy, 35*(4), 2466-2480. DOI: http://dx.doi.org/10.1016/j.enpol.2006.09.006

Khalili-Damghani, K., and Tavana, M., 2014. A comprehensive framework for sustainable project portfolio selection based on structural equation modeling. *Project Management Journal, 45*(2), 83-97. DOI: http://dx.doi.org/10.1002/pmj.21404

Kocmanova, A., and Docekalova, M., 2012. Construction of the economic indicators of performance in relation to the environmental, social and corporate governance (ESG) factors. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 60*(4), 195-206. DOI: http://dx.doi.org/10.11118/actaun201260040195

Kocmanova, A., and Simberova, I., 2013. Multidimensional Modelling of Social Performance Indicators in Processing Industry Companies in the Czech Republic. *International Journal of Mathematical Models and Methods in Applied Sciences, 5*(7), 500-507.

Labuschagne, C., and Brent, A. C., 2005. Sustainable project life cycles in the manufacturing sector. *International Journal of Project Management, 23*(2), 159-168. DOI: http://dx.doi.org/10.1016/j.ijproman.2004.06.003

Lindsey, G., 2001. The Holy Grail of Sustainable Development: Blueways in Viet Nam and Greenways in Indianapolis. *Perspectives.*

Mangram, E. M., 2013. A Simplified Perspective of the Markowitz Portfolio Theory, Global. *Global Journal of Business Research, 7*(1), 59-70.

Manzini, F., Islas, J., and Macias, P., 2011. Model for evaluating the environmental sustainability of energy projects. *Technological Forecasting and Social Change, 78*(6), 931-944. DOI: http://dx.doi.org/10.1016/j.techfore.2011.01.012

Markowitz, H., 1952. Portfolio selection. *The Journal of Finance, 7*(1), 77-91. DOI: http://dx.doi.org/10.1111/j.1540-6261.1952.tb01525.x

Martens, M. L., and Carvalho, M. M., 2013. An exploratory study of sustainability evaluation in project management. *Product: Management & Development, 11*(2), 111-117. DOI: http://dx.doi.org/10.4322/pmd.2013.019

Merton, M. L., 1972. An analytic derivation of the efficient portfolio frontier. *Journal of Financial and Quantitative Analysis, 7*(4), 1851-1872. DOI: http://dx.doi.org/10.2307/2329621

Moldan, B., Janouskova, S., and Hak, T., 2012. How to understand and measure environmental sustainability: Indicators and targets. *Ecological Indicators, 17*, 4-13. DOI: http://dx.doi.org/10.1016/j.ecolind.2011.04.033

Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffman, A., and Giovannini, E., 2008. *Handbook on constructing composite indicators: methodology and user guide*. Paris: OECD Publishing.

Ness, B., Urbel-Piirsalu, E., Anderberg, S., and Olsson, L., 2007. Categorising tools for sustainability assessment. *Ecological Economics, 60*(3), 498-508. DOI: http://dx.doi.org/10.1016/j.ecolecon.2006.07.023

O'Ryan, R., and Pereira, M., 2015. Participatory indicators of sustainability for the salmon industry: The case of Chile. *Marine Policy, 51*, 322-330. DOI: http://dx.doi.org/10.1016/j.marpol.2014.09.010

Oehlmann, I., 2011. *The Sustainable Footprint Methodology*. Cologne: Lambert Academic Publishing.

Peylo, B. T., 2012. A Synthesis of Modern Portfolio Theory and Sustainable Investment. *Journal of Investing, 21*(4), 33-46.

Rutkauskas, A. V., and Lapinskaitė, I., 2012. *Marketing as Core Instrument to Implement Sustainability Strategy for a Business World. The Case of Fast Moving Consumer Goods.* Paper presented at the The 7th International Scientific Conference "Business and Management 2012", Vilnius.

Sanchez, M. A., 2015. Integrating sustainability issues into project management. *Journal of Cleaner Production, 96*, 319-330. DOI: http://dx.doi.org/10.1016/j.jclepro.2013.12.087

Sharpe, W. F., 1994. The sharpe ratio. *Journal of Portfolio Management, 21*(1), 49-58. DOI: http://dx.doi.org/10.3905/jpm.1994.409501

Siew, R. Y. J., 2015. Integrating Sustainability into Construction Project Portfolio Management. *KSCE Journal of Civil Engineering*, 1-8. DOI: http://dx.doi.org/10.1007/s12205-015-0520-z

Silvius, A. J. G., 2014. Overview of Literature on Sustainability in Projects and Project Management. Retrieved 14 April 2015, from http://www.slideshare.net/GilbertSilvius/spm-literature-overview-2008

Silvius, A. J. G., and Schipper, R., 2010. *A maturity model for integrating sustainability in projects and project management*. Paper presented at the 24th World Congress of the International Project Management Association, Istanbul, Turkey.

Silvius, A. J. G., and Schipper, R., 2014. Sustainability in Project Management Competencies: Analyzing the Competence Gap of Project Managers. *Journal of Human Resources and Sustainability Studies, 2*, 40-58. DOI: http://dx.doi.org/10.4236/jhrss.2014.22005

Silvius, A. J. G., Schipper, R., and Nedeski, S., 2012. *Sustainability in Project Management: Reality Bites*. Paper presented at the 26th IPMA World Congress.

Silvius, A. J. G., and Tharp, J., 2013. *Sustainability Integration for Effective Project Management*. Hershey: IGI Global Publishing.

Singh, R. K., Murty, H. R., Gupta, S. K., and Dikshit, A. K., 2007. Development of composite sustainability performance index for steel industry. *Ecological Indicators, 7*(3), 565-588. DOI: http://dx.doi.org/10.1016/j.ecolind.2006.06.004

Singh, R. K., Murty, H. R., Gupta, S. K., and Dikshit, A. K., 2012. An overview of sustainability assessment methodologies. *Ecological Indicators, 15*(1), 281-299. DOI: http://dx.doi.org/10.1016/j.ecolind.2011.01.007

Ten Brink, B., 2007. *Contribution to Beyond GDP Virtual Indicator Expo (The Natural Capital Index framework NCI), International Conference*. Paper presented at the Beyond GDP- Measuring progress, true wealth and the well-being of nations, Brussels. http://ec.europa.eu/environment/beyond_gdp/download/factsheets/bgdp-ve-nci.pdf

Tobin, J., 1958. Liquidity Preference as Behavior Towards Risk. *Review of Economic Studies, 25*(2), 65-86. DOI: http://dx.doi.org/10.2307/2296205

Trenado, M., Romero, M., Cuadrado, M. L., and Romero, C., 2014. Corporate social responsibility in portfolio selection: "A goal games" against nature approach. *Computers & Industrial Engineering, 75*, 260-265. DOI: http://dx.doi.org/10.1016/j.cie.2014.07.005

Tufinio, S. P., Mooi, H., Ravestijn, W., Bakker, H., and Boorsma, M., 2013. Sustainability in project management: Where are we? *Intenational Journal of engineering, 11*(1), 91-100.

Ugwu, O. O., and Haupt, T. C., 2007. Key performance indicators and assessment methods for infrastructure sustainability - a South African construction industry perspective. *Building and Environment, 42*(2), 665-680. DOI: http://dx.doi.org/10.1016/j.buildenv.2005.10.018

Utz, S., Wimmer, M., Hirschberger, M., and Steuer, R. E., 2014. Tri-criterion inverse portfolio optimization with application to socially responsible mutual funds. *European Journal of Operational Research, 234*(2), 491-498. DOI: http://dx.doi.org/10.1016/j.ejor.2013.07.024

Vandaele, N., and Decouttere, C. J., 2013. Sustainable R&D portfolio assessment. *Decision Support Systems, 54*(4), 1521-1532. DOI: http://dx.doi.org/10.1016/j.dss.2012.05.054

Zhou, L., Tokos, H., Krajnc, D., and Yang, Y., 2012. Sustainability performance evaluation in industry by composite sustainability index. *Clean Technologies and Environmental Policy, 14*(5), 789-803. DOI: http://dx.doi.org/10.1007/s10098-012-0454-9

Zhou, P., Ang, B. W., and Zhou, D. Q., 2010. Weighting and aggregation in composite indicator construction: A multiplicative optimization approach. *Social Indicators Research, 96*(1), 169-181. DOI: http://dx.doi.org/10.1007/s11205-009-9472-3