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GINTĖ JONKUTĖ

**MODEL OF SUSTAINABLE CONSUMPTION AND
PRODUCTION MANAGEMENT OF THE COMPANY**

Summary of Doctoral Dissertation
Technological Sciences, Environmental Engineering (04T)

2016, Kaunas

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INTRODUCTION

Research relevance

During the last decades, initiatives in sustainable production have successfully focused on improving resource efficiency in manufacturing systems (Jackson, 2008; Sikdar, 2011). However, despite the improvement in the results of environmental practices of many individual producers, an increase in the amount of general consumption often exceeds the achieved progress (the so-called “rebound” effect) (Clift, 2006; Mont, Plepys, 2003; Solgaard, 2003; Staniškis *et al.*, 2012; Stø *et al.*, 2006). Thus, it is becoming obvious that technological approaches are not enough to realise the goal of sustainable development (SD) without the critical assessment of human choices (Hertwich, 2005; Kunz *et al.*, 2013; Lorek, Spangenberg, 2014).

Consumers are more environmentally and socially aware today, but they still do not generally consume with concern (López *et al.*, 2007; Vaishnavi *et al.*, 2014; Vinkhuyzen, Karlsson-Vinkhuyzen, 2014). This statement has been confirmed by the implications of many researchers (Francis, Davis, 2015; Gadenne *et al.*, 2011; Horne, 2009; Hughner *et al.*, 2007; Kolkailah *et al.*, 2012; Leary *et al.*, 2014; Liobikienė *et al.*, 2014; Liu *et al.*, 2012; Pickett-Baker, Ozaki, 2008; Welfens *et al.*, 2010 and others) also proven by the results of the situation analysis that was investigated in this dissertation. Many different authors have proposed that consumer behaviour is strongly influenced not only by such worldwide tendencies as globalisation, the rise in global economy, technological progress, innovations and demographic changes, but also by many various elements of the socio-cultural system and interactions between socio-cultural, economical, technological and many other factors (Caeiro *et al.*, 2012; Hutter *et al.*, 2010; Jackson, 2008a; Lorek, Spangenberg, 2014; Mont, Power, 2010; Peattie, Collins, 2009; Ritter *et al.*, 2014; Soron, 2010; Tukker *et al.*, 2008; Welfens *et al.*, 2010 and others). With the aim of influencing more sustainable choices of consumers, the first thing is to change their attitudes by shaping the demand for sustainable products and services (Krantz, 2010). It looks like consumers will not change their consumption habits as long as their sustainability awareness is low, and there is not sufficient information concerning production and product environmental performance (Redman, Redman, 2014; Staniškis *et al.*, 2012). They also would not demand improved products until compelling alternatives are available in the market (O’Rourke, 2005).

Theorists and practitioners highlight the importance of business for progress in sustainable consumption and production (SCP) (Carlsson *et al.*, 2014; Carson, 2007; Kunz *et al.*, 2013; Lüdeke-Freund, 2010; Michaelis, 2003). In terms of sustainability, the corporate sector must be the leader because it is the engine of economic activity and development in the world (Azapagic, 2003;

Azapagic, Perdan, 2000; Santolaria *et al.*, 2011). However, problems in many SD areas are too complex for companies to deal with alone (Barber, 2007; Sakarya *et al.*, 2012; Young, 2006). Yet, the responsibility of SCP should not be placed on an individual consumer (Stø *et al.*, 2006). Despite the fact that without strong leadership from government, changes in the overall SCP system would be hard to obtain (Rebitzer *et al.*, 2004; Stevens, 2010; Zhao, Schroeder, 2010), these problems cannot even be solved solely by government (Hartman *et al.*, 1999). According to Jackson (2008a), as consumption comes naturally to humankind, changes require a supportive social environment. In summary of comments in earlier publications of many authors (Barber, 2007; Shin *et al.*, 2008; Staniškis, Stoškus, 2008; Stevens, 2010; Trencher *et al.*, 2014; Von Hauff, Wilderer, 2008 and others), efficient progress in the area of SCP may only be achieved by a systematic struggle of both producers and consumers, incorporating members from other interested groups such as governments, non-governmental organisations (NGOs), education and science institutions, the press and the media, etc. This cooperation could help to catalyse behavioural change leading to more sustainable practices, increased competitiveness and a healthier environment (Boons *et al.*, 2013; Carson, 2007; Seuring, Gold, 2013).

Because of increasing demand for sustainable consumption and production patterns, many various promising models, frameworks, roadmaps and recommendations have been created in different science branches to help companies to realise the global goals of SCP. The overview of more than 30 different models, frameworks, roadmaps and approaches, covering the period from 1995 to 2013 has disclosed that despite these scientific attempts, *a detailed model that integrates the aspects of all three sustainability dimensions (economic, environmental and social), offers practical solutions, incorporates well-known engineering, management and communication tools and measures, controls characteristics of industrial processes, products and services as well as engages various stakeholders is still absent.*

The object of the research is the sustainability management of a company considering the aspect of sustainable consumption.

Objective and targets of research

The main objective of the research is to create a *model of sustainable consumption and production management of the company*, which integrates engineering and other sustainable development tools and helps to solve the problems related with the three aspects of the company's activities – manufacturing processes, products/services and relationship with stakeholders, thereby improving the environmental and social performance of the companies and contributing to the implementation of sustainable development goals.

Targets:

1. Perform a scientific literature review and analysis of the present sustainable business models as well as the actions and cooperation opportunities of the main stakeholders of the consumption and production system;
2. Analyse the current consumption and production system of Lithuania to assess consumers' consciousness, tools and initiatives applied by consumers and companies as well as the most influential, inhibitory and motivating factors to reach SCP;
3. Define the actions of stakeholders of the consumption and production system and evaluate their significance regarding the SCP implementation in the country;
4. Develop a model of sustainable consumption and production management of the company, which integrates SD tools and create an algorithm for the application of this model;
5. Test the application opportunities of the model in the companies from different economic sectors.

Key thesis:

The new interdisciplinary model of sustainable consumption and production management of the company, which incorporates SD tools for the three aspects of the company's activities (manufacturing processes, products/services and stakeholders), integrate consumers and consider other stakeholders help to improve the environmental and social performance of the companies and contribute to the implementation of sustainable development goals.

Research methodology

This dissertation is based on the general methods of scientific research – systemic and comparative analysis of scientific literature regarding the topic of the thesis. In consideration of the interdisciplinary subject of the research, the analysis of the current consumption and production system of Lithuania with the aim of assessing the most suitable actions and initiatives of its stakeholders as well as the demands and structure of a model of sustainable consumption and production management of the company was performed by applying the surveying method – questionnaires for consumers and companies' representatives. Empirical research data were processed by the means of mathematical statistical analysis applying data processing software packages *STATISTICA 12* and *SPSS 17.0*. The descriptive statistics and multidimensional (correlation analysis) statistical methods were applied. During the efficiency evaluation of the algorithm application, the pair-wise comparisons between each pair of indicators were based on the Analytic Hierarchy Process (AHP) method.

Scientific novelty of the research

- The new model of sustainable consumption and production management of the company integrates wide-accepted SD measures and tools applied to the company's manufacturing processes, products/services and cooperation with stakeholders and for the first time includes the consumer as an active participant, which can influence the producer.
- The algorithm for the application of the model helps to select the most suitable SD tools for the specific company considering values of the three sub-indices of the new integrated index for the overall sustainability state of the company, I_{SCP} .

Theoretical and practical value

- The overview and analysis of more than 30 models, frameworks and roadmaps related to corporate sustainability and SCP, covering the period from 1995 to 2013, allowed their common structure to be identified, to determine the most popular tools, their integration methods and participants as well as their advantages and deficiencies. All these implications were considered during the development of a new model of sustainable consumption and production management of the company.
- The analysis of the scientific literature related with potential actions and cooperation opportunities of the main stakeholders of the consumption and production system formed the theoretical background of the surveys for the following situation analysis research.
- Situation analysis research in the country, which was performed by surveying, allowed the investigation of the current consumption and production system of Lithuania and to assess the consumers' consciousness, tools and initiatives applied by the consumers and companies as well as the most influential, inhibitory and motivating factors to reach SCP. Moreover, this analysis also helped to identify the most appropriate actions of other main system's stakeholders and determine the demand and structure of the model of sustainable consumption and production management of the company.
- The aim of the model, which is based on the integrated management system combining and controlling other SD tools and for the first time including the consumer as an active participant, is to save resources and energy and minimise waste as well as increase the satisfaction of consumers that directly influences the company's competitiveness in the market and its profit.
- The efficiency evaluation of the algorithm application was performed in two Lithuanian enterprises from different business sectors – telecommunications (service sector) as well as construction and real estate (manufacturing sector). The results of the algorithm implementation confirmed that it is universal

enough to be adapted for both manufacturing and service companies. Considering the values of the sub-indices of the composite index I_{SCP} for the overall sustainability state of the company, the particularities of the companies' performance and the measures they have already applied, the specific recommendations for both companies to implement most suitable SD tools were proposed.

Structure and contents of dissertation

The dissertation consists of an introduction, 5 main chapters (review of the recent research, methodology of theoretical research, theoretical research, model of sustainable consumption and production management of the company and its application), conclusions, references (268 items) and supplementary material (2 appendixes). The dissertation text covers 156 pages, including 34 tables and 25 pictures, excluding appendixes. Its general structure is presented below.

CHAPTER I. Review of the recent research

The chapter introduces the analysis of the recent relevant research related to the consumption and production system, discussing the opportunities of companies, consumers and other stakeholders to promote and implement SCP, including a review of the most influential factors regarding global unsustainable consumption. Also, an overview of models, frameworks, roadmaps and approaches related to corporate sustainability and SCP, covering the period from 1995 to 2013.

Although the researchers strongly highlight the importance of business for progress in SCP (Lüdeke-Freund, 2010; Michaelis, 2003), however, the problems in many SD areas are too complex for companies to deal with alone (Barber, 2007; Carson, 2007; Sakarya *et al.*, 2012; Young, 2006). The responsibility should not be placed on individual consumers (Stø *et al.*, 2006) or government (Hartman *et al.*, 1999). As consumption comes naturally to humankind and the change requires a supportive social environment, it could be proposed that efficient progress in the area of SCP may only be achieved by a systematic struggle of the producers and consumers, incorporating members from other interested groups, such as governments, NGOs, education and science institutions, the press and the media, etc.

The analysis of present models and frameworks demonstrated that there are many scientific attempts to propose progressive sustainable business models for companies for the purpose of reaching the worldwide goal of SCP. However, a detailed model that integrates environmental, social and economic aspects of sustainability, offers practical solutions, incorporates well-known engineering, management and communication tools and measures, controls characteristics of industrial processes, products and services as well as engaging various stakeholders is still absent.

CHAPTER II. Methodology of the theoretical research

The chapter reviews the research methodology of the dissertation that was applied to perform the situation analysis of the consumption and production system.

A stratified sample with simple random sampling in the strata was used in the research to guarantee representative results. All the Lithuanian inhabitants were divided into eight strata according to their gender in consideration of the current age structure of the population. Similarly, all the enterprises in the country were separated into eight strata according to the indicated number of employees. The samples were selected trying to retain the distribution of respondents according to the real gender and age proportions of Lithuanian inhabitants as well as the proportion of the quantity of employees in country's enterprises.

With the aim of optimising data collection procedures as well as to combine the advantages and compensate for the weaknesses of the different survey methods (De Leeuw, 2005; EC, 2004; Martelli, 2005), the mixed-mode survey was adjusted. In this study, two surveying methods were applied, i.e. an on-line questionnaire and a survey in *Word* (MS Office) format distributed as an attachment to an e-mail. Moreover, a certain part of the surveys was disseminated in a paper form to reduce bias emerging from the fact that part of the population still has no opportunities and/or skills to use a computer and the internet (Cobanoglu *et al.*, 2001; Rosenbaum, Lidz, 2007; Schaefer, Dillman, 1998; Sills, Song, 2002).

The research data were processed by means of mathematical statistical analysis; the data processing software packages *STATISTICA 12* and *SPSS 17.0* were employed. The descriptive statistics and multidimensional (correlation analysis) statistical methods were applied. The significant differences between the answers of the consumers' and companies' respondents and the significant relations between the consumers and company's characteristics as well as various factors that determine their behaviour were estimated by applying Pearson's Chi-Square test with the levels of significance (p) of 0.05 and 0.01.

CHAPTER III. The theoretical research

The aim of this chapter is to present the main results of the surveys for the representatives of the consumers and companies in Lithuania that form the basis for the demand and structure of the model of sustainable consumption and production management of the company. The section discusses their general sustainability knowledge and attitude, SCP practices and initiatives as well as determining the relevant factors that influence, inhibit and motivate them to choose a sustainable behaviour. Moreover, some of the most significant correlations between the aforementioned factors and respondents' characteristics are also reviewed. The findings of the surveys either help to assess the opinion of

the consumers and companies regarding the most relevant stakeholders and their most influential actions that could support the successful movement towards SCP.

The comparison of the research results with the findings of earlier studies in the country allows for the proposal that the consumers' consciousness regarding sustainability were positively mediated during the latter years (e.g. the importance of the sustainability characteristics of the products for Lithuanian consumers has increased by 41.3% from 2006 to 2012). According to the interviewees' answers, 71% of them highlighted the importance of the sustainability of the products and services as well as everyday activities they choose, however, it was determined that only 58% and 5% of the aforementioned respondents tended to act sustainably often and constantly.

The consumers most frequently applied such sustainable consumption initiatives as the re-use of packing materials, conservation of natural resources and refusal of optional purchases, as well as waste screening and choices of eco-friendly products. The biggest part of the respondents stated that the most influential factors to choose environmentally friendly behaviour were the aspiration to live in a cleaner environment, cognition that eco-friendly behaviour was important and beneficial, as well as the economic benefit. The disadvantageous choices of the majority of the respondents were mostly determined by their limited financial resources, distrust of information about the products and services that the companies proposed and a lack of political initiatives. The most significant incentives to stimulate the consumers to choose an eco-friendly lifestyle and consume sustainably could be the facts that the products and services would not cost more than their less eco-friendly alternatives, the products would be clearly marked and labelled as well as reliable information about the services would be provided.

The most widely applied SD tools in Lithuanian enterprises were an environmental management system (EMS), corporate social responsibility (CSR) and cleaner production (CP) as well as sustainability reports, stakeholder engagement, industrial ecology (IE) and eco-labels, while the most popular standards were a quality management system (QMS), EMS as well as occupational health and safety (OHSAS) standards ISO 9001, ISO 14001 and OHSAS 18001. According to the companies, the most efficient measures were such commonly-used tools as CP, IE, eco-design, EMS and QMS as well as an energy management system, eco-labelling and a set of supplementing SD tools that can also be integrated in a management system. Enterprises mostly applied efficient consumption of resources, energy and water, appropriate disposal of waste and products together with their transfer/sale to other companies, as well as the implementation of innovative technologies, replacement of equipment and setting the environmental criteria for suppliers. The main reasons for the producers to engage in sustainable practices were financial benefit from resource

savings, reduction in material expenditures on the output and earnings from waste sales, as well as the increased competitiveness and advantages in the market. Whereas, the major obstacles for companies were deficiency of finances, experience and knowledge, technical barriers and difficulties to choose the most suitable and efficient measures, methods and tools.

Although the different factors and initiatives were significantly but diversely influenced by various respondents' characteristics and it would be quite complicated to unambiguously define the most important of them, generalisation of the survey outcomes proposed that sustainable behaviour, choices and consciousness of Lithuanian consumers were largely influenced by their gender, education, family status, number of under-aged children, place of residence and incomes, while the sustainability state of companies were mostly determined by their average annual turnover, form of governance, type and field of activity. Thus, a presumptive sustainable consumer of the country could be a highly educated single woman with no children who lives in one of the largest cities and obtains a minimum income, whereas a sustainable enterprise of the country could be a state institution with a higher annual turnover.

The interviewees agreed that the majority of the listed stakeholders' initiatives based on the literature analysis had favourable opportunities to promote the implementation of SCP in Lithuania. The aforementioned findings support the demand to include not only the most important participant, i.e. the consumer, but also other significant stakeholder groups, such as the government, NGOs, education and science institutions as well as the media and their highest rated initiatives into the new model of sustainable consumption and production management of the company.

CHAPTER IV. Model of sustainable consumption and production management of the company

Considering the lack of a complete framework and recommendations for companies to realise SCP, the new model of sustainable consumption and production management of the company is presented (Fig. 1). This model is based on a classic closed loop cycle scheme for the management system and suggests a plan for the consistent integration of SCP principles into an organisation's practices. The model integrates a set of widely-accepted engineering and other SD measures and tools – resource efficiency and cleaner production (RE & CP), IE, life cycle assessment (LCA), eco-design, eco-labelling, environmental product declarations (EPD), CSR and stakeholder engagement and sustainability reporting – that can be applied to the 3 aspects of a company's activities, namely manufacturing processes, products or services and cooperation with stakeholders. The framework, similar to the real life SCP system in a broad sense, is a complex structure, composed of a number of links not only in the manufacturing cycle, but also between producer (company),

consumers/customers and various groups of stakeholders. These links in the model are presented as the flows of materials, energy and information, circulating in the system and crossing its boundaries. The information flows between company, consumers and other stakeholders that are beyond system boundaries in the model are based on the findings of theoretical research – the survey for consumers and companies that have evaluated the potential of various initiatives of different stakeholders to promote SCP in the country (Fig. 2). According to the IE concept, the objective of the model is to minimise energy and material use as well as waste output, and to eliminate the “rebound” effect, which can be observed when achievements in industrial efficiency are compensated by unsustainable changes in consumer behaviour. It is very significant to notice that consumers/customers, considering their major role for efficient implementation of SCP initiatives in the company, are distinguished as a separate stakeholder group in this model, lying within the system boundaries. Efficient feedback mechanisms towards the company from consumers and other stakeholders as well as interconnections between them guarantee the successful operation of the model. The survey for regular company’s consumers/customers is additionally included in the model for the purpose of guaranteeing effective feedback from customers.

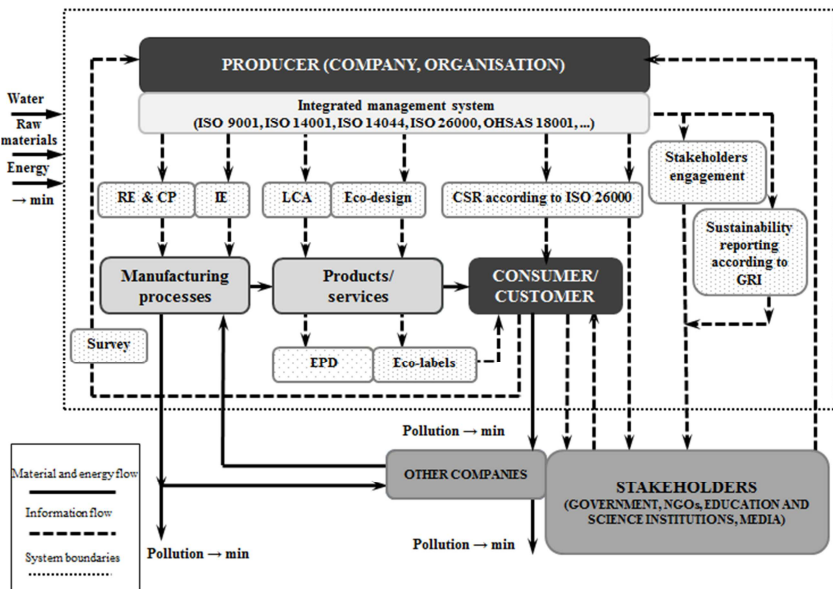


Fig 1. Model of sustainable consumption and production management of the company

The relationship between producer and consumer in this framework is the most significant to reach SCP not only in the company, but also beyond its boundaries. The assumption was made that consumers in the model were already environmentally sophisticated and were able to understand the essence and the meaning of sustainable consumption. In turn, producers not only generate the niche of environmentally friendly products and services in the market, but also educate consumer society stimulating the demand for such goods. Regarding this reason, while consumers become more and more environmentally conscious, they can influence producers to develop their business requesting sustainable products and services that correspond to their demands.

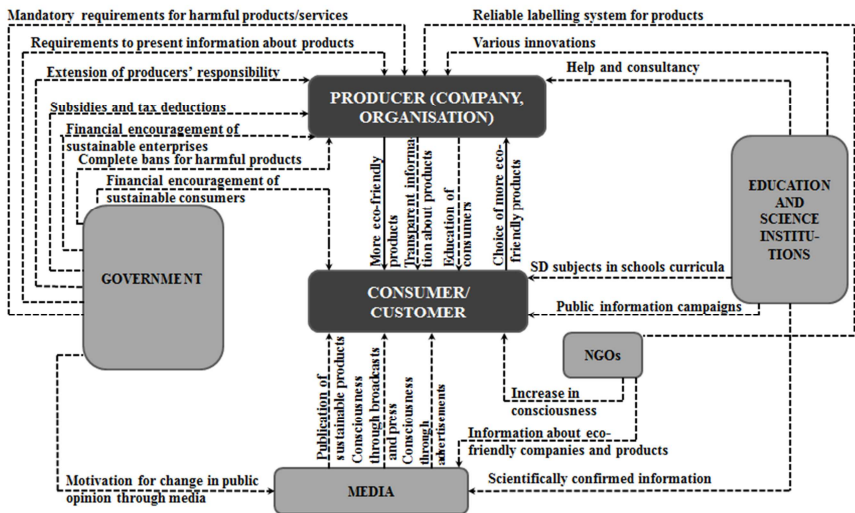


Fig. 2. The most significant information flows between the company, consumers and other main stakeholders in the model of sustainable consumption and production management of the company

The algorithm for integrated sustainability assessment of the overall company state that forms the basis for the application of the earlier introduced model offers methodical suggestions to assess the customers opinion about the presence of the company’s environmental and social sustainability activities and initiatives; to identify and select most appropriate sustainability indicators; to determine their significance according to AHP; and to solve the most important sustainability problems related with 3 aspects of company’s activities – manufacturing processes, products/services as well as the relationship with various stakeholders by adapting most suitable SD tools. The final suggestions of the algorithm are based on the values of the 3 sub-indices of a new integrated index for the overall assessment of the SCP state in the company, I_{SCP} . The

connection between the model and the algorithm for its application is presented in Figure 3.

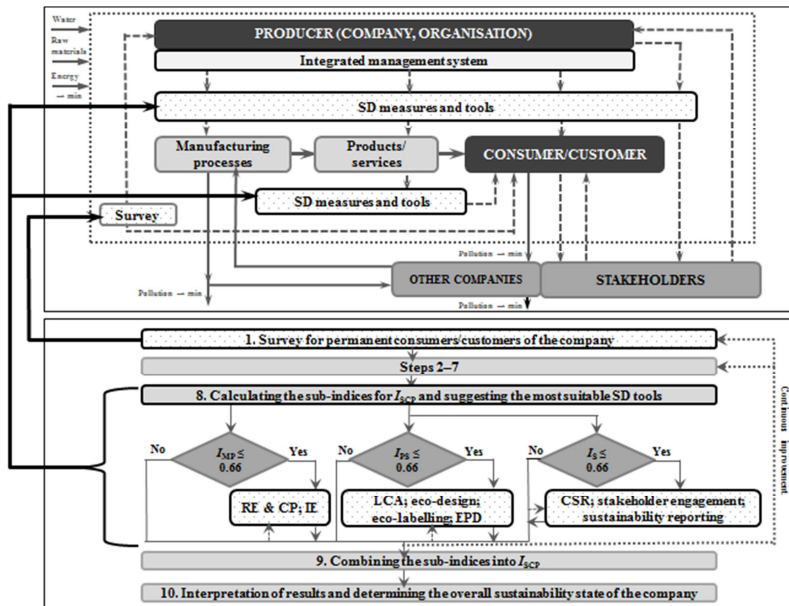


Fig. 3. The connection between the model of sustainable consumption and production management of the company and the algorithm for its application

The algorithm (Fig. 4) consists of 10 essential steps.

First of all, the survey to assess the opinion of company's consumers/customers (1) about the presence of its sustainable activities and initiatives, related to manufacturing processes, products or services and stakeholders are performed. The results of the survey (2) are used to estimate the values of the coefficients K_j for manufacturing processes/company's activities (K_{MP}), products or services (K_{PS}) and stakeholders (K_S) that are necessary for the calculation of corresponding sub-indices I_{MP} , I_{PS} and I_S in the step 8.

Then, the board of experts (3) that include representatives from all the internal and external stakeholder groups of the company are organised to be involved in the two following steps. During the identification and selection of sustainability indicators (4), experts are asked to identify and rate the quantitative and qualitative sustainability indicators related to all 3 aspects of the company's activities by expressing their importance for a particular company using the list of performance indicators from the Global Reporting Initiative (GRI) framework as a primary set of indices. The best rated indicators for each level are selected for the further weighting procedure (5) that is performed by

applying the pair-wise comparison technique based on the method of AHP (Krajnc, Glavič, 2005a; Saaty, 1980). The process of such comparison expresses the intensity of the indices importance according to the scale from 1 to 9 and is repeated for each column of the matrix, making independent judgments over each pair of indicators (Krajnc, Glavič, 2005, 2005a; Singh *et al.*, 2007). Later, the solution of the right eigenvector of the matrix provides an estimate of the relative weights W_{ji} of the indicators evaluating their priority level (Saaty, 1996; Singh *et al.*, 2007).

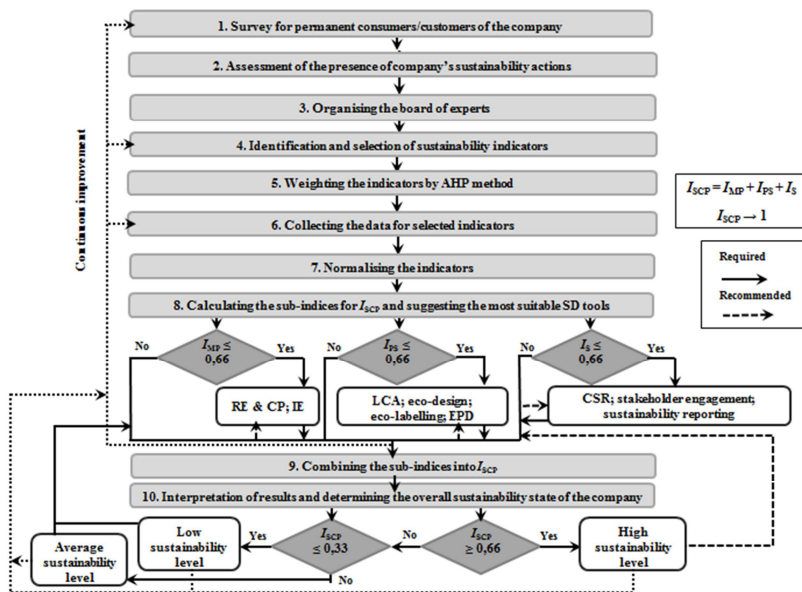


Fig. 4. The algorithm for the application of the model of sustainable consumption and production management of the company

During the next step, the quantitative and qualitative data for previously selected indicators, reflecting the performance of the company for the period of 1 year or 3 years are collected (6). Then, the collected data are normalised (7) by applying the Min-Max (Kinderytè, 2010, 2011, 2013; Krajnc, Glavič, 2005, 2005a) or Z-score (Singh *et al.*, 2007) methods.

And finally, the last 3 steps of the algorithm are implemented. The sub-indices are calculated (8) for every 3 aspects, considering the weight of every indicator W_{ji} , which were generated during an expert weighting procedure as well as coefficients K_j from the consumers' survey. Each of these sub-indices shows the tendency of the company's sustainability development regarding the SCP in one of the corresponding aspects. The minimal value of a particular sub-

index notices that the related aspect is the weakest in the whole system; thus, the condition of it should be improved by applying suitable tools and measures. If the lowest value is recorded at the level of manufacturing processes/company's activities ($I_{MP} \leq 0.66$), the model suggests realising RE & CP as well as IE opportunities. Poorest conditions regarding the characteristics of products and services ($I_{PS} \leq 0.66$) can be fixed by applying LCA, eco-design, eco-labelling and EPD. If the weakest area of the enterprise seems to be relationships with stakeholders ($I_S \leq 0.66$), CSR according to ISO 26000, various stakeholder engagement initiatives as well as improvements in sustainability reporting should be reconsidered.

The aforementioned sustainability sub-indices are combined into an integrated index for the assessment of the overall SCP state of the company, I_{SCP} (9), using equal weights for all the sub-indices (Kinderytė, 2011, 2013; Krajnc, Glavič, 2005, 2005a). This integrated index can help to disclose the overall SCP state of the company (10). If index is less than the value 0.33, the particular company can be named as unsustainable and must urgently rethink the whole business strategy, implementing the possible actions and measures considering all the aspects of the company's activities with the purpose of improving its overall sustainability condition. If the calculated value lies between 0.33 and 0.66, the enterprise shows the average level of the sustainability state regarding the implementation of SCP practices. In this case, it is strongly recommended to implement suitable measures and tools, especially in those particular levels, which show the worst results according to the values of sub-indices. And finally, if I_{SCP} exceeds the critical value of 0.66, it can be stated that the enterprise is progressive and its overall sustainability is as high as the value of I_{SCP} is closer to 1. However, even on a high level of sustainability, the company can still improve its current sustainability state by implementing additional measures and tools and, thus, exploiting all its sustainability potential.

Periodical review of the customers' opinion and periodical assessment of the company's sustainability state compose a very important part of the algorithm that guarantees the continuous improvement of the enterprise's sustainability state. These assessments could help to estimate the results of sustainability enhancement concerning newly implemented measures and to observe changes in the customers' opinion. Periodical review and assessment can be realised in 3 levels, by applying the algorithm from the very beginning or by performing the inner evaluation selecting new sustainability indicators or just collecting data for the indicators that have already been chosen to estimate the changes in the 3 aspects of the company's activities.

CHAPTER V. The application of the model of sustainable consumption and production management of the company

In respect of the demand to examine the real potential of the algorithm, the efficiency evaluation of its application with a few minor changes in the aforementioned structure of the algorithm was performed in 2 large, well-known Lithuanian enterprises from different business sectors. One of the companies represents the sector of telecommunications (service sector, company No. 1), the other, the sector of construction and real estate (manufacturing sector, company No. 2). To make the evaluation easier and more time efficient, the public opinion surveys with the respondents that do not essentially belong to the clientele group of the particular enterprises were deliberately introduced. However, as both companies are well-known, the results of these surveys partly reflected general public opinion. Moreover, in order to simplify the testing procedure, the step of the organisation of the board of experts was excluded and replaced by communication with the group of representatives from each company.

Since both enterprises are already more or less engaged in the sustainability reporting based on GRI, 52 (in the case of company No. 1) and 40 (in the case of company No. 2) sustainability indicators were selected from the already available list and classified into the 3 groups related to manufacturing processes (or the company's activities in the case of the service company), products or services and stakeholders. Thus, 9 (company No. 1) and 5 (company No. 2) indicators were included in the group of manufacturing processes/company's activities; 13 and 8 indicators in the group of products or services; as well as 30 and 27 indicators in the group of cooperation with stakeholders. The representatives were asked to weight the indicators in each of the 3 groups by applying the AHP pair-wise comparison technique. Then, the quantitative and qualitative data for all the indicators, reflecting the performance of a company for the period of 3 years were collected and normalised by applying the Min-Max normalisation method. Finally, the sub-indices were calculated for all 3 aspects, considering the weight of every indicator W_{ji} from the AHP weighting procedure as well as coefficients K_j generated from the public survey.

Calculated values of the composite index I_{SCP} indicated an average level of the sustainability state regarding the implementation of overall SCP practices in both companies ($I_{SCP} = 0.46-0.49$; $0.33 \leq I_{SCP} \leq 0.66$). As the results of the sub-indices showed the similar moderate results in the case of both companies (0.5–0.6 in company No. 1 and 0.4–0.5 in company No. 2) (Table 1), the enterprises are strongly recommended to reconsider all 3 aspects of their activities by applying some of the recommended measures and tools or at least by correcting the management and operation of the already implemented ones. Considering the values of the sub-indices of the composite index I_{SCP} for the overall sustainability state of the company, the specifics of the companies' performance and measures

they have already applied, concrete, more detailed recommendations for both companies to implement the most suitable SD tools were proposed.

First, company No. 1 was recommended to implement the integrated management system or at least EMS. Then, it was suggested to seek more efficient and economical consumption of energy, water and paper by applying the proactive RE & CP strategy of good housekeeping as well as apply LCA-based tools for sustainability improvements in the services provided. In order to enhance its sustainability in the area of cooperation with stakeholders, the company was advised to register its sustainability report within the GRI system.

Considering the specifics of company No. 2, it was suggested to use IE as the most purposive measure regarding the generation of a large mass of different wastes. The application of this tool can be helpful in realising certain flows of waste (e.g., composite construction and demolition waste fractions, forestry waste, etc.) by selling them to other companies. Moreover, LCA and eco-design measures were recommended to be applied for wider evaluation of the environmental impact of buildings under construction or redevelopment for the purpose of choosing the most appropriate scenarios according to the most problematic stages. The communication with various stakeholder groups can be improved by employing public nationwide sustainability reports that could be registered within the GRI system in the near future.

Table 1. Values of the integrated index for the assessment of overall SCP state of the company I_{SCP} and its 3 sub-indices in both companies

Value of sub-indices and integrated index	Company No. 1	Company No. 2
I_{MP}	0.45	0.38
I_{PS}	0.57	0.54
I_S	0.45	0.47
I_{SCP}	0.49	0.46

Research limitations and future research issues

It should be noted that the efficiency evaluation of the algorithm application definitely has some limitations. First of all, the public survey cannot guarantee that the respondents are familiar enough with the companies' activities and the real situation regarding the presence of sustainability initiatives in the enterprises. Moreover, the simplified weighting procedure including only representatives from the companies could possibly produce subjective evaluation results. In order to sufficiently assess the application of the model, it is necessary to proceed with similar verification procedures covering a larger number of enterprises from different business sectors, while trying to ensure that surveying is allocated to the companies' clientele and the AHP weighting is performed by a team of members from different stakeholder groups of the companies. It would

also be relevant to assess the application of the model in enterprises of different sizes.

Nevertheless, despite the above discussed limitations, the results obtained are sufficient to propose that the model of sustainable consumption and production management of the company and the algorithm for its application are universal enough to be adapted for companies from various sectors of activities involving different manufacturing enterprises as well as service companies and organisations. Since the algorithm was created as a guide to apply the model based on an integrated management system, it can be easily incorporated into the common management system of any enterprise.

Despite the model being partly based on the results of situation analysis of the consumption and production system of Lithuania, the assumption about the applicability of this model in countries with similar development and economic conditions could be made. Whereas, after a new evaluation of the information flows of the model, it could also be applied in other countries.

The other potential future research issues could be the efficiency assessment of the implemented model in companies by applying the algorithm from the very first step, thus ensuring periodical monitoring of consumers' opinion changes and continual improvement of the company's sustainability condition. Moreover, various enterprises from the same business sectors that have chosen analogous sustainability indicators could be compared considering the values of the integrated index for the overall assessment of the SCP state in the company, I_{SCP} as well as the sustainability state of the different aspects of the company's activities (manufacturing processes, products/services and stakeholders) that is indicated by the ratings of 3 sub-indices of the aforementioned sustainability index.

Main conclusions

1. The analysis of scientific literature demonstrated that despite scientific attempts to propose progressive business models for companies for the purpose of reaching the worldwide goal of SCP, a universal model that integrates environmental, social and economic aspects of sustainability, offers clear and practical solutions, incorporates wide-accepted engineering, management and communication tools and measures, controls characteristics of industrial processes, products and services as well as engages various stakeholders, such as government, NGOs, education and science institutions, media, etc. is still absent.
2. The research results disclosed that Lithuanian consumers' consciousness regarding sustainability is growing (the importance of sustainability characteristics of the products for consumers has increased by 41.3% from 2006 to 2012). Although this finding does not highlight the people everyday choices enough (only 58% and 5% of the interviewees indicated that they

- tended to act sustainably often and constantly), it already indicates that consumers are not indifferent regarding the environmental and social influence of products and services (71% of the respondents highlighted the importance of sustainability of products and services they choose).
3. Consumers most frequently apply such sustainable consumption initiatives as re-use of packing materials, conservation of natural resources and refusal of optional purchases as well as waste screening and choices of eco-friendly products (67–90% of the respondents agreed). The largest group stated that the most influential factors to choose environmentally friendly behaviour are the aspiration to live in the cleaner environment, cognition that eco-friendly behaviour is important as well as economic benefit (77–90%). The disadvantageous choices of the majority of the respondents were mostly determined by their limited financial resources, distrust of information about products and services that companies propose and a lack of political authority initiatives (50–63%). The most significant incentives to stimulate consumers to choose an eco-friendly lifestyle could be the fact that products would not cost more than their less eco-friendly alternatives, products would be clearly marked and labelled, as well as reliable information about the services being provided (90–92%).
 4. The most widely applied SD tools in Lithuanian enterprises are EMS, CSR and CP as well as sustainability reports, stakeholder engagement, IE and eco-labels (23–40% of the interviewed companies agreed), while the most popular standards are QMS, EMS and OHSAS standards (42–68%), i.e. the integrated management system. Enterprises mostly apply efficient consumption of resources, energy and water, appropriate disposal of waste as well as the implementation of innovative technologies (62–81%). The main reason for producers to engage in sustainable practices is financial benefits and other factors related with economic incentives, e.g. increased competitiveness and advantages in the market (69–73%). The major obstacles for companies are deficiency of finances, experience, skills and knowledge, technical barriers and difficulties in choosing the most suitable and efficient measures (39–55%).
 5. Consumer respondents and representatives from companies agreed that the majority of the initiatives of listed stakeholders; companies, consumers, government, NGOs, education and science institutions and the media, are significant for the implementation of SCP. The aforementioned findings support the demand to include not only the most important participant, i.e. the consumer, but also other significant (67–82% of the respondents agreed) stakeholder groups and their highest rated (73–91%) SCP initiatives into the model of sustainable consumption and production management of the company.

6. The new model of sustainable consumption and production management of the company incorporates a set of widely-accepted SD measures and tools, such as RE & CP, IE, LCA, eco-design, eco-labelling, EPD, CSR, stakeholder engagement and sustainability reporting, that can be applied to the 3 main aspects of the company's activities, namely manufacturing processes, products/services and stakeholders. The consumer in the general consumption and production system of the model was included as an active participant for the first time, which can influence the producer through the feedback mechanism.
7. The algorithm for model application can help to assess the current sustainability state of the particular company and to select most appropriate SD tools that can support the implementation of SCP. The final suggestions of the algorithm are based on the values of the 3 sub-indices of a new integrated index for the overall assessment of the SCP state in the company, I_{SCP} .
8. The results of the efficiency evaluation of the algorithm application that was performed in 2 enterprises from different business sectors confirmed that it is universal enough to be adapted for manufacturing enterprises as well as service organisations. Considering the values of the sub-indices ($I_{S_{jt}} = 0.5-0.6$ in company No. 1 and $I_{S_{jt}} = 0.4-0.5$ in company No. 2, $I_{S_{jt}} \leq 0.66$) of the composite index I_{SCP} for the overall sustainability state of the company, the particularities of the companies' performance and the measures they have already applied, the specific recommendations for both companies to implement most suitable SD tools were proposed.
9. The efficiency evaluation of the algorithm application confirmed the possibilities of the developed model of sustainable consumption and production management of the company to improve the environmental and social performance of the companies from various economic sectors by selecting the most suitable SD tools for a particular enterprise in consideration of the sustainability state of 3 aspects of the company's activities. It also validated the perspectives of the model to contribute to the implementation of sustainable development goals through the feedback of consumers, and other stakeholders' participation in the acceptance of the decisions in the company.

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LIST OF SCIENTIFIC PUBLICATIONS ON THE TOPIC OF THE DISSERTATION

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REZIUMĖ

Darbo aktualumas

Per pastaruosius dešimtmečius darniosios gamybos iniciatyvos buvo sėkmingai nukreiptos išteklių panaudojimo gamybos sistemose efektyvumui didinti (Jackson, 2008; Sikdar, 2011), tačiau, nepaisant daugelio gamintojų aplinkosauginės veiklos rezultatų, išaugęs bendrojo vartojimo mastas dažnai viršija pasiektą pažangą (vadinamasis rikošeto (angl. *rebound*) efektas) (Clift, 2006; Mont, Plepys, 2003; Solgaard, 2003; Staniškis *et al.*, 2012; Stø *et al.*, 2006). Taigi tampa akivaizdu, kad darnaus vystymosi (DV) tikslams pasiekti nepakanka vien tik technologinio požiūrio – tam būtinas ir kritiškas žmonių pasirinkimų įvertinimas (Hertwich, 2005; Jackson, 2008; Kunz *et al.*, 2013; Lorek, Spangenberg, 2014).

Pastebima, kad vartotojų aplinkosauginis ir socialinis sąmoningumas pastaruoju metu vis labiau auga, tačiau kasdienėmis pasirinkimo situacijomis jie dar retai atsižvelgia į tausiojo vartojimo tikslus (López *et al.*, 2007; Vaishnavi *et al.*, 2014; Vinkhuyzen, Karlsson-Vinkhuyzen, 2014) – materialinių ir energijos išteklių tausojimą. Tai patvirtina daugybės mokslininkų išvados (Francis, Davis, 2015; Gadenne *et al.*, 2011; Horne, 2009; Hughner *et al.*, 2007; Kolkailah *et al.*, 2012; Leary *et al.*, 2014; Liobikienė *et al.*, 2014; Liu *et al.*, 2012; Pickett-Baker, Ozaki, 2008; Welfens *et al.*, 2010 ir kt.) ir šioje disertacijoje atliktas situacijos analizės tyrimas. Skirtingi autoriai teigia, kad vartotojų elgsena ne tik labai priklauso nuo tokių pasaulinio masto tendencijų, kaip globalizacija, pasaulinės ekonomikos kilimas, technologinė pažanga, inovacijos ir demografiniai pokyčiai, bet ir yra veikiamą daugybės įvairių sociokultūrinės sistemos elementų ir sąveikos tarp sociokultūrinių, ekonominių, technologinių bei kitų veiksmų (Caeiro *et al.*, 2012; Hutter *et al.*, 2010; Jackson, 2008a; Lorek, Spangenberg, 2014; Mont, Power, 2010; Peattie, Collins, 2009; Ritter *et al.*, 2014; Soron, 2010; Tukker *et al.*, 2008; Welfens *et al.*, 2010 ir kt.). Dėl šios priežasties, siekiant, kad vartotojų pasirinkimai būtų palankesni aplinkai, pirmiausia būtina pakeisti jų požiūrį ir nuostatas, formuojant aplinkai palankių gaminių ir paslaugų poreikį (Krantz, 2010). Panašu, kad vartotojai nepakeis savo vartojimo įpročių tol, kol jų sąmoningumas darnumo atžvilgiu bus nedidelis ir jiems stigs informacijos apie gamybos ir gaminių aplinkosaugines charakteristikas (Redman, Redman, 2014; Staniškis *et al.*, 2012), o aplinkai palankių gaminių poreikis neišaugs tol, kol rinkoje bus vartotojams patrauklesnių alternatyvių produktų (O'Rourke, 2005).

Mokslininkai teoretikai ir praktikai ypač pabrėžia didžiulę įmonių svarbą siekiant tausiojo vartojimo ir darniosios gamybos (TV ir DG) pažangos (Carlsson *et al.*, 2014; Carson, 2007; Kunz *et al.*, 2013; Lüdeke-Freund, 2010; Michaelis, 2003). Korporatyvinis sektorius, būdamas varomąja jėga ekonominės veiklos ir plėtros pasaulyje, turėtų tapti darnumo lyderiu (Azapagic, 2003;

Azapagic, Perdan, 2000; Santolaria *et al.*, 2011), tačiau problemas daugelyje darnaus vystymosi sričių vis dėlto yra per daug kompleksiškos, kad įmonės jas išspręstų savarankiškai (Barber, 2007; Sakarya *et al.*, 2012; Young, 2006). Atsakomybė už TV ir DG tikslų įgyvendinimą taip pat negali būti užkrauta eiliniams vartotojams (Stø *et al.*, 2006). Ir nors be stiprios valdžios institucijų paramos pasiekti reikšmingų pokyčių visoje gamybos ir vartojimo sistemoje būtų sunku (Rebitzer *et al.*, 2004; Stevens, 2010; Zhao, Schroeder, 2010), šios problemos taip pat negali būti išspręstos vien tik politikų pastangomis (Hartman *et al.*, 1999). Atsižvelgiant į tai, kad poreikis vartoti žmonijai kyla natūraliai, dideliems pokyčiams įgyvendinti būtina palaikanti socialinė aplinka (Jackson, 2008a). Apibendrinant daugelio autorių (Barber, 2007; Shin *et al.*, 2008; Staniškis, Stoškus, 2008; Stevens, 2010; Trencher *et al.*, 2014; von Hauff, Wilderer, 2008 ir kt.) išvalgas, efektyvi pažanga TV ir DG srityje gali būti pasiekta tik vieningomis gamintojų ir vartotojų pastangomis, įtraukiant ir kitas vartojimo ir gamybos sistemos suinteresuotųjų asmenų grupes: valdžios institucijas, nevyriausybinės organizacijas (NVO), švietimo ir mokslo institucijas, žiniasklaidą ir kt. Toks bendradarbiavimas padėtų skatinti vartotojų ir gamintojų elgsenos pokyčius, aplinkai palankius vartotojų pasirinkimus, garantuotų didesnę įmonių konkurencingumą ir kartu padėtų užtikrinti palankesnę aplinkos būklę (Boons *et al.*, 2013; Carson, 2007; Seuring, Gold, 2013).

Esant išaugusiam darnių gamybos ir vartojimo būdų poreikiui, skirtingose mokslo šakose buvo sukurta daugybė įvairių perspektyvių modelių, gairių ir rekomendacijų įmonėms, norinčioms prisidėti prie pasaulinių TV ir DG tikslų įgyvendinimo. Mokslinės literatūros analizė (disertacijoje buvo išnagrinėta daugiau nei 30 skirtingų modelių ir rekomendacijų, pasiūlytų 1995–2013 metų laikotarpiu) parodė, kad, nepaisant šių mokslinių pastangų, *universalus modelio įmonėms, apimančio visų trijų darnaus vystymosi sričių (ekonominės, ekologinės ir socialinės) aspektus, siūlančio aiškius ir praktiškus sprendimus, integruojančio plačiai taikomus inžinerinius, vadybos ir komunikacijos įrankius bei priemones, valdančio technologinių procesų, gaminių bei paslaugų charakteristikas ir įtraukiančio įvairias suinteresuotąsias šalis, nėra.*

Tyrimo objektas – įmonės darnios plėtros valdymas atsižvelgiant į tausiojo vartojimo aspektą.

Darbo tikslas ir uždaviniai

Darbo tikslas – sukurti *įmonės tausiojo vartojimo ir darnios plėtros valdymo modelį*, integruojantį inžinerines ir kitas darnaus vystymosi priemones, kuris padėtų spręsti problemas trijų veiklos aspektų – gamybos procesų, produktų (paslaugų) ir santykių su suinteresuotosiomis šalimis – atžvilgiu, kartu gerindamas įmonių aplinkosauginį bei socialinį veiksmingumą ir spartindamas darnaus vystymosi tikslų įgyvendinimą.

Uždaviniai:

1. Atlikti mokslinės literatūros apie esamus darnaus verslo modelius, pagrindinius vartojimo ir gamybos sistemos dalyvių veiksmus ir tarpusavio bendradarbiavimo galimybes apžvalgą ir analizę.
2. Išanalizuoti dabartinę Lietuvos vartojimo ir gamybos sistemą įvertinant vartotojų sąmoningumą, vartotojų ir įmonių taikomas priemones bei iniciatyvas ir veiksmus, kurie daro didžiausią įtaką (labiausiai skatina arba kliudo) siekiant tausiojo vartojimo ir darniosios gamybos.
3. Nustatyti vartojimo ir gamybos sistemos dalyvių veiksmus siekiant tausiojo vartojimo ir darniosios gamybos plėtros šalies mastu ir įvertinti jų reikšmingumą.
4. Sudaryti įmonės tausiojo vartojimo ir darnios plėtros valdymo modelį, integruojantį darnaus vystymosi priemones, ir sukurti algoritmą šiam modeliui taikyti.
5. Ištirti sukurto modelio taikymo skirtingų ekonomikos sektorių įmonėse galimybes.

Ginamasis disertacijos teiginys

Pasiūlytasis naujas, tarpšritinis įmonės tausiojo vartojimo ir darnios plėtros valdymo modelis, jungiantis DV priemones, taikomas trimis veiklos aspektams (gamybos procesams, produktams (paslaugoms) ir santykiams su suinteresuotosiomis šalimis), įtraukiantis vartotojus ir atsižvelgiantis į kitas suinteresuotąsias šalis, padės gerinti įmonių aplinkosauginį bei socialinį veiksmingumą ir spartinti darnaus vystymosi tikslų įgyvendinimą.

Tyrimo metodika

Disertacinis darbas atliktas taikant bendruosius mokslinių tyrimų metodus – sisteminę ir lyginamąją mokslinės literatūros disertacijos tema analizę. Atsižvelgiant į darbo tarpšritinę tematiką, esamos Lietuvos vartojimo ir gamybos sistemos analizei bei tinkamiausių šios sistemos dalyvių veiksmų, įmonės tausiojo vartojimo ir darnios plėtros valdymo modelio poreikio ir struktūros analizei atlikti taikytas anketinio tyrimo metodas – vartotojams ir įmonių atstovams pateikti klausimynai. Empiriniams tyrimo duomenims apdoroti taikytas matematinės statistikos metodas naudojant *STATISTICA 12* ir *SPSS 17.0* statistinių duomenų apdorojimo programas. Buvo taikomi aprašomieji ir daugiamačiai (koreliacinė analizė) statistiniai metodai. Sukurto algoritmo, skirto įmonės tausiojo vartojimo ir darnios plėtros valdymo modeliui, taikymo metu, siekiant atlikti rodiklių porinį palyginimą, buvo taikoma analitinio hierarchinio proceso (AHP) metodika.

Darbo mokslinis naujumas

- Sukurtas naujas įmonės tausiojo vartojimo ir darnios plėtros valdymo modelis, integruojantis plačiai naudojamas darnaus vystymosi priemonės, taikomas įmonės gamybos procesams, gaminiams (paslaugoms) ir bendradarbiavimui su suinteresuotosiomis šalimis, kuriame vartotojas pirmą kartą yra aktyvus, gamintojui įtaką darantis dalyvis.
- Algoritmas šiam modeliui taikyti padeda parinkti konkrečiai įmonei tinkamiausias darnaus vystymosi priemonės remiantis trijų subrodiklių, sudarančių naujai sukurtą integruotąjį rodiklį bendrajai įmonės darnumo būklei įvertinti I_{DVG} , skaitinėmis vertėmis.

Teorinė ir praktinė darbo vertė

- Atlikta daugiau nei trisdešimt 1995–2013 metų laikotarpiu sukurtų modelių, gairių ir rekomendacijų, susijusių su įmonių darnumu, TV ir DG tikslų įgyvendinimu, apžvalga ir analizė padėjo nustatyti jų struktūrą, dažniausiai juose taikomus įrankius, jų integravimą ir tipinius modelių dalyvius, taip pat nustatyti esamų modelių pranašumus bei trūkumus ir į tai atsižvelgiant pasiūlyti naują įmonės tausiojo vartojimo ir darnios plėtros valdymo modelį.
- Pateikta mokslinės literatūros analize paremta galimų pagrindinių vartojimo ir gamybos sistemos dalyvių veiksmų ir tarpusavio bendradarbiavimo galimybių apžvalga. Ja remiantis buvo sukurtas tolesnio situacijos analizės tyrimo dalies anketų teorinis pagrindas.
- Situacijos analizės tyrimas, atliktas anketavimo būdu, leido išnagrinėti esamą Lietuvos vartojimo ir gamybos sistemą, įvertinant vartotojų sąmoningumą, vartotojų ir įmonių taikomas priemones bei iniciatyvas ir tausiamam vartojimui bei darniajai gamybai didžiausią įtaką darančius (skatinančius ar kliudančius) veiksnius, taip pat nustatyti tinkamiausius kitų pagrindinių šios sistemos dalyvių veiksmus ir įvertinti kuriamo įmonės tausiojo vartojimo ir darnios plėtros valdymo modelio poreikį ir struktūrą.
- Pasiūlytas naujas, integruotos vadybos sistemos, jungiančios ir valdančios kitas darnaus vystymosi priemones, pagrindu sukurtas, pirmą kartą vartotoją, kaip aktyvų sistemos narį, įtraukiantis įmonės tausiojo vartojimo ir darnios plėtros valdymo modelis, kurio tikslas – išteklių bei energijos taupymas ir taršos mažinimas kartu didinant vartotojų pasitenkinimą, tiesiogiai lemiantį įmonės konkurencingumą rinkoje ir jos ekonominį pelną.
- Algoritmo įmonės tausiojo vartojimo ir darnios plėtros valdymo modeliui taikymo efektyvumas buvo nustatytas dviejose skirtingų ekonomikos sektorių – telekomunikacijų (paslaugų) ir statybos (gamybos) – įmonėse. Šio algoritmo diegimo rezultatai patvirtino jo universalumą ir pritaikomumą tiek gamybos, tiek paslaugų sektoriaus įmonėms. Atsižvelgiant į apskaičiuotas subrodiklių, sudarančių integruotąjį rodiklį bendrajai įmonės darnumo būklei

įvertinti, skaitines vertes, įmonių veiklos specifiką ir jau naudojamus įrankius, abiem įmonėms buvo pateiktos konkrečios rekomendacijos diegti joms tinkamiausias darnaus vystymosi priemonės.

Darbo apimtis ir struktūra

Disertaciją sudaro įvadas, 5 skyriai (tyrimų apžvalga, teorinių tyrimų metodika, teoriniai tyrimai, įmonės tausiojo vartojimo ir darnios plėtros valdymo modelis bei šio modelio taikymas), išvados, naudotos literatūros sąrašas (268 pavadinimai) ir 2 priedai. Pagrindinė medžiaga išdėstyta 156 puslapiuose, įskaitant 34 lenteles ir 25 paveikslus, neįtraukiant priedų.

Išvados

1. Literatūros analizė parodė, kad, nepaisant mokslinių pastangų pasiūlyti pažangius verslo modelius įmonėms siekiant įgyvendinti pasaulinius tausiojo vartojimo ir darniosios gamybos tikslus, universalaus modelio, integruojančio aplinkosauginius, socialinius ir ekonominius darnumo aspektus, siūlančio aiškius ir praktiškus sprendimus, apimančio plačiai taikomas inžinerines, vadybos ir komunikacijos priemones, valdančio pramonės procesų, gaminių bei paslaugų charakteristikas ir įtraukiančio įvairias suinteresuotąsias šalis – valdžios institucijas, NVO, švietimo ir mokslo institucijas, žiniasklaidą ir kt., – nėra.
2. Situacijos analizės tyrimas atskleidė, kad Lietuvoje vartotojų sąmoningumas auga (gaminių darnumo charakteristikų svarba šalies vartotojams nuo 2006 m. iki 2012 m. išaugo net 41,3 %). Nors kol kas tai dar nepakankamai atspindi kasdieniai žmonių pasirinkimai (58 % apklaustųjų nurodė aplinkai palankiai besielgiantys dažnai, tik 5 % – nuolat), tačiau matyti, kad vartotojai jau nebėra abejingi paslaugų ir gaminių, kuriuos įsigyja, aplinkosauginiam ir socialiniam poveikiui (71 % respondentų jų vartojamų gaminių palankumas aplinkai yra svarbus).
3. Dažniausi šalies vartotojų veiksmai, prisidedantys prie tausiojo vartojimo tikslų įgyvendinimo, yra pakartotinis pakavimo medžiagų naudojimas, gamtinių išteklių taupymas ir nebūtinių pirkinių atsisakymas, taip pat atliekų rūšiavimas ir aplinkai palankesnių gaminių pasirinkimas (67–90 % respondentų). Rinktis aplinkai palankesnę gyvenimo būdą ir vartoti tausiai juos labiausiai skatina siekis gyventi švaresnėje aplinkoje, tokios elgsenos svarbos ir ekonominės naudos supratimas (77–90 %). Didžiausios kliūtys – riboti asmeniniai finansiniai ištekliai, nepasitikėjimas įmonių pateikiama informacija apie gaminius bei paslaugas ir politinių valdžios iniciatyvų trūkumas (50–63 %), o svarbiausios paskatos – ekologiškų ir įprastų gaminių kainų panašumas, suprantamas gaminių ženklavimas ir išsamios, patikimos informacijos apie paslaugas pateikimas (90–92 %).

4. Daugiausia Lietuvos įmonėse taikomos darnaus vystymosi priemonės – AVS, ĮSA ir ŠG, darnumo ataskaitos ir suinteresuotųjų šalių įtraukimas, PE ir ekologiniai ženklai (23–40 % apklaustų įmonių), o populiariausi standartai – KVS, AVS ir DSSVS standartai (42–68 %), t. y. integruota vadybos sistema. Dažniausiai šalies gamintojai imasi efektyvaus žaliavų, energijos bei vandens vartojimo, tinkamo atliekų šalinimo, pažangiųjų technologijų diegimo (62–81 %). Tuo užsiimti įmonės labiausiai motyvuoja finansinė nauda ir kiti su ekonominiais rodikliais susiję veiksniai, tokie kaip konkurencingumo padidėjimas ir pranašumas rinkoje (69–73 %). Pagrindinės kliūtys, su kuriomis susiduria įmonės, yra lėšų, patirties, įgūdžių ir žinių trūkumas, techninės kliūtys ir sudėtingumas pasirinkti tinkamiausias ir efektyviausias priemones (39–55 %).
5. Vertindami vartojimo ir gamybos sistemos suinteresuotųjų šalių – įmonių, vartotojų, valdžios institucijų, NVO, švietimo ir mokslo institucijų bei žiniasklaidos – galimus veiksmus, vartotojai ir įmonių atstovai patvirtino daugumos pateiktų iniciatyvų reikšmingumą. Todėl į kuriamą įmonės tausiojo vartojimo ir darnios plėtros valdymo modelį, be svarbiausio dalyvio – vartotojo, įtrauktos ir kitos palankiausiai (vidutiniškai 67–82 % pritarusių vartotojų ir įmonių respondentų) įvertintos suinteresuotųjų grupės ir reikšmingiausios (73–91 %) jų iniciatyvos, galinčios prisidėti prie TV ir DG tikslų įgyvendinimo.
6. Pasiūlytas naujas įmonės tausiojo vartojimo ir darnios plėtros valdymo modelis jungia įvairias plačiai naudojamas darnaus vystymosi priemones: INE ir ŠG, PE, BCĮ, ekologinį projektavimą, ekologinius ženklus, GAD, ĮSA, įvairius suinteresuotųjų šalių įtraukimo veiksmus ir darnumo ataskaitas, kurios gali būti taikomos trimis pagrindiniams įmonės veiklos aspektams – gamybos procesams, produktams (paslaugoms) ir santykiams su suinteresuotosiomis šalimis. Modelyje pirmą kartą bendroje vartojimo ir gamybos sistemoje vartotojas (pirkėjas) yra aktyvus sistemos narys, per grįžtamąjį ryšį darantis įtaką gamintojui.
7. Modeliui taikyti sukurtas algoritmas gali padėti įvertinti esamą konkrečios įmonės darnumo būklę ir, atsižvelgiant į ją, pasirinkti tinkamiausias darnaus vystymosi priemones, padėsiančias siekti TV ir DG. Galutiniai algoritmo siūlymai pagrindžiami trijų subrodiklių, sudarančių naują integruotąjį rodiklį bendrajai įmonės darnumo būklei įvertinti I_{DVG} , skaitinėmis išraiškėmis.
8. Algoritmo diegimo dviejose skirtingų ekonomikos sektorių įmonėse rezultatai patvirtino jo universalumą ir pritaikomumą tiek gamybos, tiek paslaugų organizacijose. Atsižvelgiant į apskaičiuotas subrodiklių, sudarančių integruotąjį rodiklį bendrajai įmonės darnumo būklei įvertinti, vertes ($I_{S,jt} = 0,5–0,6$ įmonėje Nr. 1 ir $I_{S,jt} = 0,4–0,5$ įmonėje Nr. 2, $I_{S,jt} \leq 0,66$), įmonių veiklos specifiką ir jau naudojamus įrankius, abiem įmonėms buvo

- pateiktos konkrečios rekomendacijos diegti joms tinkamiausias darnaus vystymosi priemonės.
9. Tikrinant algoritmo taikymo efektyvumą įsitikinta sukurto įmonės tausiojo vartojimo ir darnios plėtros valdymo modelio galimybėmis gerinti įvairaus veiklos pobūdžio įmonių aplinkosauginį ir socialinį veiksmingumą, parinkus konkrečiai įmonei tinkamiausias DV priemones (atsižvelgiant į trijų jos veiklos aspektų darnumo būklę), taip pat pagrįstos modelio perspektyvos spartinti darnaus vystymosi tikslų įgyvendinimą užtikrinant vartotojų grįžtamąjį atsaką ir kitų suinteresuotųjų asmenų grupių atstovų dalyvavimą priimančias sprendimus įmonėje.

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