

ФГБОУ ВПО «УФИМСКИЙ ГОСУДАРСТВЕННЫЙ АВИАЦИОННЫЙ  
ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»

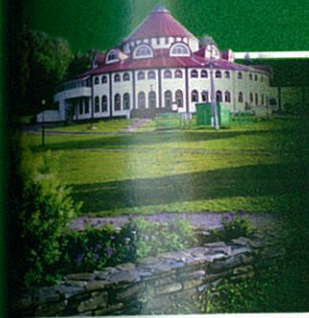
ФГБУН «ИНСТИТУТ ЭКОНОМИКИ УРАЛЬСКОГО ОТДЕЛЕНИЯ  
РОССИЙСКОЙ АКАДЕМИИ НАУК»

УН «ИНСТИТУТ СОЦИАЛЬНО-ЭКОНОМИЧЕСКИХ ИССЛЕДОВАНИЙ УФИМСКОГО  
НАУЧНОГО ЦЕНТРА РОССИЙСКОЙ АКАДЕМИИ НАУК»

SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA

ЕВРАЗИЙСКИЙ НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ ИМЕНИ Л. Н. ГУМИЛЕВА

КЫРГЫЗСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ  
ИМЕНИ И. РАЗЗАКОВА



## *Управление экономикой: методы, модели, технологии*

*XV Международная научная конференция*

Том II

*Уфа - Красноусольск 2015*



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#### СЕКЦИЯ 4. КОРПОРАТИВНАЯ СОЦИАЛЬНАЯ ОТВЕТСТВЕННОСТЬ БИЗНЕСА

Božiková Lucia, Šnircová Jana

#### MODEL OF SUSTAINABLE COMPETITIVENESS OF SLOVAK INDUSTRIAL COMPANIES

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The paper is a part of submitted KEGA project No. 037STU-4/2012 "Implementation of the subject "Corporate Social Responsibility Entrepreneurship" into the study program Industrial management in the second degree at MTF STU Trnava".

**Annotation:** In this article we introduce a model of sustainable competitiveness, which we created on the base of long term study of literature and created analysis. This article is divided into the several parts. In the first part we present the issues of sustainable competitiveness and also we combine the global competitiveness of the state with the sustainable competitiveness of enterprises. In the second part we present the proposed model of sustainable competitiveness. In the third part we focused on software created for calculation of sustainable competitiveness index.

**Key words:** Sustainable competitiveness, corporate social responsibility, sustainable development, competitive models.

The specific result of the adverse impact of the global crisis has created EU efforts to redress and increasing the competitiveness of individual Member States in the form of documents that talk on how states should approach to achieving competitiveness. It is in the documents of the EU to mitigate the impact of the global crisis began to combine competitiveness with sustainable development. Thus, the suggestions and recommendations for improving the competitiveness of individual states began idly in line with sustainable development. View of the competitiveness of previously defined as rivalry or fighting, often between more or less by equal rivals has diametrically changed by defining a new concept of sustainable competitiveness. There are two approaches to sustainable competitiveness in generally. The first defines sustainable competitiveness as achieving a long lasting competitive advantage. The second one is also based on the achieving of advantage in long term but simultaneously must company observe the rules of sustainable development. We define the sustainable competitiveness as a: fulfilling the competitive advantage in long term but simultaneously must company observe the rules of sustainable development and also must company contribute to creation of social environment, ecological environment and economic environment.

#### 1 Index for assessing the global competitiveness of countries as a tool for evaluating sustainable competitiveness of companies

A company that decides to enter the market is becoming part of the global market. As part of this market, the company must respect some rules and

conditions that follow from it. The company also, as part of global market, is still an integral part of domestic market. If the company wants to be successful must focus not only on the conditions resulting from the global market, but also on the conditions based on the policy and the economic situation of the country in which the company operates. Every company is part of external environment. And this environment has a huge influence over every company.

The aim of our research is a formulation of the sustainable competitiveness of Slovak industrial companies. Our research links the global competitiveness of the state with internal factors of sustainable competitiveness of companies. We evaluate the sustainable competitiveness of enterprises through the predicted changes in the external global environment. As the main source of information on the state of the external environment we use the GCI report. Global Competitiveness Index (GCI) established the World Economic Forum (WEF), The World Economic Forum has been studying the competitiveness of nations for nearly three decades. Global competitiveness report is based on M. Porter's work. GCI was designed with the goal of unifying the two indexes currently produced by the World Economic Forum (the Growth Competitiveness Index (McArthur and Sachs.,2001) and the Business Competitiveness Index (Porter.,2001), and it is meant eventually to replace them in the Global Competitiveness Report. GCI assesses the key factor for sustained economic growth and long-term prosperity of individual countries' economies. Global Competitiveness Index was developed by Xavier Sala-i-Martin and Elsa V. Artadi (Martin, Blanke, Hanouz ...,2015). Global Competitiveness Index measures national competitiveness—defined as the set of institutions, policies and factors that determine the level of productivity (Porter.,2004). Global competition's report is a result of global competitiveness' index. This

report evaluates the economics of states in the world. This report includes a chart showing the order in which the states ranked in terms of achieving competitiveness. We processed this chart more detail. We performed a comparison of global competitiveness SR from different perspectives. We created a prediction of the future development of GCI index. This prediction is based on the historical data. On the base of prediction we have created an application for calculate of sustainable competitiveness index of Slovak industrial companies. The application was also created for the expression of expected development of index and development of internal factors that are important for creating sustainable competitiveness. Before you say more about building applications move on to a model of sustainable competitiveness. This model summarize and explain the wide area of issues related to sustainable competitiveness. The model reflects our view and understanding of achieving sustainable competitiveness.

## 2 Design of model sustainable competitiveness of Slovak industrial companies in global environment in the context of sustainable corporate social responsibility

Sustainable competitiveness model consists of several parts (fig. 1). Basic model's elements are ecological, economic and social pillars. These three pillars are based on our understanding of sustainable competitiveness. Simultaneously, these three pillars are also pillars of sustainable development. These three pillars are displayed vertically in proposed model. Every other element of this model is built on these three pillars.

Other building elements of model are three horizontally arranged levels/spheres of influence. Spheres of influence determine factors of sustainable competitiveness in this way: Global policy is situated on the top of model. Policy of EU is situated under the global policy. A national economic policy leads off from policy of EU. This deployment shows us the impact of individual policies. These policies provide decision level (The uppermost global politics and the lowermost local politics). The next element of model represents level of global competitiveness of country. This level comes from national policy of state. Global competitiveness of Slovak Republic is defined by global competitiveness factors of country those factors are based on the global competitiveness report of countries.

This determinants represent: level of innovations, business sophistication of country,

institutions, infrastructure, macroeconomic environment, health and elementary education, higher education, goods market efficiency, labor market efficiency, financial market development, technological readiness and market size. There is a relation between the company and global competitiveness of SR. That argument we have already confirmed through controlled interview. Level of global competitiveness of country determines level of global sustainable competitiveness of company. It is because state creates conditions for development and existence of companies and also position of state is dependent on the level of companies in chart of global competitiveness. The force of the impact is determined by the size enterprises.

We introduced the building elements of model. In the next part, we will focus on the importance of this elements and rightness of placement. The increased interest in social pillar in the field of transnational, national and enterprise is an urgent need and one of the basic requirements for the operation of not only markets, but also the whole society. All new models based on modern economics, hence our model, must be supported and respected the requirements arising from improving the quality of the social environment. Global policy, policy of EU, national policy of states and enterprises must respect these requirements. Questions of increasing the quality of the social environment at the enterprise must enter the decision-making process at each level of the organization just as the requirements arising from the quality improvement of the economic and ecological environment. Economic, ecological and social pillar is essential to building sustainable development in the world, and therefore these pillars integral part of our model. Social, economic and environmental requirements have become part of global policies are integrated into EU (2020 Strategy) and economic policy. If the company wants to be successful in the global market and its goal to increase sustainable competitiveness, these policies must respect and contribute to sustainability of social, economic and ecological environment. Enterprises should pay more attention to these policies, to increase their awareness of global changes, changes resulting from EU documents and economic changes of country.

Enterprise in our model is shown in the form of a modified Porter's value chain (fig. 1 - bottom of the image). This chain is created from primary and supporting sustained action. Modified Porter's value chain was created by Šmída and Sakál (2011). Modified Porter's value chain is based on M. Porter's value chain.

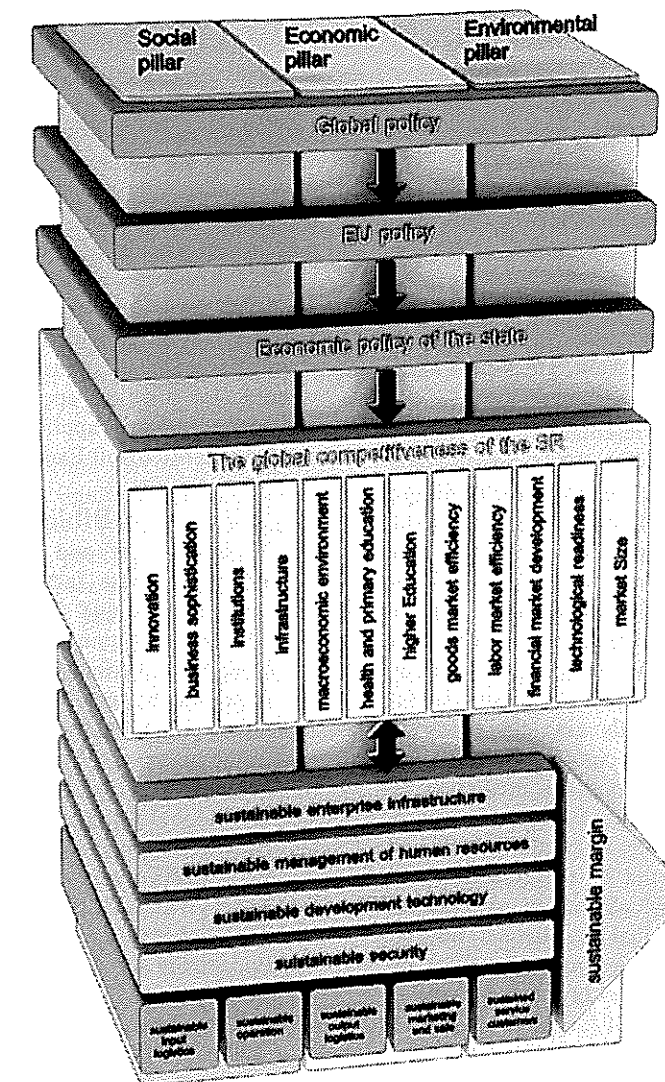


Fig. 1 Model of Sustainable competitiveness of Slovak industrial companies

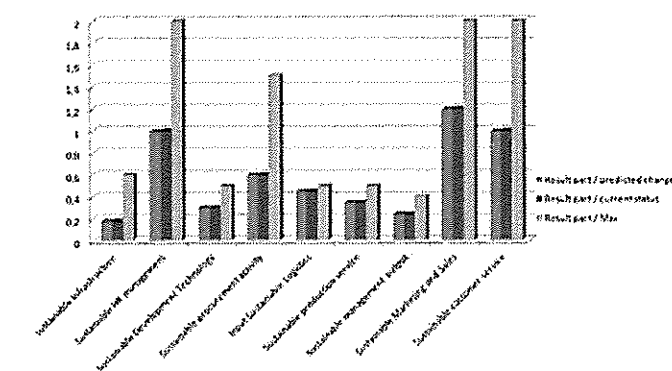


Fig. 2 Result chart

In our research, which we are presenting in the article, are described in detail precisely any connection between the state of global competitiveness and sustainable competitiveness of enterprises. Definition of this relationship is used to calculate the index of

sustainable competitiveness of industrial enterprises in Slovakia and it is the basis for creating software that we developed an.



### 3 Software application for calculation of the sustainable competitiveness index

Software application for calculation of the sustainable competitiveness index is made in Microsoft Excel. Entries in the program are organized into five letters in order to improve transparency at work. Working with this software application is as follows.

The enterprise is a living cell, not an isolated unit. Enterprise is defined by environment of company. Environment of company is also characterized by the level of global sustainability competitiveness of the country. Exactly, we focus the relation global competitiveness of SR and enterprises more deeply in the second form of output of our work. The model itself is shown on figure 2.

The user (company representative), will receive via e-mail or other carrier the Excel file, which finds already pre-prepared entries. The user's task is to fill the first data - sheet program. The first list includes a set of questions that the users answer yes (in the form of registration 1) or not (0 enrollment form). These questions are set in advance by us identified sustainable value-creating activities in the Slovak industrial companies. The outcome of the proposed platform is graph. This graph is created on the base of result of the first questions. The graph is showing the index of sustainable competitiveness of company up to the present. The graph is also showing the prediction of future state of index. Input data for calculation of sustainable competitiveness index is initial evaluation of the activities already carried out by representatives of company. Input data for calculation of sustainable competitiveness index is initial evaluation of the activities already carried out by representatives of company. The results are evaluated in the pre-prepared tables. The tables contain a set of formulas leading to calculate the index.

The whole calculation is based on the existence of a relationship between the external environment and internal factors of increasing sustainable competitiveness of the company. The external environment is expressed by criteria based on the Global Competitiveness Report of countries, GCI index. Internal factors increase sustainable competitiveness of businesses based on modified Porter value chain. Numeric values to serve us to the fulfillment of pre-tables are based on interviews we conducted online with five representatives of various businesses. Through these interviews, we obtain the average value assessment, we determined weight - the importance of their internal operations and numerically evaluated state between the external parameters and internal business venture. Next showing of results is a graph showing the development of individual major sustainable value-creating activities in the examined company in accordance with change of various external parameters. For businesses more interesting, is a graph evaluating

each of the main sustainable activities itself (figure No. 3). This chart compares the current status of the evaluation of the sustainable actions with the predicted state and the best possible achievable state.

### Conclusion

In the article, we introduced new way how to think about competitiveness. We presented the new concept - sustainable competitiveness and we also presented the model of sustainable competitiveness. Our model collects very complex issues. Through the model, we try to show links between the external environment and sustainable competitiveness of companies. Apart from the graphical representation of the model we offered also practical application of the model in the form of a software application. The application was created in a Microsoft Excel due to user friendly.

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Fidlerova Helena, Sakal Peter

## PROPOSAL FOR IMPROVEMENT OF EFFECTIVENESS AND SUSTAINABILITY WITHIN THE PACKAGING PROCESS IN MANUFACTURING COMPANY

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The article is a part of VEGA project No. 1/0448/13: "Transformation of ergonomics program into the company management structure through integration and utilization of QMS, EMS and H&SMS."

**Annotation:** The paper deals with packaging process as part of sustainable logistics and its impact in context of sustainable development and three pillar principle (Economic, Environmental, Social). Aim of the paper present the existing synergy effect in economic and environmental advantages in new solution with change of packaging material in packaging process within the case study in manufacturing company. The priorities in the project were cost reduction and minimizing negative impact of packaging on the environment.

**Key words:** Packaging, Sustainable Development, Effectiveness, Environment, Logistics

Packaging is an important part of logistics in manufacturing company with significant influence on effectiveness and sustainability. Packaging includes operations such as group packing, handling in warehouses and removal. (Kacenak, 1996, 2011). Product packaging offers the protection against a reduction in the utility value by external or internal influences on the way from production to the consumer, establishment of effective units of packaged goods for transport, storage and handling, facilitation of efficient power distribution. It enables consumer's quick reference which type of products to buy and its aesthetic and hygienic consumption. Packaging protects the environment from the effects of packaged aggressive or harmful substances and facilitates the production and marketing effective disposal of used packaging. (Dzurova, 1997).

The aim of package is to ensure an appropriate arrangement, protection and identification of products in accordance with customer requirements and current legislation. (Sakal, 2009). The basic functions of packaging are protection, storage, transport, handling and information (Kacenak 1996)

### Characteristics of Packaging

Packaging as a process can be understood in many ways in theory. It is defined often as grouping of goods in suitable packaging units for transport, storage, sale and consumption. Its aim is to protect the goods from external influences with lowest financial cost. The packaging is defined by Krajcovic (2004) as a set of resources that protect goods from damage. The Packaging Law of the Slovak republic (2010) introduces: *the packaging means a product which is used for packing of goods, its protection, its handling, delivery and presentation, from raw materials to processed goods, from the producer to the user or consumer who meets the criteria.* For packaging they are also considered disposable parts of packaging used for the same purposes. Legislation in the Slovak Republic regulates the packaging process and there are defined three main phases in the process of circulation packaging. In the first phase, the container understood as the product subject to the Law no. 264/1999 on

technical requirements for products. The second phase is used for packing or filling other products and in the last third stage, which packaging becomes waste. (Sakal, 2009). According to the *Directive of the European Parliament and the Council 94/62 / EC on packaging and packaging waste while minimizing negative impacts on the environment and therefore in applying the principles of sustainable development, the following trends:*

- The best means to prevent the formation of packaging waste is to reduce the overall volume of waste.
- The packaging should be designed, manufactured and implemented in the market so that it can be reused or renewed, and to minimize its negative impact on the environment.
- The packages to be produced by the presence of harmful metals and other hazardous substances, as part of a packaging material is limited to a level to minimize the combustion of by landfill or packaging.

Also the Slovak legislative in the Packaging Act of the Slovak Republic (2010) says that packing must be designed, manufactured and placed on the market or put into circulation so as to meet the basic requirements for its composition and properties and to enable its reuse or recovery, including its use for energy recovery, recycling and organic recycling.

*Sustainable packaging is higher level of understanding need and requirements of future in context of sustainable development. It meets all sustainability criteria for economic feasibility, safety, security and marketing. It also corresponds to the economic and ecological requirements.* (Fidlerova, 2013).

The Packaging Act of the Slovak Republic (2010) defines the packaging as a product to be used for the containment, protection, handling, delivery and presentation of merchandise, from raw materials to processed goods, from the producer to the user or the consumer; non-returnable items used for the same purposes shall also be considered to constitute packaging; There are the criteria defining packaging:

**Criterion 1** - A product is considered to be packaging, without prejudice to other functions package when the detachable part of the product, it is necessary to store, support or preserve that product throughout its



lifetime, all parts are not intended to be used, consumed or disposed of.

Criterion 2 - items created for the purpose of meeting the point of sale and non-returnable items created, filled or sold at the point of sale shall be deemed to be packaging if they fulfil a packaging function.

Criterion 3 - Packaging components and ancillary elements integrated into packaging shall be considered as part of this package. Ancillary elements hung directly on, or attached to, which perform a packaging function, shall be considered packaging only if they are detachable part of the product, all parts not intended to be shared depletion and destruction

For efficiency of the packaging process, packaging and prevention of damage to transported goods is crucial the resistance of packaging and objective determination of claims on packaging. This depends on transport routes and the risks to which the goods are exhibited. Individual risks causing damage can be divided into several categories: mechanical - deformation or destruction of the packaging, including damage, breakage packaged product (pressure, vibration, repetitive shock), climate - water, humidity, aggression air, dust, temperature and solar radiation, biological - rodents, insects, moulds, fungi, etc., social - theft, loss, etc. Right chosen container means reducing the cost of handling and limiting waiting times at loading and unloading, shortening delays in supply, reduction of damage and theft during transport and storage, and so on.

First, during planning the requirements of packaging should be decided, if there is the need (necessity) to pack the good or not, how the goods will be packed and whether could be used returnable or non-returnable containers. The goal of decision is the packaging that ensures protection of the goods against losses and damage while ensuring economic efficiency (Krajcovic, 2004).

Criteria for the selection of packaging are as follows:

1. Nature of packaged goods - physical, chemical and biological properties;
2. The influence of the environment - temperature conditions, humidity, dust, pollution and other;
3. Claims for transport and storage - transport type, weight, space limitations, stress, number and type of loading and unloading, storage conditions;
4. The sale and consumption - multi-use packaging, weight requirement for one package, return, usability, requirements for the production of pallet units;
5. The economic effect - evaluates the gains, and the cost of the packages, which consist of the price of the packaging material, the auxiliary packaging means, and production costs of the packaging. Also should be considered the effectiveness of recovery in returnable containers
6. Ecology - impact on the environment. Prevention shall mean according Slovak legislative the reduction of the quantity and of the harmfulness for the environment of materials and substances contained in packaging and packaging waste; the quantity and

of the harmfulness for the environment of packaging and packaging waste at production process level and at the marketing

Ecology as one of the pillars of sustainable development is one of important criteria for selection of optimal packaging materials and packaging techniques. Three basic trends in the greening of packaging can be identified (Krajcovic, 2004):

- a) Saving the packaging material - reducing the coating thickness and other material savings that lead to savings on the capital cost of packaging materials;
- b) Increased use of returnable packaging - multiple use packaging contributes to savings in packaging materials costs and reduces the volume of waste materials for disposal;
- c) Use of environmentally friendly packaging - change from packaging negatively affecting the environment for compostable and recyclable packaging.

#### Proposal for improvement of effectiveness and sustainability in the packaging process in manufacturing company

The project to improve the packaging process in accordance with the requirements of sustainable development regarding economic and ecological view takes place in an enterprise engaged in the production of LCD TVs. Management of the manufacturing company decided that it is important to minimize the amount of packaging waste in several respects, minimize its impact on the environment and cost regarding packaging process.

Within the production program in the company is divided actual production of LCD TVs in to production of final products, placing of printed circuit boards (providing production logistics) and department focused on the actual production facilities. All production processes are characterized by a high degree of synchronization, mutual communication and cooperation. Materials Division in the company cares according the production program about the flow of materials for different production departments. The aim of the work of this division is to take material from suppliers to company warehouses, manage and deliver then to the end point of manufacturing. Material division consists of the following three departments: Inbound Logistics Department - This department provides acceptance of all production materials from different countries (Europe, Asia, and America etc.). Since this is a material with a longer delivery time called lead-time, the amount of inventory is higher regarding the efficiency of the logistics and costs. Department Matecon (JIT - "just in time") deals with acceptance and subsequent release of the storage materials from local suppliers. This material may be imported at time intervals (e.g. hourly), or according the needs of production departments. Kitting Department - this department provides the preparation and removal of material for external partners. Usually are these foreign partners of company.

In before mentioned three departments work 350 employees and are divided into the following three groups:

Production Group) is the staff responsible for physical handling of the material in stock and production.

System Group is the personnel responsible for management of the inventory as part of warehousing in company.

Process Group - workers responsible for developing the operating procedures and standards for material handling.

In the next part of the article we will focus on packaging process of LCD in company. When packing LCD televisions are used following packaging materials: anti-static bags, polystyrene protective padding, cardboard boxes.

The finished products come to the end of the production line, where takes place the quality control. If fulfills the product all the requirements, can be packed into an antistatic bag. The edges of the LCD are covered with the protective polystyrene panels. It depends on the size of the model, if there are used 4 or 5 pieces of polystyrene panels. Subsequently, the product is inserted into the cardboard box and thus has wrapped on the pallet.

Packed products are then stored on wooden pallets on which is placed paper relocation. When the pallet is filled with a sufficient amount of packaged products, then are added protective cardboard corners and is used also a polypropylene tape. The prepared transport unit can be moved to the machine where it is covered with packaging film.

On production lines are delivered the following materials:

*Cardboard boxes* - used for packaging of finished products to protect them and help to ensure the transport of manufactured products;

*Antistatic bags* - used to protect the electronics, by means of these sacks and a couple of extra strong protection layer is formed inside the bag right Faraday cage, which prevents static electricity around the object;

*Paper relocation* - used to maximize the amount of goods that can be fit on a pallet and to ensure the stability of the pallet unit. It is between each layer of the product and also on the top and bottom pallet;

*Wooden pallets* - are intended for the transport of manufactured products;

*Styrofoam* - used to protect and stabilize the product packaged in cartons;

*Polypropylene straps* - used for strapping, thus helping to stabilize the goods on the pallet;

*Cardboard corners* - used to protect products, reduce shocks and vibration of transported goods.

These materials are supplied to packaging process in the following quantities:

Cardboard boxes - depending on the model are supplied to the production line of different sizes. Cardboard boxes are delivered to the company as the transport units with 75 pcs;

Anti-static bags are similarly as cardboard boxes, according to the model supplied to the production line

in different amounts. However the pack contains usually 1000 pcs;

Paper relocations are delivered in the number of 100 for each packaging place (planned one at top and bottom pallet, more shall be given between the layers);

Wooden pallets are stored and on the packaging workplace are mostly 10 pieces of pallets; if needed are delivered from material warehouse;

Styrofoam fillers - the delivered transport unit has 128 pieces;

Polypropylene straps - on the packaging workplace are at disposal always available more pieces, if necessary, more pieces can be shipped from the warehouse material;

Cardboard corners - for each pallet are delivered 4 units.

During our analysis in the company, we focused on Styrofoam, which are delivered from a supply company from distance 40km. One transport unit of polystyrene contains 48 pieces EPS. In a truck which transports polystyrene can be delivered 33 Euro pallets. It means that one truck is capable to transport one dose of 1584 units of Styrofoam. That quantity was not able to even partially cover the need for one work shift. The economical reasons for analysis were increased transport costs for this type of packaging material. As mentioned above, the company decided that it was necessary to deal with the situation. Therefore for some most frequented models is planned change in packaging material. Expectations of change were mainly lower transport cost, reducing storage costs and because of new responsibility of producer for waste also reducing environmental impact of packaging.

A team of experts on the basis of these requirements were selected as the optimal variants Substitute EPS with the air cushion. The main benefits of air cushion are declared by the producers as follows: easy handling, excellent surface protection product, short time of packaging, reducing the packaging costs by 20-40%, reducing the transport costs. Most important, however, is the use of air cushion in the packaging of products, means that 98% of the packaging material consists of air and only 2% of film. "Airbags" are made from material produced according the special recipe. This material does not contain any heavy metals, which was confirmed by passing tests for heavy metals. After the burning of the material occur not toxic air pollutants. As reported by the manufacturer, it is the best choice to replace Styrofoam and other materials in the field of packaging products (Product comparison, 2010).

Changing the packaging material from EPS to air cushion has brought efficiency and cost reduction and less negative impact on the environment.

Management of the manufacturing company decides to replace the Styrofoam corners by air-filled pockets - air cushion. Important factor for packaging process is also that use is very simple. The only tool that is required is the standard air compressor equipped with air regulator and air nozzle. Air control allows adjusting and controlling the air pressure. In terms of corporate social responsibility and sustainable development is a positive step in the company in several ways. The first

thing we can mention is the impact on the environment, expense and difficulty of recycling, the amount of waste EPS. As mentioned above, the main advantages of air cushion use also include: complete recyclability, production from non-toxic materials, defined as environmentally friendly.

The economical advantages brought about by the application of the proposed solutions are economization storage by 95%, better tear resistance, better storage because the airbags are before use completely flat.

### Summary

Well-designed and used packaging meets the requirements of the product while minimizing economic and environmental impacts of both the product and its package.

As shown in our contribution the changes in packaging have impact on a number of logistical processes such as transport, handling and storage. During project were also designed the layout of workplaces for air cushions towards the production lines and storage aircushions. Also was proposed a design of means for internal transport in company, including their marking. The scope of article does not allow addressing in detail all mentioned proposals.

We consider as significant from the case study the confirmation of our statement and experience from previous research project that in despite of the skeptics it is possible for companies to achieve sustainable development and synergies in the area of economic, ecological and social.

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Hitka Miloš, Lorincová Silvia

## CORPORATE CULTURE – A MANAGEMENT TOOL IN SUPPORTING PROCESSES OF FACILITY MANAGEMENT

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This research has been supported by the project VEGA № [1/0268/13] Perspectives of facility management application for the increasing of competitiveness within the wood processing and forestry companies in the context of outsourcing principles.

**Annotation:** In the work we deal with the corporate culture as a management tool in supporting processes of facility management in the company. The aim is to propose a modification of the corporate culture in the company. The research was aimed to define problem areas and formulate proposals for measures to strengthen it. The starting point was the analysis of company documentation, analysis of employees' opinions, conducted by written questionnaire. The analysis allowed to recognize the most visible reflections of the corporate culture in the company and to define the proposals and measures to strengthen the corporate culture as to the support of facility management. Through the information received, modification of the corporate culture was proposed to the company. Adjusting of the culture in the firm, concerned by its application in practice, can bring success within the company's human resources.

**Key words:** corporate culture, supporting processes, human resource management, facility management

### Introduction

A satisfied customer is the basic prerequisite for the existence and prosperity of a company. The customer is objective and more and more demanding. At the same time he requires products that meet the specific requirements and total quality. He is not interested in cost rising of producers, in individual items of calculation formula but he is interested in a unique output. It is up to business management to be flexible and respond promptly to changes, mainly in the form of an explosion of new information technologies, focus on intellect, knowledge and experience. Presently there are different approaches around the world aimed to the enterprise development and its individual parts. The globalization of markets creates a new dimension of competition. The strengthening the quality of human resources is becoming the decisive factor (Blašková, Hitka, 2011). A key determinant of the successful profitable enterprise is the corporate culture, values and norms applied by the organization through its human potential. A global management style is creating, which is able to absorb and adopt the experience of different national cultures. If the corporate culture should be properly applied, it must be primarily understood. Even the most perfect project will not bring the expected results, if they are not the right people involved. The dysfunctional environment creates dysfunctional behavior (Potkány, 2008). Number of companies gets into the problems because the company does not have the motivation system that drives to the achievement of the objectives which gives the opportunity for other competitors. What some overlook, others can use quickly. The support of people produces the highest level of the corporate culture. The strong corporate culture focused on internal cohesion and the joint achievement of objectives, achieves higher performance. The corporate culture has a significant and lasting impact on the overall effectiveness of the organization. If the culture fulfills its purpose, it must be

sufficiently strong and united, it must lead the organization to the implementation and achievement of objectives. So it is what significantly and unmistakably distinguishes one company from another (Armstrong, 1995). It is one of the options for achieving of competitive advantage.

### Issue

The existing literature focuses on the consequences of relations between the strong culture and performance but does not examine the impact of strong culture on variability of the performance or reliability of the performance. This is surprising because the arguments concerning a strong culture on performance give the attention to the benefits of the large internal consistency of the objectives and behavior. It would be expected that companies with strong cultures have less variable performance. This expectation is complicated but also the fact that the variability in the corporate performance does not depend only on the ability to maintain the consistency of internal processes, but also does not depend on the company's ability to adapt to changes in the environment. The relations between strong culture and reliability of performance should depend on learning by doing and its response to changes in the environment (Plamínek, 2008). Incremental adjustments of organizational routines should be easier in companies with a strong culture because the participants have agreed on a common set of procedures for response and feedback on various signals from the environment. In the relatively stable environment the firms with strong culture should have less variable performance compared to the companies with weak culture, they have a higher average level. In a more volatile environment, the incremental adjustments of organizational routines may not be sufficient (Myšková, 2005). This suggests the variation and nullifying a strong culture may be attenuated as increased volatility environment and can



help to explain why the difficulties were discovered in some strong culture in response to changes in their own environment (Kachaňáková, 2010, Vetráková et al. 2011). The corporate culture and the reputation are the intangible assets of the company used to create a competitive strategic advantage. They differentiate the companies, increase the business performance (Porter, 1997). Numerous articles show how the corporate culture can be an important predictor of intangible reputation, but only few scientists empirically tested the relationship between culture and reputation (Stacho et al. 2013).

## Methodology

The aim of the work is to analyze the corporate culture and its impact on business success and based on the findings to formulate the proposals to help to implement the change in the corporate culture of the organization. The methodology is based on the acquisition of theoretical knowledge about solving issues that we will draw mainly from specialized literature and electronic resources. Acquired data will be supplemented by findings from reporting enterprise. The survey was conducted by extrapolation methods, through questionnaires filled out by all employees of the company. When analyzing the corporate culture of the firm, we have used a questionnaire of Organizational Culture Assessment Instrument (OCAI) developed by American authors Kim S. Cameron and Robert E. Quinn out of the book *Diagnosis and change of organizational culture*, 1999. OCAI questionnaire consists of six content items, each containing four alternatives A, B, C, D. Hundred points will be divided between these alternatives, depending on the extent to which alternative is most similar to type of culture in the firm concerned. The highest points score will have the type of the culture in this company. The questionnaire evaluated the current state of the existing culture in column "NOW", and there is the second column "PREFERENTIALLY", where a preferred culture is found for five years. The questionnaire was evaluated by statistical methods through arithmetic mean of formula (Scheer, 2007):

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \quad (1)$$

Where:

$\bar{x}$  is arithmetic average,  
 $x_i$  are individual values,  
 $n$  is total of selection.

As a first step, we conducted a review of the six dimensions of the questionnaire. In each dimension we added together the points from all respondents for alternative A. The same procedure was for other alternatives B, C, D. Then, for each of the alternatives A, B, C, D, we calculated the arithmetic average, the total of the selection = 8 are our employees. The results

were tabulated for two columns NOW and PREFERENTIALLY. To identify the type of the corporate culture, we added arithmetic averages of alternatives from all dimensions. The results are entered into tables. For better orientation in the resulting values, we constructed a Gossamer graph. The axes of the graph represent the values, where we clearly see the evaluation of current and desired type of the corporate culture in the next five years. We obtained the profile of organizational culture, which initiate the change in cultural company strategy.

## Results

The company was founded in 2004 as an alternative regional provider of telecommunications services and IT. The main focus is on the provision of Internet value-added services, focusing on customers looking for right quality / price ratio. Their main task is to satisfy the widest possible customer needs and bring them the services that reflect the needs and requirements of clients. The service portfolio consists of Internet services, radio communications, fiber optics, LAN and WAN. The company is building its own infrastructure that meets the high requirements for flexibility and deployment options for future services, ensuring the possibility of expanding to meet the needs of current and future customers. The company aim is to secure a leading position in the field of alternative providers of Internet and data services in the region, and offer to the customers the security measured by quality and reasonable price.

According to the six dimensions of the questionnaire, we evaluated the organizational culture in enterprise observed. The following tables show the points and for a better orientation we show the results in the Gossamer graphs for the various dimensions. The following table shows the points recorded for alternatives A, B, C, D and calculated arithmetic average. The dominant characteristics of the company create the first dimensions captured in Table 1, where the respondents identified the alternative A as the most preferred at present and also in the next five years.

Table 1  
Table 1 The dominant characteristics

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	150	18,75	250	31,25
B	100	12,5	50	6,25
C	100	12,5	50	6,25
D	50	6,25	50	6,25

Most of the respondents identified the company as a very friendly place for work where people share with each other, family atmosphere is dominated. Alternative D was marked as the least dominant characteristics of the company, which is a controlled and structured place and formal procedures. Alternative D was rated by the lowest number of points even for a period of five years.

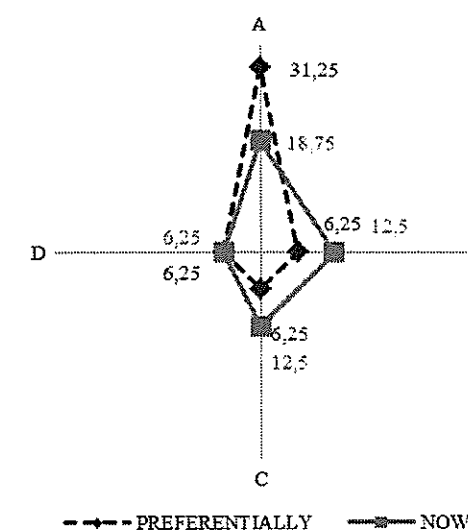


Fig 1. The dominant characteristics

Regarding to the organizational leadership, the respondents identified the alternative C as the most preferred in the company at present. However for five years, they marked the alternative A, which means management of the company as mentoring and care of business.

Table 2  
Table 2 Organizational leadership

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	50	6,25	200	25
B	100	12,5	50	6,25
C	150	18,75	100	12,5
D	100	12,5	50	6,25

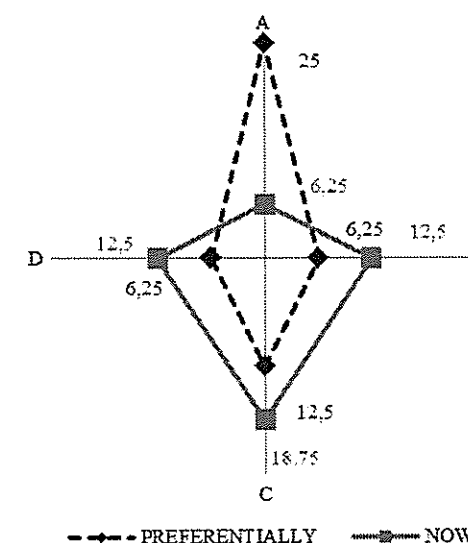


Fig 2. Organizational leadership

The respondents currently highlighted the alternatives C, D, which are targeted to high demands

on management of employees, success and competitiveness, employee safety, predictability and stability in relations. For five years, they highlighted the alternative A, which is an organization characterized by teamwork, compliance and participation.

Table 3  
Table 3 Human resource management

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	50	6,25	200	25
B	50	6,25	100	12,5
C	150	18,75	50	6,25
D	150	18,75	50	6,25

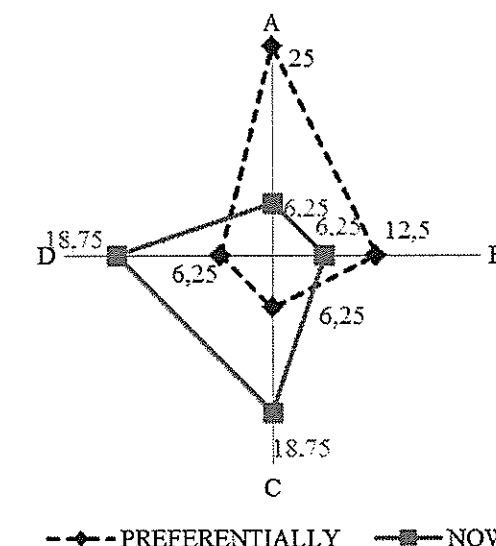


Fig 3. Management of employees

The respondents identified at present the alternative B as the most used in enterprise, oriented in innovation and development. For a period of five years they preferably chose the alternative A, what means a loyalty and mutual trust.

Table 4  
Table 4 Organization glue

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	50	6,25	200	25
B	150	18,75	100	12,5
C	100	12,5	50	6,25
D	100	12,5	50	6,25

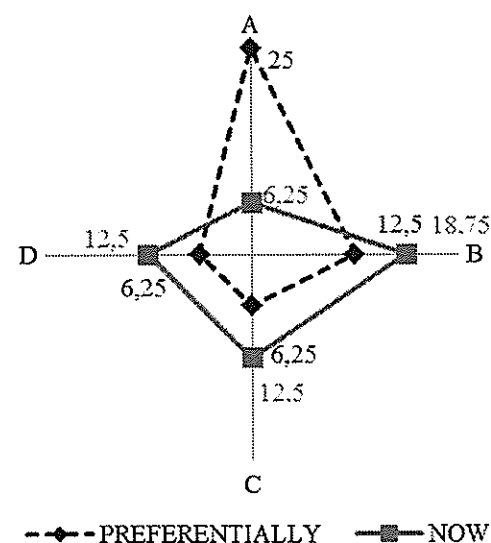


Fig. 4. Organization glue

The respondents currently identified alternative B as the strategic emphases, which is aimed to the obtaining of resources, new challenges, trying new things, searching for new market opportunities. In the future, they prefer alternative A, C. This means the emphasis on human development, trust, participation, openness, the emphasis on competitiveness and achievement.

Table 5 Strategic emphases

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	100	12,5	150	18,75
B	150	18,75	50	6,25
C	100	12,5	150	18,75
D	50	6,25	50	6,25

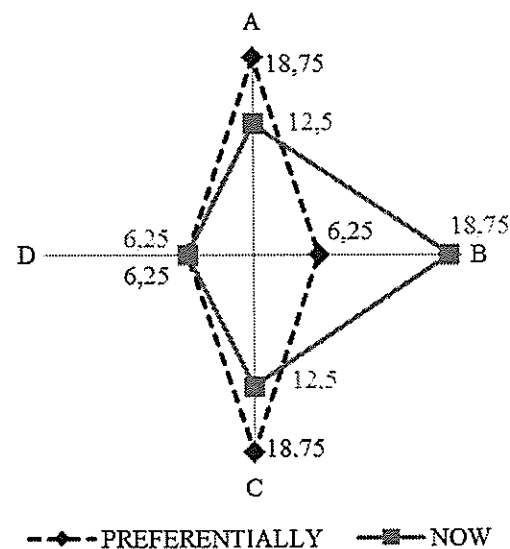


Fig. 5. Strategic emphases

In the last sixth dimension labeled as the criteria of success, the respondents currently characterized the company as the organization which emphasizes a portfolio of new services and their uniqueness. For five years, the respondents would prefer alternative A, which characterizes the success of the organization based on the development of human resources, teamwork and respect for employees.

Table 6

Table 6 Criteria of success

Alternatives	„NOW“		„PREFERENTIALLY“	
	POINTS	AVERAGE	POINTS	AVERAGE
A	100	12,5	200	25
B	150	18,75	50	6,25
C	50	6,25	100	12,5
D	100	12,5	50	6,25

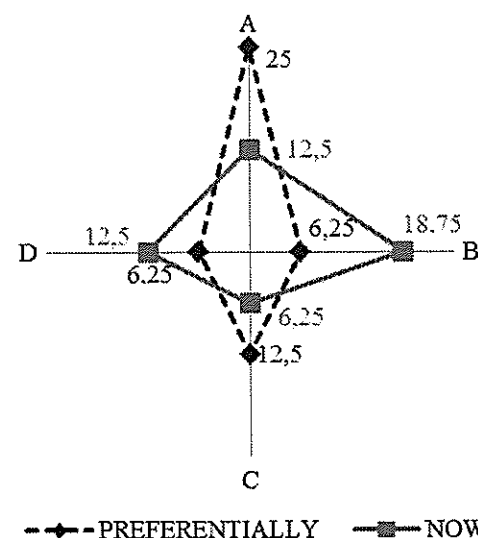


Fig. 6. Criteria of success

Table 7 shows the different types of the corporate culture in the company concerned by adding the averages of the alternatives of all dimensions and calculating their average.

By evaluation of questionnaires according to Quinn, we concluded that employees perceive the corporate culture through alternative C, which received the most evaluation points. For this alternative it is typical to focus on results. People are competitive and goal-oriented. The leaders are demanding manufacturers and competitors. The emphasis on winning, success, reputation and common interests hold the organization together. In the long term, alternative C focuses on competitive advantage and achieves measurable goals and success. Success is defined in terms of market share. Competitive prices and leading market positions are very important in the market.

The employees prefer alternative A in period of five years. This alternative is characterized by a clan culture, a very friendly place for work is dominated, man shares with each other and a family atmosphere

dominate. Leaders are considered as mentors and even as the other parent. Loyalty and tradition hold the organization together. The obligations are primary. The organization emphasizes the long-term benefit of development of human resources and emphasizes great

importance to solidarity and morale. Success is defined as a condition of sensitivity. The organization emphasizes the teamwork, participation and consensus.

Table 7

Table 7 Type of the corporate culture according to the OCAI questionnaire

Type of the corporate culture	„NOW“		„PREFERENTIALLY“	
	Average	Mean diameter	Average	Mean diameter
THE CLAN CULTURE	83,33	10,41	200	25
THE ADHOCRACY CULTURE	100	12,5	66,67	8,33
THE MARKET CULTURE	108,33	13,54	83,33	10,42
THE HIERARCHY CULTURE	91,67	11,46	50	6,25

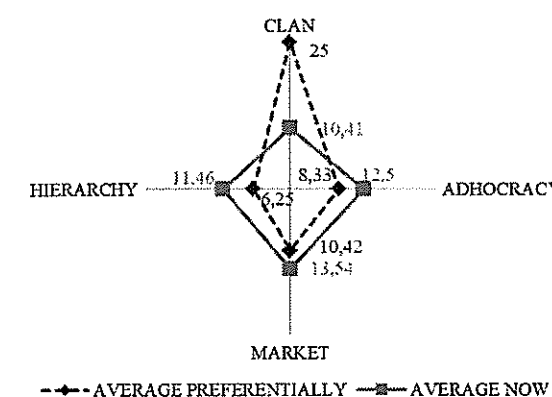


Fig. 7 Type of the corporate culture according to the OCAI questionnaire

### The proposal for modification of the corporate culture in the services company

An overall analysis of the corporate culture in the reporting enterprise of services provides information about the state of the culture and about its new perspectives in terms of employees and the management. The analysis provided sufficient information about advantages and shortcomings need to be solved and propose the changes necessary to be improved. By the examination we conclude that there is the corporate culture through an external perception, focused on external company presentation, in the form of the logo, modifying the external appearance of buildings, but also interior equipment of the company, communication, either directly with the customer or through the website. A deficiency seems to be in favoring the market success and the achievement of measurable objectives. The employees and their personal satisfaction are behind. As the results of the questionnaires show, in the part of PREFERENTIALLY, employees clearly express the desired further development of the company and to make culture more focused on trust, openness, teamwork and participation. Employees suggest the corporate culture to orientate as a family business focused on tradition. Based on the evaluation of questionnaire, we propose to edit the corporate culture in reporting enterprise of services as follows:

- *Long-term financial target* – achieving of financial stability by proactive approach to customers.
- *Motivation* – to provide the highest quality products, it will have an impact on competitiveness, to motivate the employees by their personal involvement on the various processes of the company, to take care of their health and personal training, to use symbolic motivation tools and personal motivation tools.
- *A small family business* – to joint the problem solving, mutual trust produces the best vision for the future direction and development of the company. Family businesses tend to longer-term commitment to employees and also to accountability to local communities. Family members are involved and have a vested interest in the growth of the company. Family holds together in good and in bad. Thus, they can better deal with a crisis scenario.

At the analysis of individual levels of the corporate culture, we observed the elementary elements that reflect a significant share. On the one hand, the company tries to focus on results, on the equipment of department, on the external appearance and on the competitiveness. On the other hand, the some values absent, which is reflected in the failure of the company. The absence of values, interest in employees is the primary step that we would recommend to add and to adjust the declared values of human resources.

- *Focus on the employees* – is one of the most important factors of company success in the long and short term. It is possible to motivate the employees through fair appraisal system, communication, praise, recognition, encouragement, expressions of interest in supporting their further progress, education, with regard to their safety and health. The success depends on whether we can manage to get the right people to share knowledge. For this purpose, it is important to know the knowledge profiles of people, teams and business units. A self-assessment is a suitable method of management of the company that is made in order to link those who know, with those who need to know. The self-assessment is carried out by considering the level of competence in different areas, whether the employees or the organizational units. The self-assessment serves as a guideline for further education.

- *Customer Orientation* – try to meet the needs and requirements of all customers on time by open



access and quality. Employees should treat customers as they wanted to make customers behave towards them. The customers are all people who pass the door, either only with the intention of informing or to conclude contract.

- *Solidarity* – the joint achievement of objectives through harmony and unification of the company values such as accountability and credibility in the successful operation of the market.

As the positive side of the corporate culture, we highlight the short daily meeting of management and employees in the morning. The individual activities are placed. It results in a correct understanding of what is expected. These meetings are informal. It is valued as showing greater trust and openness. Once a week there is a formal meeting during which everyone is familiar with the achievements of the previous instructions. There is a space for personal insights and expressions of will. Employees are making greater efforts to achieve the success but may feel more control. After the working hours, the management often meets with their employees in informal conversations with familiar effects. The employees can gain a sense of belonging. Through these conversations it is possible to find out their family background where the company brings to the family type company. A celebration of the birthday and name-day, we regard as positive. It is in the form of a friendly atmosphere with the possibility of familiarity with family members.

As a negative, we would identify the absence of the corporate culture in writing, which would clearly define the conduct principles in the daily work activities in the internal and external environment of the company. In the company, there is only one written document. It concerns the safety rules and health protection at work. As the corporate culture is abstract, it is very important that there exists a physical document, which would clearly formulate the parameters of the desired culture. In some companies, you can find similar documents such as the Code of Ethics, Code of employees and others. The problem may be a narrow profiling on a particular aspect of work or life in the company. The solution is the existence of a document which would be a penetration of any other documents of similar nature. The significance and importance of a document depends in the unification of similar elements from existing documents and the removal of abstractness and vagueness of what the company culture is, allowing enterprises to more easily enforce the desired culture.

## Discussion

When a clear system of values is missing in the company, the overall orientation and identity is missing. Enterprises as its values often hold superior quality, freedom of action, ownership, customer orientation, progress, continuity, high-tech, helpfulness, traditional values, exclusivity. These values create the pride of the company and its employees, a clear business profile, its identity. The company's values must be in balance with

the values of its employees, otherwise identification with the company does not occur. The employees may feel frustrated, their effectiveness decreases. They are not willing to take decisions individually, they are not willing to assume risk. They become consumers of business benefits. They behave wasteful in the company. To prevent this, management should take care of a clear and compliance system of values that would be motivating for the greatest proportion of employees and match the vision of the company.

The first step is to find out the real values of the company and the satisfaction of the employees with these values. The next step is to unify the vision of the management and the imagination of the employees. It is necessary to take into account the position which we want to build or maintain in the market. It is possible that the market "force" some values. We should provide an environment that respects values of employees, if we want the employees to achieve above-average results, to have an innovative approach to work and to be responsible for work.

When examining the control cultures, we come from bottom to up. How the employees see their supervisor? An internal model is for this procedure, which makes the supervisor responsible for everything: for the motivation of subordinates as well as for the benefit of the company.

Our observations are confirmed by the latest research. They proof that successful and unsuccessful businesses differ in four areas:

- In the successful business, the subordinates appreciate their supervisor, they accept him and they are loyal to him, because that is what they expect (and receive) from him. In the unsuccessful businesses, subordinates have only little trust to their supervisor, but subordinates want the supervisor to trust them. The subordinates want the supervisor to admire them, but they appreciate the supervisor rarely.

- In the successful business, there is a climate of openness, subordinates are not afraid to say a critical word to the supervisor. In the unsuccessful businesses, subordinates do not give the feedback to the supervisor, but then they expect him to somehow discover what style of leadership they would have wished from him.

- In the successful companies, subordinates do not have the feeling, that they are powerless against their supervisor, otherwise they use the possibilities of decisions influencing and work management. In the unsuccessful businesses, the subordinates have no idea what options they have to influence the superior (except mental extortion which is often used).

- In the successful companies, the subordinates feel responsible for the decisions of his supervisor. In the unsuccessful companies, the supervisor makes decisions, subordinates boycott and sometimes maliciously subordinates allow him to make a mistake.

## Conclusion

The basic aim of any enterprise is to achieve success and prosperity. The overall enterprise policy, its

decisions and concrete actions depends on it (Vaníčková, 2015). In this context, the concept of the corporate culture arises increasingly. The managers of enterprises begin to realize that the corporate culture can be a source of competitive advantage, especially if it is considered as rare, hard to be imitated and is incorporated into its strategic management. Such corporate culture is a combination of strategic perspective of enterprise with human resources management, resulting in the quality standards of behavior required from managers and employees. A strong corporate culture influences positively the decision making, cooperation, communication, motivation, level of cooperation, problem solving and their implementation, which facilitate the progress and implementation of management processes. The corporate culture gives the opportunity to individuals to justify its behavior in relation to the preferred value in the company. On the other hand, the managers can use the corporate culture to support the activities in which they are interested.

A set of standards, rules, actions, reactions to events occur in any human group, which is enabling to have a relatively unified view of reality. This set of meanings, behavior and norms are known as culture. Even businesses as community groups are developing their own individual and characteristic culture. Therefore, the companies that should be the same as they are the same nationality, they are working in the same business area and in the same market, they have the same organizational structure, provide the same products or services, they compete with a very close, but they show significant differences in the way they act. The proposal to modify the corporate culture refers to the more consistent orientation to employees, in customer orientation and in solidarity with the company. We have proposed to the company to change the corporate culture through motivation of employees by fair appraisal system, moral support, praise, recognition, team unity, friendly atmosphere in the workplace and beyond, thereby improving better identification of the employees with the company, it will create a loyalty and harmony. As a support to these claims, we proposed to introduce a Code of Ethics the company where it is possible to state values adopted by the company. This document formally defines the expected behavior of employees, management and the entire company. The document shows the employees and the management how to behave in a particular situation. The document is freely accessible to the employees, the clients, the media and the public. It is a part of a wider program which aim is to provide guidance for ethical decision making and prevent misconduct by members of the organization. It is a communication tool that an organization can use to declare its commitment to compliance with ethical and legal standards. It is a document where the content can be changed according to the internal expectations of the company and to the changing situation in the external

environment. The proposal for adjustment applies to the further education of the employees through training. These proposals for adjustments have not been implemented, the management promised to implement them in the future. Our adjustments and proposals can not be imitated, but certainly we can say that employees are important engine that drives the company forward. Their behavior largely depends on their own satisfaction, which is reflected in their work and results of the company. The management should not forget this.

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Jurik L., Sakal P.

## THE USING OF AHP METHOD IN THE MANAGEMENT OF HUMAN RESOURCES VERSUS SUSTAINABLE DEVELOPMENT

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**Annotation:** In the submitted paper, we expressed our conviction about the unsustainability of the current state, as well as the development of Slovakia, Europe and the global society in the present direction of the supranational integration. According to our knowledge, critical, systemic, historical and logical analysis, published in many international scientific and professional conferences, published and presented to the general professional and lay public, in solved approved grant projects, but also in bachelor, master, dissertation and habilitation theses, the only alternative of the human civilization on planet Earth is a change of paradigm of thinking from the strategy of unlimited economic growth to the sustainability strategies at all hierarchical levels of the management systems, as well as in all three pillars of sustainable development in the Slovak industrial enterprises. The paper deals with the conceptual issues related to the proposal of the competency model of employees of industrial enterprises in Slovakia using the method of the analytic hierarchy process.

**Key words:** sustainable development, human resource management, Analytic Hierarchy Process, competency model

### INTRODUCTION

We want to prove with our long term effort in our scientific-research, publishing a educational activities and based on the knowledge of real state, that proclaimed strategies of the European Union strategy for smart, sustainable and inclusive society are counterproductive [3]. And because, as stated in all the relevant documents of the EU and SR [3, 2, 13], citizens and thus human resources are of the basis of society. Human resources management must be, even in our opinion, directed to the values valued on the basis adopted by consensus in application of sustainability criteria. We call them "sustainable development criteria" and we propose their use in the creation of competency models by employees of industrial enterprises.

Our but also global experience recommended to use in dealing with such complex systemic issues such as the creation of competency models, multicriteria optimization, specifically method of AHP [12, 8].

### THE CREATION AND THE APPLICATION OF COMPETENCY MODELS

Nowadays, management by competences is considered the most progressive system of human resource management in enterprises. All members of the enterprise - employees and managers, often also external consultants, which specialize in creating competency models and their implementation in enterprises - are involved in the management by competencies [14].

Competency by management is a system of human resources management bringing together strategic staffing processes (HR functions) into a single unit (system). The competency model is an integral element of this system. A competency model is a set of competencies and includes the definitions of all competencies behaviors across an enterprise or in part of an enterprise [1].

Competency can be simplistically understood as the ability to behave in a certain way, thus it manifests by certain human behavior.

The behavior is the result of complex internal processes. The behavior of a specific person in a specific situation is a result of the dynamics of his personality, which is composed of multiple elements.

Some parts create relatively stable characteristic of the person, such as the attitude, the value and motifs. Additional elements content of competence, knowledge and skills. The observed behavior is the result of interaction of these and other factors. This means that competency is relatively complicated concept, and among experts there is no consensus about what is in it and what is not [15].

Kubeš, Spillerová, Kurnický [6] states, "competency model describes a specific combination of knowledge, skills and other personality characteristics that are necessary for the effective performance of duties in the organization."

Hroník [4] by our opinion, too tautologically "simplified" the definition of competency model, when he writes: "A competency model is somehow arranged competencies."

According to Hroník [4] is competency model also bridge between the shared values of the company and the job description. The company usually has one set of values governing. The job descriptions is more. In small companies, their may be as much as employees. In this case, competency model is also a practical tool, which links all activities of human resource management.

Katarína Ladvenicová in her doctoral thesis [7] created "Proposal of methodology for the application of competency models in terms of medium-sized industrial enterprises".

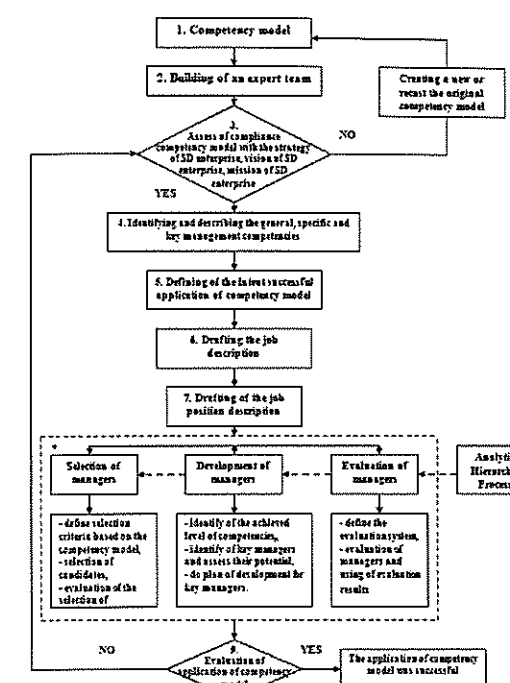


Figure 1 Modified proposal of methodology for the application of competency models [own work]

Building on many years of work prof. Sakal and in accordance with the application of sustainability criteria in the creation of competency models is necessary in the third step of methodology to make adjustments in the methodological procedure (Figure 1).

Important in the creation of competency models is then their compliance with the strategy of sustainable development of enterprises, vision and mission of sustainable development of enterprise. Several authors agree that the proper setting up of model must be based on corporate culture. If the company has included in the corporate culture values and principles of sustainable development, they are subsequently reflected in the competency model, thereby enhancing the quality of human resources in the direction of sustainability. In the modified proposal of methodology for the application of competency models it appeared a new element, namely analytical hierarchical process that serves as an objective tool of selection, development, and evaluation of employees.

### MULTICRITERIAL OPTIMIZATION AND ANALYTIC HIERARCHY PROCESS

Multicriteria optimization in strategic management is a key element of decision-making in the economic, political, military area. Decision-making process is largely understood the process of solving the problem with more than one option of solution. Process of solving of multicriterial decision-making task is the procedure, which investigator finalize to determine the optimal condition.

This procedure can be called multicriterial optimization [8]. At the Institute of Industrial Engineering and Management MTF STU Trnava for

decades we devote multicriterial optimization through methods of analytical hierarchical process (AHP) and Expert Choice software purchased from grant funds APVV no. LPP-0384-09 from 2009.

The author of the theory of analytic hierarchy process (AHP), American professor Saaty, characterize the AHP as a practical tool for supporting decision making and applied it for the quantity of practical decision problems [8]. According Saaty [10] by the usage of AHP, a decision maker knowingly and intentionally directs to increasing the quality and efficiency of all his decisions. It is used in economic, management, environmental science, administration, business, industry, health, education, etc. It is a suitable method for the evaluation in manufacturing company, where many criteria lead to the objectification of their evaluation.

The decision-making according to AHP method is based on the three principles [10]:

1. *The principle of structuring a hierarchy.* The most often alternative of viewing the hierarchy within this method is a diagram, with the aim placed at the top, the variants placed at the bottom and the criteria placed between them.

2. *The principle of determining priorities.* After the creation of own criteria set and hierarchy structure, all the proposed variants or criteria are compared at all levels of the evaluation, which influences the evaluation using the word meaning and numerical values. The resultant state is determined by the weight in the relative scale for variants. The basic scale of pair wise comparison of the AHP method is presented in Table 1. The value 1, 3, 5, 7, 9 represent the basic scale of the evaluation used in the AHP method.

Table 1  
Measurement scale of pair wise comparison [10]

Measurement scale	Comparison of the elements x and y
1	x is as important as y
3	x is slightly more important than y
5	x is strongly more important than y
7	x is greatly strongly more important than y
9	x is extremely important than y

3. *The principle of logical consistency.* In determining relationships between objects according to the criteria, it is necessary to achieve consistency of intensity of the relationship between objects according to individual criteria.

### OUR EXPERIENCE WITH USING AHP METHOD IN HRM

We have dealt with in my practice using methods of AHP in human resources management:

1. selection of candidates for the job position,
2. employee evaluation,

### Model for the selection of candidates by using the AHP method in industrial enterprise No. 1

The role of personnel selection is to assess the assumptions of candidates for a specific job position and their prospective use in enterprise and decision about



selection the most suitable candidate. In work [5] we propose the following procedure:

- Determination of objective decision:** Selection of a suitable candidate for the job position recruiter.
- Proposal of solution alternatives:** Alternative solutions are presented by candidates themselves for a job position. Shortlisted selection were 6 candidates - the candidate A, candidate B, candidate C, candidate D, candidate E and candidate F.
- Proposal of criteria for evaluation of alternatives solve:** In this case, they are competencies - qualification requirements. An important step of application AHP method is a creation of hierarchical structure (Figure 2).

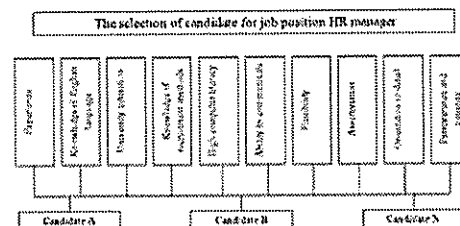


Figure 2 Hierarchical structure of AHP [5]

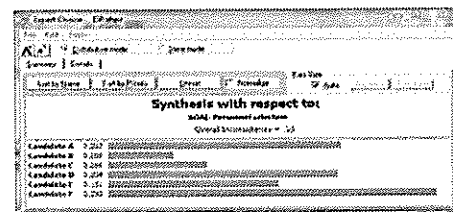


Figure 3 Order of candidates [5]

As a result of application software EC is a table shown in Figure 3, which describes the order of candidates. The order of candidates is determined by the values calculated by EC. In AHP method, the best candidate will be candidate F and he was followed by candidate A, candidate D, candidate E, candidate C and candidate B.

#### Model for evaluating employees through AHP method in industrial enterprise No. 2

We used the software Expert Choice to evaluating a competency model for managers. In work [11] we propose the following procedure:

- Determination of objective decision:** determine the sequence of managers by level of set of competencies".
- Proposal of solution alternatives:** Alternatives are managers (identified as RP 1 to RP 26).

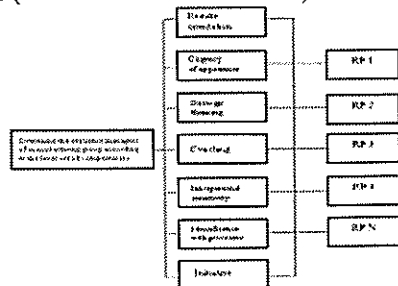


Figure 4 Hierarchical structures for evaluating managers [11]

- Proposal of criteria for evaluation of alternatives solve:** The competence of competency model for managers are the criteria. The output of the decision-making is a hierarchical structure, which is shown in Figure 4.

Figure 5 determine the sequence of managers of industrial enterprise. Based on the results, it was found that the RP 23 reaches the highest value of set of competences Above-average values reported RP 6, 9 RP, RP 16 and RP 10.

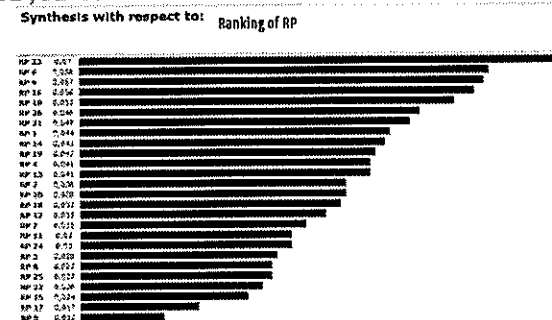


Figure 5 Final evaluation of the significance managers [11]

#### Model for evaluating employees through AHP method in industrial enterprise No. 3

In work [9] we propose the following procedure:

- Determination of objective decision:** Evaluation of managers in individual operations.
- Proposal of solution alternatives:** Managers of the individual operations: A – Head of design and technology, B – Head of sales, C – Head of MTI, D – Head of metal production and E – Head of technical control.
- Proposal of criteria for evaluation of alternatives solve:** Required competencies for managers shows Table 2.

Table 2

The competency model No. 1 and No. 2 [9]

Competency model No. 1	Competency model No. 2
Experience	1 Experience
Technical skills	2 Technical skills
University education	3 Ability to solve problems
Efficiency	4 Efficiency
Independence	5 Independence
Ability to solve problems	6 Knowledge of PC
Knowledge of PC	7 University education
Focusing on the company	8 Focusing on the company

Figure 6 describes a sequence of variants.

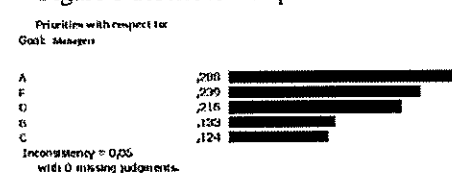


Figure 6 The resulting evaluation of managers [9]

The first evaluation was carried out according to the competency model No. 1. After 2 months evaluation was repeated, the importance of competence has been changed and a competency model No. 2 was

created. Figure 7 shows the pairwise comparison of department heads under the new criteria.

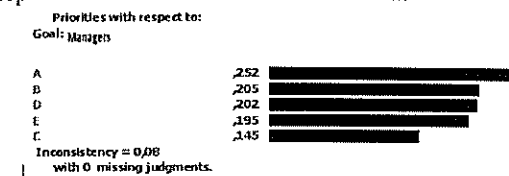


Figure 7 The resulting evaluation of managers [9]

According to the proposed model of competence, we found the result, where department of design and technology was the most effective. Second place with satisfactory conditions had department of metal production and then department of technical control. Worst place had department of MTI.

#### CONCLUSION

Objective of paper was to contribute "micro-solving macro-problems" to enhance the quality of human resources and competency models into which is essential for sustainable development of the planet Earth not only industrial enterprises but also the whole society to incorporate sustainable development criterias. We aware of the complexity of the issue creation of competency models in accordance with UR is necessary to pay more attention to the creation of "sustainable competencies". In the paper was described two applications of AHP methods in human resources management, namely the selection and evaluation of employees in industrial enterprises to increase their objectivity and complexity. We have also demonstrated the appropriateness of using AHP method in the field of human resources management with described applications.

#### ACKNOWLEDGMENT

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## INSTITUTIONAL SUPPORT OF INNOVATION IN SMALL AND MEDIUM-SIZED ENTERPRISES IN SLOVAK REPUBLIC

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**Annotation:** The aim of the paper is to examine the current institutional support of innovation in small and medium-sized enterprises in Slovak Republic as there are various possibilities of support of innovative processes. The institutional support of innovation in the Slovak economy will be the subject of our closer examination. We will focus on business incubators, which represent one of the types of supporting institutions. They are the institutions that are most numerous in Slovakia. They offer different types of services. The purpose is to offer the services to small and medium-sized enterprises at the beginning of their activities. Subsequently there is a bigger chance that small and medium-sized enterprises will survive and will be able to adjust better to market conditions. First business incubators were established in the United States at the turn of the 50th and 60th of the 20th century. Since that time, the perception of business incubators did not changed very much. While in the past century, business incubators should remove a rising unemployment and support business, currently business incubators are the tools for the growth and success of businesses located in this type of supporting institutions. Incubators should focus on companies with an interest in innovation because in the world, the business incubators create space for the transfer of scientific knowledge and research to practice and increase employment rate. It is evidenced by experiences from Austria and Germany where these institutions have become an important tool for economic development.

**Key words:** small and medium-sized enterprises, support of innovation, business incubators

## Introduction

Small and medium-sized enterprises are considered as the major players of the national economy because they are competitors of large enterprises (Marková, 2003). Small businesses have a big opportunity in their flexibility. They are able to overtake large firms in the pace of change, in the introduction of innovations, in order to get a better position in the market, because a number of large companies are burdened by bureaucracy and inflexible (Bujnová, 2001). Basically, it is their only strengths. If they do not use it, for a company it would mean a great difficulty in achieving stability, development and maintenance its position in the market (Borovský, 2005). Small businesses usually do not have the opportunity to influence the research, development and technology in such a way as companies with sufficient capital facilities. On the other hand, small and medium-sized enterprises have the opportunity to use creativity and flexibility of their leaders. In the management, there work managers who have the ability to lead and guide employees to higher performance with the aim that the organization should benefit under their control through human resources management which represents a strategic and well-considered logical approach towards managing personnel (Vetráková, 2011; Stachová, 2013). In this context, a man became the most important and the most expensive factor in an enterprise, its main asset which, if an enterprise wants to exist, run and develop, must be used to achieve goals very carefully (Hitka, 2015). But everything depends on the ability of small businesses manage the process of innovation and change process properly.

The basic economic goal of every company is to make a profit. Companies must to find and build a sustainable competitive advantage in the long term that the business can survive and continue to expand service

portfolio (Antonová, 2014). In this context, sooner or later the company must recognize the need for business development (Zapletalová, 2012). It is possible through innovations that have crucial importance in the competitiveness of enterprises and in long-term growth chances of region (Šindleryová, 2009). A growing number of studies and research papers show that innovations have a significant role in the social and economic development assuring economic competitiveness (Szabo, 2013). One of the potential tools for the development of economically weak regions is the creation of innovative companies whose potential for development is mainly in technology transfer and innovation process (Rydvalová, 2007). The contribution of technological progress to economic growth in Western countries is estimated at more than 90% (Šindleryová, 2009).

In a market economy, the business sector is considered as the carrier of innovations. Especially it is sector of small and medium-sized enterprises because small and medium-sized enterprises introduce and use innovations in new products, technologies and services. A healthy business sector is crucial factor for the innovation performance of the economy. Small and medium-sized enterprises are important for the region and the state and therefore for the creation and development of these businesses, various support is required. In Slovakia, there are several types of institutions aimed at supporting and developing of small and medium-sized enterprises designated as supporting institutions such as Regional Advisory Information Centers, Regional Development Agencies, Business Innovation Centers, Regional European Information Centers, Business Incubators and others. The aim of all institutions is to support the development of small and medium-sized enterprises. Other entities can be included to the support infrastructure of small and medium-sized enterprises, such as science parks,

research parks, technology centers (parks), innovation parks (centers), industrial (trade) parks, shopping centers (parks), business parks and others (Molnár, 2005). There is no exact dividing line that would clearly define functions of innovation centers. But they have one thing in common. It is namely the fact that in some way they support the development and well-being of small and medium-sized enterprises. It is important for the regional development which became a frequent topic also in the Czech Republic mainly after the country entered the EU (Víturka, 2014).

In the article, primarily we focus on exploring of business incubators which are considered as tools of institutional support of innovations in small and medium-sized enterprises. These institutions are the most numerous in the Slovak economy, significantly enhance environment of the region, support the development of the region and help to create a dynamic economy of 21st century based on knowledge.

## The concept of business incubators in the world and in Slovakia

Incubators are an important part of worldwide support infrastructure for small and medium-sized enterprises. They imply different areas of support (Procházková, 2012). In economics they represent the institute to avoid the failure of new businesses. They are an important economic instrument for stimulating of innovation in small and medium enterprises (Guštafiková, 2007). Incubators represent an important economic tool to support the business environment and to create new jobs (Guštafiková, 2008). World experience shows that business incubators can be effective levers for employment creation, commercialization of new technologies and the development of local economies. Foreign experts pointed out that 30% of companies established on the basis of new technologies concluded their work within ten years (Rydvalová 2007). Incubators develop the activities aimed at supporting of a business environment, acceleration of the innovation process through the transfer of research and development results into practice (Guštafiková, 2008). They are considered as tools of economic development that accelerate the growth and success of companies. They profile successful companies, which become financially viable and autonomous after the program (Zajko 2008; Ryzhonkov, 2013). Studies which evaluate the performance of incubators in Western Europe and North America argue that in the period of three years the incubation may reduce the rate of failure among start-up enterprises under 10%. For comparison: the failure rate generally varies between 60 and 80% (Guštafiková, 2007).

In the world, more than 60 national and international associations of business incubators deal with the issues of business incubators. In Slovakia, with the aim to provide information, create and develop contacts, 11 business and technology incubators established Slovak Association of Business and Technology Incubators, which has been active in building awareness of business and technology

incubators in Slovakia. More incubators may arise and work through the existence of different associations. The annual increase in the number of incubators is the proof of worldwide support from agencies. Figure 1 shows a rapid increase in the number of incubators in the world. While during the 90th of the 20th century the number has grown by 2000, the same increase was recorded from 2011 to 2013.

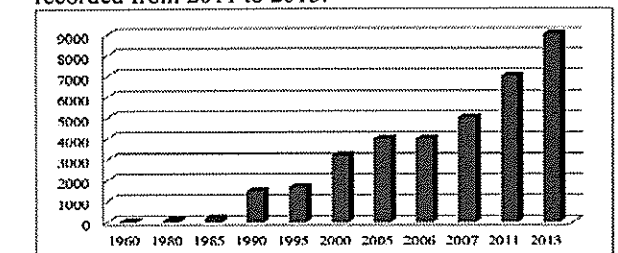


Fig 1. The development of the number of incubators in the period of 1960-2013

Business and innovation centers have become supporters of starting small companies in Slovakia (Slovak Business Agency, 2013). They provided a care to 109 companies. By 2000 there still existed 74 of them, which is approximately 70%. This fact became argumentative base for formal networking of incubators. Business incubators in Banská Bystrica, Bratislava, Košice, Martin, Prešov, Rožňava and Spišská Nová Ves were built during the years 2002 – 2003 by using the funds from the PHARE program and the state budget. Technology Incubator Inovatech in Sládkovičovo and University Technology Incubator of the Slovak Technical University were opened and put into operation in 2005. In 2006, there were the investments into the incubators in Gelnica, Handlová, Martin, Rimavská Sobota and Spišská Nová Ves. In 2007, the construction was finished or final financial support was provided to incubators in Gelnica, Handlová, Martin, Moldava nad Bodvou and Spišská Nová Ves. A total of over 18.5 million EUR was invested to the construction of nationwide network with a capacity of 20,700 m<sup>2</sup>. Till the end of 2011, 13 Slovak incubators created 602 jobs in 88 incubated companies in direct connection with the operation, services and activities. Another 37 jobs were created in the management and operation of incubators. The average occupancy in the reporting incubators reached 85% in 2011 (Slovak Business Agency, 2013). In 2015, there were operating 15 incubators in Slovakia (Slovak Business Agency, 2015). For comparison, we offer an example from Finland. In 2008 there existed 27 business incubators. 15 of 27 business incubators were located only in the Helsinki region (www.inovace.cz, 2008). It is the same number of incubators as a total number of incubators in Slovakia in 2015. In terms of number of incubators the best situation was in 2015 in the region of Košice. Four incubators were placed there. Three incubators were situated in region of Banská Bystrica and Bratislava. Technology Incubator VTP Žilina and City Incubator Martin were located in region of Žilina. Each one of the region of Prešov, Trenčín and Trnava had located one incubator. In contrast, no business incubator realized business activities in the Nitra region.



Table 1

Table 1 The economic indicators of incubators in Slovakia in 2015

No.	Name of the incubator	Availability (in %)	Number of jobs created	Number of companies incubated
1.	Business Innovation Center Banská Bystrica	81	4	4
2.	Business Incubator Handlová	-	-	-
3.	Business Incubator and Business Center (Fiľakovo)	-	-	-
4.	Incubator Bratislava	58	-	-
5.	Incubator Malacky	83	65	24
6.	University Technology Incubator of the Slovak Technical University	95	43	12
7.	Business Incubator Gelnica	96	126	6
8.	Business Incubator Moldava nad Bodvou	55	14	11
9.	Business Incubator Rožňava	95	50	13
10.	Business Incubator Spišská Nová Ves	87	13	8
11.	Technology Incubator VTP Žilina	80	26	7
12.	City Incubator Martin	100	15	4
13.	Technological Incubator Centre Prešov	99	31	12
14.	Technology Incubator Prievidza	96	42	10
15.	Technology Incubator Inovatech Sládkovičovo	55	11	5

From the point of view of the availability, in 2015 only City Incubator Martin was fully occupied, at 100%. In 2015, the overall average occupancy rate of all incubators was at 72%. Compared with the data of 2011, it is 13% less. From the point of view of the employment, Slovak incubators created 446 jobs in 116 companies incubated. We can evaluate positively the number of incubated businesses. There was an increase of 28 firms. Despite the fact that in 2015 it was incubated more businesses than in 2013, incubated companies has managed the creation of less job. It was 156 jobs less (Slovak Business Agency, 2015).

#### Material and Methods of Research

Each problem and its solution require the use of adequate materials, to fulfill the partial objectives as a prerequisite for achieving the main objective. In the processing of our article, we used primary and secondary sources. Local and international book and magazine were used as secondary sources. The method of analysis was the dominant. The causal analysis was used for a deeper understanding of research problem. We used the method of abstraction by using which we processed knowledge about research problems. As the primary source, empirical research served for obtaining information about practice of current support of innovation in small and medium-sized enterprises in Slovakia. The research results have been processed statistically through a program Statistical Package for Social Science (SPSS). It was used for analysis of sociological and marketing research. To generalize the results, we used statistical methods tested at a significance level of 5%. We used Binomial test, Cochran Q test and Spearman's rank correlation coefficient.

The research was provided electronically. Due to the increase the return, which is associated with the electronic form of the questionnaires, we filled out the questionnaires in personal contact with businesses established in the Slovak Republic. A total of 1,000 questionnaires were distributed. Collected 555 questionnaires from small and medium-sized enterprises ensured the response rate at 55.5%. The questionnaire consisted of two parts. The first part contained identification questions. To ensure the representativeness of the survey sample, we followed the composition of the participating enterprises by legal form, number of employees, regions and the classification of economic activities.

In terms of legal form, Limited Liability Company and Trades symbolized most numerous groups in our research. From this point of view, our research can be considered as representative because these two groups of companies symbolized most numerous groups in tracking of Statistical Office of the Slovak Republic. Quite same percentage of each size of enterprise types took part in our research. The most companies were employing up to 9 employees (micro companies – 34.96%). The medium-sized enterprises employing between 50 and 249 employees reached the limit of 34%. The minimum number of companies which participated in the research reached small businesses. It was more than 31%. Similarly, in terms of staff form, we can consider the research as representative, as from 2001 in the Slovak Republic there is the greatest number of micro enterprises. By territory form of the participating small and medium-sized enterprises, the most companies established in Banská Bystrica region (38.20%) took a part in the research. More than 18% of businesses were located in the Žilina region and 11.53% in the Bratislava region. The classification of economic activities issued by the

Statistical Office of the Slovak Republic was the final criterion for the dividing of enterprises surveyed (Ministry of Agriculture and Rural Development, 2014). Based on this criterion, the largest part of all companies symbolized the enterprises of industrial production. It was almost 30% of surveyed respondents. 58 businesses operated in the field of information and communications and 54 companies dealt with the transport and storage. More than 60% of the addressed sample consisted of small and medium-sized companies that would use the services of business incubators.

#### Results and Discussion

The presented research focused on two groups of companies. The majority of respondents belonged to the enterprises operating outside of business incubators. It was more than 94% of enterprises. The second group of respondents included businesses that were located in different business incubators in Slovakia. We received 28 questionnaires from them. In the 28 business entities located in business incubators, we have focused on the period of cooperation with business incubators. Table 2 shows the most of the companies (15) cooperated with the business incubators in the period of 1 – 3 years.

Table 2

Table 2 The period of cooperation with business incubators

Indicator	Absolute frequency	Relative frequency
To 1 year	1	3.57%
1 – 3 years	15	53.57%
3 – 5 years	5	17.86%
Over 5 years	7	25.00%
Total	28	100.00%

Furthermore, we verified the assumption that more than 50% of the firms located in one of the incubators evaluates positively its existing in the business incubator. The studied assumption was confirmed based on verifying and by using the Binomial test. Therefore, in general we can state that most of the firms located in one of the incubators evaluates positively its existing in the business incubator (Binomial test,  $p = 0.000$ ). 50% of surveyed enterprises rated their action as positive. The assumption can be confirmed by another fact that the remaining 50% of surveyed companies rated their business more positively and none of the surveyed firms identified its business rather negative or negative.

The subject of our next concern was to examine whether there is dependence between the number of years during which firms cooperate with business incubators and business quality. Based on the Spearman test the hypothesis did not confirmed (Spearman's rank test,  $p = 0.043$ ). Therefore it can be stated that in general there is no dependence between the factors examined.

In the companies located in one of the incubators in Slovakia, we examined the views of

respondents on the benefits, which business incubators provided. Respondents had the opportunity to choose several options. Respondents rated the following advantages as the most common: lower cost compared to business outside of the business incubator (17.65%), preferable rental conditions (16.34%), the possibility of using different services (13.07%), assistance in identifying and obtaining funds, grants, loans (11.11%), visibility of the company (10.46%).

Furthermore, we investigated the opinions of respondents located in incubators in relation to possible disadvantages that they felt in their business. 30% of companies felt the absence of advisory services. 30% of entrepreneurs agreed and rated inappropriate structure of services provided as a disadvantage. Nearly 37% of interviewed respondents noted the possibility of others. According to these respondents business incubators have no disadvantage.

21st century is quite frequently referred to as the century of information (Sucháček, 2014) but ignorance and absence of information about the mission and activities of incubators for businesses is limited and does not allow business to support entrepreneurship efficiently (Procházková, 2012). This is the reason why we assumed that there exists a lack of information of small and medium-sized enterprises about business opportunities through business incubators. This claim was verified through further questions in the questionnaire. The question was designed for all businesses, also for companies located in and outside of the business incubator. 414 of 555 companies responded to this question. They expressed the view that they do not have information about business incubators. It represents 74.59%. Only a quarter (25.41%) of surveyed enterprises had sufficient information about the support of innovation in enterprises through business incubators. It represents 141 of 555 companies. Statistical testing of hypotheses by using the Binomial test confirmed our assumption that there exists a lack of information of small and medium-sized enterprises about business opportunities through business incubators (Binomial test,  $p = 0.00255$ ).

Businesses that have enough information about business incubators, they had to specify in the next question of the questionnaire the sources from which they learned about business incubators. The internet was the most common information source that provided information about business incubators to businesses (35.69%). Different media such as radio, television, newspapers or magazines were the additional important sources of obtaining information about business incubators. 83 respondents rated this possibility.

In the following question we verified the opinions of small and medium-sized enterprises to the fact whether the innovations should be supported in small and medium-sized enterprises through creating of business incubators. 410 of 555 companies rated this idea to support it by this way. To generalize the arguments we used the Binomial test ( $p = 0.000$ ). Therefore we can conclude that the majority of small and medium-sized enterprises took the view, according to which in the future the innovations should be

Учитывая современное состояние сельскохозяйственного производства и задачи, определенные различными государственными программами, особое значение приобретают как продуктовые, так и процессуальные инновации. Относительно первых, то наиболее ожидаемым являются инновации по:

- внедрение новых высокопродуктивных сортов и гибридов сельскохозяйственных культур и пород животных;
- создание новых комбинированных минеральных удобрений и средств защиты растений и животных, высокопитательных кормов;
- применение новых высокопроизводительных машин и механизмов;
- расширение ассортимента выращивания сельскохозяйственных культур за счет внедрения новых их видов (овощи, лекарственные растения) и реанимации утраченных отраслей (льноводство и коноплеводства)

Основные технологические инновации связаны с:

- внедрение новейших ресурсосберегающих технологий ведения земледелия и ухода за животными;
  - применение новых систем ведения сельскохозяйственного производства, в частности интегрированной и экологической.
- Особое внимание должно быть уделено организационным инновациям, в частности:
- внедрению кооперативных форм хозяйствования;
  - применению новых методов труда;
  - развитию инфраструктуры аграрного рынка;
  - диверсификация деятельности субъектов хозяйствования в сельском хозяйстве и развитие сферы услуг.

Приоритетными целесообразно признать инновации направлены на повышение эффективности использования ресурсов в сельском хозяйстве, уравновешенный развитие сельских территорий, сохранение биоразнообразия, повышения качества и обеспечения здорового образа жизни сельских жителей, безопасность питания.

Обеспечение инновационного развития в сельском хозяйстве может быть осуществлено при следующих условиях:

- введение системного подхода в управлении инновационным обеспечением развития сельского хозяйства;

• адаптация национальной инновационной системы в условиях глобализации и повышения ее конкурентоспособности;

• совершенствование механизма связи науки с производством и стимулирования научной деятельности;

• переориентация системы продуцирования инноваций на рыночный спрос потребителя;

• стимулирование развития и создания институтов инновационной инфраструктуры;

• улучшение кадрового обеспечения научно-инновационной сферы и создание привлекательных условий для создателей инноваций;

• поддержка сотрудничества между сельскохозяйственными производителями, перерабатывающими предприятиями и другими субъектами рынка в развитии новых технологий и товаров.

Комплексный подход к проблеме должен дать ответ на причины слабой инновационной деятельности субъектов сельского хозяйства в процессе трансформации экономики и послужить основой для формирования целостной концепции и системы инновационного развития, в которой аграрный сектор будет играть особую роль, в частности для аграрных регионов.

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## ASPECTS OF SUSTAINABLE DEVELOPMENT OF INDUSTRIAL ENTERPRISES

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**Annotation:** The paper deals with key aspects of sustainable development management of industrial enterprises by using the requirements of individual management systems. Enterprises need implement effective management systems involving the area of quality management, environmental management, management of health and safety at work, information security and others. An integrated management system (IMS) combines all related components of a business into one system for easier management and operations. Its implementation gradually results in to enterprise reduction of cost, materials, workforce, improving corporate reputation and acceptability - whether it is from business partners or the public and opens the way for new customers.

**Key words:** industrial enterprises, integrated management system, sustainable development

### Introduction

Most industrial enterprises have implemented quality management systems based on existing normative documents. Today it is evident, that meeting the requirements of standards represents only a minimum, with the expectations focused on successful and prosperous organization. Within improving the efficiency and competitiveness of enterprises must also apply other management systems with an emphasis on corporate responsibility. Responsible business is a concept within which companies on a voluntary basis in its business processes and in their interaction with their stakeholders integrate social and environmental aspects. It is an organization's overall relationship with all stakeholders - customers, owners, investors, employees, public administration, suppliers, competitors, communities etc. The organization must develop its economic activities effectively and responsibly towards society and the environment taking into account the interests of all stakeholders. Everyone concerned in some way affects the competitiveness of the organization. Owners and shareholders are involved in the growth and prosperity of the organization, staff assess working conditions, customers are interested in quality of products and services, government is interested in reducing unemployment and the creation of favorable conditions for business and citizens are interested in the behavior of organizations in their place of action.

### Integrated management system

An integrated management system (IMS) combines all related components of a business into one system for easier management and operations. Quality, Environmental, and Safety management systems are often combined and managed as an IMS. These systems are not separate systems that are later joined together, rather they are integrated with linkages so that similar processes are seamlessly managed and executed without duplication.

In terms of Slovakia IMS can create the following management systems:

- Quality System Management - QMS
- Environmental Management System - EMS
- Occupational Health and Safety Advisory Services - OHSAS.

Management systems QMS, EMS and OHSAS introduced or more precisely developed according to the requirements of standards ISO 9001, ISO 14001 and normative recommendations OHSAS 18001 are obviously different in the subject of their interest, but the structure of the requirements, procedures for their implementation and maintenance are very close. The structure of requirements, procedures for their implementation and maintenance are very close. The basis for all three management systems is a process approach that allows the realization of continuous or more precisely continuous improvement.

QMS must be designed to continuously improve organizational performance while addressing the needs of all stakeholders. Quality management can provide a framework for continual improvement and provides confidence in the organization and its customers that the organization is able to provide products that consistently meet the requirements. ISO 9001 supports the acceptance process approach when developing, implementing and improving the effectiveness of the quality management system aimed at improved customer satisfaction. Within the process approach the organization must identify and manage a large number of related activities that use resources and are managed so as to enable the transformation of inputs into outputs. The output of one process is often a direct input into the next process.

The advantage of the process approach is the continuous management of the links between the different processes within the system of processes, as well as management of combinations and interaction processes.

EMS includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for preparing, implementing, achieving, reviewing and maintaining the



environmental policy. The environmental policy of the organization is overall aims and principles of its activities with regard to the environment, including the fulfillment of the conditions generally applicable legislation, as well as the commitment to continuously improve its environmental performance. The environmental policy provides the framework for setting and reviewing long-term environmental objectives and short-term environmental objectives. Long-term environmental objectives are overall objectives arising from environmental policy that an organization may determine. A short-term environmental objective is a detailed, if it is possible quantified requirement of conduct applicable to the organization or its part, arising from the long-term environmental objectives, which need to be identified and met in order to achieve the long-term environmental objective. Organizations are required to establish a system of environmental management approached voluntarily. Specification requirements of the environmental management system according to ISO 14001 allow the organization to prepare and implement a policy and long-term objectives taking into account legal and other requirements, which the organization committed itself to fulfill and information about their own significant environmental aspects. The standard in itself does not specify the criteria for environmental behavior, in addition to the obligation in respect to the relevant legislation and other regulations and continuously improve. The success of the system depends on the involvement at all levels and functions, especially senior management.

OHSAS forms the basis for a new approach to OSH, defines the precautionary principle and introduces system tools of management OSH, such as OSH policy, risk assessment, systems of education, documentation, communication, cooperation among all stakeholders, etc. The standard OHSAS 18001 ensures the fulfillment of legal and other requirements in the field of OSH, allows management processes in the organization focused on high levels of OSH and its continuous improvement, increasing staff awareness of the protection of their own health and their cooperation in ensuring OSH, enhanced cooperation with stakeholders in the prevention of accidents and also increasing the health protection of workers. In the system of management OSH according to OHSAS 18001 are clearly identifiable steps of the Deming Cycle (PDCA) and outlined the principle of continuous improvement. The requirements of OHSAS give the same priority to safety at work, environmental protection, quality assurance and also economic aspects. The economic effect is the most apparent in the fact that, the processes, that lead to the improvement of health and safety and improving working conditions, leading also to optimize the work process, the reduction of losses to higher productivity, efficiency and quality of work, the greater prosperity of organizations and society.

An extensive review of the standard ISO in 2000 opened the way to integrate quality management systems, environment and safety.

As appropriate, the extent of the IMS can be extended also to other management systems e.g. Information Security Management System - ISMS (ISO/IEC 27001), IT Service Management (ISO 20000), corporate social responsibility (ISO 26000), food safety management systems (ISO 22000).

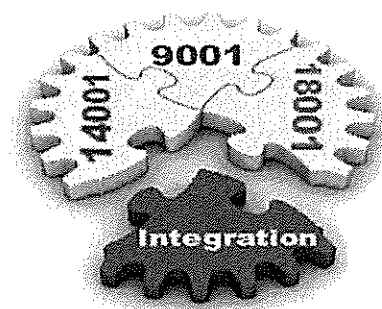


Fig.1 Integrated management system

Organization during its growth standardize its processes and organization can be characterized as a system of fixed structures declared competences and responsibilities that as the core of its success considers the minimization of costs, high performance in a transparent processes and flexible information system. The integration of management systems is the connection of individual systems oriented to the client (customer, public, employee and owner) into one whole organization. It is the process of organizing the various parts into one whole higher step to ensure efficient functioning of all its parts. From the perspective of a systematic approach to the processes, that affect the quality of production cannot be regarded as a by-product of the process of devastation of the environment or endangering the health of employees. Activities related to ecology and the working environment is an integral part of all processes from the stage of creation to disposal. [1]

New modern theories of management thinking and actions prioritized the application of synergistic effect. Combining management systems create a very effective and efficient integrated management system. Its introduction gradually brings to the organization reduced costs, materials, workforce, improving the reputation of the organization and its acceptability, either from business partners or the public and opens the way for new customers. The implementation of IMS or CSR is primarily associated with the change of strategy, company policy and the new direction of the enterprise. Within the survey realized in the selected industrial enterprises in Slovakia, we investigated whether the employees of these enterprises are informed about these changes.

An integrated management system is for the organizations the opportunity to demonstrate their commitment to sustainable development in relation to the customer as well as in relation to the environment and health and safety at work, management of information security.

## Corporate Responsibility

The European Commission proposed a new definition of CSR designated as "responsibility for the impact they have on society." In accordance with the new definition must be available to enterprises, procedures involving into their business and basis strategy issues relating to social policy, environment, ethics, human rights and consumer requirements. The objective of this process must be the creation of shared values between the owners (shareholders), other stakeholders and society at large and in such way that it is possible to find, prevent and mitigate the negative effects resulting from the operation of the business.

Corporate social responsibility in the previous period was defined by the European Commission as "a concept based on which companies voluntarily incorporate into their business operations and relations with stakeholders, social and environmental aspects".

By the new definition should be eliminated the contradiction between voluntary and mandatory approaches which have so far polarized debate on CSR. The discussion about corporate social responsibility should be integrated into the wider context in which indeed preserves the voluntary primary orientation CSR, but which, if necessary, facilitate dialogue on regulatory measures. (3)

Corporate Responsibility is important for people who work in and for enterprises which can help create a more beneficial and inspiring working environment. It matters to those who buy from enterprises, to consumers who are paying more and more attention to the social and environmental character of the products and services they buy. It is important for the local communities where companies operate - communities which want to know that they are living amongst organizations that share their values and worries. It matters to investors who feel the need to promote responsible business conduct, but also for people from other parts of the world who expect from European enterprises, that they will behave in accordance with European and international values and principles.

Currently, the customers/citizens perception of the market is more complex and customers are interested in products and services from such enterprises, whose objectives are not only economic, but also social and environmental. This fact is a challenge for small and medium-sized organizations.

It can be concluded, that corporate responsibility is not a new concept. It is primarily a new approach and attitude of leaders and creating conditions for the fulfillment of all three pillars - economic, environmental and social, in balance to the satisfaction of all stakeholders. A change in the approach is much like the philosophy of total quality management (TQM), where the primary objective is to compete and be exceptional in the business. If the organizations want to prosper it is not enough to produce products or provide services that satisfy their customers. If an organization wants to be prosperous, it must be viewed positively by

their surroundings and to that leads the application of corporate responsibility.

Socially responsible organizations are acting to take account of the needs of its internal and external environment to contribute to sustainable development, transparent and generally facilitate the overall improvement of the state of society within and beyond its commercial operation.

Social responsibility extends as the integration of positive attitude, practices and programs in business strategy of the organization at its top management. It requires a shift in view on their own social role of the level of "only profit" to a wider perspective in the context of today often alluded to the three "P" - "People - Planet - Profit". These three aspects known as Triple-bottom-line influence the behavior of organizations that do not just focus on economic growth, but also the environmental and social aspects of its activities. Organizations are realizing that they do not work in isolation from the outside world, but they are directly a part of it. Social responsibility of the organization is sustained commitment of the enterprise to behave ethically and contribute to economic growth and to make every effort to improve the quality of life for employees and their families, as well as the local community and society as a whole (World Business Council for Sustainable Development, 1997).

Organizations which respect the principles of social responsibility, gradually discovers the importance of including these principles in basic business strategy and its integration with strategic and daily objectives.

Enterprises, in addition to economic challenges are confronted with the environmental and social challenges. Coordinated performance of all tasks should lead to integration, the ultimate objective of sustainable development.

CSR is in practice about building of capacity for sustainable development, while respecting the cultural differences and finding ways to communicate with employees, public and governments.

Enterprises which are able to demonstrate that the issues that are important to society understand and integrate them into their business, increase the value of their brand, reputation, good relations with society, as well as with stakeholders.

Integrated management should be the result of the integration of all dimensions of sustainability. Joint management presupposes interdisciplinary awareness about sustainable development, which is not present in a small number of enterprises yet.

## Improving the management of industrial enterprises

The responsibility of each organization is the implementation of continuous improvement through the improvement of all processes and activities in the different stages of the production cycle. The term continuous improvement should be understood as activities that lead to achieve a new, previously unattained level in any areas of life organization. If an organization wants to be successful, it must constantly

evolve and not to be satisfied with the current state. It follows a series of obligations that must be met, but also a number of advantages, which will be ensured. One of them is ensuring competitiveness against other organizations and strengthening the market position. The philosophy of continuous improvement must be applied throughout the organization.

In line with the long-term strategy and the strategic documents and public policies of the EU, the National Quality Program (NPK) of the Slovak Republic for the years 2013-2016 was introduced. Its mission is to promote quality development work, production quality, services and promotion of sustainable quality of life and competitiveness in all areas of society in Slovakia. The vision of the program is to co-create in the SR environment, in which quality will be a permanent part of all areas of society and individual citizens.

In the NPK are listed activities to improve the business environment and success of the business, which include the following activities:

- initiate credibility QMS certification in accordance with international standards (ISO 9001), EMS (ISO 14001), health and safety at work (OHSAS 18001), ISO / IEC 27000 (Information Security SMS), HACCP, ISO 22000, personnel certification, ISO 50001 (energy intensity), social responsibility ISO 26000 (CSR), develop a competition program NCSRK by supporting the introduction of the EFQM Excellence Model in the organizations business sector (self-assessment, benchmarking), active promotion of competition NCSRK, cooperation with stakeholders,
- coordinate a program of social responsibility of organizations (CSR - Corporate Social Responsibility) - start verification of "CSRs reports" by independent third partner (Correct business) and the use of voluntary instruments to implement environmental programs, coordinate the development of technical standardization, metrology and testing in accordance with the needs of the market,
- promote and initiate the use of models and tools of quality leading to excellence - EFQM Excellence Model, Six Sigma, Balanced Scorecard, Kaizen, lean manufacturing and other (IFS, BRC),
- coordinate in cooperation with relevant departments, programs and improving verification of quality and safety of products, including specifications placing on the market and their use/operation.

Based on the fact that in many industrial enterprises in Slovakia are implemented management systems focused on quality, environment, safety and health at work or other management systems, further development of the management of enterprises could be realized through total quality management. For

industrial enterprises, it is in particular the EFQM Excellence Model. The application of the EFQM model requires the implementation of self-assessment, which is carried out with use of a logical framework RADAR as an objective methodology for expressing outputs of self-assessment. The result of self-assessment is a set of strengths and weaknesses, on the basis of which will develop an action plan for improving for the following period. A necessary prerequisite for completing the questionnaire for self-assessment is the real determination of evaluation [5]

One of the requirements for achieving the excellent results is creating the conditions for corporate social responsibility, which in essence is in the responsible planning, organizing, leadership and enterprise management. The benefit in this area is the standard ISO 26000: 2010 Guidance on social responsibility. The significant parts of the standard are principles and key areas of social responsibility. By understanding and applying these principles can be applied the concept of corporate social responsibility.

Through the EFQM Model can be processed concrete proposals for socially responsible activities and proposed activities introduced into enterprise practice and will gradually become part of normal activities. By using the principles of the EFQM model and incorporating socially responsible activities within individual criteria, the enterprise can contribute to strengthening the competitiveness and efficiency of the economy and the development of its own activities towards excellence in terms of quality, environment and health and safety at work.

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Potkány Marek, Štefková Jaroslava

## COMPARISON OF POSSIBILITIES OF CREATING AND ADMINISTERING DIDACTIC TESTS IN AN ELECTRONIC ENVIRONMENT OF E-LEARNING MODULE SUPPORT AT THE TECHNICAL UNIVERSITY IN ZVOLEN

Technical University in Zvolen (Slovakia, Zvolen)

Source of funding (Zavedenie elektronického vzdelávania cudzích jazykov na základe multimediálnych výučbových materiálov na TU vo Zvolene, grant Kega № 013TU Z-4/2014)

**Annotation:** Information and communication technologies (ICT) are integrated technology kit used not only to prepare and process data but also to manage information and processes to achieve more efficient and more effective results by optimisation of resource management and information distribution. Orientation of education onto the use of ICT is a common form of education in European educational space. The aim of the article is to present a comparison of possibilities to create and administer electronic didactic tests in the virtual environment of two- e-learning modules usable to support the instruction of economic study programmes at the Faculty of Wood Sciences and Technologies at the Technical University in Zvolen.

**Key words:** education, e-learning, the Internet, didactic test

### Introduction

Present information society which is based on information and communication technologies (ICT) lies an emphasis on numerous information advantages connected with a need of constant improving, consolidating, adapting and developing the educational level of people. Alvin Toffer, as the first one, introduced the term of ICT in the book *The Third Wave*. He desired to describe so called the third stage of a society development (pre-industrial, industrial, and post-industrial). ICT in post-industrial society contribute significantly to globalisation of world where everybody can communicate with everybody without any difficulties and where all kinds of information can be accessed relatively quickly.

Requirements on a man's knowledge and skills are constantly changing in the modern age and to be able to function as work force one must deepen and widen their knowledge and skills. Education and development of professional abilities has become a life-long process in the modern information era. Information society works with so called virtual space. Virtual space is a term connected lately to the field of communication, searching for information including education

If we wanted to describe the virtual space in more detail it concerns the space associated with use of the Internet. Massive spread of the Internet and mobile communication in recent years caused that these tools have become an inseparable part of everyday life. The virtual space has its own rules, specifics and risks caused especially by the Internet such as a disinhibition effect connected to invisibility and anonymity of its users (Gregussová, Kováčiková, 2012). The expediency of the virtual space lies in speed of communication and accessibility of information and contacts, bridging long distances but it also bears negatives such as new forms of dependences, violence, and criminality. We cannot image personal computer, notebook and many of us even a mobile phone without an internet connection. Thanks to the internet we are able to communicate quickly, receive information, react and search.

Therefore the virtual space is beginning to be used for various activities. It serves for fun, relax and work as well (Kaliňák, 2011). Of course, it cannot skirt the field of education.

### Education, e-learning and e-testing

The effectivity of ICT use in education depends to a considerable extent on a virtual space which is connected to the Internet. The term Internet is an abbreviation of an English expression interconnected networks. It concerns a network of networks, virtual world, cyber space or more formally said publicly accessible world-wide system of inter-connected computer networks. It is an incredibly quickly developing information medium.

It regards transmission of data by internet protocols sometimes called TCP/IP – Transmission Control Protocols/ Internet Protocol. The data are transmitted in packets or datagrams.

If we wanted to describe the term of education it is a process of purposeful, conscious process of providing and acquiring of scientific and technical knowledge, intellectual and practical experience, forming of ethical features, special interests and attitudes. This explanation is offered by Wikipedia. In other words it is the process of constant improvement of knowledge, skills and overall abilities of a man.

In the field of education ICT and virtual space offer a number of advantages compared to traditional form called presence education and they make it more attractive and modern. This is because of the following attributes (Kučerová, Páľušová, 2006):

- *great instruction potential* – traditional textbooks cannot compete with the information flood offered by ICT,
- *speed of work* – ICT can process, save, analyse, evaluate, update a high amount of information,
- *interactivity* – ICT are not passive media, they enable communication between a teacher and a student,



- *creativity* – ICT present space for thinking and for effective and creative work
- *motivation* – the use of ICT often motivates more to acquire new knowledge because these technologies are a common part of everyday life so that they are also more effective.

E-learning can be characterized as modern method of multimedia instruction based on the Internet and ICT. E-learning in a wider sense means a process which describes and deals with creation, distribution, instruction process control and feedback within the e-learning courses ([www.e-doceo.cz](http://www.e-doceo.cz)). These applications include simulations, multimedia lessons i.e. combinations of text lecture and animations, graphics, schemes, audits, videos, and electronic tests. By elearns.org is „e-learning electronic education which uses computer network for execution, interaction or support of education“. The area of electronic education is relatively large as it covers creation and distribution of interactive electronic courses (e-learning courses), management of instruction and feedback related to it based on the modern technologies. To make education controlled and managed and possible for evaluating there exist systems for management of education. The most commonly used form is Learning Management System – LMS. It is a software product which offers and automated support of the process of education. LMS is usually a complex system offering various interfaces for creation, administration and presentation of electronic courses and support of communication among individual users of the system. The LMS environment in education enables a certain extent of freedom regarding time and place of the study. The student can study anywhere he/she is providing he/she has necessary means (e.g. a computer/mobile phone with an internet connection), any time and at their own pace. Nowadays, the offer of LMS systems is quite wide. The most used in Slovakia are *eDoceo*, *iTutor*, *Moodle*, *uLern*, *IBMLearning Management System* a *WebCT*, *e-ducation*, and so on.

Electronic testing accounts for a significant part of e-learning. It diverges from the traditional testing in the features which are caused by individualisation of the study and by a computer delivery. The most significant are represented by cheating during testing and inability of testing software to evaluate certain types of testing questions, in particular open-end tasks and longer word-chain tasks regarding tests themselves. From the viewpoint of administration of the test it is necessary to provide a classroom with the sufficient number of computers in a well-organised layout and reliable connection to the Internet.

Didactic tests may be defined as tools of systematic measurement of the results of educational process (Byčkovský 1982) including almost all tests used in education in schools. These results serve the teacher to evaluate a student. The class of didactic tests covers mainly diagnostic tests, summative tests and achievement tests. Turek (2008) claims that an important part of a didactic test are validity, reliability and aspect of feasibility and economy, while the former two are not affected by the virtual environment.

Bajtoš states (2008) electronic tests compared to traditional forms of assessment and evaluation have advantages, namely relative reliability of achieved results, more precise differentiation of individual students, higher degree of objectivity, and time efficiency of their administration. Ravasová (2009) describes other views of the e-testing which needs to be taken into account – advantages and disadvantages for a teacher, advantages and disadvantages for a student and requirements for a teacher's and students' skills and knowledge and for technical equipment as well. Based on our experience we find the essential advantages of e-testing enrichment of tests with the use of audio and video files, equivalent variants of the tests, immediate results which can be retroactively checked and reevaluated by the teacher, the results can be further filtered and statistically evaluated. Disadvantages which must be considered during preparation and administration of tests include the following: connection to the Internet, mastering the technique of creation and administration of tests through the software and last but not least feature is sufficient number of computers and suitable layout for the particular number of the students (in case the test is associated with the classroom and time). When we intend to carry out e-testing successfully these disadvantages must be eliminated. Nevertheless, advantages of e-testing outweigh its disadvantages therefore e-testing functionality is a natural part of the most e-learning software. However, Brallier at al. (2015:258) on contrary adds that “there is a considerable body of literature that suggests when using unproctored online exams, the exams should be viewed more as a learning activity and be used in conjunction with other assessments of student learning such as papers, portfolios, and assignments“. Other authors (Maliková, Bubeníková, Genesee, Upshur) who dealt with testing also confirm such understanding of testing stating that testing is only one form of assessment beside recorded dialogues, interviews, portfolios, case studies and others (Genesee - Upshur, 1996).

### Comparison of possibility of creation and administration of didactic tests in the virtual environment of e-learning modules of e-education and University Information System.

Currently, the Technical University in Zvolen, as most of universities in Slovakia, uses own information and education management portal. It is University Information System (UIS) accessible for employees, students of the university through a web site <https://is.tuzvo.sk/> (Figure 1). That offers a number of functionalities including a possibility of creation and sharing electronic materials for individual subjects of the study programmes.

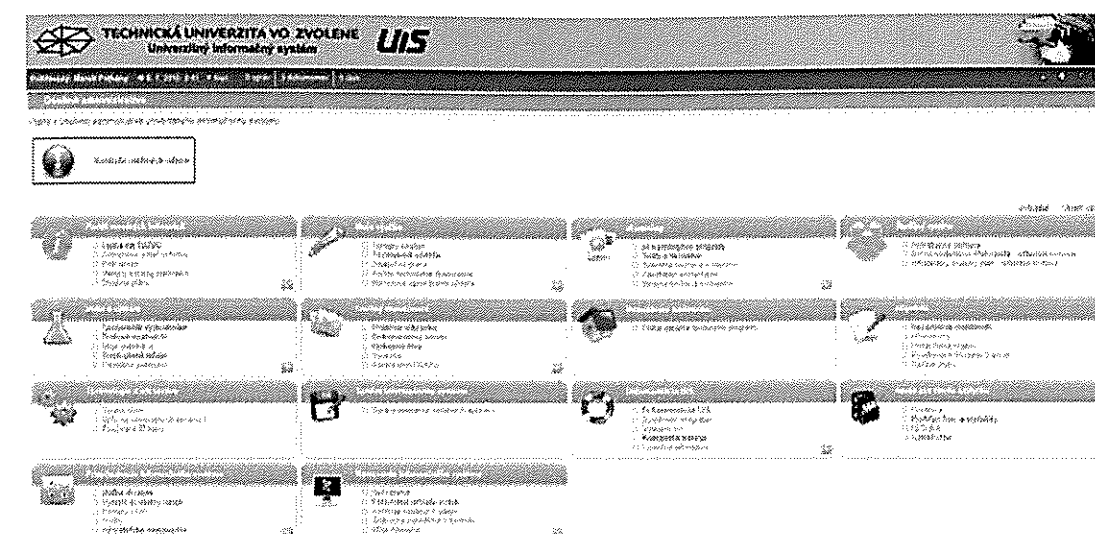


Fig. 1 University Information System Source: <https://is.tuzvo.sk/>

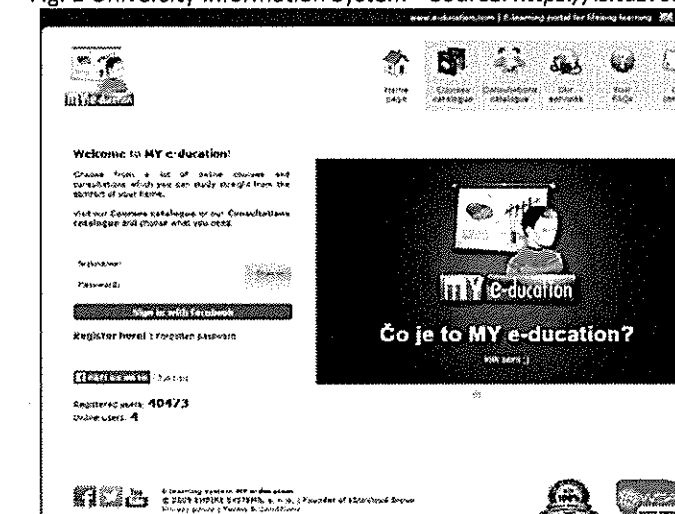


Fig. 2 LMS system „e-education“ Source: <http://www.e-education.com/my/login/mylogin.php>

Though, it is a free form of e-learning with the possibility of students' evaluation via didactic tests. Parallely, LMS system of *e-education* is being used for certain subjects of economic study programmes as an e-learning support. The LMS is accessible after free registration at the web page <http://www.e-education.com/my/login/mylogin.php> (Figure 2)

Both systems offer wide instances of creation of e-learning materials (consisting of multimedia presentations, combinations of animations, videos, sound and textual lectures), their gradual sharing, assigning of on-course tasks and their collection in a free storage site also including evaluation of didactic tests. The comparison of all available functionalities is not possible due to the limits of the paper, therefore we shall draw our attention to the comparison of electronic didactic tests in the virtual environment of the particular e-learning modules.

The comparison is based on creation and administration of the identical exam test for the students of the study programme of Enterprise Management in Wood-processing Industry and more precisely for the

subject of Enterprise Economy in the second semester of the study. The comparison of selected criteria is presented in Table 1.

According to the criteria of comparison it is obvious that UIS is more suitable for creation and administration of tests from the point of access, variability of question formation, administration and possibilities of evaluation. UIS displays wide space for its use in the area of e-learning. It is visually sophisticated with an option to download its manual and interconnected to official school reports and other functionalities. A problem appearing at the university seems to be its low promotion as a support of teaching and, perhaps more importantly, its complicated structure of creation of an e-learning project (i.e. e-learning course or lesson) and its consequent features (sorting, access rights, imports, limitations ...). These are the reason why the use of electronic didactic tests still has not found such utilisation as a teaching support in everyday teaching as it would deserve with its potential of advantages.

Table 1 Comparison criteria of the available e-learning modules and their assessment

Comparison criterion	LMS „e-ducation“	University Information System „UIS“
Access to individual modules	- necessary registration, assigning of identification number, after its sending access provided by the administrator	- automatically assigned access to all students' UIS functionalities after student's study enrolment
Variability of question formation	- limited variability of question formation for multiple choice questions with one or more correct answers and 'fill-in a word' questions	- wide variability of question formation for: - multiple choice questions with one/several correct answers/ with indefinite or open answer/with a forced choice, - dichotomic questions, - fill-in a word questions, - matching q., - ordering q., - gap-fill q., - open q.
Database of test questions	- database is created within individual chapters of the subject e-learning modules via practice tests while the system allows to compose the final exam test by the direct choice or by creation of new questions	- database is created within pre-created e-learning projects for individual subjects within testing databases while the system chooses automatically and combines the desired number of questions within a created database established as practice or exam test
Test preparation time	- test preparation time is shorter due to the limited variability of question formation - considering alike question conception formation this factor is irrelevant	- test preparation time is longer due to the wider variability of question formation
Administration of a test	- it is possible to set a time limit for practice and final tests with an option of control over the testing itself	- it is possible to set a time limit, a specific place of connection (computer classroom with IP addresses) associated with the date of the exam set in the UIS with an option of the control of the testing itself
Evaluation options	- the test question weight is not possible to set, each question has the same value, while the test is evaluated as percentage result which is necessary to recalculate into points	- the test question weight is possible to be set, test is evaluated on the bases of gained points depending on the tester's setting, including percentage of the result.
Interconnectedness to official evaluation reports	- It is not possible to connect it to the official students reports	- It is possible to connect it to the official reports

### Conclusion

The present information society based on the modern information and communication technologies and the use of the internet creates a suitable environment for education by opening virtual space for the public. Education in virtual space called e-learning. It uses electronic documents which are a means of social communication and differ from the traditional documents by formal characteristics.

The utilisation of ICT and e-learning for achievement of educational aims is a modern and developing trend within the European education. It brings a number of advantages (saving time, costs, materials related to printing and distribution, individualisation of the study, flexible and fast evaluation, modern form of education, motivational

aspect) but also some difficulties and risks (demanding creation of educational materials for e-learning courses, initial financial burdens to equip and implement this form of education, computer skills, software support,...)

The process of assessment is an inevitable part of education. Electronic didactic tests are used in virtual space to fulfil this aim. Even those must meet certain criteria of their creation emphasising the scoring and classification. Our experience shows that a well-designed and tailored testing system can be of great help in assessing the students. Due to its advantages it will very likely become an inseparable part of teaching and assessing students.

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Instruction Materials at the Technical University in Zvolen (Zavedenie elektronického vzdelavania cudzích jazykov na základe multimediálnych výučbových materiálov na TU vo Zvolene, grant Kega № 013TU Z-4/2014).

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Sakál P., Hrdinová G.

# TRANSFORMATION ERGONOMICS PROGRAM (HCS MODEL 3E) INTO STRUCTURE MANAGEMENT COMPANY (IMS) INTEGRATION AND INTERFACING QMS, EMS, HSMS IN THE CONTEXT OF STRATEGY SUSTAINABLE DEVELOPMENT AND SUSTAINABLE CORPORATE SOCIAL RESPONSIBILITY

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The article is a part of VEGA project No. 1/0448/13: "Transformation of ergonomics program into the company management structure through integration and utilization of QMS, EMS and H&SMS."

**Annotation:** This article is the result of conceptual design methodology for development of a sustainable strategy of corporate social responsibility (SCSR) in the context of the HCS model 3E formed a co-author within the said grants and dissertation. On the basis of the use of propositional logic is proposed procedure SCSR incorporation into the corporate strategy of sustainable development and integrated management system (IMS) industrial enterprise.

**Key words:** Sustainable strategic management, sustainable corporate social responsibility, integrated management system, HCS model 3E

## 1. HCS model 3E versus CSR

HCS model 3E local ergonomics program specific to the countries of Central and Eastern Europe, was created under the project APVV no. 019/2001: „Transforming Industry in Slovakia Through Participatory Ergonomic“ USA – Slovak cooperation on the basis of the results of four years of solutions. Authors K. Hattar, T. M. Cook and P. Sakál [3] on the values of the person as object and subject of all efforts and focus in it for concept in which the working environment should contribute to building the quality of working life of each person in the sustain environmental quality and adequate economic conditions for the overall quality of life of human. A number of stakeholders of lobbyists Slovak industrial companies either do not realize or do not want to admit it mostly for his personal gain economic reasons, this an objective link of three E (HCS model 3E) [3].

## 2. The industrial (traditional) model of economy versus sustainable (new) model of economy

According to [4] an industrial model of economy based on the large-scale industrial factory after 150-200 years has exhausted the possibilities of development, because it was based primarily on the overall expansion and disproportionate implementation of resources and raw materials. The new model of economy should be based on the overall structural of change in the economy, which consists in the change to patterns of production and consumption, minimizing of inputs and efficient recovery of resources. The new business model, which is more mention in Sec. 3 is based on the change in the production and distribution of the added value – concept Created Shared Value (CSV), respectively transition from „strategy win – lost“ to „strategy win – win“, respectively to „non-zero sum game“. This new business model will form the methodological basis of our design concept of

methodology of system SCSR for SMEs in the context of the concept of HCS model 3E.

## 3. Created Shared Value (CSV) versus Corporate Social Responsibility (CSR)

On the idea of American professors Porter, M. E. and Kramer, M. R. how to save advantages of the capitalist system by modifying the concept of CSR to concept of CSV (Creating Shared Value) triggered a land the Czech Management Association (www.cma.cz) a public debate professor Zbyněk Pitra.

The straight-line article „How to save the primacy of the capitalist system?“ professor Pitra answered the following frequently asked questions in mentioned public debate:

- 1) How to change the methods of formulating a business strategy of the organization, which will focus on optimizing the social benefit of their businesses?
- 2) What role should play a new business model in the implementation of the newly conceived a business strategy?
- 3) How to create a business model which focuses on improving social benefit?
- 4) How will the role of the representatives of the senior management of the organization, which decides to implement a new business model?
- 5) It will not end the effort to optimize the social benefit of business activities in the same trap as the initiative of obligations CSR?

According to [6, 7], the concept of raising social benefit "CSV - Creating Shared Value) differs significantly from now widely frequented "the concept of social responsibility of organizations" (CSR - Corporate Social Responsibility).

CSV concept became the basis for the design of concept SCSV [4].

## 4. Concept design of methodology for development of sustainable CSR strategy for SMEs in the context of the concept HCS model 3E

From the definition of the concept *HCS model 3E*, shows that [4]:

$$\text{HCS model 3E} \approx (\text{SQW} \wedge \text{SPQ} \wedge \text{SQL}), \quad (1)$$

where:

$\approx$  – is the symbol of the operation of equivalence – ekvivalentor.

$\wedge$  – is the symbol of a logical product operation (conjunction, "and") - konjunktör,

SQW – sustainable quality of work,

SPQ – sustainable production quality (goods and services),

SQL – sustainable quality of life.

From the current document [8] „*National Quality Program*“ (NOP for the years 2013-2016) follows that:

$$\text{NQP} \approx (\text{SQW} \wedge \text{SPQ} \wedge \text{SQL}) \quad (2)$$

According to the established methodology of the concept of sustainable CSR strategy for SMEs in the context of the concept HCS model 3E, Fig. 1, apply [4]:

$$\text{SD/PSD} \supset \text{SCSR} \supset \text{IMS} \quad (3)$$

i.e., the IMS subsystem ( $\supset$ ) SCSR and this is the subsystem ( $\supset$ ) SD/PSD.

And if *SD/PSD* is according to *ISO 26000*:

$$\text{SD/PSD} \approx (\text{Soc},p \wedge \text{Env},p \wedge \text{Ec},p), \quad (4)$$

where:

$\supset$  – is the symbol of the operation- subsystem,

Soc,p – the social pillar,

Env,p – the environmental pillar,

Ec,p – the economic pillar,

$$\text{then it have to be also } \text{SCSR} \approx (\text{Soc},p \wedge \text{Env},p \wedge \text{Ec},p) \quad (5)$$

Fig. 1 illustrates the idea of replacing hierarchical subsystems SD / PSD, CSR and IMS under registration (3). Ground plan expresses necessity the (equivalence) SCSR and its three pillars - the relations (4) and (5). This means that all subsystems SD / PSD, UCSR and IMS contain all three pillars: social pillar, the environmental pillar, the economic pillar (which is methodological/ system/ holistic perspective very significant by us).

Also on the left side of Fig. 1 are arranged (recommended by us and used in the effective functioning of SCSR) exact tools and concepts. As indicated by Peter Ponický in the title of his presentation "Quality is not a the result of using of quality tools" [9]. Our words are: if the fundamental systemic issues is not resolved then in solving partial problems we will always impinge on these unresolved system. This of course does not reach the desired goal, and our efforts are already pre-inefficient and doomed to failure. Cited author asks the question: "Who and what constitutes quality" in his article and hi also

answers on this question: "PEOPLE AND THEIR RELATIONS SHIP!"

We also add "A PADADIGM SHIFT OF THINKING"!

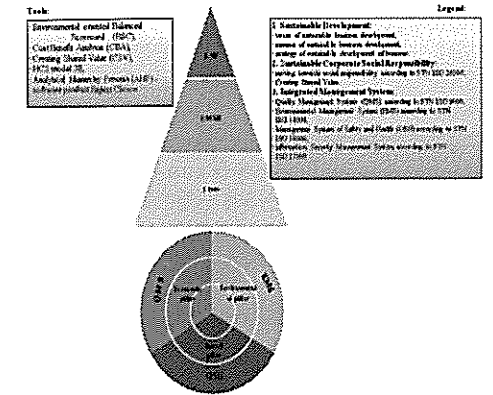


Fig. 1: Concept design of methodology for development of sustainable CSR strategy for SMEs in the context of the concept HCS model 3E

Source: [4]

From standards of *STN ISO* follows that:

$$\text{IMS} \approx (\text{QMS} \wedge \text{EMS} \wedge \text{OSH} \wedge \dots), \quad (6)$$

where:

QMS – Quality Management System (STN ISO 9000),

EMS – Environmental Management System (STN ISO 14000),

OSH – Occupational safety and health (STN ISO 18000).

Almost all historically incurred definition of CSR contains three components/ aspects/ dimensions: economic, social and environmental. The definition of CSR in the standard STN ISO 26000 does not contain an economic component. If at this standard is reflected holistic/ systemic approach, then in definition of CSR and PSD is broken. If a PSD is a system, then CSR as his subsystem have to be composed of the same elements. It has three dimensions: economic, social and environmental, which are connected to each other!

By created of the concept, Fig. 1, it follows that sustainable CSR is dependent on using of concepts and tools as:

$$\text{SCSR} = f(\text{HCS model 3E; CSV; CBA; BSC; AHP, IMS, ...}) \quad (7)$$

where:

f – is a symbol of function.

From *modified Porter value chain* shows, that:

$$\text{SCSR} \approx (\text{SLog},in. \wedge \text{SPro.} \wedge \text{SLog},out. \wedge \text{SM\&S} \wedge \text{SCS} \wedge \text{SE} \wedge \text{SDTg.} \wedge \text{SMHR} \wedge \text{SBI} \wedge \text{SMP}), \quad (8)$$

where:

- SLog,in. – Sustainable Input Logistics,
- SPro. – Sustainable Production,
- SLog,out. – Sustainable Output Logistics,
- SM&S – Sustainable Marketing and Sales,
- SCS – Sustainable Customer Services,

SE – Sustainable Ensuring,  
SDTg. – Sustainable Development of Technology,  
SMHR – Sustainable Management of Human Resources,  
SBI – Sustainable Business Infrastructure,  
SMP – Sustainable Margin/ Profit.

Based on the system analysis of relevant documents and concepts can be argued that:

$REPORT \supset NPQ \supset SD \supset SCSR$  (9)

i.e., that SCSR is subsystem of ( $\supset$ ) SD, it is je subsystem of ( $\supset$ ) NPQ and this is subsystem of REPORT.

And if REPORT is according to REPORT

EC:

$REPORT \approx (Soc,p \wedge Env,p \wedge Ec,p)$  (10)

then is, at least formally (de jure), theoretically, created the basic system requirements for the implementation of sustainable strategy of CSR in the context with the HCS model 3E enterprises (SMEs) in the EU and in Slovakia and at least theoretically, are formed European basic system requirements to „Concept design of methodology for development of sustainable CSR strategy for SMEs in the context the concept HCS model 3E " got out of position" utopia " to position of " reality".

#### 5. Proposal of the implementation of the concept of SD to business strategy

In the management and strategy of the enterprise according to the principles of SD and [4] is required implementation of the following seven steps: 1. Implementation of stakeholder analysis. 2. Determining the policies and objectives of the SD. 3. Designing and executing an implementation plan. 4. Creating a supportive corporate culture. 5. Establishing limits and performance standards. 6. Message Processing. 7. Improving internal monitoring processes.

A comprehensive strategy SD of enterprise- as a company document- then is strategy of SD this enterprises, which should be according to [4] the following structure: 1. Introduction. 2. Analysis of the overall situation. 3. Vision SD of enterprise based on a new business model, which focuses on improving social benefit business assets. 4. Mission SD of enterprise on the base of vision of SD enterprises. 5. Defining of strategic objectives SD of company. 6. Identify the strategic objectives of stakeholders. 7. Analysis of the external business environment. 8. Analysis of sectoral business environment. 9. Analysis of internal business environment. 10. SWOT analysis of the company. 11. Creating the vision, mission and strategic objectives of the strategy SD enterprise. 12. Creating the vision, mission and strategic objectives, business strategies on the level of strategic business units – SBJ. 13. Creating the vision, mission and strategic goals of sustainable functional strategies business. 14. Sustainable marketing strategy. 15.

Sustainable manufacturing business strategy. 16. Sustainable innovation strategy company. 17. A sustainable strategy of ICT of company. 18. Sustainable human resources strategy company. 19. A sustainable financial strategy the company. 20. A sustainable environmental business strategy. 21. The organization of the company. 22. Risk management of company. 23. Change management in the enterprise. 24. Joint ventures. 25. Implementing of the strategy SD. 26. Check a fulfillment of strategy SD.

In short, it is possible to complete the process of creating a comprehensive strategy SD enterprise formally represent in 4 phases of strategic management as a process according to [4] as follows:

$PC \ S \ SD \approx (ANALYSIS \wedge CS \ SD \wedge IMPLEMENTATION \wedge CONTROL)$  (11)

where:

PC S UR – the process of creating a comprehensive strategy SD enterprise,  
ANALYSIS – analysis of the external business environment, sectoral business environment, internal business environment, SWOT analysis,  
CS SD – creation strategy SD (vision, mission and corporate, business, functional strategies),  
IMPLEMENTATION – implementation of the strategy SD,  
CONTROL – check a fulfillment of strategy SD,

and a train of thought is possible to write in the development of a comprehensive strategy SD enterprise according to [4] as follows:

$PC \ S \ SD \approx A1 \rightarrow A2 \rightarrow A3$  (12)

where:

$\rightarrow$  – is a symbol of implications operations ("if" – "then") – implikátor,  
A1 – operator A1 – justify the social meaning of existence of company (specification of long-term social and business mission of the company – the acceptance of a paradigm change thinking towards SD and sustainable CSR critical stakeholders),  
A2 – operator A2 – generate insights into its validation in specific socio-economic conditions (creation of vision SD and sustainable CSR of the future – in the medium term – business success),  
A3 – operator A3 – bringing this vision to life by selecting of specific strategic business objectives and implementation scenarios for their success in achieving (formulation of a sustainable business strategy and build implementation plans pursued its goals).

IF a business entity (BE) needs a thriving local community (LC), then the local community (LC) also needs a successful entity (SE).

Thus, the following applies:

$BE \approx LC$  (13)

#### 6. Proposal for the implementation of the concept of sustainable CSR strategy to the strategic management of the company

Like any process of implementation of a hierarchical system in the organization, and the introduction of the concept of sustainable CSR strategy to the system of strategic direction of the company (as a subsystem of enterprise strategy SD), is a long, difficult, time-consuming, effort, new information and knowledge and change of mindset – a complex task. The main purpose of implementing the concept of sustainable CSR strategy to the strategic management of the company is the successful integration of the various areas of CSR (economic, social and environmental) to the vision, mission, values and strategic objective and values of the enterprise to its culture and operational decisions at all levels of management as responsible approach to promote long-term retention on the market.

Hrdinová in [4] suggests using the procedure of implementation of the concept of sustainable CSR strategy into practice of strategic management (not only industrial) enterprises, according to [12, 13], which has been modified, implemented and verified in [5]: 1. Management Commitment. 2. Identification of key stakeholders. 3. Determination of values and principles. 4. Analysis of the current situation. 5. Action Plan. 6. Implementation. 7. Monitoring. 8. Reporting. 9 Measures to improve.

#### 7. The proposal incorporating the concept of sustainable CSR strategy in business practice in IMS

Sustainable CSR, according to [4] is actually a strategy that an enterprise should create and follow it. Besides three main parts of which it is consists SD, i.e. "Triple-bottom-line", has the following three pillars: economic, environmental and social. There are also other parts of the IMS enterprise that also in coherence with CSR itself consists the overall company strategy.

The concept of sustainable CSR strategy should cover all processes within the company is seen as an integral part of the strategy SD, industrial and other companies/ organizations. In article [14] the authors propose the inclusion of the concept SD into the strategy SD of enterprise. In this authors presented a so-called. "GRC approach", [15] which is the abbreviation of three English words: G – governance, R – risk

management and C – compliance, and especially to the uninitiated Greek acronym.

G – Means Governance – leadership, the government, power. R – Means Risk – risk. C – Means Compliance – compliance with the many laws and guidelines affecting business (and residents).

$GRC \approx (G \wedge R \wedge C)$  (14)

where:

G – Governance (leadership, the government, power),

R – Risk (risk),

C – Compliance (adherence), Controls.

From the above entry indicates that *sustainable CSR strategy can not only exist as a single strategy in the company. Always represents one of the components of strategic business management. It is an integral part of such a comprehensive strategy SD enterprise together with other management systems – IMS. Together, they create a symbiosis cannot separate one without the other work.*

#### CONCLUSION

The present article had as main objective to offer a solution EU recommendations outlined in [16], p. 11: „The European Commission proposes a new strategy for a new definition of CSR, designated as "responsibility for the impact of enterprises, which they have on society." In accordance with the new definition, enterprises have to have available procedure which include in their business strategies and the basic strategies questions, which are related to social policy, environment, ethics, human rights and consumer requirements The aim of this process should be the creation of the common values between owners / shareholders, other stakeholders and society in such a way that it can find, prevent and mitigate the negative effects arising from the operations of the company.".

Gabriela Hrdinová in [4] proposed the concept and we (on UPIM MTF STU Trnava) are trying this concept finalize to a successful practical application through cooperation with Slovak industrial enterprises without VEGA grant support by addressing the bachelor's, master's and doctoral theses, [17].

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## CONTRIBUTION TO THE SUSTAINABLE SHARED VALUE CREATION OF INDUSTRIAL ENTERPRISES IN THE CONTEXT OF SUSTAINABLE CORPORATE SOCIAL RESPONSIBILITY

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The article is a part of VEGA project No. 1/0448/13: "Transformation of ergonomics program into the company management structure through integration and utilization of QMS, EMS and H&SMS."

**Annotation:** The article is aimed at the Sustainable Shared Value Creation in the line with the Sustainable Corporate Social Responsibility and the Sustainable Development. In the context of long-term development of the world economy and the related impact of the new rules of economy and society, industrial enterprises got to the imaginary boundary to change the policy of new value/wealth creation. Implementation of changes to the system of wealth creation requires a review of the existing misleading assumptions of the unlimited growth in the global economy and direction to the wealth creation in an environment accepting economic interests, society and the environment as a congenial unit. Considering the facts, the main ambition of the article is to contribute to addressing the current situation of injustice in wealth creation and distribution on the planet Earth.

**Key words:** Sustainable Corporate Social Responsibility, Sustainable Development, Sustainable Shared Value Creation

There are constantly emerging questions regarding the impact of enterprises on the society and the environment as a result of permanent global social, environmental and economic issues associated with unlimited economic growth. One of the concepts that companies accept, as a beneficial concept for reducing the negative impact of enterprises on the society and the environment, is the concept of Corporate Social Responsibility (CSR).

The CSR is built on the concept of Sustainable Development (SD). The SD is based on three pillars, social, environmental and economic.

There exist various approaches and concepts of the CSR. We focus on the concept of Creating Shared Value (CSV) in the article. According to Porter and Kramer (2011), founders of the concept, the CSV represent the concept aimed at connection between social and economic business objectives.

The CSV includes also the idea of application the measures in the intention of Sustainable Corporate Social Responsibility (SCSR) within the entire value chain (Sakal, et al. 2013).

The focus on the CSV is also a part of discussions in the European Union and the Slovak Republic (EP, 2013a, UNMS, 2013, EP2014).

In our opinion, despite the fact that the CSV represents an important shift in the CSR, the concept itself is not conducive to the promotion of such transformational changes which are beneficial for the elimination of the causes of disparate key societal challenges. Without these systemic/institutional solutions that should result from effective collaborative business solutions beyond national framework is, currently in our view, sustainable improvement of the quality of work, production and life (also mentioned in the document of the National Quality Programme of the Slovak Republic), impossible.

Despite the many benefits of various concepts dealing with issues SD, CSR/SCSR, respectively CSV, at the level of enterprises/industrial enterprises, we do not find a comprehensive solution to the current state of the unsustainability of the systems often causing permanent negative consequences for the society, the environment and the economy as a whole.

Our aim is therefore to shift from conventional practices of enterprises in SD, CSR/SCSR and CSV – non-exhaustive solutions of debilitating issues – to the transformational notion to the SCSR, Sustainable Shared Value Creation (CSSV) (Smida, 2015).

The evolution of CSV is largely influenced by enforcing the SD, SCSR and CSV policy/issue to the forefront of global interests through global governance, as stated Stiglitz (2006) at the present days "chaotic and uncoordinated illegitimate global governance without global government", with whose view we agree.

Stakeholders, benefiting from the current unsustainable system, will resist to the changes. They will use their skills and even illegitimate and privileged, but they prevent possible changes (Stiglitz, 2006).

That is the reason why it is necessary to apply bottom up pressure through conduct the research within dissertation, master and bachelor thesis that link with the university research and following implementation of concepts in small and medium enterprises, because of unsustainable strategies of large and transnational corporations.

Dissertation thesis (Smida, 2015) and submitted article should promote added value in this field.

The CSV is influenced by a series of social, environmental and economic determinants, Table 1, in terms of the Earth's ecosystem. These determinants should be the interest to industrial enterprises as part of business SD strategy, based on the CSSV.

Table 1  
Determinants influencing the evolution of sustainable shared value creation

<b>Social determinants</b>	<ul style="list-style-type: none"> <li>• social justice and equity,</li> <li>• awareness on sustainability,</li> <li>• cooperation in the context of sustainable development,</li> <li>• social cohesion.</li> </ul>
<b>Environmental determinants</b>	<ul style="list-style-type: none"> <li>• sustainable use and management of natural resources,</li> <li>• sustainable energy,</li> <li>• healthy environment,</li> <li>• environmental safety.</li> </ul>
<b>Economic determinants</b>	<ul style="list-style-type: none"> <li>• sustainable economic growth/sustainable business growth,</li> <li>• creation and fair distribution of wealth,</li> <li>• transparent economy/transparent business,</li> <li>• security and stability.</li> </ul>

Source: Own processing

Co-evolutional understanding of the current responsible existence and the future SD of industrial enterprises requires to apply systemic/holistic approach to solving global issues as an objective societal requirement and an opportunity for industrial enterprises. According to our opinion, industrial enterprises have to encourage sustainable (re)arrangement of the individual components of the Earth's ecosystem, Fig. 1.

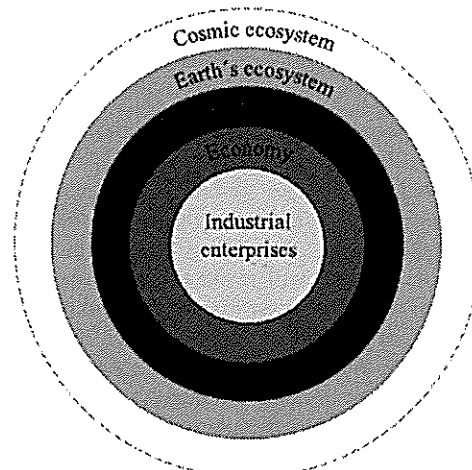


Fig. 1: Position of industrial enterprises in the Earth's ecosystem as part of the Cosmic ecosystem  
Source: own processing

The CSSV requires also to accept a wider range of stakeholders (Stead J., Stead E., 2012), which means that we can define relations between industrial enterprises and their stakeholders as a set of complex competitive-collaborative relationships. The interest of entities is moving from individual values, in the form of maximum profit, to collective values in terms of

sustainable/legitimate profit, with the focus on collective prosperity.

This is a transition to a win-win strategy (Sabanov, 2014), through the implementation of CSR actions within the entire value chain, from raw materials extraction through trade, to recycling (EP, 2013a).

The practical application example of win-win strategy is the cooperation between China, Russia and India on the creation of Silk Road (Ria Novosti, 2015).

In relation to the existence of any industrial enterprise is its orientation to the CSSV a matter of mutual interest in mutually beneficial SD throughout entire sustainable global industrial ecosystem, Fig. 2.

Our vision of the functioning of sustainable industrial ecosystem involves of the co-evolution between global value chain, modified Porter's value chain (Smida et al., 2011) and SCSR (Hrdinova, 2013).

The structure of the global value chains is:

1. Mix of renewable and non-renewable materials, and technical materials, and energy mix.
2. Suppliers.
3. Final production.
4. Customers.
5. Final consumers.
6. Biologically degradable and non-degradable waste, and technical materials.

As we already mentioned above, the success of CSSV in the sustainable global ecosystem will greatly depend on the attitude of the main international organisations, institutions and groups that affect the world stage and their abilities and willingness to enforce particularly the SD, SCSR, CSV/CSSV policy/issue to the forefront of global geopolitical interests.

We see following major global stakeholders in relation to the global value chain (Smida, 2015): United Nations, International Monetary Fund, World Bank, World Trade Organisation, G7, European Union, USA, Eurasian Economic Union, BRICS, Organisation for Economic Co-operation and Development, NATO, Think tanks.

Stated stakeholders, especially International Monetary Fund, World Bank and World Trade Organisation, could, within certain changes to existing competencies, significantly influent global affairs and establish the sustainability trend.

We agree with the statements of Stiglitz (2006) and Korten (2001) on the necessity of reforms in stated organisations in favour of global SD.

The duty of global stakeholders goes even further. Korten (2001) and Zeleny (2014) stated that we are leading to the era, when it is necessary to support not only economic globalisation, but also economic localisation, respectively re-localisation.

Capra (2009) similarly expresses criticism of economic globalisation. In his view economic globalisation was purposefully planned by the most powerful capitalistic countries, the largest transnational corporations and global financial institutions, created just for this purpose.

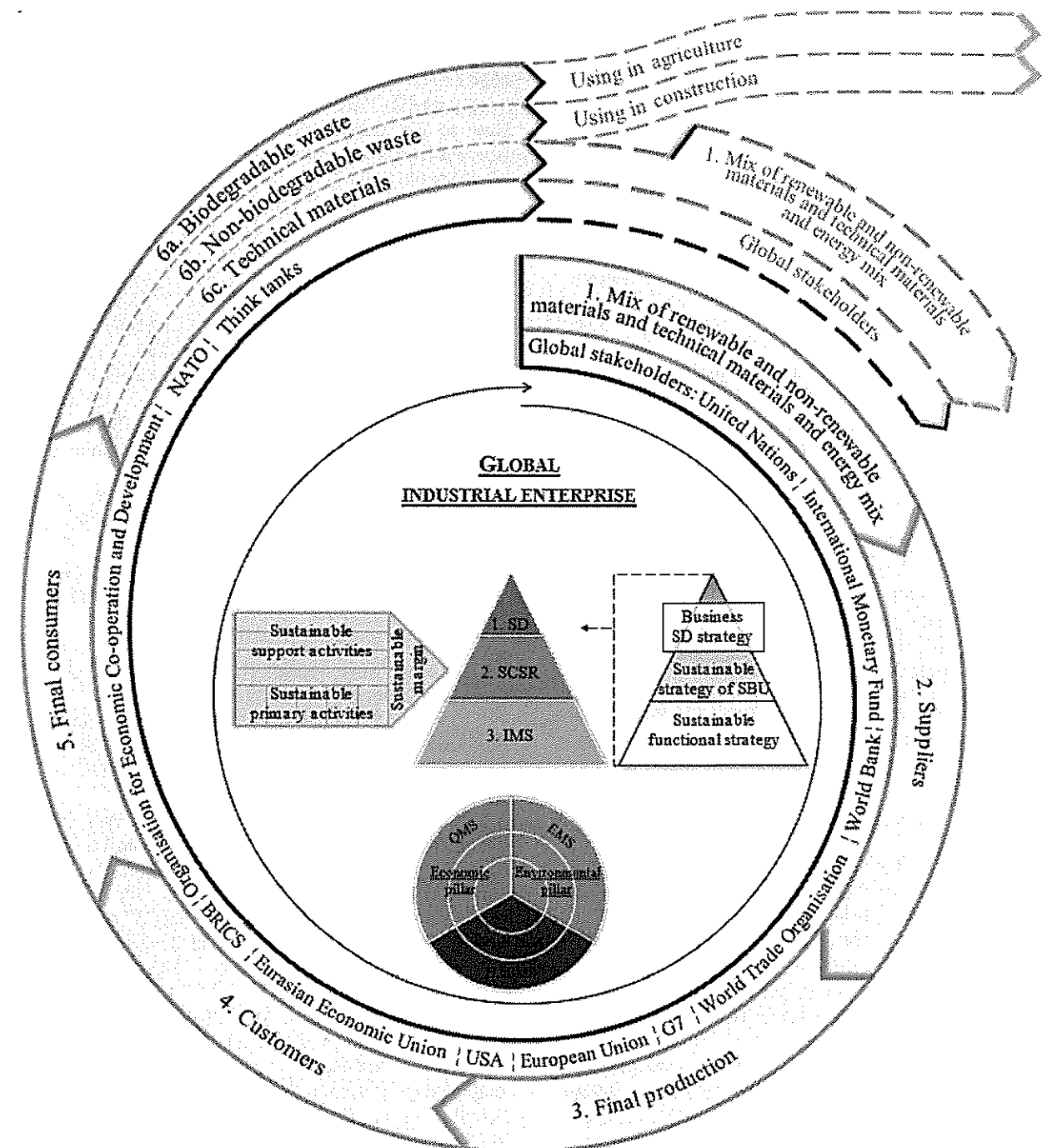


Fig. 2: Proposal of sustainable global industrial ecosystem (global value chain vs. modified Porter's value chain vs. proposal of the methodics for sustainable CSR strategy system creation for SMEs in the context of the concept of HCS model 3E)

Source: own processing according to (Smida et al., 2011; Stead J., Stead E., 2012; Hrdinova, 2013; OECD, 2013; EP, 2013a)

Another component of the sustainable global industrial ecosystem is "Global industrial enterprise" that represent abstract, introduced by us, concept of global enterprise integrated all industrial enterprises on the planet Earth.

We have ambition to declare, through this global enterprise, on the basis of already published outputs (for example: Smida et al., 2011; Steingart, 2008; Pitra, 2011; Rezac, 2012; EP, 2013a; Sabanov,

2014 and further), that it is necessary to change strategies of unlimited growth to sustainable strategies (Stead, J., Stead, E., 2012). According to (EP, 2013a; EP, 2013b), enterprises have to have sustainable strategies for the shift of their business to new business model.

Modified Porter's value chain (Smida et al., 2011), as a model/systemic tool of CSSV influence conceptually/in value on the SCSR system of industrial



enterprises. Practically it means the paradigm shift in thinking in the context of moving from zero-sum strategy to non-zero sum strategy, which makes a change in the creation and distribution of profit.

Simultaneous part in the Fig. 2 is complex business SD strategy – as a business document – it is then formed by business SD strategy, sustainable strategies of SBU and sustainable functional strategies.

We conclude, in relation to the analysis of the concept of the methodics for sustainable CSR strategy system creation for SMEs in the context of the concept of HCS model 3E, that the integration of SD concept to business environment requires following steps (Hrdinová 2013):

1. Implementation of SD concept to the business strategy.
2. Implementation of sustainable CSR strategy to the business strategic management system.
3. Integration of sustainable CSR strategy in business practice.

The success of Sustainable Shared Value Creation will be also linked with the approach of industrial enterprises to the stated issue and also with the understanding its importance regarding objective societal need. It is related to the requirement of proactive approach in business management and further employees in CSR behaviour support.

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#### HOW TO MEASURE NEW CREATED VALUE IN THE TRANSFORMATION PROCESS OF THE COMPANY?

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**Annotation:** Objective of this article is to present the new created value indicator as a quantification tool of a value, which a company adds to a value of inputs spent in the transformation process, in order to create new – higher value for the consumers and other stakeholders. We searched for an indicator that could be relatively easily calculated from publicly available financial data on enterprises – financial statements, and that could be used for a purpose of enterprises comparison on national or world level. In the article we also present breakdown of performance results of Slovak industrial companies during years 2007 – 2013.

**Key words:** new created value, added value, financial analysis, corporate social responsibility (CSR)

In the last decades the notion "value creation" or "created value" or "added value" is more often used not only in the economical environment, but is also incorporated in other fields of our lives. For instance in these days a project focused on high school valuation is being prepared in Slovakia. The valuation will be based on "added value" as a difference between values of a student's knowledge when coming to the high school and when graduating the high school. At first sight it may seem that the measuring of created values in the economical field is already fixed and clear issue. But it is not like that.

In the macroeconomics field the indicator GDP is relatively widely used. However the concept of sustainable development and the corporate social responsibility puts the indicator under reflection on its deficiency and unsuitability and brings necessity to search for a new indicator. In March 2012, the European Economic and Social Committee adopted an opinion which states: "This is a measurement that "specialises" in a particular segment of activity – essentially market-based – of a given society. Only by means of a "lazy" interpretation could this indicator switch from being an "indicator of production" to an "indicator of social well-being". (Detailed also In: Šnircová, Fidlerová, 2014)

The situation in the microeconomics field is even more complicated – when measuring value created in a company. The problem is hidden in ambiguity, application of variety of indicators that even do not have similar definition. For instance a comparison of sales and profit which are completely differently defined indicators: while the sales measure value of the company's outputs, the profit is residual figure calculated as difference between value of outputs (sales) and value of inputs used to create the value. Moreover, economical theory offers two conceptions how to measure this difference: the economic profit concept and the accounting profit concept.

From the accounting point of view, the profit is defined as a positive difference between accounting revenues and accounting costs based on the matching principle. The accounting legislation specifies what and

when is considered as a cost or revenue. Revenue is a value of sold goods or services (sales), but also value of sold securities or sold assets of a company (buildings, land, equipment, ...). On the other hand cost represents an usage of inputs (material, energy, services), amortization of equipment used in the transformation process (depreciation) and value of human resources utilized (personnel costs and connected levy – all together as labour costs), but also price for utilization of loan capital (financial costs – interests and fees – of bank loans, leasings and other financial liabilities).

**Accounting profit** = accounting revenues – accounting costs (1)

Accounting legislation does not consider price of Equity - reward of the owner for investing his own capital in the company as a cost. Meaning that the price of own capital (unlike price of loan capital) is not taken into account as the unit influencing volume of the accounting profit. **Economic profit** is a difference between total revenues generated in a company and economic costs (including opportunity costs, ie. considered also price of own capital):

**Economic profit** = total revenues generated by the invested capital – costs of the invested capital (2)

When measuring value created by using indicators of the accounting profit concept we may encounter with another ambiguity, namely the accounting policy. These often allow alternative reporting of various transactions and thus give opportunities to creativity in the accounting. That is why we should select which data on the result of the transformation process from the accounting (usually more than one is offered) is the most realistic and the least "creative".

In the following text we would like to focus only on one field of corporate performance measurement, namely the definition of the value that is added to the value of the output (product) generated in the transformation process. We remain loyal to the concept of the accounting profit as we search for a tool

that could be used for evaluating companies upon publicly available financial data presented in numerous databases. This means that we can get the required data easily from financial statements per end of year which (in Slovakia and whole European Union) has to be publicized, even in the electronic form. Usually for this purpose the added value indicator is used in corporate financial analyses. It is very often reported as separate line of the financial statements (if the P&L Statement is prepared according to nature of expense method, what is more typical for continental Europe). This classic corporate indicator is connected also to macroeconomic indicator GDP: sum of added values generated by all subjects of the domestic economy gives GDP of the country. What we would like to stress is the fact that the added value indicator does not quantify new added value in the corporate transformation process as it still contains value of some utilized inputs.

**Added value** is the difference between revenues for sold outputs (sales) and value of purchased inputs (purchased material, sub-supplies, energies and services).

**Added Value = Sales – Costs on purchased inputs (3)**

This financial indicator however contains also value of other costs that are expression of utilization or amortization of other inputs important for production and creation of outputs. It includes depreciation of tangible and intangible assets as result of utilization of production capacities in production process and personnel costs as the expression of labour price that creates new value in the company. Purchased inputs, depreciation and personnel costs represent in broad outlines price of three fundamental inputs without which a generation of outputs would not be possible. The value of outputs deducted by value of the above stated three inputs can be considered as a new value, as a basic effect of the transformation process, as a certain "primary" profit which results into (after adjustments of some other costs and revenues) accounting profit. Ľudmila Kalafutová (In: Zalai, K. et al., 2007, p. 153) named this residual indicator the **new created value (NCV)**. In the meantime NCV represents result that is very likely to be repeated in the future (only on assumption of no significant qualitative changes in the core business of the company, e.g. change of production programme, technology, etc.), as it is not very influenced by occasional extraordinary revenues and costs unlike it is in the case of the total accounting profit indicator. That is why it is a **suitable indicator of permanent ordinary company's performance**.

Its quantification is possible directly from data stated in P&L statement without any other corrections by accounting or non-accounting data:

**NCV = Added value – depreciation – personnel costs (4)**

In this relation the new created value can not be considered as profit, does not substitute the genuine total profit as it does not take into account all costs, e.g. taxes and fees, creation of adjustments, value of sold

assets, financial costs, and also all revenues, e.g. revenues from sold assets, financial revenues, etc.:

**NCV ≠ accounting profit (5)**

**Accounting profit = NCV ± other operating revenues and costs (mostly occasional, extraordinary) and financial revenues and costs (6)**

So far we have not heard of any other researches on the indicator of the new created value, beside the one elaborated by its original author, – comparison of NCV levels in different businesses in European context (Kalafutová, Prokeš, 2005) and beside our own publications, e.g. analyses of factors determining generation of NCV (Šnircová, 2008). Team of authors led by Hrvol'ová (2011) presented an interesting article about the application of the indicator in the corporate evaluation. This, so far, relatively meagre propagation of the NCV indicator was the reason why we decided to "refresh" this financial indicator.

This time, we decided to test the indicator NCV in the environment of the database of Slovak industrial companies and compare it with other financial indicators, ratios of the efficiency. We present their typical level reached during years 2007-2013 via statistical characteristics mental picture of branch and quantiles. This long period was chosen purposely with the aim to cover years of economic boom (2007), followed by economic crisis (mostly 2009) and period of a modest recovery of economy (after 2010), in order to research how the individual indicators react on the fluctuation in the economic cycle of the national and world economy. Statistic elaboration was carried out on a wide representative database of companies provided by CRIF – Slovak Credit Bureau, s.r.o. We chose data from section C – Industrial production according to the classification SK NACE. The number of companies in the chosen database varied from 7250 in the year 2007 up to 11587 in the year 2013.

**Mental picture of the branch** characterizes a branch like one big company. Its financial situation is described by aggregated financial statements in which individual units are represented by a sum of units for all companies in the branch. Most often a standard form of statements is used. Financial ratios calculated from such statements can be interpreted as ratios of typical representative of the branch.

**Quantiles** represent an estimation of positioning. They divide a group into several equally large sub-groups (tiers). Unlike the average they are sensitive to the order of values, but resistant to the size of the value and particular the extreme ones. The main representative of quantiles is the median, which enables to place a company into better or worse half of a group. More detailed characteristic of companies' positions is provided by quartile (they divide a group into four sub-groups, in each 25 % of objects).

To be able to compare companies of different size we had to work with relative indicators – ratios. That is why we put every absolute indicator into

Table 1 Development of value created ratios in the industrial production companies – mental picture of the branch

Year	2007	2008	2009	2010	2011	2012	2013
number	7250	8215	8217	9525	8809	9635	11587
AV/S	0,17906	0,17813	0,18848	0,18232	0,16309	0,15611	0,17725
NCV/S	0,04005	0,02600	0,00145	0,02429	0,02440	0,01964	0,02022
OP/S	0,04273	0,03111	0,00539	0,03098	0,02985	0,02489	0,02472
EBIT/S	0,00173	0,03945	0,00824	0,03411	0,03054	0,02700	0,02727

Source: CRIF – Slovak Credit Bureau, s.r.o. and own research

Table 2 Level of value created in the industrial production companies in selected years – quartiles

Indicator / Year	quantile	2007	2009	2012
number		7250	8217	9635
NCV/S	lower quartile	-0,02222	-0,11351	-0,07409
	ratio median	0,02958	0,01358	0,01804
	upper quartile	0,09206	0,07262	0,08485
AV/S	lower quartile	0,12848	0,09727	0,06956
	ratio median	0,25582	0,24552	0,21964
	upper quartile	0,40293	0,40926	0,38774
Depreciation/S	lower quartile	0,00716	0,00507	0,00000
	ratio median	0,02947	0,03866	0,02452
	upper quartile	0,06566	0,09163	0,06962
Personnel costs/S	lower quartile	0,06382	0,05430	0,01951
	ratio median	0,15786	0,16437	0,13008
	upper quartile	0,28655	0,31896	0,27554
Purchased inputs/S	lower quartile	0,44418	0,42790	0,43481
	ratio median	0,65260	0,63497	0,66549
	upper quartile	0,81166	0,82126	0,85675

Source: CRIF – Slovak Credit Bureau, s.r.o. and own research

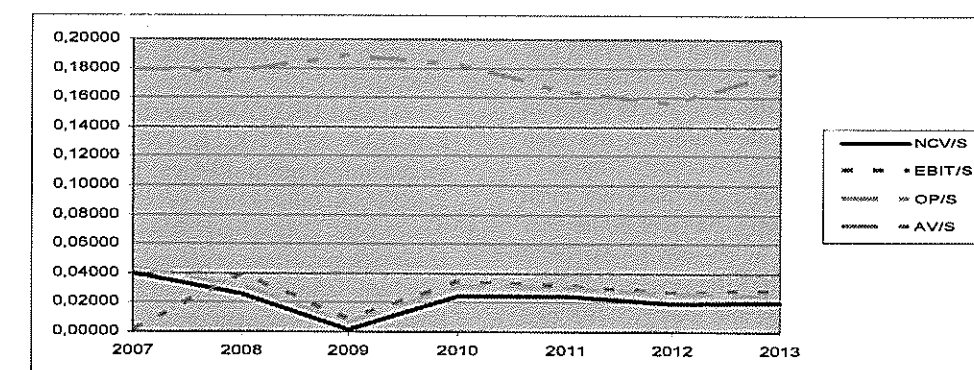


Fig. 1 Development of value created ratios in the industrial production companies – mental picture of the branch  
Source: CRIF – Slovak Credit Bureau, s.r.o. and own research

relationship with value of sales, meaning that we used efficiency ratios:

AV/S – added value/sales

NCV/S – new created value/sales

OP/S – operating profit/sales

EBIT/S – earning before interest and tax/sales.

In the table 1 we present development of four selected ratios for the chosen period of years 2007-2013, based on the mental picture of the branch. The graph (fig. 1) is related to the table 1. In the table 2 we demonstrate level of value created in the transformation process of Slovak industrial companies via quartiles, that enable more detailed insight into the situation in the branch. For a straightforward view herein we selected

only some years from the whole tested period: peak of the economic boom (2007), year of the deepest crisis of the Slovak economy (2009) and a year which is considered to be the recovery year of the after-crisis environment (2012).

Based on the data stated in the table 1 and graph 1 we can conclude the following:

1. The NCV/sales is significantly lower than the AV/sales. This means that beside purchased material, energies and services, value of production capacities (in depreciation) as well as contribution of the employees (in the price of the personnel) - take an important stake of the product value. The biggest difference is recognized – paradox – in the crisis year 2009. This confirms the reasonability of the ratio NCV as a supplement or alternative to the indicator AV.

2. Unlike the AV/sales, the NCV/sales better correlate with economic cycle (better reacts to the crisis with its decline and to the recovery with its growth), what is an impact of different price development of material and energies compared to the price development of outputs.

3. The indicator NCV/sales has its relevance compared to OP/sales, what can be seen mostly in the crisis year 2009, when the development of NCV/sales better reflects economic reality. Value of OP/sales indicator and its development is influenced, improved by extraordinary profits from sold assets or other accounting operations without any direct relation to the transformation process. Similar situation is with the indicator EBIT/sales, which reports totally different value compared to other indicators in the year 2007. This is caused by losses from financial activities, mostly effect of the exchange rate (it was in the period before Slovakia entering into the Eurozone) when the volume of exchange losses in the whole database was 1,7 times higher than the volume of exchange gains.

Having several parameters of positions in a group of values, quartiles, we can conclude (from the table 2) that NCV is very low in Slovak industrial production companies – the median in the year of economic boom 2007 does not even reach 3 cents in 1 euro of sales! Its level dropped even more significantly in the crisis year 2009 and on the other hand went up only little in the recovery year 2012. The fact that the lower quartile of this indicator is in all years negative means that more than quarter of Slovak industrial companies (in the year 2012 it is more than 2400 companies) does not create any new value in its transformation process!!! It can be also interpreted that the inputs do not gain value but are deteriorated in the transformation process. And all that despite the fact, that the AV/sales is positive. But its volume is not high enough to cover costs of other necessary inputs – depreciation and personnel costs. AV does not even react to the growth of the economy. Its level in the year 2012 does not reach the level in the crisis year 2009 neither in median nor in quartiles. The reason is hidden in the price increase of material and energy costs that cannot be copied by the price incline of outputs. It can be obviously watched in the growth of the purchased inputs/S. Reversed, the personnel costs / sales as well as depreciation / sales went down not only in the crisis year but also in the following year of a modest recovery of the Slovak economy.

#### Summary

To quantify the new value which is added to the value of inputs in the transformation process of an industrial company we propose to use the indicator NCV. Compared to the indicator AV, it better presents the fact that the value in the industrial production is created by three main inputs. On the other hand, compared to the total profit indicator it reflects more transparent also historical results of a company –

without any impact of extraordinary transactions. It can be considered to be more reliable source to predict future successes of the company and its stability. It is also perceived as better indicator for the reason that it does not include accounting items that are strongly subjective or can be booked in alternatives, meaning that it minimizes manipulating possibilities. In these terms it is more suitable indicator for measuring success of a company in line with the concept of the sustainable development and the corporate social responsibility entrepreneurship. However, even this indicator is not resistant to the manipulation of input and output prices in intra-group transactions so typical for group of companies (or holding).

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Veselovská Lenka, Zavadský Ján

## ANALYSIS OF MATHEMATICAL PROGRAMMING APPLICATIONS IN PRACTICE

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**Annotation:** This paper focuses on a current topic of production management and operations research which serves as a tool for small and medium enterprises to cope with pressure put on the by continuously changing market conditions and global economy itself. Paper presents results of research conducted on sample file of Slovak production companies. The main aim of this paper is to explore the extent of optimization methods utilization in production practice in Slovakia and to analyze possible relationship between company's size and used optimizing method. Representativeness of the sample file was confirmed by application of Pearson's chi-squared test ( $\chi^2$  - test) due to criterion of company's size. The results of this research have got an implication for business practice. In managerial practice companies have to deal with many different problems concerning their production. The majority of them can be resolved using linear programming. Our results provide an insight of current applications with stress on types of mathematical programming modifications used in optimization.

**Key words:** Mathematical programming; Process optimization; Company size; Operations management.

In the 21st century production companies face a severe competition which puts that much pressure not only on their quality requirements, but also on their production processes. It is the goal of every enterprise's operations management to ensure the best possible outcome and gain the competitive advantage which enables company to establish a desirable market position. However it is not a single set of managerial decisions which make it possible. A strive for excellence is a continuous process which does not only involve establishing a good market position, but it also focuses on implementing measures necessary to maintain it. One of the effective ways companies can achieve excellence is through implementing specific measures in order to achieve flexibility and cost minimization of their processes. One of the basic tools is linear programming.

The theoretical aspects of process optimization are broadly covered at various Universities all around the world and that includes application of various optimizing tools such as mathematical programming. These methods of mathematical programming are extensively taught at the universities; still there is a question if such methods are applied in the businesses and how successful they are. Thus, we consider the closer look at the Slovak reality to be extremely valuable. Another uniqueness of this topic lies in the fact that no such study has been conducted for the last 10 years in Slovakia.

One of the characteristics of optimizing tasks is the large amount of solutions matching the basic task conditions. The selection of a particular solution as the best to a problem depends on the overall objective that is implied in the statement of the problem. A solution which satisfies both the conditions of the problem and the give objective is considered to be the optimal one (Gass, 2010). The analysis of any given optimizing problem involves the transformation of necessary data into the set of equations.

Table 1  
Modeling possibilities of mathematical programming modifications in optimization

Type of programming	Characteristics:
Linear programming	- objective function and conditions are linear equations, - $\min c^T x: Ax = b; x \geq 0$
Non-linear programming	- objective function and conditions are non-linear equations, - $\min c^T x^n: Ax^n = b; x \geq 0$
Quadratic programming	- special type of non-linear programming, - objective function and conditions are linear or quadratic equations, - $\min c^T x^n: Ax^n = b; x \geq 0; n \in \{0, 2\}$
Integer programming	- objective function and conditions only contain integer numbers, - $\min c^T x^n: Ax^n = b; x \geq 0; x \in Z$
Stochastic programming	- based on the probability theory, - parameters are random variables, - mainly used for modeling optimization problems with a high degree of uncertainty and optimization of multiple objectives
Fuzzy programming	- variables and constants in objective function and conditions are expressed approximately – by intervals, - suitable for optimization problems where it is not possible to quantify precisely the variables and/or their values change frequently

Source: Sákal, Jerz (2003); Mangasarian (2004, s. 3-4); Mula et al. (2010, s. 380); Peidro et al. (2010, s.67-70).



Various authors (Sarker & Newton, 2008, Buresh-Oppenheim & Davis & Impagliazzo, 2011, Baker, 2011) evaluated the advantages and disadvantages of the mathematical programming utilization. They both consider the possibility of applying these methods for the long-term production planning to be the most significant advantage. Other advantages include the relative accuracy of these methods for the needs of certain companies. The use of mathematical programming in management assumes the creation of the objective function which describes the problem as closely as possible. The variables also enable their modeling as closely to the conditions in the company as possible. One of the main disadvantages of mathematical programming utilization is the fact that sometimes the linear function may not be the best option to model the processes and the situation may arise when company would have to resort to other methods of the operations research. Despite of this fact, the advantages of mathematical programming utilization in companies are far greater and more significant. The application of these methods can help companies solve many different problems.

In order to fulfill our goal we use data provided by Slovak production companies via survey which was conducted in a period between March 2014 and June 2014.

Our research sample file was created as a representative sample of the base file. This file consists of Slovak companies classified by the SK NACE classification as production companies. Moreover we took into account other criteria, mainly the size of company. We focused our research on medium-sized and large-sized companies, since we assume the higher extent of linear programming applications in these companies. The decisive criterion was set according to the European Standard No. 96/280/EC.

Research was carried out on a file consisting of 1300 Slovak production companies. The companies were selected randomly and chosen respondents were addressed by email. The questionnaire was fulfilled by 236 Slovak companies which represents 18.15 % return. In key companies we used method of structured interviews with company's representatives. Overall research sample consists of 248 Slovak companies.

Our questionnaire consisted of 16 questions divided into 3 categories. The first set of questions was focused on exploring various aspects of applications of optimizing methods. This section of questionnaire was fulfilled by all companies. The second part of questionnaire involved questions designed in order to gain data about linear programming utilization. This section was fulfilled only by companies which currently use these methods or have used them sometime in the past. Lastly we also added the socio-economic questions created in order to gain data about respondents. We asked companies to provide information about their size (the number of their employees), sector of economy and region where they operate.

Our sample file consists of 38.31 % large-sized companies with number of employees over 251. More

importantly 61.69 % of companies in our sample file have between 51 to 250 employees (Table 2).

Table 2  
Structure of sample file based on the size of company

Number of employees	Number of companies	Percentage
51 - 250	153	61.69%
over 251	95	38.31%
Total	248	100.00%

Source: Own elaboration.

With the use of SPSS Statistics and information about data base set we can verify the representativeness of the sample according to the size of the manufacturing company. Based on data from the Statistical bureau of the Slovak Republic we can characterize the data base set. In 2013 there were 70 370 manufacturing companies in Slovakia. The number of medium-sized companies (based on number of employees) was 1 641 and 627 were large companies. The verification of the representativeness of the sample is based on data for year 2014.

To verify the representativeness of the sample we used chi-square test. We set the null hypothesis which assumes that the sample is representative. The alternative hypothesis is an assumption of non-representativeness of the sample. From the mathematician point of view the hypothesis are formulated as:

$$H_0 = F(x) = G(x)$$

$$H_1 = F(x) \neq G(x)$$

Statistics testing in SPSS software is based on following formula (1):

$$K = \sum_{j=1}^r \frac{(n_j - m_j)^2}{m_j} \approx \chi^2_{(r-1)} \quad (1)$$

where  $K$  is Pearson statistics,

$r$  is line,

$n$  is overall frequency in the base set,

$m$  is measured frequency.

Consequently we find the critical value of  $K$  distribution for  $(r-1)$  degrees of freedom and selected level of significance  $\alpha$  from tables of critical values of chi square. However Chi square tests requires the fulfillment of two conditions:

- no interval should have zero frequency;
- a maximum of 20 % confidence intervals should have frequency less than 5 as discussed by Maloney and Byard (2013).

We have performed the test at a significance level of 95 %. If the critical value is lower than value of tested statistics, null hypothesis is rejected and alternative hypothesis  $H_1$  is accepted. Our calculated chi-square value was 21.171; it means that the null hypothesis can be accepted. Our sample is representative.

In the first part of the questionnaire we have obtained information about optimization of company processes in general, regardless of the used method. We have found out that 68.55 % of selected production companies are using optimization methods regularly (Table 3).

Table 3  
Application of optimizing methods structured by the size of companies

Application of optimizing methods	Size of company				Total
	Medium-sized companies		Large-sized companies		
Yes	81	52.94%	89	93.68%	170
No	72	47.06%	6	6.32%	78
Total	153	100.00%	95	100.00%	248

Source: Own elaboration.

The use of the optimization methods is equally divided among the positive and negative answer in the group of medium-sized companies. In the group of large companies we can mostly identify positive answers. 93.68 % of these companies use optimization methods regularly. Only 6 companies with more than 251 employees do not use any of the optimization methods (6.32 %). These findings indicate that the use of optimization methods in industrial production practice is proportionally dependent on the size of the company.

If the respondent does not use optimization method, we set out to find the reason of this decision. The most frequent answer was that company does not consider the optimization necessary. In many cases it was the fact that companies need to strictly uphold their production processes to customer requirements. Any changes including optimization of the production process is not possible in this situation. Another reason was the satisfaction of the company with achieved results and therefore no need to change or optimize anything. Several answers were connected to financial aspect, since many companies consider optimization very expensive. This is the fact that we consider as one of the major reasons for non-using optimization methods in companies.

If a company applies optimizing methods we further explored various aspects of optimization. Firstly we focused on what types of techniques these companies use. Based on our findings we can state that only 2 companies (0.8 % of all companies) use nonlinear programming. This implies that only 1.18 % companies which regularly optimize their processes chooses these methods. 8.82 % of companies which optimize their processes applies methods of dynamic programming. Network models are used by 21.76 % of these companies. No respondent uses sequence models. More than half of companies which optimize use simulation models. These companies compose almost one third of all respondents. Moreover we found out that 41.76 % of production companies which apply optimizing tools choose linear programming. This group

of companies represents 28.63 % of all production companies in sample file.

These results indicate the importance of mathematical programming utilization in practice. Consequently we consider a closer look at possible applications extremely useful. These provided examples draw an overview of various possible advantages of mathematical application in process optimization.

Avis, Umemoto (2003) describe how mathematical programming can be used in solving the cutting problems. In these cases the objective is to create an optimal cutting pattern which provides the best use of raw materials and minimizes waste produced as a byproduct. The problem of determining a cutting pattern also involves maximizing the sum of the profits of the cut items (Lodi, Monaci, 2003). The problem of cutting a given set of small rectangles (items) from large identical rectangular pieces of stock material has been regarded as a prototypical problem of how mathematical programming can be used in practice. The objective function of such tasks is to minimize the amount of raw material used.

Arguably the largest group of problems which can be solved with the use of mathematical programming is the allocation problems. Azapagic and Clift (1998) have successfully used mathematical programming in product life cycle assessment. It can be used to solve the problem of allocation in multiple-output systems in both the inventory and impact assessment phases. In addition mathematical programming can also provide the calculations of the environmental impacts and burdens. In the improvement assessment phase, it provides a systematic approach to identifying possibilities for system improvements by optimizing the system on different environmental objective functions. Ultimately, if the environmental impacts are aggregated to a single environmental impact function, mathematical programming optimization can identify the overall environmental optimum of the system.

Bertomeu, Bertomeu and Gimenez (2006) provide yet another example of how mathematical programming can become an essential tool for solving problems in practice. They proposed an alternative solution to some of the problems of agroforestry industry. These authors developed a simple mathematical programming model which enables small farmers to optimize the allocation of land and resources to different activities. The application of this model can not only help the farmers meet the criteria set by the law, but also to increase the financial incomes from their activities. The most important feature of this model is the fact that it enables the variability in different crop production, which is necessary due to the nature of this industry since small farmers' decisions are highly influenced by the prices on the market. Consequently it effects the land use allocation. Therefore the adaptability is also one of the key requirements for such mathematical programming model.

In order to provide more evidence that mathematical programming can be used in all aspects of companies' operations management, Fagoyinbo and

Ajibode (2010) demonstrate its use in personnel management. They focused on creating a mathematical model which would represent the allocation of resources for staff training. In practice this problem actually consists of two separate problems which are highly dependent on each other. Firstly the company has to find the optimal amount of resources to allocate for staff training and secondly it has to deal with the problem of scheduling such training. A mathematical programming model with duality can be used to provide a company with the optimal solution.

The calculations for the preparation of mixtures can also be solved using the mathematical programming. It enables companies to prepare a certain type of mixture using a determinated ingredients and recipe (Eiselt, Sandblom, 2010). Mathematical programming can also help to estimate the standard error of the chemical data, which is introduced as weights into the set of linear equations. This way, it is possible to assign the limits to the solutions which are obtained and to apply them in the mixing model. Satisfactory solutions to mixing problems can be obtained by minimizing the sum of absolute values of the individual substances. In consequence, the entire analysis can be handled as a mathematical programming problem with a considerable savings in time. On the other hand Banks (1979) warns that if the composition of a mixture involves different types of material, linear programming may not be enough to provide the best possible results. Therefore he recommends the use of two-stage optimizing process which would require the use of linear programming with combination of other methods.

Many authors also describe how mathematical programming can be used to solve problems in different aspects of routing optimization. Bley (2011)

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demonstrates the utilization of this method in finding the shortest path. In this case, the main goal is to find the routing lengths of each unique demand and to minimize the congestion over all links in the resulting routing. Bertsekas (2003) and Gass (2010) illustrate the use of mathematical programming in other transportation problems.

Guest et al. (2012) provide a special example of how mathematical programming is being used in managerial practice. They describe how a certain company built an entire operating system of their plant based on these methods. This involves daily optimization of scheduling processes, control processes, time and cost minimizations etc. They also describe some of the advantages that come with the mathematical programming utilization, which involve flexibility, simplicity, generality, both long and short term planning, incorporation of safety restrictions into business tasks, short-term period of achieving desirable solutions etc.

Moreover we cannot limit the possibilities of mathematical programming utilization only to the options described above. The limitations of its utilization are just in terms of needs of individual companies. Therefore we can state that mathematical programming can be used to provide solutions to a variety of different problems which companies encounter. Rajan et al. (2010) provide evidence to this theory. They describe another possibility of how mathematical programming can improve companies' processes, specifically the decision-making process. To strengthen their argument, they offer an example of mathematical programming utilization in supply chain management. They created a model for vendor selection based on the foundation of mathematical programming.

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Závodský Ján, Závodská Zuzana

## EFFECTIVE PERFORMANCE MANAGEMENT THROUGH KEY PERFORMANCE INDICATORS

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**Annotation:** This paper aims to who the critical set of selected key performance indicators attributes. Coming from the review of various literature, we defined four groups of attributes relating to the performance indicator: formal attributes, attributes of target value, informational attributes and attributes of evaluation. The whole set contains 21 attributes. Effective performance management is based not on maximum or minimum number of attributes, but on the same type of attributes for each performance indicator used in performance management system at both the operational and strategic level. The main findings are: companies use various financial and non-financial indicators at strategic or operational level; companies determine various attributes of performance indicator, but most of the performance indicators are otherwise determined; we identified the common attributes for the whole sample of companies.

**Key words:** Performance management system, Performance indicators (PI), Management control, Performance efficiency

## 1 Performance management

Flapper, Fortuin & Stook (1996) present a systematic method for designing a consistent performance management system to be used in practice where explicit attention is paid to the relations between the PIs. With a consistent performance management system they intended a system that covers all aspects of performance that are relevant for the existence of an organization as a whole. Such a system should offer management quick insight into how well the organization is performing its tasks and to what extent the organizational objectives are being obtained. The method consists of three main steps:

1. defining performance indicators,
2. defining relations between performance indicators and
3. setting target values or ranges of values for performance indicators.

Ferreira & Otley (2009) are describing the structure and operation of performance management systems in a more holistic manner. Coad, Harris, Otley & Stringer (2009) made a wider literature review in management control. Performance management system can be defined in many different ways. Závodský & Závodská (2014) describe it as a part of business process models. It could be also defined as a management control system (Bisbe & Otley, 2004; Chenhall, 2003; Chenhall & Euske, 2007; Otley, 1994). Another point of view on performance management is a strategic view, in literature mostly described by Kaplan & Norton (1996), Kaplan & Norton (2000), Kaplan & Norton (2004) and Gavurová, B., Šoltés, M. & Balloni, A. J. (2014). A critical view to their publications was presented by Otley (2008). Chenhall (2005) also refers to the Integrative strategic performance measurement system. In literature we are confronted with three important terms:

1. management control system,
2. performance measurement system and
3. performance management system.

From our point of view the type of that system is not important because we can find the performance

indicator in each one. Performance indicator is a subject of our research, especially its attributes that need to be defined. Another view to PMS is the excellence models that include requirements for measurement and evaluation of the performance efficiency. There exists a number of these models. Evans, Ford, Masterson & Hertz (2012) explore how to further improve and achieve higher levels of performance in accordance to the Malcolm Baldrige Award. Abdullah, Hamid, Mustafa, Husain, Idris, Suradi & Ismail (2012) present a conceptual framework for the development of a value-based total performance excellence model in organisations. This model signifies core values as a strategic component for an organisation to achieve total performance excellence and this extension integrates the intangible parts of performance measurement that have become a pivotal issue in many organisations. An interesting work is presented by Doleman, Have & Ahaus (2012). Their study deals with the moderating role of leadership in the relationship between management control as part of total quality management and business excellence in terms of purposive change. Their results also indicate that transformational leadership is the most influential factor in the relationship between the management control construct and purposive change. It is concluded that organisations are strengthened by a management control system which is applied in combination with an intensive management communication approach in a context of transformational leadership. Wang (2012) presents the results of a literature review which indicate the lack of an appropriate framework for evaluating organisational performance during crisis. He identifies key indicators and then he develops a multi-dimensional framework for evaluating OP during crises. Alfaro-Saiz, Carot-Sierra, Rodriguez-Rodriguez & Jabaloyes-Vivas (2011) describe how to use the information coming from applying the EFQM excellence model to analyse the perception that the members of an organisation have of it regarding their business vision. Saizarbitoria, Marimon & Casadesús (2012) present an empirical

study of the relationships between the categories of the EFQM model.

## 2 Performance indicators

At the beginning, we used an affinity diagram that helped us to clarify and to group various attributes of performance indicators (PI). Affinity diagram are sometimes called diagram of relatedness or cluster chart is a suitable tool for creating and organizing information related to selected problem. Affinity diagram helps to sort this information into natural groups and to clarify the structure of solved problems. The diagram was created by teamwork and we used intuitive thinking. The professional composition corresponded with the issues that are being dealt with. The first step consists of a problem definition: what are the attributes of the PI? To make the team focus their attention, we wrote down the solved problem in a visible place. The task of the team was in the use of brainstorming to collect the attributes that could help solve the problem. The effort was to gain as many ideas as possible because there is an assumption that the more ideas are found the higher probability of their helpfulness in problem solving exists. We were writing down all gained ideas to the cards. The report was created by the coordinator of the brainstorming session and every attribute was clearly formulated. After the discussion the cards along with their gained ideas were lay out in a large space. Then the ideas were divided into natural groups by their relatedness. This activity was realized by each member of the team individually. The stage of grouping was finished by the coordinator. The important step was to name the related ideas that could help to characterize each group. At the end we created four groups of attributes of the PI:

1. formal attributes of the PI,
  2. attributes of the PI's target value,
  3. informational attributes of the PI and
  4. attributes of the PI's evaluation. Each group consists of various attributes.
- Each set of attributes consists of 21 attributes of PIs.

## F: Formal attributes of the PI

## F1: Name of the PI

Each indicator should have a specific name which implies an area of the performance that is measured by this indicator. To make the indicator able to describe the context it is good to answer to the following question: How could we find out if the performance or strategic goal has been reached?

## F2: Relation to the business process (name and sign of the process)

This formal attribute refers to the connection of indicator to the specific business process.

## F3: Relation to the strategic goal

There is a possibility that an indicator is related to operational or strategic level in a PMS. If the indicator is used for the measurement of strategic goals it refers to measurement and evaluation of strategic performance. The fact if the indicator belongs to first (strategic) or second (operational) level depends also on

the utilization of the Balanced scorecard system. If this system was implemented in a company, it is obvious which indicators are part of the strategic set and which are part of the operational level of performance and what are the connections between them. If this approach is not used by company it is good to create a primary connection between strategic goals and indicators.

## F4: Strategic goal (name and sign of the strategic goal)

If there is a connection to strategic goal it is also necessary to name the strategic goal that is measured by the given PI.

## F5: Responsibility for the PI definition

If it is an operational level of performance and the indicator do not measure the strategic goal, the indicator can be defined by the process owner or by the line managers. If the indicator monitors the achievement of strategic goals, it is very important to follow specific principles of its definition. It means that the responsibility for the indicator definition usually lies with the top managers.

## T: Attributes of the PI's target value

## T1: Responsibility for the target value definition

It is very important to define the responsibility for the indicator definition but on the other hand from this definition it should be obvious where the responsibility for its target values definition lie. The target value is critical from the performance evaluation point of view and that is why its specification should be addressed to a specific employee.

## T2: Unit of the PI

After creating a suitable indicator and defining the target value, the indicator should be clearly quantified in exact measurement units.

## T3: The Period defined for the target value achievement

This characteristic determines the period on which the goal is set.

## T4: The Determinants of the target value definition

Each target value should be based on real expectations and the existence of the assumption of its determination. It usually comes from retrospective analyses and future state forecasting. There exists a row of analytical, comparative and planning methods of determining the target value.

## T5: Target value (number)

One of the indicator attributes is a goal and without target value the existence and monitoring of performance would hardly be realized.

## I: Informational attributes of the PI

## I1: Responsibility for data recording

The next responsibility is a determination for the employee who records the data necessary for measurement and evaluation of the performance. It is the third responsibility as an attribute of the performance indicator.

## I2: Frequency of data recording

The next informational attribute that deals with the creation and distribution of information in connection to the business performance is a frequency



of data recording. A dependable employee should clearly identify his responsibilities and frequencies of data recording to make the performance measurement realistic. If the collecting of data is automated, the frequency of data recording is defined by software.

13: Place for data recording (name and destination of data store)

14: Source of data

If there is no definite value assignment of an indicator, it is important to determine the input data from which the final values are achieved. It is characteristic especially to synthetic indicators and relative indicators. If the calculation is necessary, it should always be clear what the partial sub indicators that are used for final value calculation are.

15: Calculation formula

If the value of the PI is gained from various input values, the mechanism of final values calculation should be defined (if the calculation is not automated). In case of complex PI it is good to use automated calculation, because the evaluation of achieved performance is easier.

16: Automation of the calculation (manually/software)

In this case it is important to determine which parts are necessary to be automated and which parts need to be calculated manually.

E: Attributes of PI's evaluation

E1: Responsibility for the PI's evaluation

Responsibility for the evaluation is usually connected with the responsibility for defining the target values. It means that one of the managers is managing "his" indicators.

E2: Frequency of PI's evaluation

Employee who is responsible for the performance evaluation should know the frequency in which the performance of the selected process is evaluated by each indicator. If PMS is automated, it can automatically warn a responsible employee to evaluation need, or system is reporting a deviation.

E3: Visualization of the achieved performance

An important attribute of the PI that should be determined is a visualization of the performance results. It represents the selection of the method or the way of visualization of the results to the evaluator.

E4: Action in case of the performance gap

Situations that caused an insufficient performance can have specific causes with specific ways of solving them. For each PI there should be a defined procedure in the case that the performance is in either the "exceed" or "failure" interval.

E5: Warning signal for evaluator

The warning signal represents an alert to the person who is evaluating the achieved level of performance.

## CONCLUSION

The performance management system is a metasytem over all business processes at the strategic and operational level. Effectiveness of the various management systems depends on many factors. One of them is the consistent definition of each system elements. The main purpose of this paper was to define

the homogenous definition of attributes relating to the performance indicator as a basic element of effective performance management system.

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## CRITICAL SET OF THE PERFORMANCE INDICATOR ATTRIBUTES

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**Annotation:** The article shows the critical set of the performance indicator attributes. We carried out the empirical study. At the beginning, we used an affinity diagram that helped us to clarify and to group various attributes of performance indicators. The main research results we achieved are through empirical study. The empirical study was carried out in a sample of Slovak companies. The criterion for selection was the existence of the certified management systems according to the ISO 9001. Representativeness of the sample companies was confirmed by application of Pearson's chi-squared test ( $\chi^2$  - test) due to above standards. We performed an empirical study in Slovak companies certified to the ISO 9001. The sample selection was based on the assumption that certified enterprises use a system approach coming from the ISO 9001. A system approach should ensure the consistency of the whole quality management system. A system approach is a way of thinking, acting and solving problems from the complex point of view, in their internal and external context.

**Key words:** Performance indicators, Quality management system, Performance management system

## 1 Empirical study

The data for this empirical study was gathered using a structured questionnaire in the period from 2<sup>nd</sup> January 2013 to 30<sup>th</sup> March 2013. According to the Slovak Statistical Office, at the time of our research 16.4 % of all Slovak registered businesses were certified. The questionnaires were filled electronically, since they were publicly accessible. During the research period, 117 questionnaires were returned, 20 were discarded due to incomplete data. The final sample file used in this study consisted of 97 enterprises. Using the statistical testing method, the level of representation of the sample file of companies was confirmed by the application of Pearson's chi-squared test ( $\chi^2$  - test), which is also known as the 'goodness-of-fit' test. It tests a null hypothesis, stating that the frequency distribution of certain events observed in a sample ( $n_i$ ) is consistent with a particular theoretical distribution ( $np_i$ ) at the level of statistical significance ( $\alpha$ ) for the appropriate degrees of freedom ( $k-1$ ), where  $k$  is the number of fitted parameters. We used the following formula (Ostertagova, 2012):

$$\chi^2 = \sum_{i=1}^m \frac{(n_i - np_i)^2}{np_i}; \quad (1)$$

The calculation of the level of representation was done at the level of a statistical significance  $\alpha =$

0.05. The expected values of theoretical distribution were achieved from the certification bodies. The frequencies observed, and the expected, (theoretical) frequencies are shown in Table 1. The degree of freedom ( $k - 1$ ) is equal to three, since four categories of business organisation were defined.

The  $\chi^2$  value we achieved is lower than the critical  $\chi^2$  value at the level of statistical significance  $\alpha = 0.05$  for 3 degrees of freedom ( $4 - 1$ ), which in particular presents the value of 7.815 (value in statistical tables). Since  $2.97 < 7.815$ , we accept the null hypothesis and we state that the sample file of companies represents their theoretical distribution.

## 2 Analysis and discussion of results

In the introduction we set two research questions: (1) what are the attributes of the PI and (2) what is the minimum set of attributes of the PI that we could say about the consistent PMS? To answer to the first question we used an affinity diagram and compiled four groups of attributes, which are shown in Figure 1. Next, we looked for the set of minimum number of attributes of the PI, which form the basis of consistent PMS. We are not looking for a framework of PMS or specific indicators, and we are not telling about relations between different indicators. Our goal is to define the set of attributes, which should be defined for all performance indicators involved to a PMS.

Table 1

$\chi^2$ - test due to enterprises' size				
	$np_i$ [%]	$n_i$ [%]	$(n_i - np_i)^2$	$\chi^2$
Micro enterprises	10	7.12	8.29	0.83
Small enterprises	50	52.37	5.62	0.11
Medium enterprises	30	34.28	18.32	0.61
Large enterprises	10	6.23	14.21	1.42
$\square$				2.97

Table 2

Indicator attribute	Priority of the indicator attributes				
	Av. Wage	Min. value	Max. value	St. deviation	Order
T5: Target value (number)	12.71	11	16.00	1.70	1
E5: Warning signal for the evaluator	11.36	8	13.00	1.84	2
E3: Visualisation of the achieved performance	10.29	6	13.00	2.43	3
E4: Action in case of a performance gap	8.57	7	11.00	1.62	4
F3: Relation to the strategic goal	7.71	5	10.00	1.70	5
F2: Relation to the business process	6.71	5	9.00	1.38	6
F1: Name of the PI	5.86	4	8.00	1.35	7
T2: Unit of the PI	5.86	5	8.00	1.21	8
E1: Responsibility for the PI's evaluation	5.07	3	6.00	1.17	9
I1: Responsibility for the data recording	4.89	3	6.00	1.03	10
T4: Determinants of the target value definition	3.89	2	5.10	1.37	11
F5: Responsibility for the PI's definition	2.77	1	5.00	1.28	12
T1: Responsibility for the target value definition	2.56	1.3	3.40	0.68	13
T3: Period defined for the target value achievement	1.89	1	3.00	0.59	14
F4: Strategic goal (name and sign of the strategic goal)	1.74	1	2.40	0.41	15
I4: Source of data	1.61	1	2.10	0.45	16
I5: Calculation formula	1.52	0.9	2.00	0.45	17
I3: Place for data recording (name and destination of data store)	1.47	0.8	2.10	0.49	18
I6: Automation of the calculation (manually/software)	1.27	0.7	1.80	0.41	19
I2: Frequency of data recording	1.15	0.55	1.80	0.45	20
E2: Frequency of the PI's evaluation	1.11	0.6	1.80	0.41	21

To determine the most suitable attributes for the company we performed an empirical study on a sampling of 97 companies. In the first stage, the companies had to determine the most important attributes of the PI for them. They had to assign a weight to each of 21 attributes and the sum of the weight is equal 100. The results are shown in Table 2.

The research showed that the highest priority has specifying the target value, with the average value weight of 12.71. The second highest importance is a warning signal for evaluator with a weight of 11.36. Others in order are: visualization of the achieved performance, action in case of a performance gap, and relation to the strategic goal and relation to the business process.

Table 3

Indicator attribute	Occurrence of the indicator attributes in the sample companies		Order
	No.	%	
F1: Name of the PI	73	100.00	1
T2: Unit of the PI	73	100.00	2
T5: Target value (number)	73	100.00	3
I4: Source of data	73	100.00	4
T3: Period defined for the target value achievement	73	100.00	5
I5: Calculation formula	70	95.89	6
I3: Place for data recording (name and destination of data store)	68	93.15	7
F4: Strategic goal (name and sign of the strategic goal)	56	76.71	8
F3: Relation to the strategic goal	46	63.01	9
F2: Relation to the business process (name and sign of the process)	45	61.64	10
I6: Automation of calculation (manually/software)	40	54.79	11
E3: Visualisation of the achieved performance	39	53.42	12
I1: Responsibility for data recording	36	49.32	13
T4: Determinants of the target value definition	36	49.32	14
E1: Responsibility for the PI's evaluation	33	45.21	15
T1: Responsibility for the target value definition	31	42.47	16
F5: Responsibility for the PI's definition	29	39.73	17
I2: Frequency of data recording	19	26.03	18
E2: Frequency of the PI's evaluation	12	16.44	19

E5: Warning signal for the evaluator	10	13.70	20
E4: Action in case of the performance gap	6	8.22	21

In Table 3 are shown the results, where we asked the companies what attributes of the PI they have defined in their PMS. We did not ask about the consistency of the system if it meant the attributes the companies defined for all indicators. The first six attributes are: name of the PI, unit of the PI, target value (number), source of data, period defined for the target value achievement and calculation formula. This attributes are defined in most of the selected companies (from 95.89 % to 100 % companies). A very interesting finding is that it created absolutely different rankings of attributes. We can see the difference in the case of importance (weight) and in the case of real occurrence. For example, warning signal for the evaluator is the second most important attribute but in fact it is determined for some or all indicators only by 13.70 % companies. The similar result was also achieved in attribute E4 Action in case of the performance gap. This attribute is the fourth most important but in fact it is defined only by 8.22 % companies. This difference represents a gap between what attributes companies would like to have defined in a PMS and what attributes they really have. According to this gap we can define the minimum set of attributes. This minimum set of attributes should be applied by companies on all performance indicators that are included in a PMS. To determine the minimum set of attributes we set the following conditions:

1. weight of the attribute has to be at least 6,
2. attribute has to be defined at least by 95 percent of the companies.

Based on these criteria we defined the group of twelve attributes of the PI that represent the core of consistent PMS of any company and in any economy sector, independently on enterprise's size. The minimum set of indicator attributes for the consistent performance management system is:

- F1: Name of the PI
- F2: Relation to the business process
- F3: Relation to the strategic goal
- T2: Unit of the PI
- T3: Period defined for the target value achievement
- T5: Target value (number)
- I4: Source of data
- I5: Calculation formula
- E5: Warning signal for the evaluator
- E3: Visualisation of the achieved performance
- E4: Action in case of the performance gap

### CONCLUSION

The research results have got an implication for business practice. If companies applied the homogenous set of attributes of performance indicator it would increase the effectiveness of the PMS. Effectiveness can be increased by faster response to non-conformity or performance gap. Our proposal targets the perception of the PMS as a management metasystem independently of the industry, size of enterprises or products. We also suggest a minimum set of attributes of performance indicator toward a consistent PMS.

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## «ЭКОНОМИКА УЧАСТИЯ»: ПРОБЛЕМЫ РОССИЙСКИХ КОРПОРАЦИЙ

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**Аннотация:** Автором актуализирована проблема участия работников в управлении в российских корпорациях. Показано, что на современном этапе важным аргументом социального порядка на предприятии является демократизация собственности, солидарность при распределении доходов и расширение партисипативного управления, подчиненность капитала труду, развитие творческих способностей работников, адекватное материальное стимулирование, обеспечивающие качественное совершенствование внутрикорпоративных отношений

**Ключевые слова:** Корпорация, «экономика участия», социально-экономические отношения, партисипативное управление, социальное партнерство.

Спецификой современной системы экономических отношений становится всестороннее подчинение человека корпоративному капиталу. Это логическое выведение отражает объективный процесс воспроизводства таким капиталом нового типа работника, претендующего не только на достойные оплату и условия труда, но и на оценку его креативного потенциала, охрану здоровья, равные права и возможности трудоустройства независимо от пола, возраста, убеждений, а также получения пакета социальных льгот.

Трансформация отношений собственности и преобразовательные процессы в организации труда и управлении на производстве становятся существенным элементом социальной экономики, создание которой в последние годы определяет экономическая, политическая и социальная жизнь развитых стран. Удельный вес экономики участия в обществе определяется достигнутым уровнем социального партнерства на предприятиях, степенью распространенности предприятий, находящихся под контролем работников, а также самоуправляемых предприятий и производственных кооперативов.

Изменения, произошедшие в последние годы в нашей стране, вместо ожидаемого улучшения социально-экономического положения людей труда привели к их массовому обнищанию и на этой основе к резкой поляризации интересов наемных работников и собственников капитала. Царит интерес «временщика». Снижение заработной платы, сверхурочные работы без дополнительной оплаты, задержки заработной платы – лишь краткий, но имеющий массовое применение перечень инструментов для реализации такого интереса. Работников призывают «войти в положение» администрации или правительства, вынуждающих поступаться элементарными трудовыми правами вплоть до права получать заработную плату, не говоря уже о праве на достойную оплату труда. Тенденции трансформации социально – трудовых отношений связаны с глобализацией капитализма. В России эта тенденция проявилась с самого начала шоковых реформ, которые правомерно квалифицировать как глобально навязанные реформы. Социально-трудовые отношения

трансформируются в сторону расширения пространства эксплуатации, ее усиления, обновления и ужесточения ее форм. Все большая часть человечества (по прогнозам до 80%) оттесняется от участия в формировании средств и условий общественного развития, их использования для прогресса созидательной деятельности и «исключается» из общества. Особенно это касается характера преобразований в социально-трудовой сфере и в целом – исторического выбора России в пользу капиталистического строя [8].

Проблема участия работников в управлении в российской экономике проявляется через несформированное социально ответственное мышление. На многих российских предприятиях отсутствуют генеральные коллективные договора, определяющие локальные нормативы своих структурных подразделений и осуществляются минимальные социальные инвестиции.

Необходимо отметить и еще ряд проблем, препятствующих эффективному функционированию «экономики участия» в российском управлении, главными из которых являются:

- формальность вовлечения работников в управление наряду с реальными формами гражданского участия, позволяющими говорить о реальном контроле и партнерстве (производственные советы, совместные рабочие группы и пр.). Учитывая долю директората в акционерной собственности российских предприятий, можно констатировать, что в реальной действительности собственность трудовых коллективов формальна и экономически мало значима. Применительно к социально-трудовым отношениям это означает, что работники превращаются в «слуг» корпорации. При этом они подчиняются даже не столько конкретной корпорации, хотя возможно и такое, сколько корпоративному капиталу как конкретно-всеобщему содержанию современного общества. Таким образом, работник превращается в трудоголика, склонного к самоэксплуатации. При соединении этого превращения с возможностью социально-престижной творческой деятельности в рамках корпорации, плюс участие в собственности данной корпорации, а также современными методами управления для слоя наемных исполнителей



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## УПРАВЛЕНИЕ ЭКОНОМИКОЙ: методы, модели, технологии

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