Health Forecasting in Europe

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SUMMARY

The primary goal of this paper is to summarise the main health forecasting methods of the WHO, the OECD and the European Union. The paper is divided into four sections. First, the main concepts are clarified, and then the methods, tools and techniques are explained. Finally, the EU health strategy 2008-2013 and the health policy responses to the financial crises of 2008-2009 are characterised.
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Journal of Economic Literature (JEL) code: C10, C50, I18, I19

INTRODUCTION

Prediction of the future is an area of growing interest nowadays. The actors of planning, strategic management and decision making use a wide range of forecasting methods and tools for their work. Due to the development of scientific and technical background, a wide range of these methods and techniques, such as simple regressions, simulations, econometrics and complex forecasting methods, are available to decision makers. They want to know the effects of their actions; what type of influences the regulations, laws, programs and different plans will exert on the population. In health strategy planninng they can identify the disparities in health outcomes caused by different political decisions by means of forecasting techniques. The policy makers need information about key health trends and changes for the planning processes, such as the changes in tendency of disease burdens and health expenditures.

THE MAIN CONCEPTS OF FORECASTING

Planning, monitoring and controlling are the three key elements of management (Shipp 1989). Planning is the most important of these because the health services necessary for the population can only be provided through precisely defined health goals, plans and programs. Planning represents what is to be done and what decisions have to be made now to achieve the concrete goals in the future. Therefore, the decision makers need information about the future effects of their present decisions (Shipp 1989).

Based on the Encyclopaedia Britannica, economic forecasting is "the prediction of any of the elements of economic activity." "… they describe the expected future behaviour of all or part of the economy and help form the basis of planning." "… Formal economic forecasting is usually based on a specific theory as to how the economy works." "… economic theory may determine the general outline of a forecast, judgement also often plays an important role. A forecaster may decide that the circumstances of the moment are unique and that a forecast produced by the usual statistical methods should be modified to take account of special current circumstances. This is particularly necessary when some event outside the usual run of economic activity inevitably has an economic effect." (Encyclopaedia Britannica 2012: Economic forecasting)

According to Garrett (1999) forecasting means numerous realizable or probable futures of quite high degrees of probability.

Forecasting models consist of a large number of equations which are used to represent the relationships between different variables (Wall 2003). There is a wide range of forecasting methods which can be used by decision makers. We can forecast almost everything; therefore it is very important to follow five major steps in the forecasting process (Ozcan 2009):

1. to determine the goal of the forecast and to identify the necessary resources for the implementation,
2. to determine the time horizon of the forecast,
3. to select an appropriate forecasting technique and model in accordance with the financial resources of the organization and the complexity of the problem examined,
4. to conduct and complete the forecast: using the appropriate data and making the accurate assumptions based on the experience with a given situation. In forecasting the appropriate data means the availability of relevant historical

data and recognition of the variability in a given data set,
5. to monitor the accuracy of the forecast.

FORECASTING METHODS, TOOLS AND TECHNIQUES

We can find a large number of forecasting methods and tools in the literature. The following is an overview of the most important forecasting methods and tools used in health policy decision making.

The first categorisation is based on the work of Garrett (1999). This work provides a comprehensive study about the health forecasting methods and applications of futures techniques in health in general. Based on this work, the forecasting methods can be grouped into three main categories (Garrett 1999):

1. quantitative methods involving trends, projections and extrapolations;
2. qualitative and normative techniques based on subjective judgements and expert opinions;
3. multi-optional, causal or systemic methods.

This grouping is just one possible way of categorization. Table 1 shows the general relationship between the functions and tools but these relationships are not one-to-one relationships.

In Table 1 we can see that most of the functions (e.g. Soliciting experts and opinion, Developing consensus, Analysing, Scanning, etc.) can be performed with one of the numerous tools (e.g. Delphi method). A single function (i.e., Soliciting experts and opinion) often requires several different tools (e.g. In-depth interviews of experts, Genius forecasting, Surveys, Idea generation, etc.). Several tools and methods can be used to perform more than a single function.

In forecasting the following functions are used frequently (Garrett 1999):

1. Soliciting experts and opinion: The goal is to obtain ideas or judgements from people outside the core group. Expert judgements might be the oldest methods of forecasting. The experts are persons whose opinions considerably influence the expectations, their viewpoints are valuable within a particular sector, they possess a great deal of experience and their professional reputations are recognized by the professional community.
2. Generating ideas: The goal is to collect and imagine many alternatives. A creative way of thinking is formulated during most of the futures activities.
3. Developing consensus is composed of many expert opinions to make a decision.
4. Analysing: clarifying and explaining the structure, function and relationships of a system.
5. Scanning: observation and monitoring the future trends and new developments that may influence the future.
6. Projecting means "moving from the present into the future".
7. Making judgements means "weighing alternatives and determining their consequences".
8. Empowering stands for "helping people to shape their future".

Further characterisation and description of the tools and functions can be found in Garrett (1999).

Table 1
General relationship between functions and tools

Tools	Functions							
	Soliciting experts and opinion	Generating ideas	Developing consensus	Analysing	Scanning	Projecting	Making judgements	Empowering
In-depth interviews of experts	xxx			x	x	x	x	
Genius forecasting	xxx			x	x	x		
Surveys	xxx		x	x	x	x	x	
Delphis	xxx		xxx	x	x	x	xxx	
Brainstorming		xxx						x
Checklist		xxx						
Attribute listing		xxx						
Morphological analysis		xxx						
Idea generation	x	xxx					x	
TKJ method	x	xxx	xxx				x	x
Quality circles	x	xxx	xxx				x	x
National group method	x	xxx	xxx				x	
Colour-based tools	x	xxx	xxx				x	
Structural analysis matrix				xxx		x	x	
Actor interviews and surveys	x			xxx	x			
Role playing		x		xxx		xxx		x
Actor analysis and political mapping				xxx		xxx		
Simulation games		x		xxx		xxx	x	x
Time-space girds		x		xxx	x	xxx		
Futures wheels		x				xxx		
Statistical analysis				xxx		xxx		
Environmental scanning					xxx			
Trend impact analysis						xxx		
Cross impact analysis						xxx		
Guided imagery		x				xxx		xxx
Relevance trees and paths							xxx	
Cost benefit and risk analysis							xxx	
Multi-objective, multi-criteria decision-making							xxx	
System dynamics modelling				xxx		xxx		
Econometric modelling				xxx		xxx		
Optimisation modelling				xxx			xxx	

Explanation: xxx- major functions of this tool, x- one possible function of this tool.
Source: Garrett 1999, pp. 130-131

Another way of grouping is based on Ozcan (2009). Five categories of forecasting methods are determined by Ozcan:

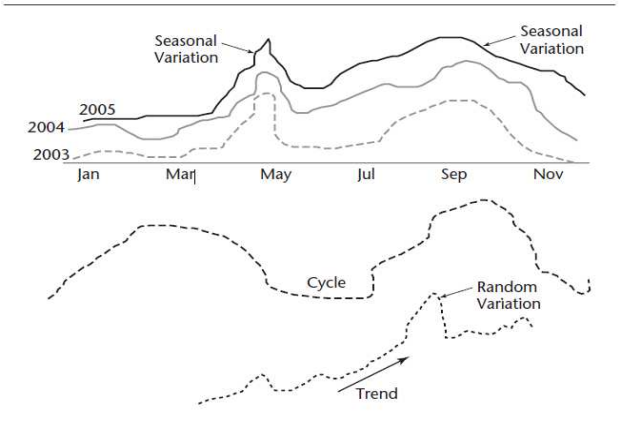
Judgmental Forecasts

Judgemental forecasts are based on subjective executive opinions, consumer surveys, mental estimates of the market, intuition and the opinions of the managers and the staff. Judgemental forecast methods include:

- the Delphi method, which obtains the opinions of managers and staff who have relevant knowledge;
- the jury of executive opinion model uses the consensus of a group of experts, often from several functional areas within a health care organisation, to develop a forecast.
- naive extrapolation involves making a simple assumption about the economic outcome of the next period or a subjective extrapolation from the results of current events.

Time-Series Approach

Mathematical and statistical techniques use historical data called time series. A time series is measured at regular intervals such as daily, hourly, weekly, monthly or yearly. A forecast which is based on time-series data assumes that future values of the series can be predicted from past values. The behaviour of the series in terms of trend, seasonality, cycles, irregular variations or random variations can be identified by analysis of time series.



Source: Ozcan, 2009

Figure 1. Characteristics of seasonal variations

Figure 1 illustrates these terms. As we can see, seasonality refers to short-term and relatively frequent variations caused by factors such as weather, holidays, and vacations. Health care facilities often experience weekly and even daily 'seasonal' variations. The regular (e.g. daily, weekly, monthly or annual) fluctuation of data is called a cycle. Cycles often behave like business cycles. Random variations are residual variations that are caused by unforeseen circumstances such as wars, accidents, etc.

Techniques for Averaging

These techniques make the smoothing of data possible. Using this technique, the forecast will be less variable than the original data set. Four techniques of averaging are described in this section: naive forecasts, moving averages, weighted moving average and single exponential smoothing.

Naive forecasts are the simplest forecasting technique. This method can be applied for a data set that exhibits seasonality or a trend. Its major weakness is that it cannot be used to make highly accurate forecasts because it simply projects the actual value of the previous period for any other period and does not smooth the data.

Moving average forecasts are updated by adding the newest value, dropping the oldest and then recalculating the average. The forecast 'moves' by reflecting the recent values. The average data points are fewer in number; therefore, the moving averages will be smoother, but less responsive to real changes. Health care managers have to face a problem in selecting and determining an appropriately reasonable number of periods for the moving average forecast. The selection depends on the number of the available periods as well as on the behaviour of the data.

The weighted moving average is similar to a moving average and – like it – is easy to calculate. All the values are weighted equally but the weighted moving average assigns more weight to the most recent values in a time series.

In single exponential smoothing each new forecast is based on the previous forecast plus a percentage of the difference between that forecast and the actual value of the series at that point, expressed as:

$$\text{New forecast} = \text{Old forecast} + \alpha\,(\text{Actual value} - \text{Old forecast}),$$

where α is the smoothing constant, expressed as a percentage of the forecast error. (Ozcan 2009)

Techniques for Trend

Data trends can be determined from time series. "Trend is a longer run direction of change which can be seen in time series data. A clear trend can be used to predict some future changes." (Wall 2003: 311)

Kerékgyártó et al. (2007) identify two basic types of trend methods: (1) moving averages and (2) analytical methods. Analytical methods include the following: linear function, exponential function, hyperbolic and logistic functions.

According to Ozcan (2009), a trend is a gradual, long-term movement and it can be linear or non-linear

(Ozcan 2009). Techniques for trend are further grouped by Ozcan (2009) in the following way:

Linear regression as a trend line method is often used for describing trends in health care data. The independent variable *x,* takes a value in time and is shown as *t*, and the equation is represented as:

$$y = a + b \cdot t,$$

where y = the predicted (dependent) variable, t = the predictor time variable, b = slope of the data line, a = value of y when t is equal to zero.

Trend-adjusted exponential smoothing can be used when a time series exhibits a trend. If the data exhibits a trend, simple smoothing forecasts can reflect it accurately. Trend-adjusted smoothing would be preferable to simple smoothing if the health care manager detects a trend in the data after the graphing. A single exponential smoothing with trend (SEST) forecast has two components: smoothed forecast (SF) and trend (T). The formula for SEST for the next period, $t+1$, can be written as:

$$SEST_t = SF_{t-1} + T_{t-1},$$

where

$$SF_{t-1} = F_{t-1} + \alpha (A_{t-1} - F_{t-1}),$$

the previous period's forecast + smoothed error, and

$$T_t = T_{t-1} + \beta (F_t - F_{t-1} - T_{t-1}),$$

i.e., the previous period's trend + smoothed error on trend.

Techniques for Seasonality

The analysis of seasonal variations is a very important factor in planning. Seasonality plays an important role in the planning capacity of systems. Seasonal variations mean daily, weekly, monthly, or other regularly repeated movements (upward or downward) in a data set. Seasonal variations in a data set deviate from the average series value. Seasonality models can be either additive or multiplicative models. In the additive model, seasonality is expressed as a quantity, in the multiplicative model as a percentage of the average amount. The seasonal percentages are referred to as seasonal indices. The use of the multiplicative model is more frequent than that of the additive model. If time series data encompass trend and seasonality, the health care manager can decompose the seasonality by using seasonal indices to get a clearer picture of the trend. Ozcan (2009) distinguishes the following seasonal indices techniques: quarterly indices technique, monthly indices technique and daily indices technique, employing seasonal indices in forecasts.

Accuracy of Forecasts

According to Ozcan (2009), the complex nature of most variables makes correct forecasting regarding the future values of the previously mentioned variables almost impossible. In his opinion, errors may be caused by using an inadequate forecasting model or an improperly used technique. Forecasting errors can occur if they are caused by irregular variations beyond the manager's control, and even random variations in data can have the same effect. A forecast error equals the actual value minus the forecast value:

$$\text{Error} = \text{Actual} - \text{Forecast}$$

Two aspects of forecast accuracy have the potential to influence a choice between forecasting models. The first one is the historical error performance of a forecast model and the second is the ability of a forecast model to respond to change. Two commonly used measures of historical errors are the mean absolute deviation and the mean absolute percent error.

Forecast Control

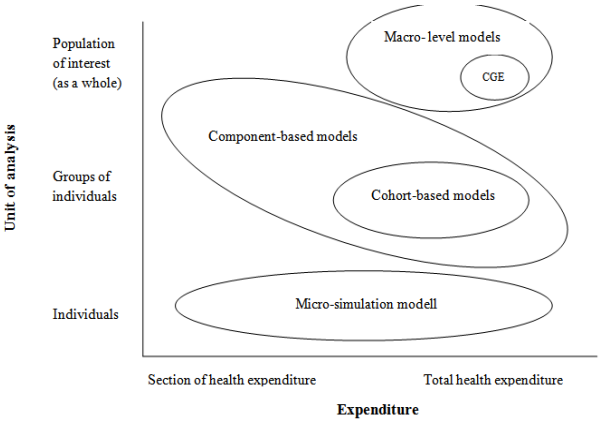
A health care manager must ensure that the forecasting methods function properly and provide consistent results. A variety of reasons can lead to the forecasts getting out of control, such as changes in trend behaviour, cycles or new regulations that affect demand. (Ozcan 2009)

AN OECD COMPARATIVE ANALYSIS OF FORECASTING METHODS

This study reviewed 25 models that were developed for health policy analysis in OECD countries by governments, research agencies, academics and international organisations. Working groups identified the following classes of models: micro-simulation models, component-based models, macro-level models and combined models (Astolfi et al. 2012a).

This comparative analysis identifies and classifies current health expenditure forecasting methods and presents the advantages and disadvantages of the methods. Based on Astolfi et al. (2012a), forecasting models are considered as either predictive or policy-oriented. Predictive accuracy is reasonably feasible over a short period of time where the probability for policy intervention to alter the future course of events is low. The aim of policy-oriented health expenditure forecasting models is to inform policy makers about when and how to implement reforms and what effects those reforms are likely to have. Most of the models that the study reviewed use a long-term horizon (from 30 years to 75

years) and only a few models use a medium-term time horizon (from 5 years to 15 years).



Source: Astolfi at al, (2012b):121

Figure 2. Classes of forecasting models

In Figure 2 we can see the classes of forecasting models that are based on OECD research. The forecasting models can project health expenditure on the levels of individuals, groups of individuals or a community. At the same time models can focus on specific sections of health expenditure, such as public expenditure, social security, private insurance and others. The higher the level we make analyses at, the higher the level of aggregation is, as shown by Figure 2.

We can distinguish three main categories of health expenditure forecasting models based on the level of aggregation of the analysed units and the level of detail of health expenditure to be projected.

Micro Simulation Models

Micro-simulation models simulate different policy scenarios related to prevention, treatment and the organisation and financing of care. They also examine results forecast by different characteristics included in the model, such as diseases, age-groups, providers or treatments. For the analysis the units are provided by the individuals. Individuals can be aggregated into policy-relevant groups and analysed using relevant indicators, such as inequality and poverty indices.

Component-Based Models

Component-based models are the most dominant group. These models forecast health expenditure by component, such as financing agents, providers of care, goods and services consumed, groups of individuals or some combination of these groups. The models often consist of different layers when expenditures are grouped by financing agents. Each layer may use a different technique to project a sub-component of health expenditure. A major sub-class of component-based models is represented by cohort-based models where individuals are grouped into cells according to several key features. The stratification of population can be made based on the interest of the population, generally into five-year age cohorts.

Further classifications can be made by sub-dividing the cohorts according to other commonly-used attributes (such as gender, health status, and proximity to death). These models are often identified with actuarial models or cell-based models. In such models, "The cell identifies the subcategories into which each cohort is divided. Each cell is associated with an average cost of health goods and services. Actuarial projections allow predicting the likely evolution of the population and therefore the future number of individuals included in each cell of the model. Future health expenditure is determined by multiplying the average costs by the projected number of individuals included in each cell." (Astolfi et al. 2012a: 3)

Cohort-based models are getting popular over the years because their implementation and maintenance tends to be simple, it is relatively inexpensive and the impact of policy changes can be assessed easily by simply modifying the policy parameters. They need less data then micro-simulation models.

Macro-Level Models

These types of models focus on forecasting the total health expenditure and include analyses of time-series and cross-sections of aggregate indicators. These models are the most appropriate to use for short-term projections in case of clear and uninterrupted trends and in the absence of structural breaks. Astolfi et al. explain that "Econometric regression analysis is used to fit time-series data. Projections can be based on pure extrapolation of the statistical models fitting the data or they can be based on the projected values of the critical explanatory variables, whenever included." (Astolfi et al. 2012a:3)

This class of models includes computable general equilibrium (CGE) models, which are a special category of macro-models. These models attempt to connect health expenditure growth to its impact on the overall economy and identify what the long-term determinants of medical spending growth are. Macro-level models require the least data because these are complex models and require strong assumptions about the behaviour of individuals, firms and governments.

Combined-models are a new approach to forecasting models. These models provide more improved tests of policy scenarios to understand the broader social and economic implications of policy changes. (Astolfi et al. 2012a)

DRIVERS OF HEALTH EXPENDITURE

The main determining factors of the drivers of health care expenditure are summarised by the OECD study. The study shows that the main determinants of health

expenditure growth vary according to the time horizon of the projection (Astolfi et al. 2012a):

1. In the short term, expenditure growth is strongly linked to government budget decisions.
2. In the medium term, technological changes play an important role in explaining growth.
3. In the long term, risk factors such as obesity and changes in the prevalence of chronic diseases play an important role in explaining growth.

The determinant factors of health spending growth can be grouped into three categories (Astolfi et al. 2012a):

1. demand-side factors, such as demographic factors and health status, income, consumers' behaviour,
2. supply-side drivers, such as technological progress, changes in treatment practices, health prices and productivity,
3. regulatory factors, such as institutional characteristics of health systems and their financing.

THE EU HEALTH STRATEGY 2008-2013

The European Commission adopted a new Health Strategy in 2007, published in Together for Health: A Strategic Approach for the EU 2008-2013. This strategy provides a strategic framework that deals with the main questions and problems regarding health in Europe. The strategy is based on a value-driven approach that is based on understanding health and the health systems. As we know, there is a relationship between the health status of the population and economic growth, therefore, the health factor is a main driver of economic growth.

The main goal of the EU Health Strategy (2008-2013) is to give direction to future EU activities in health. Member States have the main responsibility for providing healthcare to European citizens and defining health policy. The role of the European Commission (EC) is to promote cooperative action, particularly relating to health threats and issues with a cross-border or international impact and the prevention of illnesses.

The EU's principal action in the area of health started in the 1990s. "Initially, the EU worked on eight sectoral health programmes that addressed individual issues such as cancer, communicable diseases, rare diseases, injury prevention, pollution related diseases, drug prevention, and health promotion and monitoring." (PHEIAC 2011:20)

In 2000, the European Commission adopted the first public EU Health Strategy for the period 2003-2007. In 2006, the Commission acknowledged that Europe was facing new health challenges relating to globalisation, innovative technologies, an ageing population, new disease threats, and lifestyle-related illnesses that required a new approach. A new strategy dealing with this issue was presented in 2007 in a White Paper (2008-2013). Within this framework, the Strategy was structured around four core principles and three strategic objectives. (PHEIAC[1] 2011)

EU Health Strategy's Principles

Principle 1: A strategy based on shared health values that mean universal access to good quality care and respecting the social values and norms of security and solidarity.

Principle 2: "Health is the Greatest Wealth", which means a healthy population is a requirement for economic productivity and prosperity. Therefore, it is important to understand the economic relationships between health status, health investment and economic growth.

Principle 3: Health in All Policies: Community policies play an important role in the population's health in general. Therefore, it is important to develop synergies with other sectors such as environment policy, social policy, tobacco taxation, regulating pharmaceuticals and food products, trade, ICT, etc. in order to achieve the stipulated objectives.

Principle 4: "Strengthening the EU's Voice in Global Health": maintaining collective leadership in global health in order to achieve improved health outcomes for EU citizens and others plays a key role in EU Strategy.

The health of the population plays a vital role in EU policies. The objective of the EU is to reposition health in all policies in a global context. The strategy focuses on three strategic issues:

Objective 1: "Fostering good health in an ageing Europe"

This includes actions that promote health and prevention of diseases through tackling issues such as nutrition, physical activity, alcohol, drugs, tobacco, environmental risks, genetic disorders, and injuries in all settings to help promote a healthy and productive population that ages healthily.

Objective 2: "Protecting citizens from health threats"

The EC will also focus on new challenges coming from globalisation, such as pandemics, global biological incidents, climate change and bioterrorism.

Objective 3: Supporting dynamic health systems and new technologies

New technologies can help to improve the prevention of illnesses, delivery of treatments, and support a shift from hospital care to prevention and primary care, they can lower the costs of the healthcare system, facilitate patient mobility, etc.

[1] *Public Health Evaluation and Impact Assessment Consortium*

Action Areas of EC Outputs

Table 2 shows the most common EC action areas in relation to the EU Health Strategy. These actions are based on objectives or principles.

Table 2
EC outputs by action area (2008-2010)

Action area	Objective or Principle under which the majority of actions in this action area fall	Number of actions	% of total
Health information	Principle 1	16	11.7
Disease (communicable, pandemic)	Objective 2	13	9.5
Disease (common, rare, chronic)	Objective 1	10	7.3
Bilateral health governance	Principle 4	10	7.3
Global health governance	Principle 4	8	5.8
Health technology/e-Health	Objective 3	7	5.1
Health in all policies	Principle 3	6	4.4
Patient safety	Objective 2	5	3.6
Nutrition and PA	Objective 1	5	3.6
Tobacco	Objective 1	5	3.6
Alcohol	Objective 1	4	2.9
Environment/climate change	Objective 2	4	2.9
Health inequalities	Principle 1	4	2.9
Pharmaceuticals	Objective 3	4	2.9
Medical devices/medicines	Objective 3	4	2.9
Health economics	Principle 2	3	2.2
Health workforce	Objective 3	3	2.2
Transport	Principle 3	3	2.2
Healthy ageing	Objective 1	2	1.5
Mental health	Objective 1	2	1.5
Health security	Objective 2	2	1.5
Agriculture	Principle 3	2	1.5
Organ donation/ transplantation	Objective 1	2	1.5
Regional health governance	Principle 4	1	0.7
Children and young people	Objective 1	1	0.7
Energy	Principle 3	1	0.7
CBRN	Objective 2	1	0.7
Patient rights	Principle 1	1	0.7
Health services	Principle 3	1	0.7
Injury prevention	Objective 1	1	0.7
Other	Various	6	4.4
Total		137	

Source: Commission of the European Communities (2007)

HEALTH POLICY RESPONSES TO THE FINANCIAL CRISIS

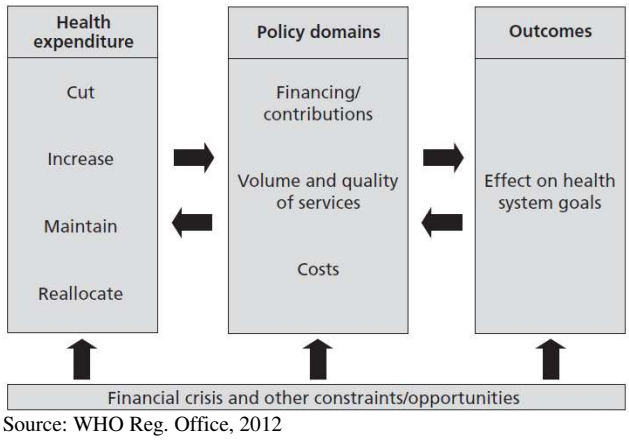
The crisis has had a substantial negative effect on the financial resources of the health system but at the same time the demand for health services increased. In this period three main challenges were identified by the policy makers due to the economic shocks (WHO Reg. Office, 2012):

1. The decision makers require more predictable sources of revenue for their planning and they need more accurate projections. The investments, the budgets and the procurements of goods and services, the human resources and the potential expenditures should be determined in a more reliable way. The unexpected effects of economic shocks endanger sustainable health systems because of the elimination or significant reduction of the revenue the demand for financial resources dramatically increases.
2. The health system is a dynamically developing industry; therefore, its needs for sources of revenue are increasing rapidly. For both the individuals and the society, health has become the most important issue. However, economic growth depends on the general health status of population, so the decision makers have to take into consideration the determinant factors of health and should promote those action plans that support our health. The determinants of health are summarized by Dahlgren and Whitehead (2007). Hence the financial resources for these action plans should not be reduced even if the resources are scarce.
3. An unequal distribution of resources would injure the essential social norms and damage the equitable and reasonable access to care and quality of care; it would increase the costs and expenditures in the long term that would aggravate the existing budgetary deficit and contribute to health disparities.

International organisations such as the WHO, OECD and the European Union have adopted general guidelines for the member states related to health policies.

WHO's Regional Committee for Europe

In 2009, the WHO's Regional Committee for Europe adopted a resolution (EUR/RC59/R3) and drew the attention of the Member States to the need to continue to protect and promote universal access to effective health services during a time of economic crisis.



Source: WHO Reg. Office, 2012

Figure 3. Health policy responses to the financial crisis and other economic shocks

Figure 3 shows the possible health policy responses to health system shocks. In the framework of the WHO three main dimensions were determined which can be seen in Figure 3: health expenditure, policy domains and outcomes. In the first dimension when the health decision

makers were confronted with an economic shock, a decision had to be made to change the rate of public expenditure on health.

Secondly, the policy tools for changing the expenditure levels can be classified into three main policy domains:

1. The level of contributions for publicly financed care: national health budget, social insurance contributions, aspects of fiscal policy such as allocating taxes for health, private expenditure on health and the private health insurance fee, etc.
2. The volume and quality of care financed by the public: the statutory benefits package, population coverage, waiting times, etc.
3. The cost of care financed by the public: the price of medical goods, health worker salaries, payments to providers, overhead costs, etc.

Thirdly, the impact of any proposed reforms for the desired health goals must be taken into account by the policy makers in the course of planning. Several goals can be identified by the decision makers, such as improving health outcomes, ensuring equal access to health services, maximising health gain from given resources and avoiding waste, and providing reliable information about features of the health system such as benefits, costs and quality.

The key message of the WHO work is that the policy makers have to handle the policy tools carefully. A difference has to be made between the policy tools that promote health system goals and those that put the health system at risk. If unexpected events require politics to reduce the financial resources and public spending on health, the negative effects on the health system operation and performance must be minimised and reforms must be carried out that will increase the efficiency of the health system in the long term.

DISCUSSION

Encyclopaedia Britannica and the literature related to health economics clearly define the terms of forecasting and economic forecasting. All forecasting activities are connected somehow with planning processes, policies or decision making. There are several forecasting methods, tools and techniques that are available for decision makers. Depending on which are applied by policy makers, they will influence the scenarios and decisions. There is a growing demand for more reliable forecasting; therefore, there is a need to identify the main determinant factors of health and to take economic, environmental, technological, social and geopolitical risks into consideration (World Economic Forum 2012). The rapid development of computer technology and the acceleration of information and data transfer also have had positive effects on the reliability and accuracy of forecasting. Qualitative forecasting methods and tools have increasingly greater importance among the forecasting methods.

The WHO, the OECD and the EU place great emphasis on improving the health of the society. Since the European countries have different historical backgrounds, cultural values, economic progress etc., the focus of policies can be different. The EU goal is to improve health in all policies with several tools and action plans and to provide guidelines for policies to achieve better health outcomes.

The global financial crisis has set a new challenge for the decision makers and the use of forecasting methods has become appreciated. At the beginning of the crisis the EU composed a strategy focused on health improvement because it is an important driver of economical growth. The health sector is a dynamically developing industry; therefore it requires ever more financial resources. The health policy responses to the crisis were examined closely by the WHO and produced the following results. In the countries which had financial reserves, a clear health strategy and well-defined long term health goals, the health system's sustainability and the health system goals were less damaged by the economic crisis. Estonia was mentioned as an excellent example of the countries well-prepared for the economic crisis.

Another key message of the WHO work is that the policy tools have to be used more carefully by policy makers. Distinction must be made between the policy tools that promote health system goals and those that risk the health system. If the decision makers face an unexpected shock, they must consider several policy options for the short and long terms. They should choose measures which promote the efficiency of the health system and health status in the long term. Furthermore, the goal of the decision makers is to take measures which avoid or decrease the negative trends and improve the positive effects in the long term.

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Assessing the Importance of Project Management Soft Competencies in an IT and Telecommunication Company

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SUMMARY

R&D projects in the IT and telecommunications sector have some special characteristics and managing these requires specialist knowledge. In these projects (as is true in general also) not only project management knowledge and professional expertise, but also soft competencies play a major role. The question is which soft competencies play what role. It is a great challenge to identify and prioritize the required industry-specific soft competencies related to project management. The aim of this research is to identify the key soft project management competencies and furthermore to highlight those competencies that require development. This paper will present findings on the most important soft competencies.
Keywords: project management, competencies, skill needs, IT projects
Journal of Economic Literature (JEL) code: M15, M53, M54, O15, J24

INTRODUCTION

Project management has been called both an art and a science. The necessary skills are common to both. There is no question that the best project managers are also outstanding leaders. They have vision, they motivate, they bring people together, and, most of all, they accomplish great things. These specific characteristics are consistently found in successful projects in every industry (Verzuh, 2008).

A project manager applies knowledge, skills, tools, and techniques to project activities so as to meet the project requirements. A project manager's job is essentially one of integration. It falls to a project manager to maintain equilibrium between the various project knowledge areas like human resource, risk, communications, procurement, scope, time, cost, and quality and project processes like initiating, planning, executing, Controlling, and Closing (Gokhale, 2005).

As this paper examines IT and telecommunication projects, it has to take into consideration the requirements that technology project managers need to fulfill (Murch, 2011):

- Define and review the actual business case and requirements by regular reviews and monitoring to ensure that the client receives the system that they want and need.
- Initiate and plan the project by establishing its format, direction, and base lines that allow for any variance measurements and managing change.
- Establish partnership with the end users, work with project sponsors and other management levels to establish the progress and direction of the project by achieving goals, reaching targets, solving problems, and mitigating risks.
- Manage the technology, people, and change in order to achieve goals, reach targets, and deliver the project on time and within budget.
- Manage the project staff by creating an environment conducive to the delivery of the new application in the most cost-effective manner.
- Be able to manage uncertainty, rapid change, ambiguity, surprises, and a relatively undefined environment.
- Manage the client relationship by using an appropriate, direct yet complete and formal reporting format that complements a respectful and productive relationship.
- Drive the project by leading by example and motivating all concerned until the project accomplishes its goal.

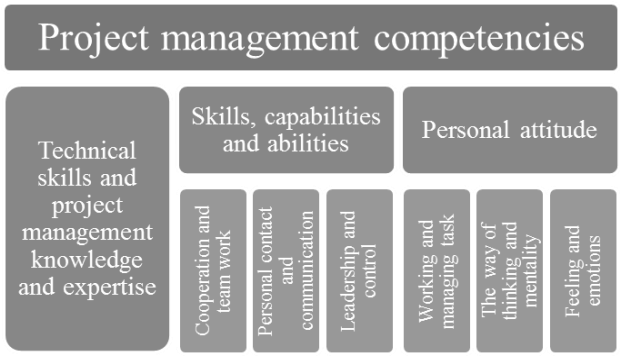
PROJECT MANAGEMENT COMPETENCE ASSESSMENT FRAMEWORK

One of the first challenges of this project is the development of a shared global understanding of what constitutes competence. Competence is a term which is widely used but which has come to mean different things to different people. In my opinion the definition from Parry (1998) is a generally acceptable definition, and the reason I have chosen this definition is that has been applied to a project management context. Parry wrote that competency could be described as "a cluster of related knowledge, attitudes, skills and other personal characteristics that …

- affects a major part of one's job,
- correlates with performance on the job,
- can be measured against well-accepted standards,
- can be improved via training and development" (Parry, 1998:60).

A competency is what a successful employee must be able to do to accomplish desired results on a job. Competencies are built up over time and are not innate. It typically takes experience on the job to build competencies. Knowledge, skills and abilities, by contrast, might be brought into the job by entry-level employees (Crawford, 1997).

After examining several types of competency models, systems and groupings (Deák, 2006; Dulewicz and Higgs, 2005; Görög, 2007;Murch, 2011; Pinto, 2009; PMBOK, 2011; Turner, 2007;), I have decided to use the following division. The following figure shows the classification of the project management competencies which has been used in the research work.



(author's own work)

Figure 1. Project management competencies

Personal Attitude and Skills, Capabilities and Abilities

IT project managers must be able to motivate and sustain people. Project team members will look to the project manager to solve problems and help with removing obstacles. IT project managers must be able to address and solve problems within the team as well as those that occur outside the team. There are numerous ways, both subtle and direct, in which project managers can help team members. Some examples include the following (Murch, 2011):

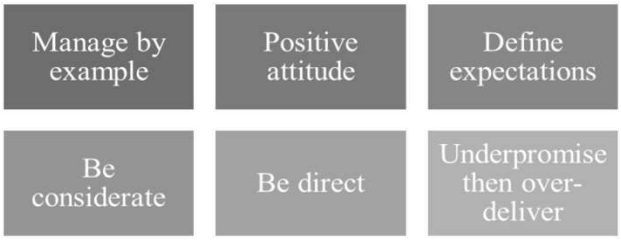


Figure 2. Main considerations for managing IT projects

IT project managers need other key skills besides those that are purely technical to lead and deliver their projects successfully. A good project manager needs to understand many facets of the business aspect of running a project, so critical skills touch on expertise in the areas of organization, communication, finance, and human resources. The following are examples of the management topics used in training efficient IT project managers (Murch, 2011):

Figure 3. Examples of the management topics used in training efficient IT project managers

Technical Skills and Project Management Knowledge

There are two schools of thought about the level needed for technical skills. Some project managers prefer to have little technical knowledge about the projects they manage, preferring to leave the technical management to other junior managers, such as programming managers or network managers. Others have detailed technical skills of computer languages, software, and networks. There is no hard and fast rule. It really depends on the type and size of projects, their structure, resources available, and the project environment (Murch, 2011).

As with all employees, project managers should have the technical knowledge and skills needed to do their jobs. If managers lack these skills, training is one option, and being mentored or coached by a more experienced

individual is another. Senior management should ask the question themselves "Do your project managers need more technical skills than they already possess?"

In larger complex projects, such as systems integration projects or multiple-year projects, there are frequently too many complex technologies for the project manager to master. Technical training that provides breadth may be useful. In smaller projects, the project manager may also be a key technical contributor. In this case, technical training may enhance the abilities of project managers to contribute technically, but it is unlikely to improve their management skills. One thing is abundantly clear — the project manager is ultimately responsible for the entire management of the project, technical or otherwise, and will require solutions to the technical issues that will occur.

RESEARCH METHODOLOGY AND ASSESSMENT RESULTS

A questionnaire was designed consisting of 8+99 statements. The first part of the survey has 8 general or introductory questions about project management experience, the field of the projects, etc. The second part contains 99 statements and each statement represents a soft competency required for managing projects. I have used the six competency groups (see Figure 1), some of them divided into two or three subgroups, in order to help the project managers to see the whole context.

Every competence has to be assessed through answering two questions. The first question is "How typical is the competence in your field?" and the other one is "In your opinion how important is the competence in your field?" Every project manager evaluated each competence from two points of view on a one-to-seven scale.

I have evaluated the survey in three ways. In this paper I will introduce the first, in my opinion the most interesting one. This means I have transferred the results into coordinates, using the standardization method.

A total of 21 project managers who are working on hardware, design and maintenance projects at the examined IT and telecommunication company answered the questionnaire, evaluating each competence in terms of its importance and typicality. It is an online survey and the project managers were asked by the company management to complete the survey. Thus I was able to compare not only the answers of the project managers but also the two dimensions in each sector. The competencies are classified into six groups, so I was able to compare the competency groups also with each other. Another part of the evaluation of the results is factor analysis, so I have identified competency clusters as well. The coordinate system contains the following quarters:

- Important and typical,
- Not typical but important,
- Not typical and not important,
- Not important but typical.

In the first quarter are found the competencies which are both important and typical according to the project managers. The second quarter contains the important but not typical or possessed competencies, so this is the most interesting quarter because these competencies need to be improved, according to the project managers. The third quarter contains competencies which are neither important nor typical according to the project managers. The fourth quarter contains competencies which are rated as not important but typical by the project managers. Since this research is based on self-assessment, I assumed that the project managers would mark competencies 'important' which were typical in their field, and give a low grade for importance in the case of less typical competencies. All of the 99 competencies can be seen in the following figure (Figure 4). Most of the competencies are in the first and third quarters, but there are also some of them in the second and fourth quarters. The dotted curve shows my expectation; before the study results were analysed. My expectation based on the fact, the survey is a kind of self-assessment, so people often evaluate their competencies as important, and their insufficiency as not so important.

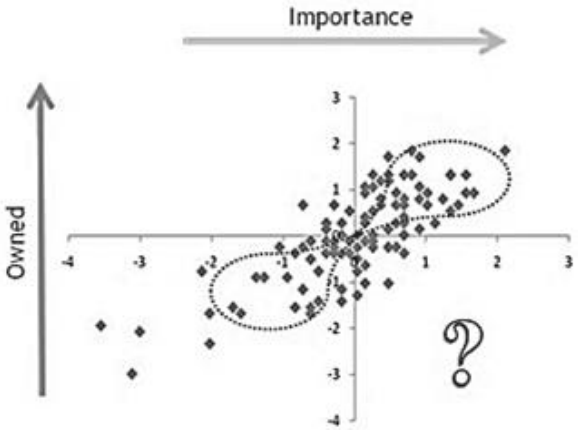


Figure 4. All 99 competencies displayed in a coordinate system; dotted line: author's expectation

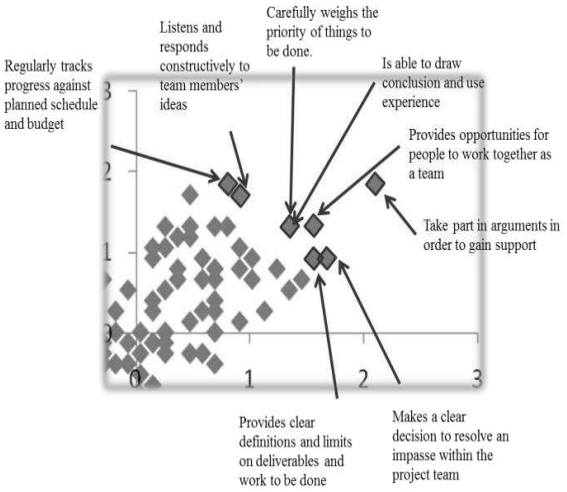


Figure 5. Quarter 1: High importance, high typicality

Figures 5 and 6 show the most relevant points of the research; the highlighted results are the highest rated coordinate points of the competencies. Figure 5 displays the competences rated as most typical and most important, while Figure 6 presents those rated as important but not possessed by the respondants.

The results of Figure 5 show that the project managers of the company examined think the following competencies are both important and typical in their field, so they rated these competencies as crucial in their case and they also evaluated themselves as possessing them:

- Regularly tracks progress against planned schedule and budget,
- Listens and responds constructively to team members' ideas,
- Carefully weighs the priority of things to be done,
- Is able to draw conclusions and use experience,
- Provides opportunities for people to work together as a team,
- Takes part in arguments in order to gain support,
- Makes a clear decision to resolve an impasse within the project team,
- Provides clear definitions and limits on deliverables and work to be done.

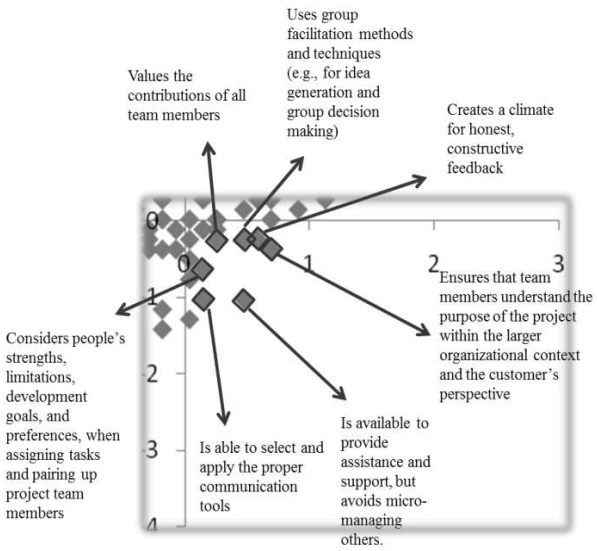


Figure 6. Quarter 2: Low typicality, high importance

The other quarter of the coordinate system that includes key competencies is the second quarter. In case of the quarters one and two importance ranks higher, so in my opinion these are the key competencies. In my opinion the second quarter (Figure 6) contains the most important information because it presents the competences which require development according to the project managers who responded to the questionnaire. The highest rated points of the second quarter are the following:

- Considers people's strengths, limitations, development goals, and preferences when assigning tasks and pairing up project team members,
- Values the contributions of all team members,
- Is able to select and apply the proper communication tools,
- Is available to provide assistance and support, but avoids micro-managing others,
- Ensures that team members understand the purpose of the project within the larger organizational context and the customer's perspective,
- Creates a climate for honest, constructive feedback,
- Uses group facilitation methods and techniques (e.g. for idea generation and group decision making).

The results show that the first step has been taken, for it is a really valuable step that the project managers have realized the need for improvement. It is interesting to note that three of the seven competencies to develop are in the Cooperation and Teamwork competence category and another three are in the Leadership and Control competence category.

My goal is find the key project management soft competencies in R&D projects for different industries and sectors. After carrying out the research I shall be able to forecast the required competence developments in those sectors. This research is the first milestone in a complex research project that I would like to carry out. The goal is to compare several innovative industries and sectors to get a wider picture about key project management competencies in terms of projects dealing with R&D.

The results of this research could be applied during the life of projects because after highlighting the key soft project management competencies of the sectors examined, the identification of the areas to develop will be much easier, this could be very useful e.g. in case of hiring and training project managers. These results could help in a situation when a project manager changes sectors, and he or she arrives in a new, also highly innovative environment, but the new projects deal with different sides of innovation. Based on the results it could be forecast which competencies should be strengthened in order to manage projects appropriately and successfully in the new environment.

CONCLUSIONS

This questionnaire study on competencies of managers of R&D projects was completed by project managers in IT and telecommunications. Here data is presented using a coordinate system, placing competencies by their ratings of importance and typicality. Results show that IT project managers feel that certain skills are especially important and typical in their field, including regularly progress tracking, support team work, clear decisions, listens ideas, priorizing, etc... On the other hand, they identified certain skills as important yet less typical. Interestingly, these tended to fall in the two competency groups of Communication and teamwork and Leadership and control.

Since the research was based on self-assessment, my hypothesis was that in case of competencies with higher importance typicality would also be higher, and vice versa. However, since competencies with higher importance and less typicality were also identified, these are the competencies that require improvement. The results show that the first step toward improvement has been taken in the company examined, for it is a valuable step that the project managers have realized the need for improvement, as shown by skills considered important yet not typical.

This study will continue with analysis of the survey data using other methods, and then be expanded to R&D projects in other areas of industry, in an attempt to provide an industry-specific catalogue of essential competencies for project managers. The findings should be of interest to project managers and companies that invest in R&D projects.

Acknowledgements

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Strategic and Operative Marketing Controlling

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SUMMARY

In uncertain economic situations, profit-seeking corporations work under constant pressure of efficiency. As a consequence, importance of evaluation is extending to such corporate areas, e.g. marketing which used to be fairly subjective, according to our past knowledge. Corporate leaders have recognized that successful corporate governance requires a system that analyses the efficiency of marketing activities. A new era is coming in the marketing profession when the effectiveness of marketing activity should be supported with specific figures. One of the evaluation methods is marketing controlling, which is widespread in the German speaking countries. This paper presents its theoretical framework and gives survey results on the use of strategic and operative methods in medium-sized and large companies in Hungary.
Keywords: paradigm change; accountability; evaluation methods; strategic marketing controlling; operative marketing controlling
Journal of Economic Literature (JEL) code: M31

INTRODUCTION

Marketing is undergoing a paradigm change due to the increased demand for evaluating marketing activities. Cutting marketing and general expenses seems to be a typical reaction to the recession in Hungarian companies (Mitev and Bauer, 2010). –According to Mitev and Bauer's research, outsourcing marketing activities is facing real danger. The lack of accountability is derived from the development of marketing, since when it was developed into a separate business area the goal was not to make marketing a profitable business unit (Webster et al.. 2003). That is why there has never been a natural theoretical link between the financial department and the main corporate leadership. (Srivastava et al. 1998) According to Sajtos (2004) the reason for this might be that the goods generated by marketing activities are of a different nature than those of the other departments; they are intangible, not included in financial, accounting statements, since they are difficult to measure.

Measuring marketing activities is of such great importance that marketing metrics and return of marketing investment (ROI) were defined as research priorities of the Marketing Science Institute for the year 2002, 2004 and 2006 (Seggie et al. (2007)). Several researchers (Homburg et al. (1999), Moorman and Rust (1999), Verhoef and Leeflang (2009), Merlo and Auh (2010)) have managed to underline this connection using empirical studies and statistical analysis. There is a wide interest in the topic throughout Hungary as well.

Berács (1997) points out that the development of marketing tools and marketing strategic aims are closely related to corporate performance. The function of marketing can be declared to be one of the sources of corporal success not only based on what the leadership has to say about it, but because also modern marketing automatically leads to competitiveness and corporate profitability growth in Hungary.

Research by Kolos et al. (2005) reveals that the companies they have interviewed detect a close relationship between their marketing activities and corporal success, and for this reason they have increased marketing functions throughout the organization. At the same time, marketing contributes mainly to the long-term success of a company. Five years later a new study was made by Kenesei and Gyulavári (2010), according to which this trend is maintained and further strengthened, since not only marketing tools, but also the possession of marketing skills are closely related to performance.

In my opinion, evaluating marketing activities is not an advantage any-more; rather it is a requirement and a basic condition for competitiveness. The Anglo-Saxon and German speaking countries have developed two separate types of methods for measuring performance. In controlling schools reflecting the Anglo-Saxon economic approach, the science evaluating marketing activities is called marketing metrics, which mainly makes use of indicators to make marketing measurable. In the German controlling schools it is marketing controlling that is wide-spread, and this includes marketing metrics. In marketing controlling the indicators are considered solely

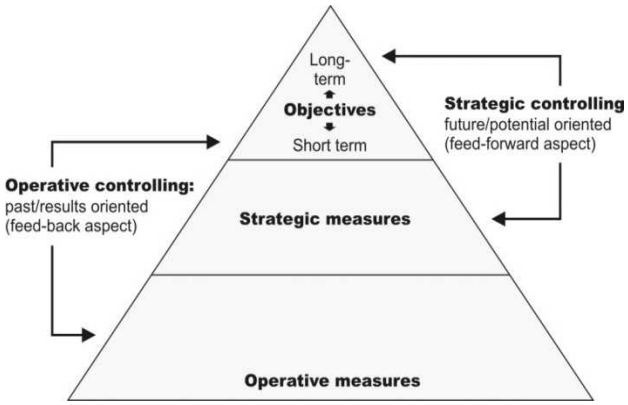
to be supporting tools, since further deeper analysis is essential. This is basically supported by strategic marketing controlling tools. The aim of this study is to describe the fundamental differences between strategic and operative marketing controlling, furthermore to introduce in detail the basic tools of marketing controlling and its application in companies throughout Hungary.

TYPES OF MARKETING CONTROLLING

The significance of marketing controlling has increased due to the ever-changing environment, which comes from the fact that because of the transformations taking place in the market there is a continuous revision of plans within marketing. Therefore, Meffert (2000) and Sander (2004) consider the following to be the most important tasks of marketing: pointing out deviations as early as possible, creating adaptive strategies according to causal analysis, and creating activities.

Regarding marketing planning in terms of time, we can differentiate short-, mid – and long-term planning due to which operational and strategic planning have become separate. This is an essential part of controlling systems; that is why also in marketing controlling we differentiate these two types: the strategic and the operative ones. Operative marketing controlling examines the already existing results, during which deviations between the earlier planned and then actual facts are analyzed, seeking the causes as well. On the other hand, strategic marketing controlling is concerned with future results to be achieved. This clearly shows the future-orientation of marketing controlling, with its forecasting function based on estimated data, which is marked as 'feed-forward' in Figure 1. This wording can be misleading, as it is clearly about forecasting and prognosis.

These two controlling systems are organically connected to each other, so they are created and operated in parallel.



(Becker, 2001 in: Ehrmann, (2004) p. 20.-)

Figure 1. Strategic and operative marketing controlling

Strategic marketing controlling makes it possible for the company to adapt to the environmental changes at the right time. Operative marketing controlling results in goal-oriented leadership, which ensures the company's operation by optimal realization of short-term profit. The main differences between strategic and operative marketing controlling are summarized in Table 1 examining the following characteristics: orientation, level of planning, leadership goals, evaluation criteria and source of data. In my opinion the best way to understand the differences between strategic and operative marketing controlling is by understanding the goals.

In the case of operative marketing controlling the goals of leadership is economy-oriented. Primarily they are creating profit, profitability and marketing effectiveness. In the case of strategic marketing controlling the aim is to ensure long-term existence of the company, growth and competitive advantage. Accordingly, there is a difference in their usage of tools. Strategic marketing controlling is oriented towards the company and its environment, that is why the methods used here are mainly focused on the environment, products and customers. Operative marketing controlling examines primarily the company, its marketing economy and effectiveness, so in this case usually different economic calculations are carried out based on internal company statistics and accounting data. Strategic marketing controlling is a tool for the operative marketing controlling.

Table 1
Differences between operative and strategic marketing controlling

	Strategic marketing controlling	Operative marketing controlling
Orientation	environment and company	company: economy and effectiveness marketing planning
Level planning	strategic marketing planning	operative-tactical marketing planning
Aim of management	– increase – ensuring existence – competitive advantage – success factors	– gain – marketing profitability – profitability – solvency
Evaluating criteria	opportunities, threatens, strengths, weaknesses	indices, index system of marketing measurement
Source	comprehensive environment and enterprise analysis	primary internal accounting

Source: author's own work based on Becker (2001) and Horváth (2003)

Auerbach (1994) identifies the potentials lying in the time-frames as the main difference. The task of strategic marketing controlling is to identify and create the potentials of future success in the long run. For operative marketing controlling – step by step defining the strategic one – it is the success of a given time-frame, economy

and profitability that matters, while at the same time creating a proper basis for the economical realization of strategic marketing controlling.

STRATEGIC MARKETING CONTROLLING

The task of strategic marketing controlling is to ensure the long-term existence of an enterprise. Its aim is to produce and keep up result potentials in the future.

Some examples of the instruments of strategic marketing controlling are:

- SWOT analysis,
- portfolio analysis (BCG -and McKinsey -portfolio),
- GAP analysis,
- positioning analysis,
- life cycle analysis and empirical curve,
- benchmarking,
- scenario -technique,
- Balanced Scorecard,
- investment calculations,
- long-term budgeting.

Strategic marketing controlling helps the enterprise to adjust to the ever-changing market environment (e.g. trends and technological innovations). Its important tasks are the following: determining, fulfilling and supervising market objectives. This is called the planning function. The most important functions within strategic marketing controlling are the information collecting and supervising functions. Like an 'early alarming' system, marketing controlling should immediately take the changes in the marketing environment of the enterprise affecting marketing into consideration.

The coordination function included in strategic marketing controlling consists of the functions of adjustment in terms of form and content to the different parts of marketing plans on the one hand, and of the comprehensive harmonization of the current activities on the other (Zerres, and Zerres, 2006).

In the literature the concept of marketing audit is used frequently to summarize the functions of strategic marketing controlling (Weis, 2004). The reason for this is that audit is linked to the strategic level. According to Zerres, and Zerres (2006), marketing audit means the supervision of marketing strategies, the process audit, the marketing mix-audit and the organizational audit.

After detailing strategic marketing controlling let us examine the definitions in the literature in Hungary:

Table 2
Definition of strategic marketing controlling

Definition of Strategic Marketing Controlling	Author
The main task of strategic marketing controlling is to support the following areas: – making situation analysis (internal and external factors), – setting goals, – defining product markets, market segments, – budgeting, – making marketing activities, – evaluating and controlling.	Körmendi and Tóth (2003), -p. 178.
Strategic controlling is the strategic subsystem of the controlling system that focuses on long- and medium-term (3-5 year) tasks in the time dimension. It is one of the future- oriented functions of strategic management. It supports the leadership to operate on a long-term goal-oriented basis and enables it to adapt to the constant changes in the environment. Functions: strategic planning, determining the gaps between planning and factual data and providing information. With the operative controlling subsystem creates a uniform hierarchical system, in which the strategic controlling is the dominant. The main chapters of strategic planning are investments, financial planning of acquisitions, project planning of strategic activities, strategic business plan, strategic tactical plans.	Kandikó, (2006), -p. 12.
Strategic marketing controlling – is a subsystem of marketing controlling, – has a time horizon is 3-5 years, which appears the future oriented aspect, so that it also relates to the desired future outcome. – allows the company to adopt to environmental changes in time, – ensures the company's long-term existence, with creating and maintaining the future success potential, – includes information providing, planning and controlling functions, – operationalizes the goals and explores their feasibility in the framework of the planning function, – observes the changes in the environment and develops an action plan for adaptation in the framework of information providing and contolling function • performing a continuous monitoring activity.	Hajdú, (2013)

OPERATIVE MARKETING CONTROLLING

Operative marketing controlling emphasises the profitability of the current marketing activities of an enterprise. To determine short-term returns, results and liquidity accounting data are used.

Some examples of the instruments of operative marketing controlling are:

- economic calculations (gross margin, process cost, objective cost, turnover-result),
- customer satisfaction measurement,
- comparing and analyzing planning and factual data,

- ➢ complaint analysis,
- ➢ short-term budgeting.

Operative marketing controlling ensures and supervises the usefulness of the strategically realised success potential in an economical way to find out whether the tunrover has brought the expected results or not.

Its aims are supervising marketing activities, analysing and deriving the reasons of the gaps, and developing suitable commercial options.

Supervision covers the whole marketing mix (product, price, place, and promotion) and the individual marketing units. Supervision referring to the whole mix can provide global information. Besides supervising marketing mix – as a whole − it also supervises the individual units (Meffert, 2000).

Following the viewpoint of Zerres, and Zerres, (2006), let us review the controlling of the marketing mix.

In the case of product controlling, the product as the aim of the calculation (gross margin, fixed cost) is in the focus. Today − within product politics supervision − product quality also belongs here. Product controlling is not limited to the controlling of the existing product, but is also linked to the development phase of the product (product innovation), as well as to the follow-up cycle (Witt, 2002; Meffert, 2000).

In case of controlling the price and condition policy, we examine the effect of price and condition on turnover. In such an analysis we study the relationship between price and brand awareness, price elasticity of demand and the various price psychological factors as well (Witt, 2002).

In distribution policy, the operation of the acquisition and distribution channels is analyzed. In the supervision of sales policy qualitative factors come to the fore when existing and potential sales opportunities for future development are evaluated. In contrast, logistic controlling operates with indices and index systems (e.g. frequency of orders, average delivery time, etc.). In this case we have the opportunity to compare plan and factual data, and if there is a difference, to carry out a causal analysis (Meffert, 2000).

Analyzing the effectiveness of the communication policy often encounters the problem that we cannot distinguish between the individual effects of each marketing communication tool. Here, as an example of the classic advertising campaign, effectiveness measurement can be mentioned in which campaign costs and turnover changes being considered. This process does not often lead to a significant result, because it is not clear whether the real success can be traced back to the campaign or to other factors. The task of marketing controlling is to find methods, procedures and tools, which approximately determine the success or the failure of the communication policy (Meffert, 2000; Witt, 2002).

After detailing operative marketing controlling let us have a look at the definitions that can be found in the literature in Hungary:

Table 3
Definition of operative marketing controlling

Definition of Operative Marketing Controlling	Author
Tasks of operative marketing controlling can be deduced from the marketing strategy plan, on this basis of the action and tactical plan prepared. In particular the following planning and analyzing tasks can be established: – making inputs of the annual marketing plan, taking into account the other sub-strategies and tactical plans, – deducing annual objectives from the strategic marketing plan, – assembling plans of marketing organization and marketing campaigns, – preparation of marketing budgeting according to the budgeting of marketing organization and marketing campaigns, – integrating marketing costs in the corporate budgeting, – collecting factual data, – comparing planning and factual data as an aspect of the whole company, the marketing unit or individual marketing campaigns, – planning the actions according to the analysis of results.	Körmendi and Tóth (2003), -p. 180.
Operative controlling is one subsystem of the controlling system which performs the controlling functions for one financial year (planning, comparing planning and factual data and providing information). With the strategic controlling subsystem it forms a hierarchical system, where the same approach and tools create a uniform system, in which strategic controlling is dominant. Input of its annual activity is given by the strategic plan related to a tactical plan of a specific year. Its main task is providing up-to-date information for the management in order to be competitive. It has four planning and factual data comparison tasks: performance planning, cost planning, result planning, financial planning and forecasting.	Kandikó, (2006), -p. 12.
Operative marketing controlling – is a subsystem of marketing controlling, – has a subordinate relationship with the strategic marketing controlling while it ensures the economical of the success factors defined previously by strategic marketing controlling, – the time horizon is one year, which reflects a past/result - oriented approach so that it can refer to the existing results, – it is essential for the company's existence because with the short-term profit optimal realization it ensures the business operation, – includes information providing, planning and controlling functions, which cover both the marketing mix and the marketing tools, – coordinates the marketing mix, – supervise marketing activities, – by analyzing planning and factual data, contributes to the early detection of deviation, which can be examined at a causal level, and in order to achieve the desired state, – it creates an action plan.	Hajdú, (2013)

Last but not least according to the specific of the company the strategic and operative marketing controlling have to be coordinate with each other, because one cannot exist without the other, being mutually complementary. In the course of elaborating them, it is advisable to endeavor to develop operative marketing controlling based on strategic marketing controlling in a parallel process.

FREQUENCY USE OF STRATEGIC AND OPERATIVE MARKETING CONTROLLING TOOLS IN HUNGARIAN MEDIUM-SIZED COMPANIES AND LARGE ENTERPRISES

Sample and Research Characteristics

The sample population is medium-sized companies operating in Hungary (with an employee number between 50 and 249) and large enterprises (employee number over 250). The number of the base population is 4784 for medium-sized companies and 917 for large enterprises.

As a feature of the base population I wanted to take the annual net revenue into consideration, but in the Law on Accounting the upper limit of the medium-sized company's annual net revenue is at most 50 million euro – which is the lower limit for a large enterprise – and in my opinion this is too high a sum for the Hungarian market. For this reason the KSH (Hungarian Central Statistical Office) 'only' examines the number of employees for the purpose of determining the corporate size.

I have chosen the companies from the CÉG-KÓD-TÁR, issue 2009/3. The research technique was stratified sampling from the random sampling methods. We tried to find connection to the marketing departments of the companies and asked the questions from a previously well-structured questionnaire on phone. Features of the stratification were activity and region. Confidence level of the total sample is 95 percent, accuracy level is ±9,7 percentage points, sample size is 100 companies (50 medium-sized, 50 large). According to the activity and region, distribution of the total sample is shown in Table 4, which accurately reflects the basic population proportions. Stratification of Hungarian medium-sized companies and large enterprises is not the same, but if we ask 50 medium and 50 large companies, the two samples are comparable with each other easily without distorting weighting.

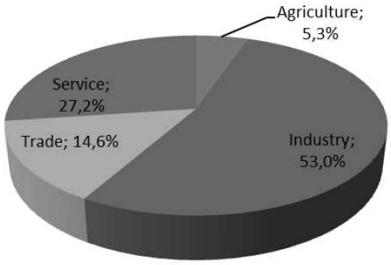
The four activity sectors are: agriculture, industry, trade and service. The seven regions of Hungary are: Southern Plain, Southern Transdanubia, Northern Plain, Northern Hungary, Central Hungary, Central Transdanubia and Western Transdanubia.

Table 4
Total sample stratification by region and activity

		1 Agriculture	2 Industry	3 Trade	4 Service	Total
	1 Southern Plain	1	3	1	1	**6**
	2 Southern Transdanubia	1	2	1	1	**5**
Medium-sized	3 Northern Plain	1	3	1	1	**6**
Companies	4 Northern Hungary	1	2	1	1	**5**
	5 Central Hungary	1	6	4	7	**18**
	6 Central Transdanubia	1	2	1	1	**5**
	7 Western Transdanubia	1	2	1	1	**5**
	Total	**7**	**20**	**10**	**13**	**50**
	1 Southern Plain	1	2	1	1	**5**
	2 Southern Transdanubia	1	1	1	1	**4**
Large	3 Northern Plain	1	2	1	1	**5**
Companies	4 Northern Hungary	1	2	1	1	**5**
	5 Central Hungary	1	6	3	8	**18**
	6 Central Transdanubia	1	4	1	1	**7**
	7 Western Transdanubia	1	3	1	1	**6**
	Total	**7**	**20**	**9**	**14**	**50**

Source: author's own drawing

The stratification of the four activity sectors is shown in Figure 2.

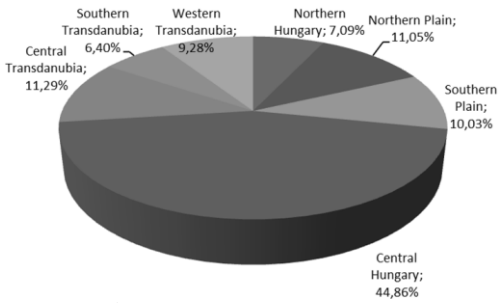


Source: author's own drawing

Figure 2. Sample stratification accordingly activity sectors for medium-sized and large companies

The majority - 53% of the Hungarian medium-sized companies and large enterprises operate in the industrial sector, 27.2% in the service sector, 14.6% in trade and 5.3% in agriculture.

The stratification of the Hungarian regions is on the Figure 3.



Source: author's own drawing

Figure 3. Sample stratification accordingly regions for medium-sized and large companies

The majority of the sampled companies operate in Central Hungary. In other regions, medium-sized and large companies are represented in almost the same numbers.

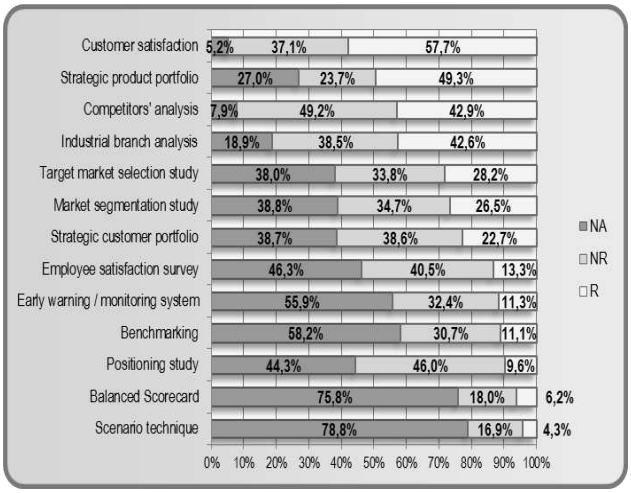
TOOLS OF STRATEGIC AND OPERATIVE MARKETING CONTROLLING

Concerning strategic marketing controlling devices, Figure 4-5 shows that the Hungarian medium-sized companies and large enterprises apply regularly the traditional tools: e.g. customer satisfaction (57.7%), strategic product portfolio (49.3%), competitors' analysis (42.9%) and industrial branch analysis (42.6%). It seems that in making important strategic decisions these companies prefer well-proven methods.

Suprising results emerged in case of market segmentation, as there is a substantial difference between theory and practice. While the necessity of market segmentation is indisputable in the literature, 38.8% of the Hungarian medium-sized companies and large enterprises do not take advantage of it, 34.7% waive its regular use, and only 26.5% apply it regularly. It seems companies have difficulties in carrying out segmentation.

An unexpected development the sporadic practical use of Balanced Scorecard, since in the literature it is a much discussed topic. Results show that 75.8% of the respondents do not use it at all, 18.0% do not use it regular and only 6.2% use it regularly. It is conceivable this method is too innovative or too complex for companies to introduce it on a regular basis.

Results show that 78.8% of the companies do not use the scenario technique at all, 16.9% do not use it regularly, and only 4.3% apply it regularly. In my opinion this method has a great advantage in that future events can be predicted.



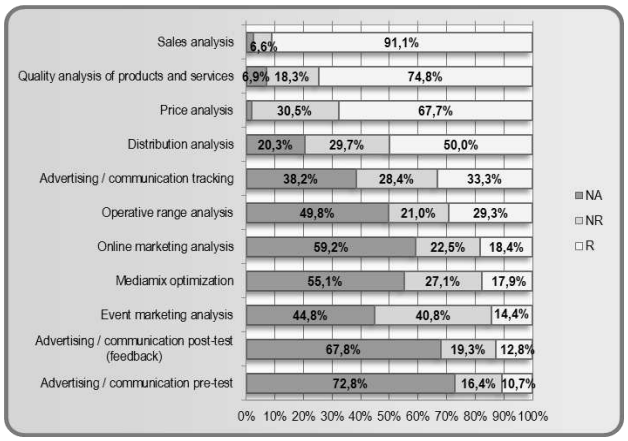
Source: author's own drawing

Figure 5 How often does the company you work at use the following tools? (Strategic marketing controlling) (NA: Not at all, NR: not regularly, R: regularly)

Concerning operative marketing controlling devices (Figure 6), traditional methods such as sales analysis (91.1%), quality analysis of products and services (74.8%), price (67.7%) and distribution analysis (50.0%) are used by the companies regularly.

Despite the fact that marketing communication carries considerable costs, few medium-sized companies and large enterprises regularly analyze their results. In measuring the efficiency and effectiveness of marketing communication regularity is important, assessment should not be performed only occasionally (not on a regular basis), for it is pointless that way. The process approach is essential because we can track the response of customers to each campaign only in this way.

In the 21st century, which from communications point of view could also be called 'the age of integrated marketing communication', it is also unexpected that media-mix optimalization can be found in less than one fifth of the companies (17.9%).



Source: author's own drawing

Figure 6. How often does the company you work at use the following tools? (Operative marketing controlling) (NA: Not at all, NR: not regularly, R: regularly)

In some aspects Hungarian companies are more conservative, e.g. they like using customer satisfaction and competitors' analysis from the strategic marketing controlling devices, and sales analysis, product and service analysis, price and distribution analysis from the operative marketing controlling methods. But unfortunately, there are some tools, which are behind the times. These are segmentation, benchmarking and scenario technique from the strategic marketing controlling devices, and marketing communication assessment from the operative marketing controlling methods. Companies should pay a more intensive attention to these tools in order to increase their competitiveness.

Regarding the frequency use of the above mentioned methods, there is not a significant difference between medium-sized companies and large enterprises. That is why I could not compare them.

CONCLUSIONS

Hungary is characterized by a tendency which Serfing (1992) noted: at that time the German practice was beginning to spread around the world in terms of strategic and operative controlling. Besides the operative controlling dominant in the Anglo-Saxon areas, strategic controlling plays an increasing role as well. In contrast to the previous view, strategic and operative controlling are no longer treated as two separate systems. Observing the development of the concept, we can say that due to an awareness of practical experience, the Anglo-Saxon and the German approaches continue to converge with each other.

Thus, medium-sized and large Hungarian companies like and use strategic marketing controlling devices to an extent similar to the use of operative ones. However, there are still underused possibilities. Among the methods of strategic marketing controlling these are market segmentation, benchmarking and scenario technique, while among operative ones these are media mix optimization and the pre- and post-test of marketing communication. I am convinced that in company practice the advantages and the concrete uses of these tools are unknown.

The framework of this research, in my dissertation work I could prove the following statement: if a company has a marketing controlling system it contributes to the success of marketing department. It is a significant result, because the use of this method the prestige of marketing profession can be improved, I mean in the future it will not be necessary to cut markeint costs.

Acknowledgements

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Regional Specialization and Geographic Concentration of Economic Sectors in the Visegrád Countries

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SUMMARY

As a result of transformational recession, the mono-structural economy has changed in the Visegrád countries. The transformation process is not yet finished. The new economic structure has been shaped by the concentration of sectors by delocalization, central industry and spatial planning. In this paper the aim was to find an answer to the following question: What kind of sector concentrations and specialized processes took place in the Visegrád countries, which included Hungary, Poland, Czech Republic and Slovakia in connection with reindustrialization and deindustrialization during the years 2000-2007? Due to the macrostructure's spatial concentration, the regions' specifications, and the (de)polarization processes of the last few years determined the ability to adapt to the economic crisis. The regional specialization and concentration processes of the Visegrád countries will be compared using various kinds of indicators (absolute and relative concentration), and special attention is paid to regional analysis within Hungary. The research questions are: after the political change of regime, where and what type of sector or industry concentration has been established in the examined countries? Is it possible to say that some specialization or concentration is disadvantagous to economic growth? The difference between regional specialization and concentration and the terms related to industrialization are also clarified.

Keywords: specialization, concentration, industrialization, Krugman Dissimilation index, Herfindahl-Hirschman index
Journal of Economic Literature (JEL) code: R11, R58

THEORETICAL INTRODUCTION

This is the first time in history that conclusions can be drawn about the development of economic systems based on central planning transforming into a market economy. The problems of the transition on a national economic basis were present on both the social and economic levels, but it was the industry that had to face the most urgent challenges (Botos, 2011). Today, the economic answers given at the time of transformational recession are still influencing the economy of the Visegrád countries, their macro structural processes and the performance of the secondary sector.

In post-socialist countries the structural change of the industrial sector was intensified by its peculiar economic policy and delayed development (Enyedi, 1989). Lux (2009) extends these catalytic factors to coordination errors, the underdevelopment of the financial sector, and the challenges of the transition into a consumer market. Due to the outdated industrial structures, the manufacturing products not only lost their (certain) foreign markets, but also the domestic markets due to changes in consumer wanted. The macroeconomic structural changes affected the work force and the changes in production. Because of the transformational recession, in these countries the number and ratio of people working in agriculture and classical industrial branches decreased. New workplaces were mostly created in the tertiary sector, mainly sponsored by foreign capital. But in spite of the tertiarization of the economies, industry has kept its influential role, both in the labour force and in the production of added values (Enyedi, 2005). The performance of the manufacturing industry determined mainly the export potential and volume, and directly influenced the growth of the whole economy (including other sectors) and its income level (Horváth, 1999).

My research topic is to identify the direction of these processes in the different countries taking place after the political changes, during 2000-2007, focusing on locations and types of industrial concentration. In the time period chosen, the preparation of these countries was completedand the economic crisis to come did not yet have any effect on the opportunities open to the workforce. Change is a natural part of the economic structure and it shows differences in its extent and direction in each country. The composition of the

economic structure influences performance on a short and medium term level, and is related to an increase in the competitive potential, which includes production data (Szalavetz, 2007). To explain the other factors helping the economic development two theories are referred to: the accumulative and structural theories.

According to the accumulative theory, the source of economic growth and structural modernization is the accumulation of physical and human capital; it influences production, and the development of factor inputs. On the other hand, the structuralist point of view focuses on the changes in the composition of production, in the various sectors; this is the source of economic growth and the dynamic changes in development (Szalavetz, 2007; Nelson, 1998). The major vertical and horizontal company integrations and the concentration of monolithic structures developing in one territory are not beneficial for the development of the area. The concentration of production hinders economic growth and increases the dependence of the economy on cyclic fluctuations. It hinders the revitalization of the economy after economic crises and increases the possibility of the emergence of brown field areas.

In this view, I think it is important to examine both macro-level changes and changes in branch structures, and all the more so since the countries included in the study went through an industrialization process because of their socialist industrial policies. The development of regional mono-structures was common. Among the economic theories focusing on structural change I would like to emphasize Schumpeter's work (1950). He focused on innovations, the formation of new combinations, and used the term "productive destruction", which refers to the beneficial tendencies in economic development: "something dies and something new is created." At the same time economic evolution theory warns us about the difficulties caused by "road addiction", which can hinder industrial structural change like a "power of inertia" (Lux, 2009). According to Veblen (1898), "technology" consists of two main elements: the system of physical capital equipment, tools, and the "know-how" of manufacturing. The life cycle theory of the industrial sector focuses on the capital need of the specific industry sector, which in the decreasing cycle is combined with a higher need for human capital.

CONCEPTUALIZATION

The development of industrial production and labour force is called industrialization. According to the dictionary it means that a higher level of machine use in the industry has been introduced into a country's national economy. The Dictionary of Human Geography (2009) applies the following term to industrialization: "The process, through which industrial activity becomes dominant in a given territory or country's economy" (p. 380).

The process is more complex; it is closely connected to the theories of economic development. Adam Smith thought of industrialization as the natural process of economic development. Developing countries have two strategies to choose from in their industrialization policies: they can encourage the national secondary sector, especially the manufacturing industry, to substitute for imports. In order to do this, the industrial sector can be protected by tariffs or non-tariff instruments. Structural development according to the model of Fisher (1939) and Clark (1940) is economic development accompanied by tertiarization, the increase of value added services in growth rate. It is easy to see that the expansion of the service sector is the result of economic development (Szalavetz, 2008). Today there is still a professional argument about the importance of tertiary and secondary sectors. Though for Fisher and Clark economic development is clearly connected to tertiarization, if we examine the macrostructure of developed countries the conclusion is that the phenomenon is connected to an increase in the total added value of the manufacturing industry (Szalavetz, 2008). It is worth mentioning Baumol's cost disease, which means that in the service sector, because of its peculiarities, it is less possible to achieve significant productivity growth than in the production sectors (Baumol, 1967). Later in the United States Bosworth and Triplett (2003) contradicted this statement, as in most service sectors of the United States the increase rate of the productivity growth of services reached the same amount as productivity growth in the manufacturing sector. According to Cséfalvay et al. (1994), the employment ratio of the tertiary sector became dominant in the beginning of the 1900s (see the Figure 1) compared to the primary sector, and in the 1950s the secondary sector became less significant as well. Clark puts the appearance of the process of deindustrialization at the intersection of the other sectors (Figure 1).

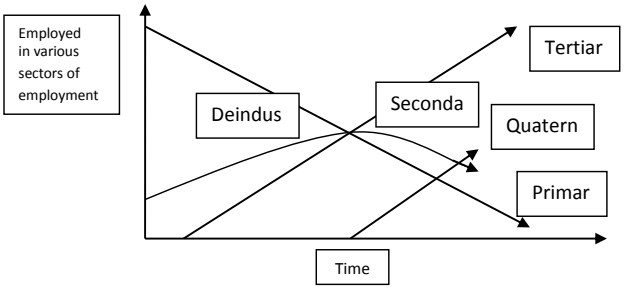

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Figure 1. Model by Fischer–Clark (1940)

The Dictionary of Human Geography (2009) gives the following definition of deindustrialization:

A sustained decline in industrial (especially manufacturing) activity and capacity. Such changes are quite normal in the course of economic development.

However, when they are linked to the declining competitiveness of industrial production to meet extra-regional, domestic and international demand within reasonable levels of employment and a sustainable balance of payments, deindustrialization represents a process of underdevelopment. (p. 150)

According to Takács (2003) deindustrialization as a term refers to industrial decline, atrophy or degeneration. Structural changes are often considered equivalent to deindustrialization, which is a narrower term and mostly refers to a reduction in the number of industrial employees (Kiss, 2010; Cheshire, 1991) and often means a reduction in industrial output. Reindustrialization or new industrialization both mean that new sectors are being formed, along with new activities and products, in places where these were nonexistent before. This also means structural change, when traditional industrial activities cease to exist or lose their significance and new industrial activities take their place. It is a complex process which contains the following elements: the appearance of new industry sectors (production of IT equipment), industrial structural change (the greater added-value sectors make the other sectors disappear: automobile industry, electronics, light industry, iron manufacturing), the need for increased production (in traditional branches as well – with new technology and new products). However, this process can be hindered in places where the industrial crisis has paid its toll and there has been downsizing of companies. If this structural change is delayed, the educated and younger generation tends to migrate, unemployment rises and rust and brown field areas appear.

After examining the process of sector transformation, we need to define industrial policies as well. Industrial policies are in interrelationship with employment policies, social policies, and spatial development. Botos (2011) agrees that all successful market economies have industry; that where there is industry there is always some kind of industrial policy, and where there is industrial policy, there is also government intervention. The argument among experts is about the types and depth of intervention.

It is important to have a definition of industrial policy, for there are great differences between regions, and the task of industrial policies is to decrease these differences. Many experts have attempted to define the term; I would like to mention two of the most relevant ones here:

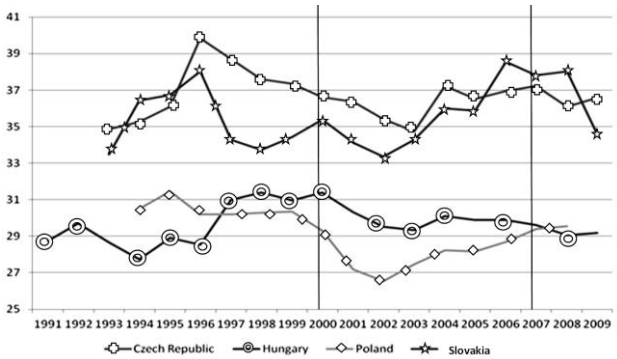
- "Industrial policies refer to all those government initiations and coordination, whose final goal is to increase productivity and to increase competition ability in the economy and especially in the industry" (Johnson, 1984. p. 15);
- "Industrial policy is the government's intention to move the various resources towards those sectors, which according to the government's decision are important in relation to the future of economic development" (Krugman- Obstfeld, 1991. p.18).

METHODOLOGY

Simultaneously, other theories also attempt to explain the expansion of industry, such as developmental theories and the literature on industrial crises. According to classical economics, regional development depends on specialization, productivity and commerce based on division of labour. It is associated with increased competitiveness, if we think about Ricardo's comparative advantages theory (1817) or the factor endowment theory of Heckcher (1919) and Ohlin (1933). Krugman (1991) came to a similar conclusion based on comparative benefits, or the specialization of regions and countries – according to him all of them could be winners. Keynes (1933) assumes, however, that the degree of specialization is inversely proportional to the factor endowment of emerging convergence trends.

Another category of models deals with the determinants of location and specialisation (Goschin et al., 2009). In the European Union the study of industry sectors' spatial concentration and the regions' branch specialization has become popular in the last few years. There are a number of research projects that focus on the trends and processes in EU countries. In these works, different measurements were used, such as new and old statistical methods, especially concentration and specialization indexes. The results of quantitative studies about the 1980s and 1990s (e.g. Hine, 1990; Hine et al., 1998; Amit, 1997; Brülhart, 1998) show that in a significant part of the industrial sectors a spatial concentration took place in Western Europe. It was accompanied by an industrial concentration in certain countries and regions (Traistaru, 2000).

Of special interest are the mobile factors, considered the engine of the agglomeration process. The improvement of the factor endowment in the destination region increases its attraction as a location for other manufacturing activities, leading to a cumulative process (Krugman, 1998; Fujita et al., 1999). Based on Boschma and Lambooy (1999) Lux (2009) discusses in his doctoral dissertation the problems of overspecialization, and the negative effects of mono-structures.



Source: author's own work based on EUROSTAT

Figure 2. Changes in industrial added value in 1991–2009 in the Visegrád countries

Cumulative causality is traditionally connected to growth processes, but it is also suitable for explaining the reasons behind economic crises. The radical sector and territorial changes in the industry make it necessary to study the spatial structures of industrial sectors, their concentration, and to examine whether industrial specialization has certain characteristics in each county.

Before I analyze the specific specialization and concentration calculation results, it is best to have a look at my database in order to have a broad overview of the changes in industrial added value during 1991-2009 (Figure 2). The economic transition in Central European countries occurred at the same time as integration into the global economy. The coincidence in time, however, did not mean that the countries or regions changed at the same speed (Rédei, 2001). On the one hand the different forms of privatization and the different approaches to industrial policy strongly influenced the developmental pathways in the Visegrád countries and the existence of regional differences. Not only relations between the centre and periphery, but the traditional regional differences solidified as well (Rédei, 2001). Also within countries there was an increased inequality. Shift-share analysis has demonstrated that both the regional and sectoral impacts have greatly influenced each country's expansion of work force during the time period before the economic crises (Kuttor and Hegyi-Kéri, 2012). Another direction of research is related to spatial polarization, trying to eliminate mono-structures, to create a successful economic structure. Based on the theories of Aiginger et al. (1999) and Markusen, A. and P. Hall (1986), Rédei (2001) describes the findings in the literature on topics of specialization and concentration. Other experts have done related studies on employment-related sector and structure concentrations and specializations, e.g. Krugman (1991), Brülhart (1995b), Molle (1997), Goschin et al. (2009) and Jeney and Szabó (2001). In this study I examine, based on regional data from Eurostat, the sector specializations of certain regions, and the macro-economy's sector concentration. The following sectors were included in the analysis: agriculture, industry (excluding construction), construction, financial intermediation; real estate, wholesale and retail trade; hotels and restaurants; transport, public administration and community services; activities of households; and extra-territorial organizations.

HERFINDAHL-HIRSCHMAN INDEX

The Herfindahl-Hirschman index is a commonly accepted statistical measure of market concentration and specialization. It is also referred to as the absolute concentration and specialization index. Jeney and Szabó (2001) say that the Herfindahl index is very similar to the Gini-Hirschman concentration ratio's formula (Nemes Nagy, 1977). The value of the index is between 0 and 1, depending on the measure of absolute concentration and specialization.

$$H_j^C = \sum_{i=1}^{n} \left(g_{ij}^c\right)^2,\ H_i^S = \sum_{j=1}^{m} \left(g_{ij}^s\right)^2$$

where $g_{ij}^c = \frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}} = \frac{X_{ij}}{X_j}$ and

$$g_{ij}^S = \frac{X_{ij}}{\sum_{j=1}^{m} X_{ij}} = \frac{X_{ij}}{X_i}$$

- H_j^c Herfindahl-Hirschman concentration measure number
- H_i^S Herfindahl-Hirschman specialization measure number
- i region
- j sector
- X number of employees ;
- X_{ij} i region's number of employees in j sector;
- X_j all employees of j sector;
- X_i all employees of i region;
- g_{ij}^c the share of region i in the total national value of branch j;
- g_{ij}^s the share of branch j in the total value of region i.

The highest absolute concentration value (HjC) for industrial employees (excluding the construction industry) of the territory in 2000 and in 2007 was in Slovakia (Table 1). The Hirschman-Herfindahl Index of spatial concentration captures the degree to which a particular industry's spatial distribution reflects that of the national urban hierarchy (McCann, 2001). A high value of the Hirschman-Herfindahl Index indicates sectoral concentration in a limited numbers of regions. A HHI index below 0.01 indicates a highly competitive index. A HHI index below 0.1 indicates an unconcentrated index. A HHI index between 0.1 to 0.18 indicates moderate concentration. A HHI index above 0.18 indicates high concentration.

Table 1
Absolute concentration values for the Industrial sector (excluding the construction industry)

	2000	2007
Czech Republic	0.134899	0.137291
Hungary	0.153068	0.151426
Poland	0.083054	0.083252
Slovakia	0.297275	0.307848

Source: author's own calculations

There is a significant difference observed in the case of Poland, where the sectors have a regionally more balanced position, almost unconcentrated. I can conclude that among the regions, Slovakia has the highest degree of concentration, which can be due to the territory of the country and its geographical location.

If we look at the financial sector, including real estate (Table 2), we can see that in Hungary, the

concentration of the financial sector is very high and it increased over the period examined. It is followed by Slovakia.

Table 2
Absolute concentration values for the Financial intermediation; real estate

	2000	2007
Czech Republic	0.164051	0.163304
Hungary	0.311148	0.349032
Poland	0.102582	0.112077
Slovakia	0.27471	0.263571

Source: author's own calculation

I would like to add that the Hungarian financial sector used to have even greater concentration than Slovakian agriculture.

However, it is necessary to make the difference between the sectorial concentration and thespatial concentration. There are always ambiguities arising from the fact that the sectorial concentration is synonymous with the specialization (Ceapraz, 2008). For my case the comparisons are made between the specialization and the geographical concentration. Statistically, after Aiginger (2004) "the specialization and the spatial concentration can be two perspectives derived from the same matrix where columns are represented by countries (regions), and lines by the industries". The specialization can be observed by reading every column while the concentration can be interpreted by reading every line (Aiginger, 2004). According to Brulhart (1998), the concentration analyzes the location in the space of some defined well sectors (for example industrial activities) while the agglomeration analyzes the spatial location of a bigger part of the economic activity as the manufacturing in general. I can conclude from an employment perspective, after examining the regions' absolute concentration index values (Table 3) (HjS) that in 2000 and 2007 in the region of Central Hungary the numbers were high, compared to the other Visegrád countries, capitals included. The estimations of Herfindahl index of concentration give us a rather different picture of spatial concentration between 2000 and 2007. The most concentrated sector in 2000 was the agricultural in Slovika, then come the Hungarian financial intermediation sector. In all sector concentration Slovaik high measures. In Hungary also the wholesale and retail trade and the public administration were concentrated. As we can see from the Table in Poland only the financial sector concentrated. Between 2000-2007 there were a growth of absolute concentration in three countries in the industrial sectors and in the construction sector. The strongest growth of absolute concentration between 2000-2007 was recorded in Hungary, the second was measured in Slovakia summarizing all the sectors absolute concentration.

The increase in concentration in Slovakia in almost all the sectors except the financial intermediation is mainly a consequence of the changes of the industrial structure specific to each area and before and a cause of the conditions of the economic transition and imminent European integration.

Table 3
Absolute concentrations by sector in 2000 and 2007

Industry (excluding construction)	2000	2007
Czech Republic	0.134899	0.137291
Hungary	0.153068	0.151426
Poland	0.083054	0.083252
Slovakia	0.297275	0.307848
Construction	2000	2007
Czech Republic	0.127288	0.128054
Hungary	0.186752	0.181412
Poland	0.078581	0.081873
Slovakia	0.281949	0.287675
Agricultural	2000	2007
Czech Republic	0.158682	0.163579
Hungary	0.174805	0.167608
Poland	0.090155	0.085709
Slovakia	0.323909	0.32794
Financial intermediation; real estate	2000	2007
Czech Republic	0.164051	0.163304
Hungary	0.311148	0.349032
Poland	0.102582	0.112077
Slovakia	0.27471	0.263571
Public administration and community services; activities of households; extra-territorial organizations	2000	2007
Czech Republic	0.129433	0.12839
Hungary	0.18414	0.187483
Poland	0.077932	0.08353
Slovakia	0.259266	0.26484
Wholesale and retail trade; hotels and restaurants; transport	2000	2007
Czech Republic	0.128736	0.128068
Hungary	0.201821	0.198832
Poland	0.079295	0.084523
Slovakia	0.264275	0.271546

Source: author's own calculation

The Herfindahl index of regional specialization is an absolute measure of industry shares in the total activity in the region. It could take values between zero and one. Its evolution might reveal to what extent a given region is becoming specialized or diversified regardless of how the economic structure of the country as a whole is evolving (Beine - Coulombe, 2004). In Hungary, the region's specialization is the lowest in Northern Hungary and in the Southern Transdanubian region. In these regions employment is low both in industry and in the financial sector. In the Southern Transdanubian region the low employment rate is compensated somewhat by agriculture's higher specialization rate, which has a very low value in Northern Hungary.

Table 4
Absolute specialization numbers in the Hungarian regions

Region	2000	2007
Central Hungary	**0.682391**	**0.675882**
Central Transdanubia	0.082847	0.068943
Western Transdanubia	0.070108	0.05889
Southern Transdanubia	0.057154	0.036779
Northern Hungary	0.066781	0.05916
Northern Great Plain	0.101967	0.071627
Southern Great Plain	0.150487	0.065649

Source: author's own calculation

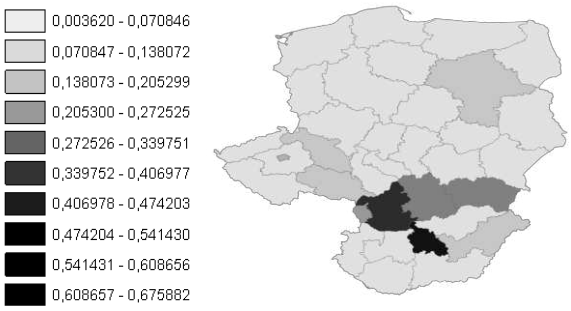
The higher employment specialization rates are increased (greatly) by the number of people working in the finance sectors, and can be traced back to the ratio of employment in the construction and manufacturing industries. In the Warsaw region (Mazowieckie) the sector specialization showed one quarter of that value. In Slovakia the absolute specialization measure number had a higher value in the Západné Slovensko region in 2000 (0.745834), which decreased in 2007 to 0.558552.

Table 5
Absolute specialization measurements in regions including national capitals

	2000	2007
Prague	0.165393	0.165088
Mazowieckie	0.150577	0.126566
Bratislavský kraj	0.221825	0.219318
Central Hungary	0.682391	0.675882

Source: author's own calculation

In summary I can say that in 2007 among the Visegrád countries there were great differences in the degree of absolute specialization (Table 4).. Figure 3 displays the results divided into 10 equal categories, showing that both in Hungary the Central Hungarian region and in Slovakia the region called Bratislavsky kraj there are highly specialized regions. Regions in Poland are more homogenous in this respect. In the Czech Republic the country's Eastern part and the central region show greater specialization, while in Hungary there are greater differences.



Source: author's own work

Figure 3. Absolute specialization measurements in regions

KRUGMAN DISSIMILATION INDEX

The Krugman Dissimilation index also resembles a commonly used formula, the Hoover spatial imbalance measure (Jeney and Szabó, 2001). The value calculated by this latter formula times two is equal to the calculated value of the Dissimilarity index. The square of the value calculated by this method is equal to the calculated value of the Herfindahl index. The second indicator is the well-known Krugman Dissimilarity Index, used for measuring either concentration or specialization:

$$K_j^C = \sum_{i=1}^{n} \left| g_{ij}^C - g_{ij} \right| \qquad K_i^S = \sum_{j=1}^{m} \left| g_{ij}^S - g_j \right|$$

g_{ij}^c- the share of region i in the total national value of branch j; g_{ij}^s - the share of branch j in the total value of region i.

The relative concentration analyzes the distribution of the activities of an industry compared to the average of the distribution of the whole of the activities. After examining the region's relative concentration (Table 5) I can see that the industry's relative concentration in Hungary is relatively high. Unlike Poland, where the index fell during the examined period, in Slovakia it stagnated, and in Hungary and in the Czech Republic the index grew.

Table 6
Industry relative concentration (without building industry) in the Visegrád countries

	2000	2007
Czech Republic	0.159716	0.185677
Hungary	0.186371	0.225624
Poland	0.179888	0.169413
Slovakia	0.133149	0.13318

Source: author's own calculation

If I closely examine the data I can see that the industry's concentration continued in Central Hungary and in the Central Transdanubian region. In Western Transdanubia there is a noticeable increase, and in Northern Hungary there is also, to a smaller extent. The concentration of employment in industry decreased the most in the Southern Great Plain, but the Northern Great Plain and Southern Transdanubia had financial losses as well.

Table 7
Industry relative concentration in Hungary

	2000	2007
Central Hungary	0.085724	0.111676
Central Transdanubia	0.038703	0.049269
WesternTransdanubia	0.030895	0.034544
Southern Transdanubia	0.002041	0.001149
Northern Hungary	0.014485	0.020266
Northern Great Plain	0.009139	0.00688
Southern Great Plain	0.005385	0.001841

Source: author's own calculation

It is interesting to examine financial intermediation in the real estate sector and the relative concentration value. Poland in this case shows the lowest value. In 2007 Hungary showed a difference from the other Visegrád countries (see Table 8 in the Appendix), with the financial sector showing a very high concentration value, which increased significantly during the examined period, in contrast to the other countries where stagnation or decline was observed.

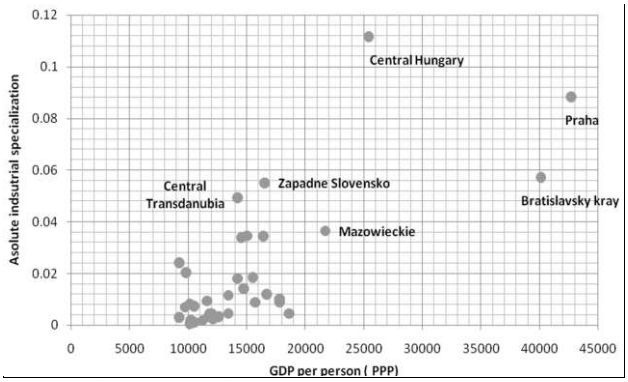
Table 8
Relative concentration of the financial sector

	2000	2007
Czech Republic	0.341607	0.342987
Hungary	0.426036	0.488161
Poland	0.285	0.245257
Slovakia	0.447574	0.372345

Source: author's own calculation

DEVELOPMENT OF THE AREA

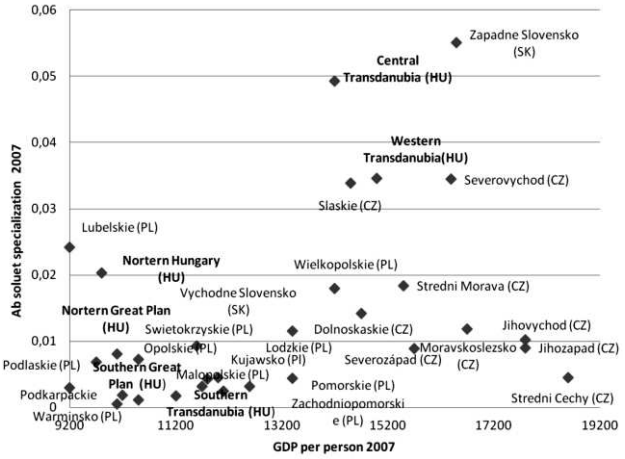
I examined the amount of GDP per person related to the absolute industrial specialization of the various regions. Figure 4 shows the outlying points include three regions with national capitals: Central Hungary, Prague, and Bratislavsky kray. The region of Central Hungary, which includes Budapest, shows a high specialization; however, the GDP per person is much lower than that of Prague or Bratislavsky kray.



Source: author's own work

Figure 4. Absolute specialization in relation to GDP per person in the regions

Despite the fact that the region of Central Hungary is highly specialized in industry, Prague and Bratislavsky kray have a higher GDP. The Warsaw region is seemingly left behind, but this could be due to the size of its territory. It is also informative that the higher specialization in Central Hungary is not related to a higher GDP index. If we leave out regions including capitals, we can see that the picture is more diversified. We can separate them into three larger groups. The regions that have a higher industrial specialization and have a higher GDP per person are defined as leader groups. The followers are the regions that have a relatively high GDP per person, and have a lower industrial specialization index. The regions of the Czech Republic belong here. In the Czech Republic the localization of the industry is the most homogenous. The lagging areas are the regions that could break out of this position through industrial specialization and with an increase in industrial activity. These regions have a low GDP, and the industrial specialization is also low.



Source: author's own work

Figure 5. Absolute specialization in relation to GDP per person in the regions

SUMMARY

In my study I examined the specialization and sector concentration tendencies in the Visegrád countries. I attempted to find an answer to how the industrialization processes such as reindustrialization, or deindustrialization influenced the development of the regions. After the socialist type planned economy, the transition into a mono-structural economy started in all the four countries. However, different developmental paths have been followed in the last two decades. In Poland, when defining industrial policies, special attention was paid to territorial equality and to the role that industry plays in the spatial development of the region (Botos, 2011). According to this theory even though the specialization of some regions is not high, the homogeneous spatial structure supports economic growth. Between 2000-2007 there were a growth of absolute concentration in three countries in the industrial sectors and in the construction sector. The strongest growth of absolute concentration between 2000-2007 was recorded in Hungary, the second was measured in Slovakia summarizing all the sectors absolute concentration. The increase in concentration in Slovakia and in Hungary in almost all the sectors except the financial intermediation should be mainly a consequence of the changes of the industrial structure specific to each area and before and a cause of the conditions of the economic transition and imminent European integration.

There is a high industrial specialization in many regions in Hungary and Slovakia. In Hungary, the industry and the financial sectors were concentrated in some territories, which hindered the development of other territories in the country. The regions that have a higher industrial specialization and have a higher GDP per person are defined as leader groups. The followers are the regions that have a relatively high GDP per person, and have a lower industrial specialization index. The regions of the Czech Republic belong here. In the Czech Republic the localization of the industry is the most homogenous. The lagging areas are the regions that could break out of this position through industrial specialization and with an increase in industrial activity. These regions have a low GDP, and the industrial specialization is also low. n Slovakia, signs appeared that show that the specialization of the area has led to long term negative effects, since the GDP of the region is influenced by the industrial concentration. The Czech Republic is an absolute winner of the transition to the macro-structural economy. The sectors in the country do not show a high specialization, but at the same time in one or two regions, the inherited industrial traditions further economic development.

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Appendices

Table 9
Absolute regional specialization in 2000 and 2007

Czech Republic	2000	2007
Prague	0.165393	0.165088
Střední Cechy	0.074112	0.059982
Jihozápad	0.094222	0.065325
Severozápad	0.061694	0.055589
Severovýchod	0.126521	0.096913
Jihovýchod	0.179005	0.122288
Střední Morava	0.078823	0.061134
Moravskoslezsko	0.063318	0.058087
Hungary		
Central Hungary	0.682391	0.675882
Central Transdanubia	0.082847	0.068943
Western Transdanubia	0.070108	0.05889
Southern Transdanubia	0.057154	0.036779
Northern Hungary	0.066781	0.05916
Northern Plain	0.101967	0.071627
Southern Plain	0.150487	0.065649
Poland		
Lódzkie	0.039664	0.034695
Mazowieckie	0.150577	0.126566
Malopolskie	0.050616	0.040547
Slaskie	0.059214	0.05836
Lubelskie	0.030043	0.011619
Podkarpackie	0.015538	0.009989
Swietokrzyskie	0.00922	0.005143
Podlaskie	0.007293	0.00378
Wielkopolskie	0.055628	0.043994
Zachodniopomorskie	0.011805	0.011471
Lubuskie	0.003757	0.00362
Dolnoslaskie	0.032351	0.031033
Opolskie	0.004749	0.003951
Kujawsko-Pomorskie	0.018201	0.015239
Warminsko-Mazurskie	0.007017	0.00629
Pomorskie	0.015927	0.015148
Slovakia		
Bratislavský kraj	0.221825	0.219318
Západné Slovensko	0.745834	0.558552
Stredné Slovensko	0.338616	0.278769
Východné Slovensko	0.395111	0.320837

Table 10
Relative concentrations by sector in 2000 and 2007

Industry (excluding construction)	2000	2007
Czech Republic	0.159716	0.185677
Hungary	0.186371	0.225624
Poland	0.179888	0.169413
Slovakia	0.133149	0.13318
Construction	2000	2007
Czech Republic	0.062646	0.064353
Hungary	0.093215	0.05772
Poland	0.110618	0.085138
Slovakia	0.080509	0.154865
Agricultural	2000	2007
Czech Republic	0.358446	0.389375
Hungary	0.511179	0.531504
Poland	0.352089	0.444292
Slovakia	0.447574	0.372345
Financial intermediation; real estate	2000	2007
Czech Republic	0.341607	0.342987
Hungary	0.426036	0.488161
Poland	0.285	0.245257
Slovakia	0.27471	0.263571
Public administration and community services; activities of households; extra-territorial organizations	2000	2007
Czech Republic	0.066396	0.075565
Hungary	0.076295	0.084759
Poland	0.082003	0.075184
Slovakia	0.079958	0.098237
Wholesale and retail trade; hotels and restaurants; transport	2000	2007
Czech Republic	0.101365	0.106105
Hungary	0.113034	0.097636
Poland	0.083745	0.084707
Slovakia	0.050242	0.022784

Table 10
Relative regional specialization in 2000 and 2007

Czech Republic	2000	2007
Prague	0.6959873	0.6777912
Střední Cechy	0.5591897	0.5789420
Jihozápad	0.5843710	0.6264985
Severozápad	0.5115709	0.5158901
Severovýchod	0.5274417	0.5095142
Jihovýchod	0.6292996	0.6551983
Střední Morava	0.5376828	0.5601588
Moravskoslezsko	0.4492754	0.4874126
Hungary		
Central Hungary	0.9459309	0.9310914
Central Transdanubia	0.5517805	0.5326360
Western Transdanubia	0.5340147	0.5290652
Southern Transdanubia	0.6227494	0.6640362
Northern Hungary	0.5311821	0.5403256
Northern Plain	0.5466783	0.5861026
Southern Plain	0.6955702	0.6481076
Poland		
Lódzkie	0.5856961	0.5216427
Mazowieckie	0.5506185	0.5285365
Malopolskie	0.5397312	0.5290839
Slaskie	0.5652524	0.5218846
Lubelskie	0.6264656	0.6102590
Podkarpackie	0.7061584	0.6813419
Swietokrzyskie	0.7771416	0.7652960
Podlaskie	0.8047933	0.8222998
Wielkopolskie	0.5094302	0.5188474
Zachodniopomorskie	0.7444017	0.7926900
Lubuskie	0.8539440	0.8359021
Dolnoslaskie	0.6175524	0.5874947
Opolskie	0.8335652	0.8546767
Kujawsko-Pomorskie	0.6711297	0.7122009
Warminsko-Mazurskie	0.7979169	0.7888178
Pomorskie	0.6975297	0.7042990
Slovakia		
Bratislavský kraj	0.7109305	0.6329031
Západné Slovensko	1.0899940	1.1746788
Stredné Slovensko	0.5207388	0.5676582
Východné Slovensko	0.6132824	0.6283568

CO_2 Pipeline Cost Calculations, Based on Different Cost Models

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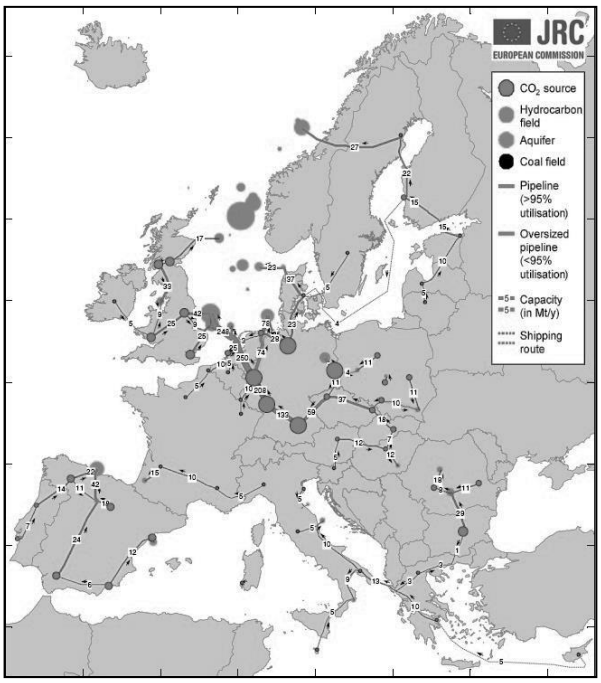
SUMMARY

Carbon Capture and Storage (CCS) is considered to be a promising technology and an effective tool in the struggle against climate change. The method is based on the separation of air-polluting CO_2 from fuel gases and its subsequent storage in different types of geological formations. The outlet points and formations used as CO_2 storage sites are often very far from each other. According to certain recently announced, medium-term EU plans, a 20,000 km long pipeline system will be established for the transportation of the gas by 2050, at a cost of 28.5 billion Euros. Obviously, not only technical ad safety planning, but also detailed, itemized financial and investment plans based on cost calculations (including construction and operation costs), are required to make such a grandeus enterprise economically feasible. We reviewed several studies from available literature that use different computational models to determine pipeline construction costs, based on the technical and financial data of natural gas transport pipelines and CO_2 pipelines built for Enhanced Oil Recovery (EOR) projects. In the following paper, these cost models are collated and analysed, with regard to their applicability to CCS process planning.

Keywords: CCS technology, CO2 transportation; pipeline; cost model
Journal of Economic Literature (JEL) code: Q57

INTRODUCTION

Since the industrial revolution began, the amount of greenhouse gases (GHGs) has constantly grown in the atmosphere, and as a result, global warming has been drastically accelerated. In recent years the CO_2 content of the total GHG emissions has reached 80%. According to the data of the European Environmental Agency (EEA), in the year 2010 this ratio exceeded 3,891 billion metric tonnes of CO_2 across the EU-27. By analysing the 'emission mix' of the economic sectors, it can be stated that the largest emitter is the heat and electricity sector, including power stations (31.3%). The second largest amount of CO_2 is being emitted by the transport sector (26.6%). At the same time the emission parameters of these two sectors differ significantly. While a limited number of resource points are represented by power stations, millions of small emitters (like motor vehicles) are present in the transport sector. In other words, one-fourth of the overall CO_2 emission is produced by relatively few polluters, and actually these are the places where the sequestration of CO_2 from fuel gases and safe storage can be technologically performed. Transportation takes place either through pipelines or by tankers (marine routes), since there are often huge distances between the outlet points and the points of underground injection. The CCS-chain consists of: detachment, transportation, storage and monitoring.



Source: JRC[1] (2010)

Figure 1. The planned CO_2 network system in 2050

[1] *Joint Resources Centre*

The transportation of CO_2 by pipeline is not a new task, since various methods for transmitting the gas to the producer units have been applied by enhanced oil recovery (EOR) technologies[2] for several decades.[3] Today, the length of the CO_2 pipelines is globally more than 6,000 km; however, it is under 500 km within Europe. Even if CCS is not assumed to be a final solution, the EU considers this technology to be an important tool in the pursuit of climate protection. Due to the lack of proven operational experience, presently only the investment and operation costs of model projects are covered. For the future, the construction of a complex CO_2 pipeline structure (see Figure 1), similar to the natural gas transportation network existing nowadays in Europe, has been set forth by the European Committee (JRC, 2008).

According to EU expectations, the changes introduced in the Emissions Trade System (ETS) starting in 2013 will give positive incentives to the implementation of these huge, cost-intensive plans. The new regulation declares that from 2013 on, captured and safely stored amounts of CO_2 are not to be considered to be emitted quantities and will not be charged as emitted shares to the country involved (Lauranson, 2011). This means that, due to probably high share prices, when the total shares will be traded later on the stock market high emitters are likely to be interested in the use of this kind of technology.

ECONOMIC MODELS OF CCS

Naturally, not only technological but also economic studies have been carried out to promote the spread of environmentally safe CCS technology. Although specialists have great experience in CO_2 transmittance, its economic modelling has not yet been fully developed. Transportation activities can vary along the CCS chain – considering the localisation of resource points and storage sites. Resource points can be 'anywhere' on land (onshore), while storage formations can be found onshore, near marine sea shelves, coastal platforms or offshore, in deep marine areas as well. The offshore sites are expected to gain priority (over onshore sites) because of their distance from any populated area.

Consequently, CO_2 transmitters can include:

- onshore pipelines,
- subsea pipelines,
- tankers.

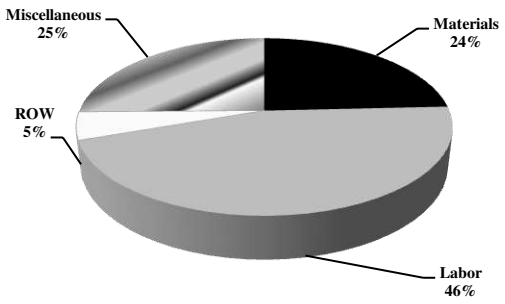
Regarding Hungarian conditions, only onshore type pipeline transportation can be taken into consideration. The cost models mentioned below also deal with this kind of transportation. When determining either CAPEX[4] or OPEX[5] parameters, the technological and safetyparameters of the pipeline are of prime importance:

- pipeline length,
- pipeline inlet pressure,
- pipeline outlet pressure,
- pipeline inlet temperature,
- CO_2 flow.

Naturally, the capital cost of the investment is not determined merely by the physical parameters of the operating pipeline. Capital costs can be divided into the following components:

- materials,
- right of way,
- labour,
- miscellaneous (e.g. engineering costs).

The share of the above components in total capital cost is represented in Figure 2. Recent studies show that in the case of a 12 inch (300 mm) diameter CO_2 transportation pipeline, the proportionate shares of these cost parts remain constant, regardless of pipeline length.



Source: van der Zwaan et al. (2011)

Figure 2. Distribution of capital costs

Cost models of CO_2 pipelines are mostly based on the cost inspection of the constantly expanding EOR-CO_2 or natural gas pipelines. The models concentrate on the parameters and the establishment costs of the pipeline. Although sizing is determined based primarily on technological and safety reasons, it gives a further basis for economic calculations.

The following models are mentioned in the literature available:

- Ogden model
- MIT[6] model
- Ecofys model
- Parker model,
- IEA GHG PH4/6 model
- IEA GHG 2005/2 model
- IEA GHG 2005/3 model.

[2] *Providing surplus oil production by CO2 injection into hydrocarbon reservoir formations.*
[3] *The first CO2 pipeline was established in the early 1970s in the USA, and in 1972 in Hungary.*
[4] *capital cost/expenditure*
[5] *operating expense*
[6] *Massachusetts Institute of Technology*

Comparing the models, it can be stated that only the Parker model offers an alternative route (Parker, 2004), since the Ogden model is comprised of other theoretical research works (Ogden et al., 2004). The MIT (Heddle et al., 2003) and Ecofys (Hendriks et al., 2003) models determine the pipeline diameters by applying the same method as used in natural gas pipeline sizing.

The International Energy Agency GHG models (IEA GHG, 2002; 2005) consider booster stations (used to increase pressure along longer pipelines) for the calculations. In models dealing with the North American area, annually published cost data from the Oil & Gas Journal (OGJ) are considered. In the following, the MIT, Ecofys and Parker models will be described:

MIT Model

As published in a study in 2003 (Heddle et al.), the technologically most appropriate pipeline diameter was determined by the Reynolds number and Moody diagramme – the way these formulae are used in engineering practice. Total capital cost can be given by the parameters calculated from basic pipeline data, with the cost data from OGJ added.

$$\text{TotalAnnualCost}\left(\frac{\$}{\text{Yr}}\right)=(\text{CC}\times\text{D}\times\text{L}\times\text{CRF})+(\text{OM}\times\text{L}) \quad (1)$$

where:

- CC construction cost ($/km) – as a function of the diameter, including material cost
- D pipeline diameter (in)
- L pipeline length (km)
- CRF capital recovery factor (at given year considering project lifetime, e.g. CRF for a 20-year project is on average 0.061[7])
- OM incremental costs – not a function of the diameter.

$$\text{Levelized Cost}\ (\ \$/\text{tonne CO2})=\frac{\text{Total Annual Cost}}{(\text{Q}\times\text{CF}\times\text{DPY})} \quad (2)$$

where:

- Q CO2 mass flow rate (tonne/year)
- CF plant capacity factor (80% in accordance with authors of the model)
- DPY day per year.

Ecofys Model

In this model, costs are given in euros, since it was first published in a study prepared for the European Commission (COM (2011) 112)The pipeline diameter is determined the same way as in the MIT model, but here, the friction factor is considered to be constant, while in the MIT model it is the function of the Reynolds number.

Total capital cost in the model:

$$\text{Totalcapitalcost}(€)=1100\,\frac{€}{\text{m}^2}\times\text{F}_\text{T}\times\text{D}\times\text{L} \quad (3)$$

where:

- FT correction factor for terrain = 1 for most common terrain
- D pipeline diameter (mm)
- L pipeline length (km).

Annual capital cost:

$$\text{Annual captial cost}\ (€/\text{yr})=\text{Total capital cost}\Big/\frac{(1+i)^n-1}{i(1+i)^n} \quad (4)$$

where:

- i discount rate
- n operational life time (years).

According to the model, annual operational cost is 2.1% of total capital cost. Levelized cost is not calculated on CO_2 transportation, but it can be given on the basis of the MIT model.

The Parker Model

Parker uses OGJ cost data just like the MIT model, but determines it in a more detailed way instead of simply giving a summated number. Calculations can be performed in four different cost categories by applying the quadratic equations given as a function of pipeline length and diameter. Materials costs account for approximately 26% of the total construction costs on average. Labor, right of way, and miscellaneous costs make up 45%, 22%, and 7% of the total cost on average, respectively.

The model was originally developed for the calculation of hydrogen pipeline costs but is applicable to CO_2 pipelines as well.

THE COMPARISON OF COST MODELS

Comparing the input and output data of the described models (see Table 1), the conclusion can be drawn that while the Parker model is simply based on the geometrical parameters of the pipeline (length, diameter), the other two models also consider pipeline material- and the physical properties of the pipe and of the gas transported.

[7] *CEPA, 2012*

Table 1
Pipeline cost models with specific parameters for CO_2 pipelines

	Models		
	MIT	Ecofys	Parker
Input	pipeline roughness factor, CO_2 viscosity, friction factor, Reynolds number, inlet pressure, outlet pressure, pipeline length, CO_2 mass flow rate, Capital Recovery Factor, Plant Capacity Factor	average flow velocity, friction factor, CO_2 density, pressure drop, pipeline length, correction factor for terrain, CO_2 mass flow rate, operational lifetime, discount rate	pipeline length, pipeline diameter
Output	pipeline diameter, Total Annual Cost, Levelized Cost	pipeline diameter, Annual Capital Cost, Annual O&M Costs, Total Annual Cost	Materials Cost, Labor Cost, Miscellaneous Cost, Right of Way Cost, Total Capital Cost

General comparisons are made difficult by the following diffenerences in approach:

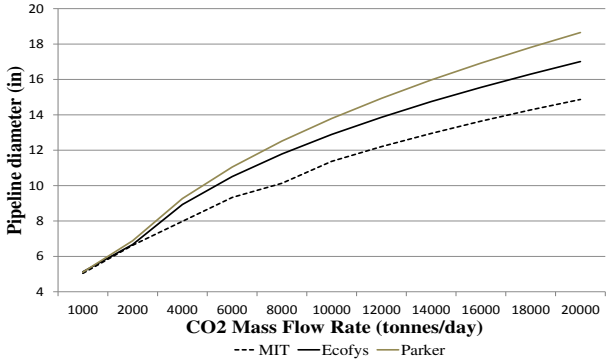
- cost calculations are nominated in USD (MIT and Parker models) versus EUR (Ecofys model)
- pipeline length and diameter are given in different standard units (e.g. diameter: inch vs. mm – 1 in= 25.4 mm)
- the Parker model uses pipeline diameter data as the basis for the calculations and applies a distinct calculation method to get to a final outcome
- the estimated lifetime of the CO_2 transmission pipeline is considered by the Ecofys model only
- O&M cost is determined as a function of pipeline length and diameter by the MIT model while it is determined as a function of the given percentage of total capital cost by the Ecofys model.

EXAMPLES

For purposes of conducting a general comparative analysis of the models described by researchers, a standard set of parameters has been defined as follows:

- pipeline length: 100 km
- plant capacity factor: 80%
- pipeline inlet pressure: 15.2 MPa
- pipeline outlet pressure: 10.3 MPa
- CO_2 temperature: 20°C
- CO_2 density: 844 kg/m^3
- CO_2 viscosity: 6.05*10^{-5}
- reference cost year: 2005
- conversion EUR/USD: 1.2
- operational lifetime: 20 years
- discount rate: 10%
- location factor: 1.00
- terrain factor: 1.2

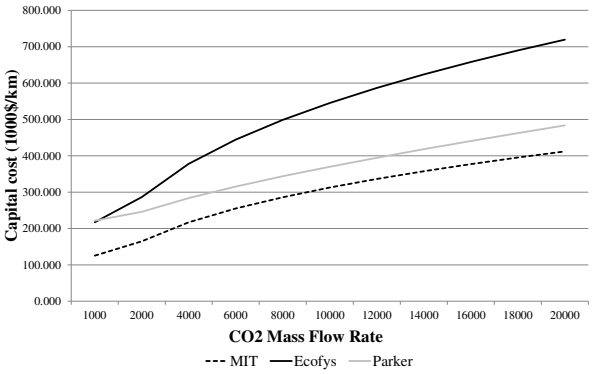
Calculation results obtained by the application of the respective models are shown in Figures 3 and 4. The calculation differences mentioned before are clearly reflected in the final outcomes. Despite the slight divergence of the results, the same type of functional relationship can be observed between pipeline diameter and mass flow rate increase for all three models. Differences practically derive from differences in the diameter calculation methods.



Source of data: McCollum and Ogden (2006)

Figure 3. Pipeline diameter vs. CO_2 mass flow rate

Figure 4 shows a more dynamic change for the Ecofys model than for the other two. The MIT and the Parker models relate capital cost results to increase in mass flow rate. The Ecofys model is somewhat more specific, as mentioned before, taking the expected lifetime of the pipeline into consideration and estimating additional costs regardless of pipeline length.



Source of data: McCollum and Ogden (2006)

Figure 4. Pipeline Capital Cost vs. CO_2 Mass Flow Rate

OBSTACLES IN APPLYING ANY OF THE THREE MODELS TO A HUNGARIAN PIPELINE PROJECT

In 2009, a CCS pilot project plan was developed involving the establishment of a 116 km long CO_2 pipeline as part of an investment plan associated with the extension of the Mátra Power Plant. The planned pipeline diameter was 350 mm (~ 14 in), inlet pressure 12 MPa, and annual flow capacity approximately millon tonnes (about 8200 t/day).

The obstacles in applying the above models to this project were the following:

- detailed, exact and reliable data on pipeline establishment costs are extremely difficult to obtain;
- the models mentioned have been developed – by European and American researchers – for natural gas or hydrogen pipelines, relying on an annually published pipeline cost database. Such a database is nonexistent in Hungary.
- The estimated construction costs of a 1 km long natural gas pipeline (of 350 mm diameter) amounts to about 51 M HUF in Hungary (Kubus, 2011). Yet, for the successful application of a cost-calculation model, incremental cost data (independent of pipeline diameters) should also be known. Such data are not public.
- The investment plan associated with the expansion of the Mátra plant has lately been suspended, which makes further cost calculations purposeless.

With the suspension of the prospective development plan, the first Hungarian CCS project has also been shelved. However, though there is no immediate need for a cost calculation for CO_2 pipelines, future developments are likely to require it someday. For this reason, it would be useful to work out a method that is applicable to the Hungarian situation. Investigations can also be made into how useful the available pipeline cost database information can be in a Hungarian context.

CONCLUSIONS

Return rates and expected profits are, of course, primary influential factors when making investment decisions on pipeline construction. From the economic aspect, however, distinction should be made between:

CO_2 pipelines related to the application of EOR technologies that aim to improve oil production performance, and CO_2 transportation pipelines integrated in the CCS technological chain, providing the transmission of the gas to the storage sites.

While the cost-efficiency of production-related, commercial CO_2 pipelines (mainly in the US) is basically determined by the fluctuations of oil market price, the assumed rentability of CCS-related transport pipelines is somewhat uncertain and might prove viable only on the long run.

Since CCS technologies enjoy the financial support of the European Union, the recent implementation of special pilot projects put focus on gaining technical-engineering expertise and field practice rather than on budgetary or commercial issues.

The economic balance of prospective investments in CCS will largely depend on forthcoming Emissions Trading Scheme implications, CO_2 quota tariffs (at present relatively low) and other governmental restrictions as well as environmental regulations (e.g. charging extra taxes on excessive CO_2 emission).

Acknowledgements

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Micro- and Macroeconomic Models and Optimization Procedures

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SUMMARY

The conventional economics lies on the fundamental assumption of neoclassical welfare economics according to which the primarily aim of economics is to achieve Pareto optimal conditions. Pareto optimum has two meanings: if Pareto optimum means Pareto norms, it reflects relevant conditions for economic policy. If Pareto optimum is linked with marginal analysis when a determined fictitious economic optimum is sought for in a perfect competition situation, it an instrument used for formal analytical analysis. According to this allocation of resources or the volume of production is optimal if there is a situation in which it is possible to make any individual better off without making someone else worse off.
Journal of Economic Literature (JEL) code: F010, B410

MICRO- AND MACROECONOMIC MODELS

It is obvious that during economic education we often come across economic models. In microeconomics this is consumer and producer behaviour. In macroeconomics, models are used for description of macroeconomic equilibrium and economic growth. The majority of these models are static, but some are dynamic, explaining factors and processes over periods of time. Thus, conventional economics is considered static and does not contain variables related to time or various time periods. (In an equilibrium model the demand is related to a particular time period of supply and price). There are economic models that use variables related to different time or time periods, but their factors are not 'properly' linked. It is obvious that real economic processes undergo different changes with time; therefore dynamic models are more efficient and realistic than static ones.

Modelling in Conventional Micro and Macroeconomics

Conventional economic theories use over simplified models which fail to reflect complex reality for several reasons (Bartmann, 1996:30):

- In real life preferences, applied techniques and technologies as well as behavioural norms are subject to continuous variation. Consequently, permanent preferences and production functions cannot be used in the models.
- Reality cannot be characterised by conditions for perfect competition or circumstances for permanent competition. Monopolies, oligopolies and other competition barriers cause major stabilisation and allocation problems.
- In most areas of economics decisions are not made on the basis of perfect information and involve a number of uncertainties. Rational expectations and perfect information ensure grounds of existence for static equilibrium theories, which are not applicable for description and explanation of decisions made in sustainable non-equilibrium and uncertain conditions.
- The illustrated equilibrium models leave out of consideration social relationships existing in the reality. Conflicts of interests and continuous clashes are experienced in distribution of incomes and wealth, of work and production factors, and in issues related to quality of natural environment, competition environment and public welfare.
- Effects of externalities are neglected in the models and are considered to be temporal problems which make economic subjects behave properly by environmental policy tools, assuming that this will resolve problems.
- The conventional theory considers Pareto optimal point to be a socially optimal condition. Even if the production and the distribution are believed to be socially acceptable and in line with Pareto optimum, not every allocation can be supposed socially acceptable since social legitimacy of such allocations can be queried.

- Evolution of society is naturally dynamic and is considerably affected by social scales of values which shape institutions, human behaviour and world views. Since the equilibrium theory takes value judgment as its starting point, it fails to give an acceptable interpretation of a complex reality.
- The conventional economic theory takes into account only factors relying on quantitative indicators and seems an exact science, which narrows the validity area of the theory. It excludes social, ecological and psychological dimensions of management in the field of raising and shooting problems.
- Conventional economists take simple rationality problems as a starting point of complex human behaviour. A human being is an idealist and is able to perform cooperative activities

Societies which base their existence only on rational behaviour do not prove viable.

Absolutization of Consumer Autonomy

Conventional economic theory deals with sovereign consumers who make their choices from possible alternatives on their own. Models often make a supposition that the behaviour of an economic player does not have an impact on the extent of a particular economic factor. Environmental economics thinks that if only one member of the group under investigation behaves non-environmentally friendly, this does not have an impact on the total profit. The feasibility study conducted of a player considers positive alternatives (the environment friendly behaviour in the model mentioned above) irrational. (See the supposition in the free rider game theory).

The conventional environmental economics neglects the idea that the impact of the laid burden on the environment will be experienced only in the future, but the profit gained from the consumption can be enjoyed at present, so the effect of consuming natural resources is often uncertain and non-transparent for economic actors. For instance, overexploitation of natural resources can lead to irreversible processes the consequences of which even the promoter is not able to predict.

The conventional presupposition saying that consumers can correctly define the product value is wrong since the information flow need improving and both social and psychological factors have an impact on the value judgment.

Limits of Applied Economic Models

Reliable data about incomes and expenditures trends cannot be provided. Resolving this issue by an ordinary discounting does not seem a good idea since due to the nature of the method discounting undervalues the present importance of long-term impacts. The climate change to be experienced in one hundred years does not require any measures to be taken at present due to a high discount rate. Thus, discounting, as an evaluation mechanism, cannot be considered relevant. On the other hand, conventional economics does not have another mechanism showing how to appraise environmental damages and incurred costs. If there is no discounting done, the incurred expenses completely affect the decisions made at present.

Conventional economics attempts to solve the market deficiencies of the distribution of natural resources by internalisation of external costs. The problems stemming from this are as follows:

- Cost internalisation requires perfect information about the extent of the damage and the expenditures to be made averting it, but this is only theoretically possible.
- If the externalities are irreversible or result in accumulating processes, the static internalisation strategies fail to work

From the difficulties listed above we cannot draw the conclusion that internalisation is a completely unnecessary mechanism. We are attempting to point out that it should not be done in a simple formalised ways or simply by computing the costs of environmental damage since the internalisation problems listed above cannot or can hardly be taken into account.

Relationship Between Economy and Ecology

One main false assumption of conventional economics apart from the already mentioned above is the pessimistic one according to which all environmental problems arise from cost issues. Actually, economic exchange processes can be non-economic (ethical, legal, political, etc.) consequences. Irreversible processes (extinction of species) or even diseases or deaths caused by environmental pollution can hardly be compared with produced material goods. The economy is only one of the sub-systems of social and ecological systems consisting of human beings having different needs. Certain basic services of the nature cannot be substituted by services and goods produced artificially. There are three functions and services which cannot be substituted:

- Life supporting functions of the nature: appropriate climate, protection against harmful rays, clear air, soil, water and other natural resources are of the utmost importance for humanity and cannot be replaced artificially.
- Complex functions of ecological systems: for instance, not only does a forest provide leisure facilities for people (which perhaps can be substituted), but have an impact on climate, store water resources, prevent soil erosion and promote sustainability of biological diversity.
- Resource and energy generating ability of the nature: laws of thermodynamics show that economy fails to operate without its natural resources in the long-run since the generated waste and the used energy cannot be regained by 100%.

Consequently, both economy and ecology are disciplines subordinated to more general and more comprehensive laws. On the other hand, proper tools to be applied for overcoming contradictions between basic approaches of the two fields do not exist yet. Humanity is not able to exist without nature, but nature can get by with humans, so the false concept related to priority of economy should be rejected. It is the economy that should be adapted to limits created by natural environment.

From the considerations above, it follows that conventional economics attempts to provide an explanation to complex social, human and organizational behaviour forms experienced in the field of economics by applying simple models. The descriptions it offers are appropriate only for understanding some aspects of particular fundamental economic processes. They are of didactic (teaching and instructing rather than explaining) character and bear features of positivism. Positivist norms hold that science should restrict itself to describing and systematising phenomena and should not explain them, since human senses are not able to comprehend internal correlations and regularities. This approach identifies objects and links them with perceptions created about them. It rejects making a distinction between the internal and external world, subjects and objects, but sets norms. The applied models face principled barriers, which conventional economics has failed to overcome despite making continuous improvements to the theory.

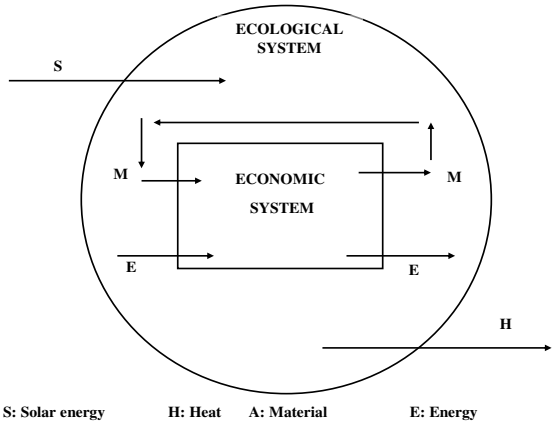
ALTERNATIVE ECONOMICS OPINIONS AND MODELLING

Several trends looking for new solutions have evolved in economics. There are two major trends in which theorists attempt to overcome the assumed shortcomings of problem solving methods by reconsidering conventional suppositions and axioms and applying methodological pluralism.

Ecological Economics

Ecological economics evolved in the 1980s and attempted to give a broader interpretation to economics incorporating ecological ideas. Pearce (1998) gives a general description of so-called ecological economics. This trend considers economics to be a subsystem of a complex ecological system. It does not completely reject conventional economics and its followers rely on the achievements of conventionalists. The pioneers of ecological economics (Kapp and Odum, among others) further developed neoclassical economic models, supplementing them with ecological factors.

The distinguishing feature of ecological economics is that instead of focusing on the relationship among nature, society and economics in monetary terms, it describes changes in natural units of measurement. Seeber (2001) holds that since theorems of ecological economics do not make up a single theoretical system, the primary task should be to create such a system.



Seeber (2001:27)

Figure 1. Ecological economics: the economy as the subsystem of the ecological system

Ecological economics can be introduced on the basis of two trends, which are perfect examples of an interdisciplinary approach and broad perspectives. One of them urges the application of thermodynamic main theorems in the description of economic processes, while the other attempts to define the total economic value.

Criticizing conventional economic approaches, Georgescu-Roegen (1971) did not agree with the general picture developed of economic circulation, emphasizing rather that management is also involved in physical issues. The major idea behind the analysis that Georgescu-Roegen urged was energy, more precisely, energy flow and energy transformation related to economic processes since they had both been unconsidered the scope of analysis until then. According to him, economics has to take into account the major laws of thermodynamics. The Second Law of Thermodynamics holds (Georgescu-Roegen, 1974) that in a thermodynamically single system like the Earth the amount of energy remains constant, but with its exploitation the utility factor of a given energy unit continuously deceases. The amount of energy which cannot be exploited further can be characterised by the term entropy. The processes going on in thermodynamics can be either reversible or irreversible. In case of reversible processes entropy remains constant. In an irreversible process entropy increases. When the natural process reaches a state of equilibrium, it reaches its maximum. An entropy change quantifies the extent of irreversibility of a physical process. Economic processes exploit low-entropy materials and energies from nature and transform them into higher-entropy wastes and pollution in production processes (Faber et al, 1998). For instance, incineration transforms highly ordered low-entropy fossil matter and when it is burnt the stored

energy is released and dispersed into the environment. The generated gases and particles can be utilized at a great cost.

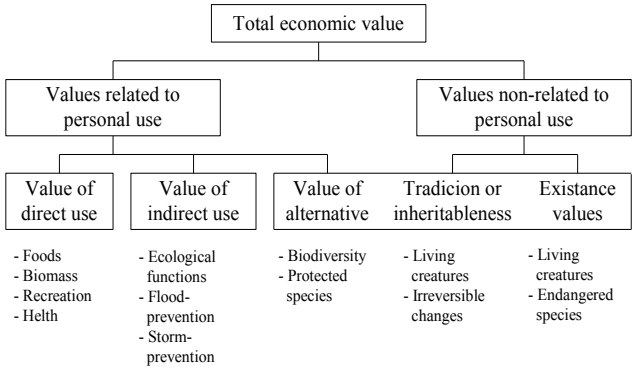
Georgescu-Roegen (1974) holds that the most serious shortcoming of conventional economics is that it neglects the existing physical boundaries and creates the illusion that the energy to be utilised is infinite.

The subject of the second trend of economics is total economic value, and a precise definition of it plays an essential role in the relevant decision making processes.

There are several factors which determine the total value of a natural matter (see Bromley, 1995; Pearce, Turner, 1990; among others). Factors determining the total economic value can be classified into two major groups: direct-use and indirect-use values. Direct-use values arise from active personal exploitation of the environment. An angler, a hunter, a hiker and an ornithologist use the natural environment and gain benefits from this. If a person finds pleasure in looking at the beauties nature either on the spot or in a photograph, he uses nature and generates benefit from this. Economic terminology defines this value as an economic value (Kerekes, 1995). The total value of private goods equals the profit generated from the exploitation.

In case of natural goods their existence value is one of the non-use values and stems from their simple existence. In this case, the individual acknowledges the right for something to exist; for instance, nature, and is willing to make sacrifices in order to conserve it.

Option value is another non-use value which includes the value of ensuring future use of the goods by an individual or by a future generation and the value of ensuring others' use of services provided by nature. The components of total economic value are presented in Figure 2.



(Kerekes 1995:26)

Figure 2. The value components of the natural resources

Neglecting differences in estimates of our achievements and natural goods results in making invalid conclusions when investment decisions are made.

If a particular investment involves the transformation of nature, nature loses some part of its total economic value. Thus, while estimating the extent of losses, not only the value loss originating from exploitation, but the value decrease (existence value, bequest value) resulting from this has to be taken into account.

There is a distinct contradiction within this idea since ecologic economics measures ecosystem services from a monetary aspect while questioning their quantification in money. (Marjainé Szerényi, 1999).

Evolutionary Economics

Evolutionary economics deals with ecological problems indirectly. It is an economics theoretical trend, which - unlike the static approach of mainstream economics - deals with evolution and dynamics of economic systems and actors (Dosi and Nelson, 1994). The representatives of evolutionary economics hold different views on the actual content of the economic evolution concept (among the biological processes there are some that can be matched with economic processes and there are some that cannot), but basically they all agree that behavioural forms of economic systems and actors undergo constant changes.

The subject of our analysis is the explanation of changes of an endogenous character emerging in systems: the idea that in economics a constant change is generated from the inside is a fundamental premise in evolutionary economics which is accepted by all trends (Witt, 1992).

Several followers of evolutionary economics experience similarities between evolutionary and selection processes of economic and ecological evolution. They hold that economic phenomena show more similarities with biological organisms and processes than with the mechanical world preferred by neo-classicists. They focus on historical determinism and post dependence of evolution. They believe that future is unpredictable. Future is not simply unknown, but at the moment when a decision is made, it does not even exit.

There are three trends in the methodology of evolutionary economics that are as follows (Witt, 1992):

- The verbal trend is based on traditions of Austrian economics schools. Its representatives deal with growth, economic boom/bust cycles and institutional changes. Its followers go back to their predecessors' main ideas and attempt to apply them to the current troubleshooting.
- Another trend is based on mathematical models and computer simulations. This trend examines the spread of new technologies, innovations and economic growth. Its most popular model, developed in 1982, considers innovation to be an evolutionary process.
- The third trend models complex systems from the perspective of structures and operations. The created models attempt to analyse time and space interdependencies between economic agents who are able to learn and are limitedly rational.

From the considerations above, it follows that the conventional economics and environmental methodologies used for describing complex and dynamic

economic processes are not applicable and have shortcomings. On the basis of the above-mentioned features of economics trends, we hold that shortcomings experienced in neoclassical environmental economics can be overcome by broadening the interdisciplinary approach to theoretical aspects of evaluation.

OPTIMIZATION PROCEDURES

The technical literature distinguishes three main types of global optimization methodology. The first is gradient-based; the second is direct search based and the third is random search based global optimization methodology. In the units to follow we are going to give a short overview of methodologies, laying special emphasis on the advantages and shortcomings of the major ones.

Conventional Methodology

The elaboration and the study of the gradient–based method of optimization started several decades ago. There are two types of this method: direct and indirect.

While using the indirect method, the extreme value can be found by defining the zero positions of a derived function, which generally means resolving a whole equation system. In the case of functions with several dimensions, the extreme values are the points where the curve rise of the tangential plane is equal to zero in all directions. When direct methods are applied, the extreme values are shifted towards the local gradient. This is usually called hill climbing, meaning that, in order to reach the extreme point (depending on the type), the steepest slope (gradient) is either 'climbed' or 'descended'. The shortcoming of both methods (they have been modified, changed and revised several times) is that they are not robust enough to be applied in a wide range of problems to be solved in practice. Indirect methods stipulate that the derived function of the problem to be resolved has to be known. Unfortunately, since this assumption is not true in a huge proportion of problems experienced in real life, the practical implementation of the indirect method is extremely limited.

Although direct methods soft conditions for problems, in practice they can only be used for determining the local extreme values.

Methods Based on Random Search

The second major type is the method based on direct search. The main principle of this method is that an algorithm finds the global optimum by examining each point of the space in a given probability space. The probability space points can often be described with a tree structure. When the whole space is walked around, intersection points are approached. Different strategies are applied for tree walking: for example, in-depth walking and width walking. The probability space of problems is so extended that it is impossible to walk along the paths in a reasonable amount of time. In some cases branching and restriction principles can be applied. They are used when conditions and/or stipulations allow us to examine given vertices on the basis of which we can decide whether the optimum is in a sub tree that does not start from the given vertices. In this case the sub tree can be neglected and the extension of the search space gets smaller. However, the complexity of the probability space of real problems puts restrains on the efficiency of the method, since it is impossible to tour along the whole or even a part of the problem paths efficiently or/and economically in a reasonable amount of time.

It is becoming more and more typical of practical problems that their probability space is large and/or multidimensional there is little information about the evaluation function estimating the 'goodness' and it is generally burdened with noise. Thus, the application of the deterministic methods mentioned above is limited in our case.

Stochastic or random search based methods belonging to the third type of global optimization algorithms attempt to fill in this gap. Randomness is beneficial in choosing the points to be examined in the search space. One of the most fundamental and simplest method is stochastic hill climbing. In this method we start from a randomly chosen actual point of the search space. Then using the stochastic method we chose one point from 'neighbourhood points'. The point with a higher value than the value of the point originally chosen will be the following actual point. The advantage of this method is that it does not use any information about the estimated space structure of the problem. Its shortcoming is that with great probability it falls into the local optimal trap. The most promising and the most intensively researched area of stochastic methods using random search is a group of optimisation methods based on different metaheuristics. Metaheuristics, compared to problem specific heuristic, provide solution probabilities to a wider level of problems. The basic idea of their methodology most often lies in processes observed in the nature. Although they do not ensure a global optimum, they give a suboptimal solution that is very close to the optimum, in a reasonable amount of time.

A short overview of the most essential metaheuristic methods and their features follows.

Simulated Cooling

Simulated cooling copies the development of an energetically 'optimal' grid system of solid materials during heat treatment. The material particles of the solid heated up to a high temperature move between energy levels relatively freely. Then the gradual decrease in the temperature allows particles to perform only small movements between energy levels and to become stabilized in a crystal structure having a very low internal

energy. The algorithm implementation steps are very similar to stochastic hill climbing steps.

During the implementation of the algorithm, from a randomly chosen 'neighbourhood' the value lower than that of the actual agent is also accepted with a changing probability that depends on the temperature during algorithm. The temperature is gradually decreased while the algorithm is running meaning that cooling is applied, which decreases the probability of accepting worse agents. The algorithm developed in this way may allow us to finding the global optimum, but it is very energy consuming and extremely sensitive to the proper selection of its parameters. At present there is no rule which could help implement proper parameter tuning that can be applied to all problems. The efficiency of the process can be increased if the system is restarted or reheated several times.

Tabu Search

Tabu search is another metaheutistic method. It works with one solution and applies random reach methodology. The word tabu comes from the Polynesia Islands to indicate holy things and places that cannot be touched or visited. Its fundamental idea, based on stochastic hill climbing approach, is as follows: the visited points of the search space are put on a tabu list. The newly chosen point is examined and is accepted only if it is missing from the list. Naturally, the size of the list cannot be enlarged to an unmanageable size, so the length of the list corresponds to a totally random whole number *n*. If the list length reaches *n* and the next point is to be put on the list, the oldest element on the tabu list is deleted. Swarm intelligence is a complex collective form of behaviour in which the agents belonging to a swarm make decisions taking their own environment into consideration. Yet, in the end, intelligent global behaviour emerges. In the following unit two key representatives of the swarm intelligence method are introduced.

The basic idea of the ant colony algorithm was taken from the nature. The concept is based on food-searching behaviour of ants. Ants apply very sophisticated methods for communicating with each other, since they mark the paths from the source of food to the colony by leaving pheromone hormones. These pheromone markers are smelled by other ants, who are likely to follow the path with great probability. The established paths to the food source can be of various characters and may even be blocked by obstacles. Ants' aim is to collect as much food as possible. Individual agents have limited opportunities, but a whole colony can resolve problems very efficiently. There are ants that move separately and along a random path, but if they find a pheromone trail, they will follow the mark with great probability. In the meantime, they also release pheromone and its concentration on the trail increases. As a result, the attraction force of the trail also grows. The pheromone level of the frequently used trail increases, while that of rarely used one decreases. Over time, however, the pheromone trail starts to evaporate, and thus, the pheromone level on a trail left without reinforcement continuously declines. The ants taking a shorter path march faster and increase its pheromone level while ensuring a stronger 'attraction' force. As a result, other ants also start using the shorter trail and after some time most ants will march along it, whereas the pheromone level of the longer trail will decrease.

The ant colony algorithm is usually applied to combinatorial optimization problems. In one of its possible implementations ants are agents.

Pheromone strip values are ordered to state space edges shown as a directed graph. Successful or less successful solutions may decrease edge values. The paths successful in the past are stored by a matrix of a pheromone stripe value. The agents build the path step by step. They estimate the possible following steps and chose one with a certain probability.

Choice probabilities depend on heuristic values ordered to steps and on the pheromone strip value. Particle swarm optimization is a population-based optimization technique modelling collective movements of bird flocks, fish schools, bee swarms or other particles. Swarm individuals make one movement each in the search space and are connected to each other according to a certain topology. All particles know the best values (actual local optimum) of their topology neighbouring particles (and naturally their own) and their swarm's best value.

Evolutionary Algorithms

By taking a step agents change their positions and combine their local and global optimum as well as their positions in the past. While combinations are developed, random values are also used. Evolutionary algorithms make up the next large metaheuristic group of global optimal methods. Evolutionary algorithms are optimization methods that incorporate biological mechanisms and a population of data structures (codes) representing search space points Features such as mutation, recombination, selection and survival of agents being better at adapting to the environment (fitness) attempt to reproduce a population of a higher quality from iteration to iteration (generation steps). (Schöneburg et. al., 1994)

The evolutionary algorithm family has four key members:

- Genetic algorithms are evolutionary algorithms that cover the search space with the help of bit strings. The latest genetic algorithms manage to cope with strings containing real values (vectors).

- The aim of genetic programming is to develop computer programs solving a given computational problem.
- Evolutionary programming is similar to genetic programming, but has a fixed program structure and the search space is expanded only by program parameters. It merged with genetic programming and other evolutionary methods more than a decade ago.
- Evolution strategies search optimum in the search space by coding agents in the form of real vectors.

A question may arise as to why there are so many types of algorithms that apply metaheuristics approach. The theory formulated for optimization and search algorithms, stating that there is no such a thing as free lunch, may provide the answer to this question. The theory holds that there is no algorithm that would offer a more efficient solution than any other method to all types of problems. In practice, it means if there is a special optimizing method for a certain type of problems, it can be more effective than a genetic algorithm that is applicable and effective in a wide range of problems.

CONCLUSION

Based on the introduction of the most significant models of conventional economics it can be stated that a theory tries to explain complex social, human and organizational forms of behaviour with the help of simple models. However, these models are only sufficient for understanding basic economics processes and are not very appropriate when dealing with more complex problems.

Due to methodological deficiencies, methods of conventional economics are insufficient for describing complex, dynamic economics processes. To eliminate these deficiencies it is necessary to widen the interdisciplinary sphere of the theoretical aspects of research.

From the discussion of optimization processes it was established that evolutionary algorithms are applicable for modelling real economics processes, based on the analogy of modelling biological evolution. Economics model modelled with genetic algorithms combine basic genetic processes with analyses of environmental management.

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Project Portfolio Management: A Pilot Survey on the Importance of 'Project Building Stones' in Corporate Life

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SUMMARY

Today portfolio management is a priority area. Unfortunately, there is a lack of information on this subject: portfolio management is not a prevailing element in corporate thinking, although the content and method of implementing projects are of key importance for companies. This paper presents a short, general theoretical introduction and the results of a pilot study. These represent the basis of defining future research directions.
Keywords: portfolio, project, management
Journal of Economic Literature (JEL) code: M59

INTRODUCTION

This paper aims to highlight the importance and possibilities of portfolio management. The pilot results presented verifies the theoretical knowledge and is used to establish further research goals, criteria and activities.

RESEARCH BACKGROUND

Project management is a management activity initiated by corporate strategy in order to perform individual and complex tasks (Görög, 2003). (A project is a time-limited effort for creating individual products, services or other outputs.) Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements. One part of project management is project portfolio management.

A portfolio refers to a collection of projects or programs and other work that are grouped together to facilitate effective management of the work to meet strategic business objectives (PMI, 2008).

Improving the processes of single projects may have tangible benefits but a consistent project management model will only be complete when the processes of project portfolio management are also included. Similarly to the logic of managing share/bond portfolios, a systematic approach is required for project portfolio management in selecting, monitoring and supervision. Portfolio management maintains a balance between the limited corporate resources and the strategic goals (Verzuh, 2006).

The projects or programs of the portfolio may not necessarily be interdependent or directly related. For example, an infrastructure firm that has the strategic objective of maximizing the return on its investments may put together a portfolio that includes a mix of projects in oil and gas, power, water, roads, rail and airports. From this mix, the firm may choose the related projects as one program. All of the power projects may be grouped together as a power program (PMI, 2008). The key to portfolio management is the systematic process of selecting, supporting and managing the firm's collection of projects.

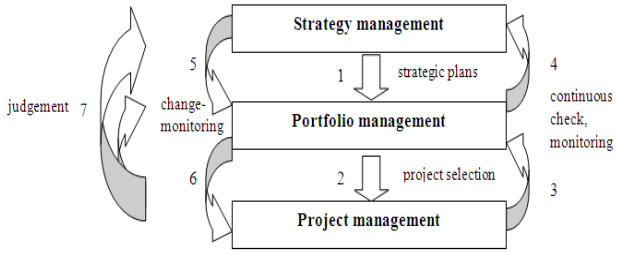
In general, the portfolio or with other expression 'basket' has an original meaning, which is the whole of the company's investments, and the other, new meaning is the projects and programs, processes, resource allocation, planning, organizing and directing methods (Turner, 2008) (Sebestyén, 2009).

In finance the portfolio of assets involves the selection of securities. A combination of assets or securities is called a portfolio. The traditional theory of portfolio postulates that the selection of assets should be based on the lowest risk, as measured by its standard deviation from the mean of expected returns. The modern theory of portfolio emphasizes the need for maximization of returns through a combination of securities whose total variability is lower.

Strategy can be briefly defined as the way of realizing the corporate objectives. In content it means the active or passive adjustment of operation to the changing

environment. The strategy helps to find the most appropriate ways of achieving the objectives; it seeks for competitive advantages; improves the market position of the company; and provides for the allocation of resources. For the whole company the strategy should harmonize or restructure the corporate portfolio against the background of corporate objectives. (The difference between project management and portfolio management can be shown by an airplane metaphor: project management ensures a smooth landing at the end of the route; the responsibility of portfolio management is choosing the right airport for landing (Darits, 2010).)

Figure 1 summarizes the relations between portfolio management, strategic management and project management. A specification of strategic objectives is that they are implemented as projects. Deák (2003) and Pálvölgyi (2011) state that the strategy cannot be realized if the wrong projects are launched.



Source: Csaba Deák and Éva Ligetvári

Figure 1. Relations of strategy-, portfolio- and project management

It can be concluded that strategic management defines the goals and direction for portfolio management through strategic plans (Arrow 1).

Portfolio management selects the projects and makes decision on launching projects/programmes. Programmes launched are under control and supervision of the project management (or program management) (Arrow 2).

Feedback and intervention are facilitated by continuous monitoring and control. Effects on resources are managed by portfolio management and the process also affects strategic management (Arrows 3 and 4).

Changes in strategy need modification in portfolio management. The results are observed in project management and in the implementation of the projects (Arrows 5 and 6). A project portfolio can be successful only if it includes the most favourable projects for the company. It must be considered that terminating or suspending a priority project will unlock resources and allow strategic management to start new projects and highlight other priorities. The aim of portfolio management is to facilitate achieving the corporate vision by the effective use of resources. Modification of a strategy and portfolio can be initiated either due to differences and internal feedback or by changes in the macro- and micro-environment. Fast reaction to changes has a key impact from the point of view of corporate competitiveness. It may affect the content of a strategy and portfolio and, as a result, the life-cycle of the project as well.

The diverging Arrow 7 shows feedback after the implementation of projects that is necessary for judging its success. In a hierarchic view of success it is to be concluded that on the first level the factors of cost, time and quality (output) are highlighted. The second level expressly analyses conformance to strategy and the third level reflects the assessment of external and internal stakeholders.

The specific components of portfolio management for maintaining harmony with plans of the project and the company are as follows:

- Scope: project-related decisions are essential
- Fiscal policy: the organization's budget for the projects financed
- Strategic and operational objectives: project prioritization criteria
- Discipline: in project management and handling
- Accurate information: estimates, cost data, time, resources and past experience
- Phase gates, milestones: checkpoints of project implementation, filtering out non-conformances.

According to another classification (based on Pap, 2009) there are three necessary factors for successful project portfolio management:

- management: management is responsible for investment decisions, including launching and completing projects
- methods: evaluation methods, return calculations (Return on Investment (ROI), Net Present Value (NPV)), supporting decision making. Indicators of project portfolio management can be classified according to quantitative and qualitative indicators. The former class includes revenue growth, cost reduction, NPV, ROI, new markets, increase in number customers, lower level of portfolio business risks, cycle time reduction. The latter class includes e.g. conformance to the corporate vision/strategy and achievement of legal and regulatory compliance.
- IT support: software packages of "what-if" analysis.

THE PILOT RESEARCH

Based on the literature overview of project management and portfolio management several questions can be formulated. My research attempts to find answers to the following:

- Do qualitative or quantitative factors dominate in the project selection process?
- How should success be evaluated? (Is conformance to strategy examined)?
- How many priority projects are to be managed in a company?

The research involved a study group of the University of Miskolc, primarily part-time MBA

students. They have the maturity, business experience and business relations for a successful structured interview. The sample consists of easily available members of the target group (Esterby-Smith, 2002). The tool of the structured interview was a survey. The structure and content of the interview provide for equivalence to a questionnaire similar to the well-known organizational research by the Aston group (Balaton and Dobák, 1982).

The structure of the list of questions is the following: after five general, preparatory questions, seven questions examine the corporate project portfolio management in broad terms. The researcher preferred an interview (instead of a written questionnaire) because this process allowed the researcher to explore the deeper relationships, internal priorities, causal relations and explanations behind the answers. As a result, a more refined description is available about the influencing factors and personal opinions. Interview results for each company can be interpreted separately, but the aim was to achieve general validity as the result of the research.

General questions ask the name, main activity andcharacteristics of the company, and the name and the position of the respondent. Questions in connection with project portfolio management explore the following:

- number and characteristics of projects running in parallel (classified by subject: business/strategic; technical, investment, IT, organizational development, competence development; product development; classified by scope: local or corporate projects),
- existence and frequency of priority projects,
- personal/organizational responsibilities in launching and maintaining projects,
- the main principles of projects based on the five most important projects actually running (qualitative and quantitative criteria),
- main criteria of project selection (project size, time limit, complexity, resource needs, likelihood of success),
- declared and recognizable portfolio management activities and responsibility, and
- evaluation of success.

Table 1
Questions of the interview

General questions	Project portfolio management questions
Name of company	Number and characteristics of parallel running projects
Main activity of company	Existence and frequency of priority projects
Name of respondent	Personal/organizational responsibilities in launching and maintaining projects
Status of respondent	Main principles of projects based on the 5 most important projects actually running
Classification of company (Hungarian, multinational or public service organizations)	Main criteria of project selection
	Declared and recognizable portfolio management activities and responsibility
	Evaluation of successfulness

RESULTS

This chapter is based on the results of a sample made up of 30 respondents. The answers to the general questions draw a divergent picture about the companies involved. The researcher was able to access companies from the electronics industry, manufacturing of medical devices, fruit and vegetable sales (wholesale) and the building industry.

The distribution of the companies contains three public service organizations (one of the public service organizations was involved twice with different interviewees in order to control the validity of the research), 14 multinational companies and 12 Hungarian companies. It is worth analysing the results of public service, multinational and Hungarian companies separately. Due to the small sample size this paper does not mention the characteristics of the public service companies.

In terms of size, the Hungarian companies can be grouped into small- and medium sized categories and most of the multinationals are large, having more than 500 employees. The sites of multinational companies also belong in the medium-sized category. In harmony with company size and ownership, the respondents are also characteristic. In case of the domestic companies the respondents were the owner-Executive Director, Commercial and/or Marketing Director, sometimes Application Rapporteur or Head of Department for projects. Five respondents from multinational companies were Project Leaders/Project Managers and five were heads of department.

Companies in the research sample come from diverse sectors. Three of them are involved in economic service provision, two are commercial, and another are two social care companies; in addition, agriculture, education and even manufacturing are also represented. The activity of most of the multinational companies (8) is industrial production. Three multinational companies are service oriented and one is in the construction industry.

The Hungarian companies examined run a relatively low number of projects; 4-5 relevant projects are carried out in parallel. These projects are listed as corporate level and high-priority projects. The characteristics of the projects are in line directly with the main activity of the company, so it stands to reason that usually it is the Executive Director who makes decisions about projects and manages the projects. Key factors in evaluating the success of projects are primarily judged on the basis of costs, time and quality/output. This approach can be followed in Figure 2. It can be seen that the dominant factor is increase in revenue; the companies consider it the most important factor in the evaluation. It is important to note that this statement is relevant to the actually running five projects and is based primarily on quantitative indicators and on the analysis of the representation of some qualitative indicators during the

selection process. Another question in the research material approaches this issue from a point of view related to project criteria.

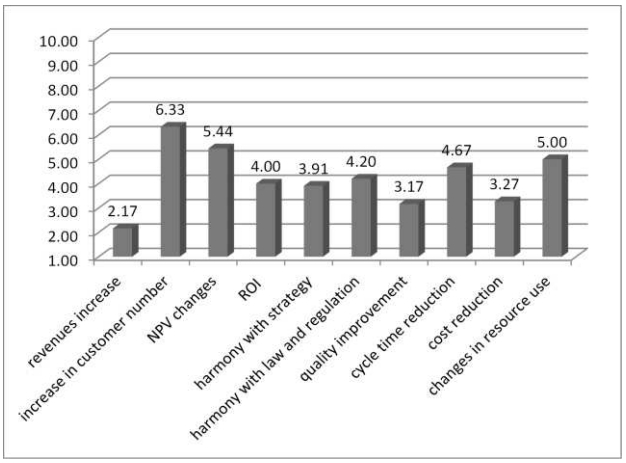


Figure 2. Importance of project selection principles evaluated by the respondents (Hungarian companies) (lower values show higher importance)

In the figures used to display results the lower values show the higher importance of a factor. Value 1 is the minimum. Figure 2 shows that the most important criteria are increasing the revenues, improving quality and reducing costs. The less important ones are increase in customer numbers, Net Present Value (NPV) changes, and changes in use of research.

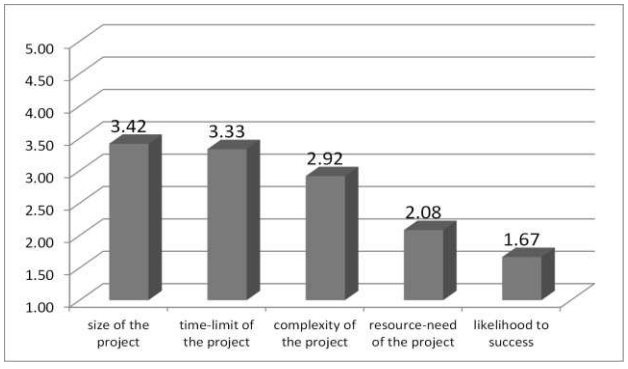


Figure 3. Importance of main project selection factors evaluated by the respondents (Hungarian companies) (lower values show higher importance)

Based on the factors presented in Figure 3, selection is determined firstly by the likelihood of success and secondly by the resource needs of the project. (It is an interesting result that the use of resources was the least determinant in the course of selection.) Domestic companies usually do not launch a project if the necessary resources are missing or the management does not believe in successful implementation.

There are more than ten projects running in each of the multinational respondents in the research. Organizational development and competence development projects are not common but it is interesting to note that the representation of local (located in a specified geographical field) projects is much higher than that of projects on a corporate level.

A maximum of 5-10 projects have top priority based on the grounds that the problem is relevant to a department/subdivision or that they need special attention because of their benefits or other company aspects.

On a local or corporate level the competence in launching a project differs. The head of unit/department or project manager can be competent in the case of a local project while in connection with a corporate level project top management approval is required.

More than the half of the companies in the sample use declared portfolio management function but overall application is rare. The concrete portfolio management activities are decentralized by type of project (e.g. governmental level applications) and a functional distribution of responsibilities is common: project selection by the (top) management, launching by the project manager, monitoring and controlling by the finance department. In addition to local projects (in companies with about 10 projects) it is more difficult to manage this decentralization than in a company with about 100 projects. Evaluation of success is based on the hierarchical model in each case. Financial indicators have primary importance and the results of the research show that it is followed by the factors harmonious with the strategy and the satisfaction of the stakeholders with similar values. Achieving the first level in the hierarchical model appears as the personal performance of the project manager.

Increase in revenues carries higher importance for multinational companies than quality improvement or cost reduction. (Figure 4.) Reduction of cycle time, increase in customer number and NPV changes have the least influence in the process of project selection. (Figure 4)

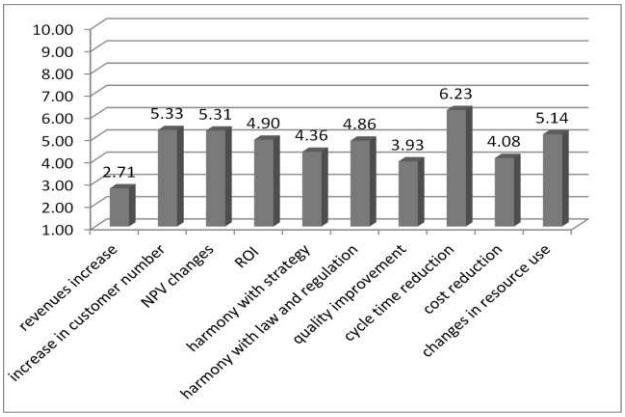


Figure 4. Project selection in case of multinational companies (lower values show higher importance)

Based on the project selection factors presented in Figure 5 it can be seen that ranking is a major challenge in the case of multinational companies. There are small differences in the values of the research results. Likelihood of success and project size may play a

determining role. According to the project size it is interesting to note that a large company can overcome the barriers of a professionally relevant project more easily than a small-sized one.

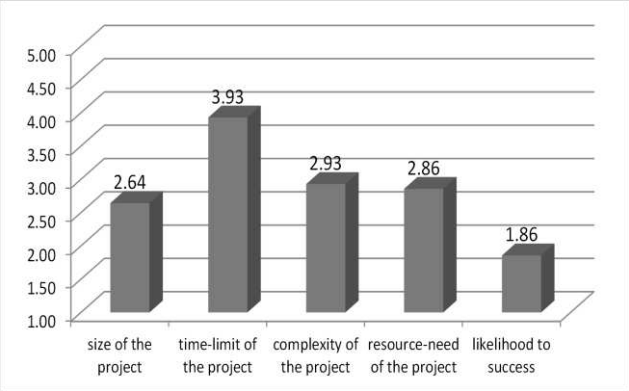


Figure 5. Main factors of project selection (multinational companies) (lower values show higher importance)

SUMMARY OF THE PILOT SURVEY

Based on the need for profit, the quantitative aspects dominate in project selection in terms of current projects. Increase in revenue (average value 2.6), cost reduction (average value 3) are the most important factors but need for quality improvement is represented with an average value of 3.9 out of 10.

The 'building stones' are defined during the project selection process. This means defining the scope of the projects for achieving the business goals. Both types of companies (Hungarian and multinational) in the sample consider the likelihood of success important. The literature highlights the dominance of quantitative factors but the need for success is less pronounced than is shown by the results of this research (Bodie, Kane and Marcus, 2003) (Pinto, 2010).

The assessment method of success is based on the hierarchical model in each examined company, which includes an analysis of the level of harmony with the strategy. The results of the survey show that various levels of the hierarchical model have different priorities. Some differences in priorities do not automatically lead to unsuccessfulness but for a company with many projects running at once, the harmony of cost, time and quality/output means in all events the basis of the performance and competence of the project manager.

The number of manageable projects for domestic companies in the research sample is between 5 and 10. In terms of the future of the company these projects have top priority. The number of projects of a multinational company may be more than one hundred but top priority is given only to less than 10%.

In general it can be stated that the survey verified the theoretical findings (Verzuh, 2006). It also showed that in general declared project management activities are present in larger companies. The level of separation of general management from project management clearly depends on the size of the company.

The most important factors of project selection are summarised in Table 2.

Table 2
Summary of conclusions

Topic	Important factors
Principles of project selection	Increase in revenue
	Cost reduction
	Need for quality improvement
Main factors of project selection	Likelihood to success
	Quantitative factors
Assessment method of the success	Based on hierarchical model
	Project manager competence

FURTHER CHALLENGES OF THE RESEARCH

Based on the survey results presented in this paper, it is worth focusing further research on Hungarian and multinational companies. Public service organizations will be excluded because as a result of the characteristics of their activity, their monopoly market position and the special regulatory systems, their main goal differs from that of companies. Achieving the broadest satisfaction of stakeholders is presented without the need for profit maximization. (The regulated price provides the source for the financial coverage of the necessary costs and reasonable profits for a public sector organization).

It is necessary to define accurately the scope and topic of the research and to classify the companies involved. Portfolio management is usually present in large sized multinational companies that run many projects in parallel. Interviewers and questionnaires shall be sent out to these organizations to be able to collect relevant information about the practical issues.

The results of the survey presented in this paper show that the research can be continued by a relationship analysis between the quantitative and qualitative factors of project selection and the project characteristics. Surprisingly the survey shows that the time-limit of the projects is the least influencing factor. (It is an interesting problem to define the real time-limit of a project. When will it end? In my opinion it is difficult to determine in connection with most of the investment projects.)

It would also be useful to explore what success means for the companies and what the criteria for measuring success are. (Instead of 'success' we can use the word 'efficiency' but it also needs to be defined.) Conformity between the success and the declared success based on the ex-post evaluation of the project (defined on the levels of the hierarchical model) deserve analysing as well. This problem leads to possibilities of research into the connection between the preliminary and ex-post assessment of projects.

Acknowledgement

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Human Resources in the Hungarian Shared Service Centers

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SUMMARY

In my research I am analyzing the Hungarian shared service market to disclose the directions of progress and the sources of impedimental factors. This paper introduces the role of human resources in Hungarian Shared Service Organizations to gain answers to questions such as why this sector resists recruitment from universities and secondary schools to such a high degree, why there is such a high turnover rate in this sector, and whether there are any career options in these Shared Service Organizations.
Keywords: shared services; service management; human resource management; strategic management
Journal of Economic Literature (JEL) code: M12, M51, M19

PURPOSE OF THIS RESEARCH

The aim of this research project is to explore the human resources of the Hungarian service sector. I hope to discover how it influences the progress or the decline of the Hungarian service sector. I analyzed what are the main factors that shared service centers want.

METHODOLOGY

This study is based on two sources. On the one hand it is a literature review of the most relevant articles connecting with this topic in Hungarian service market and on the other; it discusses ten interviews that I made with key experts from the Hungarian service market who have a realistic picture of the human resource market. These interviewees were business consultants, HR agency leaders, representatives of governmental agencies, professional non-profit organizations, and an academic researcher. I haves chosen them because I wanted to get objective opinions about the Hungarian market so I looked for experts in this topic who are not leader of the Hungarian shared service organizations.

INTRODUCTION

There are a great many arguments about whether the corporate rationale based on organizational changes, such as business process outsourcing (BPO) or establishing the company's own shared service center (SSC), helps the countries' economies where the company is located or not. The opinion concerning them may become negative when they are coupled with an offshore or near-shore location. The reason for that is that outsourced activities, or those migrating abroad, employ the home workforce to a very small degree, at most some expatriates, while no benefit to the home country is gained from infrastructure investments, operational-training costs, nor tax incomes. One justification for this kind of organizational solution is that the largest part of savings-generated profits migrates back to the homeland. There is another positive outcome. The homeland jobs that are terminated due to offshore or near-shore outsourcing/migration may be replaced by higher skilled, higher value-added or site-specific jobs. So it can actually mean a quality change in the labor market.

Although there are arguments about the effects of activities migrating, companies always make decisions on the basis of economic rationale. Since these decisions go hand in hand with the near-shore investments of large international companies, several countries are competing on the global service market to win them. In this competition the Central-Eastern European (CEE) countries, and among them, Hungary has a good position.

In this research I deal only with the shared service model and the effects of shared service centers (SSCs) on the labor market.

CHOOSING SHARED SERVICE LOCATIONS

When investor companies are looking for a location for their shared service center, it is an important question why companies invest in Hungary. They analyze the tax system, labor costs, labor skills, infrastructure, level of

bureaucracy, state of the business culture and standard of living. In establishing a shared service center the most important decisional factors are cost optimization options, the available modern 'A' category office space, foreign language proficiency, skilled work force and the infrastructural, cultural and economic environment.

The availability of suitable workforce covers the state of development of the service sector, the geographical distribution of workforce, labor skills and language proficiency and risk of attrition. The characteristics of the business environment include the Foreign Direct Investment (FDI) ranking of the country, the development of infrastructure, culture and the level of protection of intellectual capital.

The main competitive advantage of Hungary is that the average salary level is below that in Western European countries. In addition, the low salary level is coupled with a high expertise level in this region and so the companies operating the shared service centers can employ a similarly skilled workforce at a much better price. Not only the salary level is lower but also the other associated costs (office space, training, etc.) are cheaper than in the West-European countries (Nagy, 2010).

Among the many aspects of analysis, all of my interviewees confirmed that the most important decision criterion for investors is the available suitable labor.

HUNGARIAN SHARED SERVICE CENTERS

In Hungary the development of the shared service sector plays an increasingly important role in the growth of the national economy. Between 2005 and 2010 this sector showed the largest growth, an annual 20% on the national level. In the CEE region and in Hungary the salary level, geographical proximity, cultural homogeneity and the development of infrastructure attract investor companies. Mostly 'mass-production', highly standardized business services requiring mainly secondary-school-educated labor have migrated to Hungary (NFM, 2010).

As a result of the last ten attractive years, today there are more than 90 shared service centers in Hungary and the vast majority of them are operating as subsidiaries of large international companies. Naturally the largest Hungarian companies (mainly regional multinational companies and state-owned companies) also have similar service centers, but their number is much lower than that of the subsidiaries of foreign investors.

The shared service centers provide a range of business services – most notably in the areas of finance, accounting, procurement, logistics, information technology and human resources – mostly regionally and sometimes globally. Additionally, this sector is a major employer: it accounted for around 1.2% of the state budget from taxes in 2010 (PwC, 2010).

According to a research report by Randstad Hungary in 2011 (Randstad, 2011), this sector employed an estimated number of 40,000 persons directly in shared service centers. However, this number does not include the employees of different business services (recruitment, financial services, accounting, etc.), SMEs or the small call centers. In the CEE region the largest competitor of Hungary is Poland, whose market is twice the size of ours; the Polish SSC sector employs more than 70,000 persons (Gyimóthy, 2011).

The shared service centers employ primarily an educated workforce that speaks foreign languages, with about 40,000 employees. The office space leased by shared service centers is 200,000 square meters, which is approximately one-tenth of the total 'A' category office space in Hungary. According to the experience of real estate developers, the technology of these centers becomes outdated in 3-5 years and after that centers move to Asia, where the operational costs are lower. But today there is a tendency not only for these centers to remain, but for some companies to move their service centers from cheap countries like India to Central and Eastern Europe (Sütő 2012).

Every third Hungarian SSC has more than 500 employees and recruited more than 150 new employees in 2012. According to Sándor Baja, CEO of Randstad Hungary, this is very important because the average unemployment rate is higher among 25-29 years olds (13.7%) and among 20-24 years olds (27.3%) than the national average (10.4%), based on the data of the National Statistic Office in November 2012 (HR Portál, 2012a).

Service centers do not carry out the recruitment because sometimes they have to deal with such a large number (e.g. 50-100 persons at the same time) or such quality parameters (e.g. assessment of up to 20 different languages) that the HR departments of shared service centers cannot handle it. Therefore almost without exception all of the shared service centers deal with HR consultancies and head-hunting firms for this tasks. Usually they do not enter into exclusive contracts but use the maximum number of consultancy and executive search companies and expect candidates from them.

In the recruitment process the applicants who have work experience or have studied abroad, have worked in a multinational work environment or at other SSCs or in similar positions to that which they are applying for have an advantage. Naturally, the experience required depends on the position applied for, since fresh graduates are invited for some jobs where the work experience is not required but a good knowledge of foreign languages, an open-minded and communicative personality and self-confidence are of key importance.

LABOR FORCE IN THE HUNGARIAN SSCS

In service centers the most important requirements for young graduates is the ability to learn rapidly and to makes decisions quickly. In making a decision the employee's main task is to determine whether they are faced with a standard process or not. If they are, then it must be handled based on the standard knowledge base but if not, then the employee has to pass the process on to another colleague who has the authority to handle it.

The majority of workers recruited in service centers are between 25-35 years old and have at least bachelor's degree. A relatively large number of foreigners work in these centers so a multi-cultural environment is typical for these centers, which is why they are recommended only for employees who are open to diversity and like to use foreign languages on a daily basis (Dobák, 2009).

Of the Hungarian shared service centers' employees, 80% are graduates of higher education and are fluent in foreign languages, and only 20% have just a secondary education. This ratio is the reverse in services centers in the Western European countries, but in those countries the workers with secondary education are better at foreign languages. On the one hand this is because service centers in Hungary recruit among these applicants but, on the other hand, there are a great number of centers that really need highly skilled professionals such as engineers in IT fields. So the competitiveness of Hungary depends also on maintaining the low cost of labor (Mártonffy, 2010).

But usually the jobs in service centers do not require higher education degrees but the self confident behavior and diverse foreign language proficiency is typical only of college and university graduates. The Hungarian service centers recruit their workforce generally from finance, accounting, human resources and IT areas. There is real competition among the service centers for graduates in these areas with good language skills. Moreover the competition is not limited only to industry, since these employees are valuable for employers of other industries or sectors as well.

Within shared service organizations (SSOs) we can differentiate call centers, where the work is dominantly customer contact by phone and other related administration work, from contact centers. A contact center is similar to a call center but is an improved version of it. In a contact center, in addition to the phone, there are other communication channels for customer relationship: e.g. online platform, email, SMS, etc. (Szabó, 2012).

According to Ádám Hoffmann, SSC leader at Exact Solutions, with the maturing of the Hungarian market, the former trend that the leadership of shared service centers consists of foreigners has changed and today there are more and more Hungarian leaders at the top of the centers or acting as deputies. (Ádám Hoffmann, interview, June 2012)

The past few years have seen a trend towards the applicants being much more knowledgeable about job-seeking; they know the sector and the companies, and they have an idea of what work is like in such a center. This result has been achieved largely by the marketing activity of the SSCs, for they are present at every major job fair and in job advertisement publications, but naturally the growth of the Hungarian service sector has also had a positive effect.

Although most of the shared service centers advertise themselves as the starting point of international careers, according to Ádám Hoffmann there are relatively few employees who can go from a Hungarian subsidiary to a foreign one within the company. More prevalent in the sector is the 'job-hopping' phenomenon when an employee changes jobs not vertically but horizontally, i.e. he/she changes companies and not positions for a higher salary (sometimes the difference is 20,000-30,000 HUF per month). (Ádám Hoffmann, interview, June 2012)

Table 1
Annual gross salaries in financial SSCs across CEE in Euro

	Czech Republic	Slovakia	Poland	Hungary	Roman
Financial SSC					
Accounts Payable Manager	24,000	24,000	37,500	23,000	23,400
Accounts Payable Clerk	13,095	11,000	15,000	12,000	8,500
General Ledger-Book-Keeper	13,095	13,200	15,000	12,000	12,000
Financial Accountat	16,000	18,000	21,000	25,556	9,600
Credit Controller / Manager	26,000	24,000	37,500	25,000	25,200

Source: Grafton Group, 2011

The monotonous work is outweighed by the good work conditions and higher than average salary. In such positions with good language skills and a higher education degree the average gross salary is between 280,000 and 340,000 HUF. Accordingly, the Hungarian SSCs are relatively popular with fresh graduates because they promise good working conditions. For the young employees it is also important that these centers have flexible working hours, they can work in afternoon or night shifts so they can study and finance their studies while holding down a job. According to the SSC Salary Survey of Randstad Hungary in 2012, the average gross salary of an English speaking junior customer service worker was 257,500 HUF per month, but if the employee is fluent in a less common foreign language (e.g. Swedish, Russian or some Asian language), then he/she can get a gross 320,000 HUF per month. And at SSCs there are quite fast promotion options: in five years from junior level the graduate can achieve a team leader

position with twice the salary (HR Portál, 2012a). One or more years' experience with skills in a rare language may mean a gross 500,000 HUF salary per month (Takács, 2009).

Table 2
Annual gross salaries in customer service SSCs across CEE in Euro

Customer Service SSC					
Customer Service manager with additional foreign languege	35,000	38,400	36,000	45,000	22,000
Customer Service agent with additional foreign language (3+ yrs exp.)	15,500	13,200	18,000	18,000	11,000
Customer Service agent with additional foreign language (0-3 yrs exp.)	14,000	11,000	13,500	16,000	9,400

source: Grafton Group, 2011

However, according to Grafton Recruitment's research report published in November 2012, Hungary and particularly Budapest is one of the most costly locations among the eleven cities analyzed in the region. For the same positions in 2012 a service center could recruit an appropriate applicant for half the money in Cluj-Napoca (Romania) than was needed in Budapest (HR Portál, 2012c).

CAPITAL VERSUS PROVINCIAL CITIES AS SSC LOCATION

The Hungarian SSC sector has established a capacity of several tens of thousands of employees over the past ten years. While in the past the dominance of Budapest was evident, now there are a great number of centers outside the capital as well: e.g. there is British Telecom in Debrecen, Vodafone in Miskolc, Budapest Bank in Békéscsaba, and Magyar Telekom in Szeged (Szabó, 2012).

However, in the service market the vast majority of service centers are in Budapest, and if this situation does not change in the future, according to some experts it will make the growth of the sector unsustainable. On the other hand, the current number of employees in case of a positive scenario of the Hungarian service sector may expand by 5-10% annually. Market data indicates that 80% of Hungarian shared service centers are still in the expansion phase (Mártonffy, 2010). This clearly visible growth potential is a good rationale for the function expansion of service centers.

While in Hungary there is no labor oversupply in the skilled workforce for higher value-added service jobs, in Slovakia or in the Czech Republic there are some signs of labor shortage. In Hungary, the service sector concentrates on Budapest while the provincial cities, especially the university cities, are underused. The solution may be the installation of newly established service centers outside of Budapest, but this requires substantial infrastructure investment from the cities, since the larger service centers need advanced and large office space. This may be the source of further expansion because, contrary to Budapest, establishing jobs in the provinces can be supported from EU funds as well (Mártonffy, 2010).

According to Ágnes Henter, General Director of Investment Departure, Ministry of National Economy, and this trend is an obvious target of the government. In order to achieve it, the government is altering the unique subsidy system[1] so that investors will choose the provincial cities rather than the capital. It has happened previously that the government has offered a subsidy only for those investments that are carried out in the country. According to Ádám Hoffman, it should be seen clearly that this sector will always be capital city-centered because it has the adequate office and IT infrastructure and there are the potential graduates in higher volume that are vital for the SSCs. According to Ágnes Henter, the companies that need knowledge of less frequently spoken languages, more specific language in addition to English and German language proficiency do not choose provincial cities. There are some SSCs in Hungary where the employees serve customers in as many as 15-20 languages. This labor force is more difficult to find outside of the capital. And unfortunately it is also true that in such areas there is not as good an office infrastructure as in Budapest, where investors can choose from a great number of world-class office buildings. Only a few provincial cities can show adequate office infrastructure at present. And investors never take on the extra cost of greenfield investments, so they choose only between Budapest and some provincial cities. According to Ágnes Henter, the third most important reason against rural investments is the lack of proximity of an international airport. Therefore Mónika Pintér, partner of Shared Services and Finance Transformation at DLM Consulting Group, does not believe that Hungarian provincial cities may become a location for larger SSC investments because such cities may maintain a smaller call center but not a center employing several hundred accountants. (Ágnes Henter, interview, July 2012)

TURNOVER IN HUNGARIAN SSCS

According to IFUA's research, in Hungary almost all shared service centers operating here have achieved their stated goals for cost reduction, but they see that further results in this area are difficult to achieve because there is a high turnover rate and therefore the recruitment and training are quite expensive (VG Online, 2012).

[1] *Unique Governmental Subsidy: from its own and EU funds the government can support new investors that create a large number of new jobs.*

The key element in establishing a new service center is always finding the right staff and recruiting them. If a center is already operating, the next great issue is to retain the valuable staff. In these centers the vast majority of workers are young graduates with a university degree. This is also significant because the turnover rate in this sector is quite high: 15-20% annually (on average), which is higher than in other sectors (SSC Recruitment, 2010).

The increasing popularity of service centers provides an opportunity for the leaders of the centers to attempt to broaden the service portfolio. This is important for two reasons. First, leaders of the parent company continuously put pressure on the leaders of SSCs to achieve the benefits of shared services in other fields. On the other hand, the service center managers also want to broaden the career opportunities for their teams. (Nagy and Tóth, 2004) This is important because the employees of shared service centers generally do not like to remain in the same position for a long time. If there is no opportunity for further progress within the company, they will try to find a better job in another company. So the turnover rate weakens the performance of shared service centers.

In many places it is also a problem that SSCs could not always create a truly unique and distinctive image and so it is much more difficult for them to compete with well-known companies. Fostering a distinctive image might improve the turnover rates at some centers as well (Szabó, 2012).

The main reason for the high turnover rate is the expectations of new recruits, which only university graduates are often able to meet. In these centers the work may be very interesting at first but after a while it may become monotonous and the workers with foreign language proficiency change jobs. Actually, the more successful the centers are in standardization, the more monotonous the work is for the employees. This is contrary to the expectations of newly graduated, well-trained young people, and they will therefore change jobs (Thorniley, 2003).

Other reasons for resignation are the flat organizational structure, the lack of career opportunities, burnout and stress. The higher the number of university graduates is in a center, the higher the turnover ratio. In order to handle the problem, service centers use performance-based payment, team-building programs, flexible work shift schedules, and cafeteria benefits as tools of motivation. In addition, the centers continuously use satisfaction surveys and exit interviews (Nagy and Tóth, 2004).

The 'job-hopping' phenomenon in which the young workforce migrates from one center to another has long existed in India. It has become a well-known problem in Hungary as well. There is even a company that does not allow any visitors into the center because of its fear of competitors. Other companies apply incentives to retain their workforce (Sebök, 2006).

The larger centers defend themselves against the high turnover rate by offering every employee the opportunity to change areas within the center and work with different tasks after one and half or two years. Naturally, in such cases the cost of retraining is paid by the company if the employee has the necessary competencies to do the job, and thus quite extensive career changes are possible. This rotation system can be very motivating but it works well only if the center does it consciously and it is properly communicated.

According to Katalin Németh, head of the investment incentive department in HITA[2], it needs to be seen clearly that working in these centers does not mean a life-long career and this is known by the employers as well. However, for young graduates who are at an early stage of their careers it is a great opportunity to work in such a center and obtain international experience. The fairly high salary and superb work environment may also be attractive. All interviewees confirmed that the majority of these centers do not really look for university graduates but for the competencies that are exclusively held by higher education graduates in Hungary. And though these employees do not have to do jobs requiring a degree, which at the same time do not carry a good prospective in the medium term for many workers, there are complex, varied tasks and good work conditions. Gábor Vida, senior consultant of IFUA[3], added that these centers are likely to be more attractive to employees because it is in the centers' vital interest that the staff work under well-balanced conditions and that the turnover rate should be low. In a service process quality assurance and quality control are much more difficult than in the production sector because in a service process it is very hard to discover the errors. (Katalin Németh, interview, July 2012) (Gábor Vida, interview, August 2012)

It is not good for the turnover rate that many employees have other degrees than that necessary for the jobs. According to György Bőgel, senior researcher of CEU[4] on outsourcing field, these centers are likely to have a great number of employees who do not like working there because it is not sure that the objective of an employee with a liberal arts degree is to inspect invoices. Naturally, in most cases these employees work in such centers because they could not find other jobs and their language skills, general knowledge, and cultural openness make them suitable for this kind of job. (György Bőgel, interview, September 2012)

According to Gábor Vida, senior consultant of IFUA, although in Hungary it is a huge problem to manage turnover for shared service centers, the turnover rate is much lower than in the other neighboring CEE countries. In Hungary it is a general problem for investors that they can employ eligible applicants only for a higher salary.

[2] *HITA (Hungarian Investment and Trade Agency) is a governmental organization for foreign investments.*
[3] *IFUA Horvath&Partners is the Hungarian affiliate of the Horvath&Partners international consulting firm.*
[4] *CEU is the acronym of Central European University, that is an international university located in Budapest.*

However, higher salaries are partly offset by a lower turnover rate (VG Online, 2012). The attractiveness of service sector jobs will increase when the parent companies strengthen internal training courses and aim to improve the recruiting processed develop in-house career programs. (Gábor Vida, interview, August 2012)

THE LANGUAGE PROFICIENCY ISSUE

A contradictory picture exists about language proficiency in Hungary. While all of my interviewees highlighted the wide variety of foreign language proficiency in Hungary as one of the most important advantages, almost everybody acknowledged that on the social level Hungarians could not speak foreign languages so well. According to Mónika Pintér's consulting experiences, even university graduates may not have adequate foreign language and communication skills. She sees the problem as being that the language training courses are left for higher education, while it would be much better to learn foreign languages in primary and secondary school. In Hungary the issue of foreign language proficiency was solved for the service centers by the fact that almost everyone on the staff has a higher education degree: in many cases this degree is not required for the job but the competencies required could only be obtained with this degree. In Hungary every higher education graduate is required to speak at least one foreign language at an intermediate level. In addition, economics graduates, who are in great demand in Hungarian SSCs, need to speak two foreign languages. But this phenomenon is strengthened by the multi-cultural attraction of Budapest since many young foreigners are living there who speak, for instance, relatively uncommon Scandinavian languages, which may provide easy access to SSC jobs. To remedy this problem, HOA[5] started a sector-specific program for employment in secondary education. According to Katalin Németh, head of the investment incentive department in HITA, language teaching should be strengthened in secondary schools by the government. (Mónika Pintér, interview, August 2012) (Katalin Németh, interview, July 2012)

According to Éva Mária Tóth, president of the Human Resource Foundation (HEA), in general language skills are not very good in Hungary, but those who speak a foreign language are really proficient and the number of languages spoken is high in Hungary. While in India e.g. mostly English is spoken as a foreign language, in Hungary service centers can provide services in 12-15 different European languages and it is almost impossible to name a European or world language in which there is no appropriate worker with language skills.

Moreover research has also shown that the language skills of young people are continuously improving. Based on data collected in the last ten years by the Euro Examination Center[6], the number of examinees is steadily increasing and the language skills of young people are continuously improving. According to Zoltán Rozgonyi, head of the center, the language skills of young people leaving secondary school are increasingly improving but there has been no sudden rise in the level. At present we are still far from where the surrounding countries are, but among the twenty-year-olds there has been a two- or three-fold increase in the number of people who speak English effectively (HR Portál, 2011).

EDUCATIONAL SYSTEM

Attila Suhajda, president of HOA, pointed out that the experience of Hungarian shared service centers is that the education system does not follow the market requirements, so young graduates leaving universities and colleges are ineligible for immediate working without several months' training (Kovács, 2010).

Attila Suhajda and Ádám Hoffman hold that the new higher education regulations in Hungary are also likely to be detrimental to the competitiveness of the Hungarian shared service sector. Currently the Hungarian government supports more students in technical and scientific fields, which is very good, but in shared service centers more graduates of economics and liberal arts with good communication skills would be preferable. According to György Bőgel, higher education also represents a buffer of 3-5 years and it is very difficult see clearly at present what kind of students will be needed for the economy at the end. According to Attila Suhajda it may also be a mistake for the government to plan for the demand of the current economic situation of recession, for hopefully in 3-5 years the economy will start to grow slowly. This is confirmed by the fresh forecast report of Randstad, which state that in 2020 in Hungary there will be 150,000 fewer university graduates and 500,000 more secondary school leavers than the market will be able to absorb. The shortage of professionals such as engineers and IT professionals will affect the construction and business sectors. (Reviczky, 2012) The reorientation of higher education into a way with fewer state support and fewer graduates would contradict the action plan of Hungary in the European Union 2020 Agenda, which assumed the rate of higher education graduates to be 40% in the age group of 30 to 39-year-olds. György Bőgel would consider positive a higher education model where companies are actively involved in higher education, not as lecturers but rather working together with the university for several semesters. (Ádám Hoffmann, interview, June 2012) (Attila Suhajda, interview, July 2012) (György Bőgel, interview, September 2012)

[5] *HOA (Hungarian Outsourcing Association) is a non-profit organization of the sector's companies.*
[6] *Euro Examination Center is a Hungarian company providing language examination services.*

LEGAL ENVIRONMENT

The recently revised Labor Code based on a draft by ITDH-HOA[7] had a very positive response from the international service centers of the Hungarian service sector. All my interviewees confirmed that the new Labor Code of 2012 might further improve the legal situation. According to Ágnes Henter, this Labor Code is the most flexible employment regulation in the CEE region, which clearly improves the international competitiveness of the sector. György Bőgel added that it is very important for the investors that in the selected location the scalability of the workforce will be ensured. So when there is a case of overcapacity it will be relatively easy to lay off the redundant staff and when there is a shortage it will also be easy to find eligible workers. (Ágnes Henter, interview, July 2012) (György Bőgel, interview, September 2012)

VISION OF A MODEL BASED ON THE LABOR FORCE

The classical shared service model achieves savings created by economies of scale, delivering a service for more and more clients but on the basis of the same resources and low prices. The key to success is a powerful development technology for process automation and standardized processes. For the workforce employed it is very accurately prescribed what process is to be followed in which situation. This kind of work is very similar to the classic assembly line based on an industrial model, which is why it is called process-driven organization (Daleske, 2012).

However, this model cannot be maintained in a country for a long time. The development of the model needs radical innovation, which means a change in value production. It means a change from scale-based savings to the more radical process innovation-based savings. This is not about the development of administrative processes but rather about a renewal of commercial processes.

It is an obvious risk for shared service centers operating in Hungary if, due to the increasing labor costs, the country loses its competitiveness with neighboring countries or other European countries. The fact that it is not certain whether Hungary has to compete with cheap labor cost on the global service market may vary this problem. Hungary would not be able to compete on this level with some Far Eastern countries. It is true not only for the productive sector that if a country competes only with the cheap labor cost globally, then it will lose in the long term. In the service sector it is also important to attract companies into Hungary that favor higher value-added jobs because they need a trained, skilled, multilingual workforce that is valuable and attracts long-term investments. So in this sector those countries will be successful that are specialized not in the low value added, transactional work but in the more complex tasks requiring knowledge.

'Body shopping' is the nickname of migration of services into shared service centers in cheap countries. This may be true in the Far East but not in the CEE countries, where instead 'head shopping' is typical. While it is common for services with less responsibility to migrate e.g. into India, in Hungary the headquarters and research centers are more important (Figyelő Online, 2009).

According to IFUA's research in 2012 based on a survey among CEE shared service centers, one third of these centers are sure to and another third are likely to increase the number of their employees and do not plan to withdraw from this region (HR Portál, 2012b).

If we succeed in retaining staff doing higher value-added work in regional service centers, then they will contribute to having a good working relationship with their main business activity. This can be an advantage for the service centers that work on other career options. Service centers do not frequently ensure a career opportunity for young, ambitious workforce and that causes job changing. But if a service center moves closer to the main business activity by delivering its service, this can be an advantage in terms of career building (Hayward, 2010).

CONCLUSION

The role of business service centers is becoming more important around the globe but their full potential is still unexploited. In the near future a considerable number of service centers may be established globally. The establishment of service centers of global companies has the aim to achieve cost savings and increase the efficiency of the processes, but this will change over time and quality and flexibility will come into the foreground.

In a multi-polar world well-planned and well-operated shared service centers can play a key role in achieving high performance in a company. This competitive business environment requires highly professional human resource management in the service centers, for, according to several research projects, this factor is the most important for companies to find the best location for their centers.

It is important that Hungary should obtain as big a slice of the newly established service centers' pie as possible and help to improve the existing service centers. In order to achieve this aim, the key is foreign language proficiency and a skilled young workforce. Today the appropriate conditions for good operation are in place in Hungary, but it is time to prepare for the progress of the global service market.

[7] *ITDH (*Hungarian Investment *and* Trade Development *Agency) had a key role in attracting investment to Hungary until 2010. From that time on its tasks have been performed by HITA (Hungarian Investment and Trade Agency)*

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Does the European Union Walk on the Path of Sustainability?

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SUMMARY

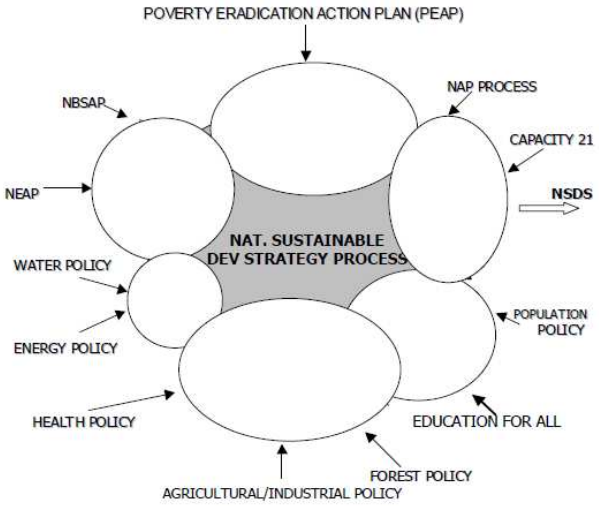
Nowadays more than 100 countries try to implement a national sustainable development strategy with hundreds of indicators in use for the evaluation of their progress. The aim of the article is to compare the sustainable development performances of the EU-27 countries through some critical indicators chosen from the Sustainable Development Indicator (SDI) set of Eurostat.
Key words: sustainable development indicators, European Union Sustainable Development Strategy
Journal of Economic Literature (JEL) code: O10, Q56

INTRODUCTION

Since the United Nations Conference on Environment and Development of 1992 in Rio de Janeiro, sustainability is a widely preferred conception all over the world. Sustainable Development Strategies (SDSs) are launched by policy-makers to define how a given nation can manage to reach sustainable development. A national sustainable development strategy (NSDS) can be defined as "a coordinated, participatory and iterative process of thoughts and actions to achieve economic, environmental and social objectives in a balanced and integrative manner." (UNDESA 2002; p.8) What is notable here is that sustainability should be targeted in all three dimensions and in addition to the economic, environmental and social dimensions, a fourth one is becoming increasingly more important, the institutional dimension.

Preparing an NSDS is not an isolated process in composing the economic policy: instead it provides a good opportunity to integrate various sectoral and other strategies. As shown in Figure 1, the already existing and working strategies of a country have a great impact on the NSDS process.

Since institutions, capacities and sustainable development priorities differ state by state, no general structure can be defined for an effective NSDS. Each country has to determine for itself its development goals and the way to develop. According to a report prepared by Division for Sustainable Development of the United Nations Department of Economic and Social Affairs, 106 member states of the UN were implementing a national sustainable development strategy in 2009 and 13 countries reported that they are developing an NSDS. (UNDESA 2010) Besides national strategies, regional commitments exist as well, such as the European Union Sustainable Development Strategy. Each NSDS contains a set of indicators that measure the progress achieved in the social, economic, environmental and institutional dimensions.



Source: UNDESA 2002. p.11

Figure 1. The National Sustainable Development Strategy process[1]

[1] *Acronyms in Figure 1: NAP=National Action Plan to Combat Desertification; NEAP=National Environmental Action Plan; NBSAP=National Biodiversity Strategy and Action Plan*

This article aims at comparing the progress of the EU member states by the set of Sustainable Development Indicators (SDIs) that are used in the monitoring report. Finally the fundamental question is answered if we really get closer to sustainability or it is just a utopia and in reality we are standing in the same point making no progress. Our analysis is based on the Eurostat headline indicators of sustainable development.

THE SDS OF THE EUROPEAN UNION AND THE EUROSTAT SDIS

The EU Sustainable Development Strategy was launched by the European Council in Gothenburg in 2001 and revised in 2006 and 2009. In 2005 the European Council announced principles to help the European countries in the NSDS progress. These principles reach the three dimensions of sustainability, so there is a need for economic prosperity based on an innovative, competitive and eco-efficient economy, besides the quality of the environment must be protected and improved and we must promote equity and social cohesion. Based on these principles in 2006 seven key challenges were assigned, that are the following:

- sustainable consumption and production
- social inclusion, demography and migration
- public health
- climate change and clean energy
- sustainable transport
- conservation and management of natural resources
- global poverty and sustainable development challenges. (Commission of the European Communities 2009; Eurostat 2011)

The NSDSs can be seen rather as a learning process, than a static and single answer to a problem, so an elemental part of the strategy should be the evaluation and monitoring, which serves as a base for revision. (Gáthy et al. 2006) The evaluation of the implementation of EU SDS is supported by the monitoring report of the Eurostat published in every two year. The SDIs in the monitoring report show a theme-oriented framework that reflects the above mentioned key challenges of the SDS. There are ten themes representing the economic, the social, the environmental and the institutional dimensions. They are further divided into subthemes which reflect the operational objectives and actions of the SDS. The more than 140 indicators can be divided into four groups according to the level they represent (See Table 1.)

- The headline indicators monitor the overall objectives related to the key challenges of the SDS. They are widely used indicators with a high communicative and educational value. e.g: real GDP per capita.
- The operational indicators are related to the operational objectives of the SDS. They are lead indicators of the subthemes. e.g: employment.
- The explanatory indicators are related to actions described in the SDS or to other issues which are useful for analyzing progress towards the strategy's objectives. e.g: female employment.
- Contextual indicators are part of the set, but they either do not monitor a particular SDS objective directly or they are not policy responsive. Generally, they are difficult to interpret in a normative way, they rather provide valuable background information. e.g.: number of persons in households. (European Commission)

Table 1
Themes and levels of the Eurostat SDIs

Themes and their headline indicator(s)	Number of		
	operational indicators	explanatory indicators	contextual indicators
Socio-economic development GDP growth rate	3	12	-
Sustainable Consumption and Production Resource productivity	3	14	2
Social Inclusion Risk-of-poverty or exclusion	4	15	1
Demographic Changes Employment of older workers	3	4	4
Public Health Healthy life years and life expectancy	2	9	-
Climate Change and Energy Greenhouse gas emissions Renewable energy	2	8	-
Sustainable Transport Energy consumption of transport relative to GDP	4	7	1
Natural Resources Common bird index Fish catches outside safe biological limits	4	5	-
Global Partnership Official development assistance	3	7	3
Good Governance No headline indicator	3	3	1
	31	84	22

Source: author's work based on European Commission

PROGRESS TOWARDS SUSTAINABLE DEVELOPMENT IN THE EU

In this section of the article three headline indicators and one operational indicator will be presented to assess the progress in the EU-27 member states. These are taken to represent the four dimensions of sustainability: Resource productivity, People at risk of poverty or social exclusion, Renewable energy and Share of environmental and labour taxes in total tax revenues. Although not all the headline indicators are explained and presented in details a summary of the way they changed in the past years is shown in Table 2.

Table 2
Progress in the headline SDIs compared to 2009

SDI theme	Headline indicator	2009 report	2011 report
Socioeconomic development	Real GDP per capita		
Sustainable consumption and production	Resource productivity		
Social inclusion	Risk of poverty or social exclusion		
Demographic changes	Employment rate of older workers		
Public health	Life expectancy and healthy life years		
Climate change and energy	Greenhouse gas emissions		
	Consumption of renewables		
Sustainable transport	Energy consumption of transport relative to GDP		
Natural resources	Abundance of common birds		
	Conservation of fish stocks		
Global partnership	Official Development Assistance		
Good governance	No headline indicator	-	-

Clearly favourable changes Moderately favourable changes Moderately unfavourable changes Clearly unfavourable changes

Source: author's work based on Eurostat 2011

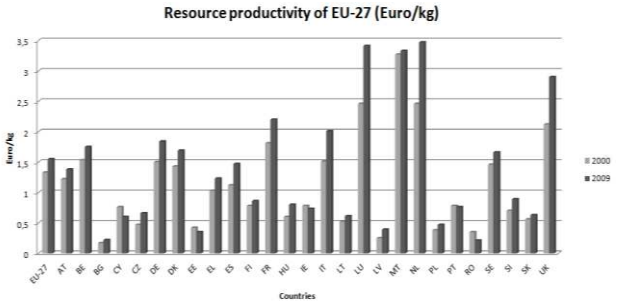
The monitoring report of the EU SDS uses the weather forecast signs to indicate in which direction the given indicator changed. Sunshine means clearly favourable changes, while sunshine with a cloud represents moderately unfavourable changes. The cloud and bolt of lightning stand for unfavourable changes. It should be noted here that there is no target level in case of most of the indicators, only the direction of change is important. In my opinion a target should be determined more frequently, so that it could be clearly seen what is sustainable. The problem is that it is difficult if not impossible to determine whether an indicator already shows a sustainable level or not.

As seen in Table 2, the changes in the 10 themes of sustainable development show quite a diverse picture. The theme 'Socioeconomic development' represents a moderately favourable change, while 'Demographic changes' shows less favourable data in the years analysed lately. Since the latest presented date in this table is from 2010, these two topics seem to be the mostly hit by the financial crisis. Real GDP per capita is not highlighted in this paper due to its well known shortcomings. What was surprising in the analysis of the data was that 'Social inclusion' and the 'Climate change and energy' themes are changing in a favourable way. This paper deals with these fields in detail.

Although no headline indicator is connected to the 'Good governance' theme because no indicator is considered to be sufficiently robust and policy relevant to provide a comprehensive overview, still in my opinion good governance is indispensable to reach the goals set by the SDS, so it should be enhanced. Therefore I dealt with the environmental taxes and their share from total tax revenue compared to the share of labour taxes as a mean of assessing good governance.

Sustainable Consumption and Production

The headline indicator of 'Sustainable consumption and production' is resource productivity, which monitors the amount of gross value added (measured as GDP) that an economy generates by using one unit of material (measured as domestic material consumption [DMC]). In other words we can say that it shows how productively an economy consumes resources in the creation of products and services for markets. The goal is to increase resource productivity when the GDP increases more than DMC does. Figure 3 compares resource productivity in the years 2000 and 2009 measured in Euro/kg.



Source: author's work based on Eurostat data

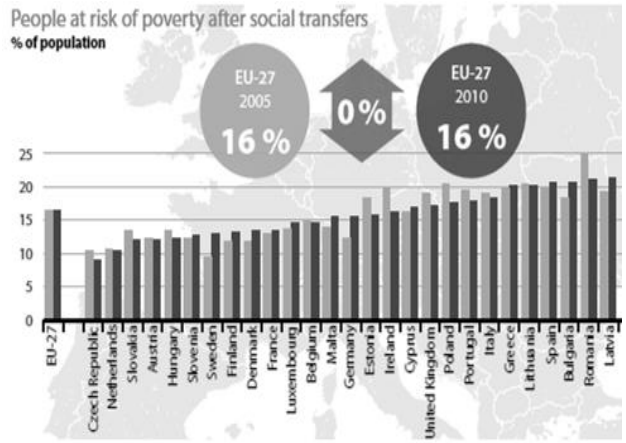
Figure 3. Resource productivity in EU-27 countries (2000 and 2009)

In majority of the member states an increase can be seen, the highest in Lithuania and the Netherlands, but in Estonia, Ireland, Cyprus and Romania less GDP was generated from 1 kg of material than 9 years earlier. Still, if we consider the EU-27 average, resource productivity increased in the 9 years examined, from 1.33 Euro/kg in 2000 to 1,55 Euro/kg in 2009. (Eurostat) Despite the

increase it was declared to be a moderately unfavourable change because in most cases the increase in resource productivity resulted from the GDP growing at a higher rate than the growth of DMC. In 2007, for example, there were only 6 countries where absolute decoupling was achieved: in Germany, Italy, Lithuania, Hungary, the Netherlands and the United Kingdom, which means that the DMC decreased and the GDP increased (Eurostat 2011).

Social Inclusion

The headline indicator of 'Social inclusion' is 'People at risk of poverty or social exclusion'. In Figure 4 the change in people at risk of poverty after social transfers can be seen as a percentage of population. From 2005 to 2010 the share of people at risk of poverty after social transfers did not change, remaining 16% of the population, representing 81 million people at risk of poverty in 2010. In the 5 years examined, in 13 countries the share of people at risk of poverty decreased, while in 14 countries the share fell, resulting in no change overall.



Source: Eurostat (2012)

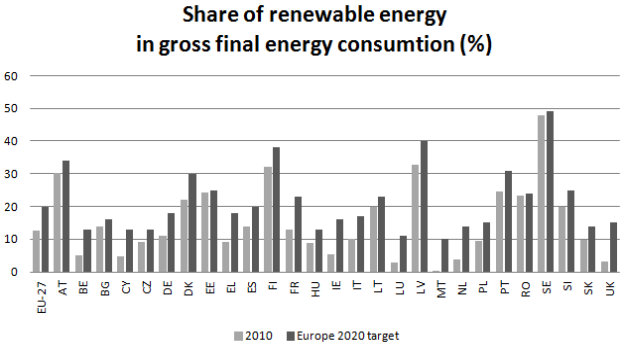
Figure 4. Share of people at risk of poverty after social transfers in % of population in EU-27 (2005 and 2010)

Despite the stagnation we could put a sunshine mark next to 'Social inclusion', showing favourable changes, because the group of people at risk of poverty includes three elements: one of them is the already mentioned 'People at risk of poverty after social transfers', remaining at 16%, while the other two are 'Share of severely materially deprived people' and 'Share of people living in households with very low work intensity (aged 0-59)'. The number of severely materially deprived people decreased by 24% between 2005 and 2010: their share of the population was 10.7% in 2005, but decreased to 8.1% to 2010. The improvement in the number of people living in households with very low work intensity was lower, showing a 4% decrease, but in 2010 it still represented 10% of population (Eurostat 2012).

Climate Change and Energy

This theme has two headline indicators: 'Greenhouse gas emission' and 'Share of renewable energy in gross final energy consumption'. I would have found the 'Greenhouse gas (GHG) emission' interesting but I saw in the monitoring report that it is not the absolute value that is measured, as the change compared to 1990 is taken into consideration. I disagree with this assumption as in countries such as Hungary, production of some sectors, e.g. heavy industry, decreased due to the political and economic transitions, resulting in a fall in GHG emission. Due to this fall the indicator of Hungary shows great improvement, although I am not sure if improvements can be seen since the 1990s.

The other headline indicator is 'Share of renewable energy in gross final energy consumption'. In the case of this indicator target levels are determined in Europe 2020 Strategy. Figure 5 shows what the member states reached by 2010 compared to their targets.



Source: edited by the author based on Eurostat data

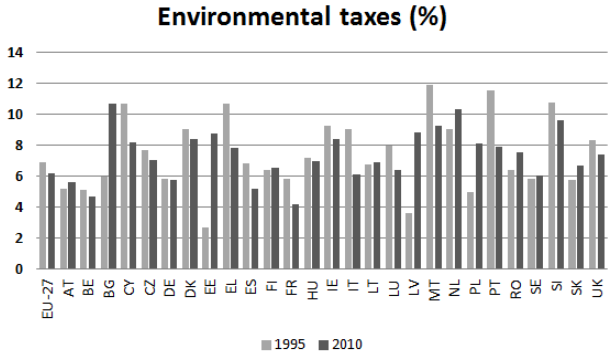
Figure 5. The share of renewable energy in gross final energy consumption in EU-27 (2010)

It is clearly seen that none of the member states have reached their 2020 target yet, but some of them are very close to it. The share of renewable energy increased in most of the countries by 2010, but I still have doubts if this alone can be declared as a clearly favourable change, as declared by Eurostat. I think the decrease in energy usage from all sources would be a favourable change. What is shown here is just that more renewable energy is consumed, while the problem is that we consume more and more energy year by year and I am not sure if this leads us towards sustainability, no matter what type we use.

Good Governance

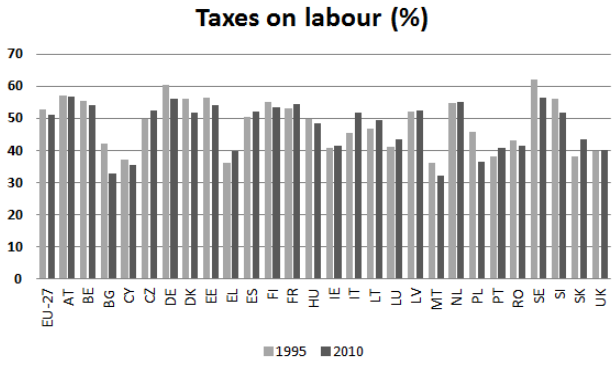
When evaluating the theme 'Good governance' I have chosen a subtheme called 'Economic instruments'. The indicator used is the ratio of environmental to labour taxes. Figure 6 and 7 show the 'Share of environmental and labour taxes in total tax revenues'. I considered it an

important indicator, as one goal of the EU SDS is to shift taxation from labour into resource and energy consumption and/or pollution.



Source: author's work based on Eurostat data

Figure 6. Share of environmental taxes in total tax revenues in EU-27 (1995 and 2010)



Source: author's work based on Eurostat data

Figure 7. Share of labour taxes in total tax revenues in EU-27 (1995 and 2010)

According to Figure 6, the average EU-27 share of environmental taxes shows a decrease over the period. This alone could be evaluated as a progress if we say the decrease was due to lower pollution, but the situation is not as simple as it seems. Such a comparison should be made with caution because low revenue and thus a low share of environmental taxes does not necessarily mean environment-friendly agents. I may be due to relatively low environmental tax rates, or could result from a change in the behavioural patterns of the agents as an effect of higher tax rates. To give another example, a high level of environmental tax revenue can be the result of the activities of individuals or businesses, so in other words, when we buy petrol or diesel in the neighbouring countries we increase their environmental tax revenue, but we pollute our own country.

The share of taxes on labour shows only small changes in the examined 15 years. It remains around 50% of the tax revenue as an average in the EU-27 countries.

The ratio of environmental to labour taxes decreased from 0.13 in 1995 to 0.12 in 2010, which does not follow the EU SDS goal. It can be evaluated as a clearly unfavourable change.

CONCLUSIONS

As for the progress towards sustainable development in the European Union in general, we can say that there are both favourable and unfavourable changes concerning all dimensions of sustainability. Evaluating the progress has a great many limitations I think. One of them is that the latest statistical data in case of many indicators are 2-3 year old. That means that it takes at least 2 or 3 years to see whether the economy or the society is moving towards sustainability or if there is something to be changed. In my opinion a second limitation is that I have doubts about the relevance of the headline indicators. In some cases, like in 'Socioeconomic development' or 'Climate change and energy' themes, more emphasis should be laid on the subtheme indicators. Thirdly, I think policy and governance has a decisive role, as do local communities, in changing the thinking of people and acting differently, but in the monitoring report this cannot be measured.

In the future the subtheme and explanatory indicators should be examined and thus further conclusions could be drawn.

Acknowledgements

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Eight Methods for Decomposing the Aggregate Energy Intensity of the Economic Structure

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SUMMARY

The energy intensity of East-Central Europe has greatly improved in the last two decades for two main reasons. The first is that after the change of regime the heavy industry collapsed, and there was a shift from agriculture towards the service sector, while the second is the technological development of the economy, which increased the energy efficiency of the economic sectors. The subject of this paper is to provide a comprehensive index decomposition analysis of the energy intensity of the economy in four East-Central European nations (the Czech Republic, Slovakia, Slovenia, Poland and Hungary) between 1990 and 2009.
Keywords: energy consumption; energy efficiency; index decomposition analysis; East-Central Europe; change of regime
Journal of Economic Literature (JEL) code: O13, Q49

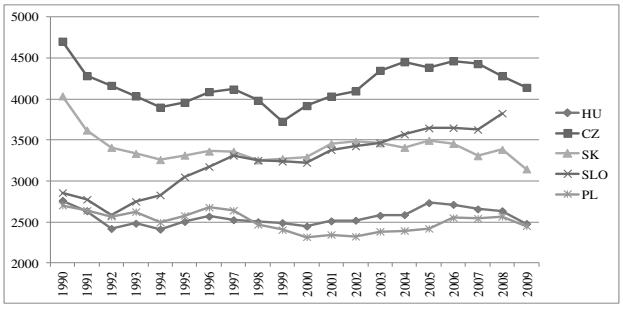
INTRODUCTION

The energy consumption of an economy is affected by many factors: the climate, living standards, national income, different consumption patterns, furthermore the structural change. The literature analyzing the structural change mainly examines the sectors' relative weight alteration and the relationship of economic growth and restructuring within the manufacturing industry (e.g. Szalavetz, 2003). The subject of this paper is to identify the factors which affect the changes in energy intensity after the change of regime in East-Central Europe (Czech Republic, Slovakia, Slovenia, Poland and Hungary).

GENERAL CHARACTERISTICS OF THE COUNTRIES EXAMINED

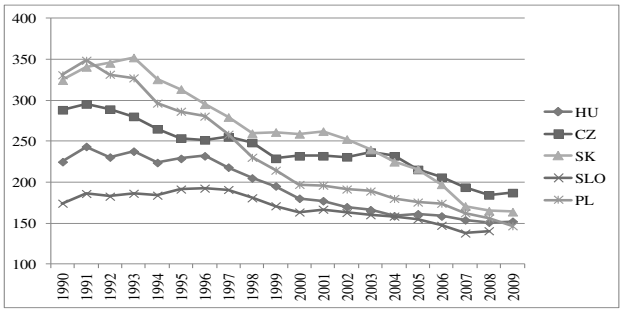
According to the Hungarian Central Statistical Office's definition, "energy intensity means the ratio of the gross inland energy use to GDP in a year, where the unit of energy use is the ton of oil equivalent (toe). A decrease in the index means the increase of energy intensity, so the smaller the value is, the more intensive the country's resource use is." (KSH, 2008: 20). Energy efficiency is the reciprocal of this indicator and it means the ratio of GDP to energy use (how much GDP can be produced with one unit of energy use).

The energy consumption per capita decreased drastically after the change of regime in every country (Figure 1) investigated. However, this decline did not become permanent; the values strongly fluctuate after a few years and show an increasing trend.



Source: World Bank database

Figure 1. Energy use (kg of oil equivalent per capita), 1990-2009



Source: World Bank database

Figure 2. Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP), 1990-2009

The energy intensity of the countries analyzed has greatly improved in the last two decades, as shown in Figure 2. There are two main reasons for this: (1) after the change of regime the heavy industry collapsed, and there was a shift towards the service sector. The second is the technological development of the economy, which increased the economic sectors' energy efficiency. My purpose is to quantify the degree of these two effects (the structural and the intensity effects). My hypothesis is that in East-Central Europe after the change of regime the energy intensity (both in the industrial sector and in the whole of the economy) was significantly affected both by the structural change and by the changes in the energy intensity of the economic sectors as well.

BACKGROUND

The effects of economic activities on energy intensity were a central research topic of energy and environmental economics after the first oil price shock (Boyd and Roop, 2004). The Index Decomposition Analysis is a widespread method used for the analysis of energy consumption and emission in both energy and environmental economics; furthermore, in the past few years it has appeared as a toolbar of human resource economics (Achao and Schaeffer, 2009). This method offers new contributions to the examination of income inequalities. It can be easily interpreted and nowadays it is a frequently used tool for decision-makers (Ang 1995, 2000; Hoekstra et al., 2003; Zhao et al., 2010; Liu and Ang, 2003, Unander, 2007). Table 1 contains the relevant publications of this topic I have reviewed, which include not only a methodology survey, but empirical results as well. Apart from some exceptions, these studies use only one method each and do not aim to check their results with others. The area analyzed is quite wide: Achao and Schaeffer (2009) attempt an explanation of the income inequalities in Brazil, Mairet and Decellas (2009) decompose the energy intensity of the French service sector, and Ang (2005) studies emission in the Canadian industry sector. The number of subsectors examined fluctuates heavily: in the reviewed papers the minimum is 3 and the maximum is 28, but Ang mentions that analyses of 2 to 400 subsectors are also found.

METHODOLOGY OF INDEX DECOMPOSITION ANALYSIS

The index decomposition method has many characteristics similar to shift-share analysis, which is presented by Nemes Nagy (1995). However, shift-share analysis is an additive approach, while index decomposition can be additive and multiplicative as well. The objectives of both are the decomposition of aggregate data into components. While shift-share analysis can be mainly observed in regional studies, index decomposition analysis is the result of the increasing interest in energy caused by the 1973 oil crisis. At that time the general objective of the governments was to restrain energy consumption and enhance energy efficiency. The first step was to determine factors that have an influence on energy consumption and to work out the appropriate methodology, with special regard to the index decomposition analysis.

The essence of this method is that it can explain the changes of an indicator at the sectoral level, and another advantage is the lowest data requirement (Hoekstra et al., 2003). The starting point is the final intensity in the economic structure (aggregate energy intensity), which is essentially affected by two factors: changes in energy intensity of the economic sectors (intensity effect) and the shift in the mix of products or activities (structural effect) (Liu and Ang, 2003). The method disaggregates the economy into sectors and then weights sectoral energy intensity by their output shares. In this paper final intensity in the economic structure means the ratio of the final energy use of the primary, secondary and tertiary sectors to the added value produced by those sectors.

Table 1
Summary of the publications reviewed

Publication	Examined country	Time period	Method	Type of method	Subsector number
Zhao et al., 2010	China	1998-2006	LMDI	Additive	15
Mairet and Decellas, 2009	France	1995-2006	LMDI	Additive	7
Achao and Shaeffer, 2009	Brazil	1980-2007	LMDI	Additive	4
Hatzigeorgiou et al. 2008	Greece	1990-2002	AMDI LMDI	Additive	3
Mercados-EMI et al. 2007	Cyprus, Estonia, Hungary, Lithuania, Latvia, Poland, Czech Republic, Slovakia, Slovenia	1995-2004	Divisia	Additive	10
Unander, 2007	Australia, Denmark, Finland, France, Italy, Japan, Norway, Sweden, Great Britain, USA	1973-1998	Laspeyres	-	7
Ang, 2005	Canada	1990-2000	LMDI	Multiplicative	23
Boyd and Roop, 2004	USA	1983-1998	AMDI Fisher Ideal	Multiplicative	19
Farla and Blok, 2000	Netherlands	1980-1995	simple average parametric Divisia method 2 (AVE-PDM2)	Additive	5 and 21
Ang, 1995	Singapore	1982-1990	general parametric Divisia 1	Additive	28

Source: author's own work

Index decomposition analysis is a truly wide research topic; many kinds of methods exist and are being used. I used the most popular ones: the Laspeyres, Paasche, Marshall-Edgeworth, Walsh, Fisher Ideal, Drobish, LMDI and the AMDI methodologies. The Laspeyres index shows the changes in the examined time period and uses the weights based on values in the base year. In contrast, the Paasche index uses values of the current year as weight. The Marshall-Edgeworth index calculates the arithmetic average of basic and target years, while the Walsh index uses the geometric means. The Fisher Ideal index is the geometric mean of the results of the Laspeyres and Paasche method, while the Drobish index argues for the arithmetic average of them (Liu et al., 2003). According to Boyd and Roop (2004), the perfect index decomposition method is the Fisher Ideal index, because it fits all of the strict requirements and the value of residual term is one. Both the AMDI and LMDI are integral index numbers and they have a great many advantages such as "path independency, ability to handle zero values and consistency in aggregation" (Zhao et al., 2010:1382).

Let V be an energy-related aggregate. We assume that it is affected by n variables, so x_1, x_2,… x_n. The aggregate can be divided into i subsectors where the changes take place (structural and intensity changes).The connection among the subsectors can be described as follows:

$$V=\sum_i V_i = x_{1,i}x_{2,i}\dots x_{n,i}$$

By the multiplicative method we decompose the relative changes (Ang 2005:867):

$$D_{tot}=\frac{V^T}{V^0}=D_{x1}D_{x2}\dots D_{xn}$$

where:

$$V^0=\sum_i x^0_{1,i}x^0_{2,i}\dots x^0_{n,i}$$

$$V^T=\sum_i x^T_{1,i}x^T_{2,i}\dots x^T_{n,i}$$

By the additive method we decompose the absolute changes:

$$\Delta V_{tot}=V^T-V^0=\Delta V_{x1}+\Delta V_{x2}+\dots+\Delta V_{xn}$$

where:

$$V^0=\sum_i x^0_{1,i}x^0_{2,i}\dots x^0_{n,i}$$

$$V^T=\sum_i x^T_{1,i}x^T_{2,i}\dots x^T_{n,i}$$

Here I will present the methodology of index decomposition analysis using the Laspeyres index. I have chosen this one because this is the most frequently used method (Ang, 2000; Mairet and Decellas, 2009), and the methodology can be easily implemented using this.

Table 2
Multiplicative methods of index decomposition analysis

Laspeyres	$D_{x_1}=I_L=\frac{\sum_i x^T_{1i}*x^0_{2i}\dots x^0_{ni}}{\sum_i x^0_{1i}*x^0_{2i}\dots x^0_{ni}}$
Paasche	$D_{x_1}=I_P=\frac{\sum_i x^T_{1i}*x^T_{2i}\dots x^T_{ni}}{\sum_i x^0_{1i}*x^T_{2i}\dots x^T_{ni}}$
Marshall-Edgeworth	$D_{x_1}=I_{ME}=\frac{\sum_i x^T_{1i}*(x^0_{2i}+x^T_{2i})*(x^0_{3i}+x^T_{3i})\dots(x^0_{ni}+x^T_{ni})}{\sum_i x^0_{1i}*(x^0_{2i}+x^T_{2i})*(x^0_{3i}+x^T_{3i})\dots(x^0_{ni}+x^T_{ni})}$
Walsh	$D_{x_i}=I_W=\frac{\sum_i x^T_{1i}*\sqrt{x^0_{2i}*x^T_{2i}}*\sqrt{x^0_{3i}*x^T_{3i}}\dots\sqrt{x^0_{ni}*x^T_{ni}}}{\sum_i x^0_{1i}*\sqrt{x^0_{2i}*x^T_{2i}}*\sqrt{x^0_{3i}*x^T_{3i}}\dots\sqrt{x^0_{ni}*x^T_{ni}}}$
Fisher 1(Fisher Ideal)	$D_{x_1}=I_F=\sqrt{I_L*I_P}$
Drobish	$D_{x_1}=I_D=\frac{I_L+I_P}{2}$
AMDI (Arithmetic Mean Divisia Index)	$D_{x_1}=\exp(\sum_i \frac{\frac{V^0_i}{V^0}+\frac{V^T_i}{V^T}}{2}*\ln(\frac{x^T_{1i}}{x^0_{1i}}))$ $L(a,b)=\frac{a-b}{\ln(a)-\ln(b)}$, $a\neq b$
LMDI 1 (Log Mean Divisia Index 1)	$D_{x_1}=\exp(\sum_i \frac{L(V^0_i, V^T_i)}{L(V^0,V^T)}*\ln(\frac{x^T_{1i}}{x^0_{1i}}))$ $L(a,b)=\frac{a-b}{\ln(a)-\ln(b)}$, $a\neq b$

where: t=0 (year 0); t=T (year T); i: economic sector
Source: author's own work based on Granel, 2003, p. 35

Using the Laspeyres index the other methods can also be easily conducted (Ang and Zhang, 2000: 1157). In every case I supported the multiplicative type because it is insensitive to units (in contrast with the additive type, which can result in serious differences) and the results can be perfectly illustrated. Ang et al. (2003) recommend also this choice in every case when the researchers analyze long time series. Every method has three main parts:

$$D_{tot}=D_{int}*D_{str}*D_{res}=\frac{I_t}{I_0}$$

where: E_t: total energy consumption; $E_{i,t}$: energy consumption of sector i; Y_t: GDP; $Y_{i,t}$: GDP of sector i; $S_{i,t}$: share of sector i ($=\frac{Y_{i,t}}{Y_t}$); I_t: energy intensity of the economy, ($=\frac{E_t}{Y_t}$); $I_{i,t}$: energy intensity of sector i ($=\frac{E_{i,t}}{Y_{i,t}}$).

The first part shows the changes of energy intensity D_{tot} in the economy in two years.

$$D_{str}=\frac{\sum_i S_{i,T} I_{i,0}}{\sum_i S_{i,0} I_{i,0}}$$

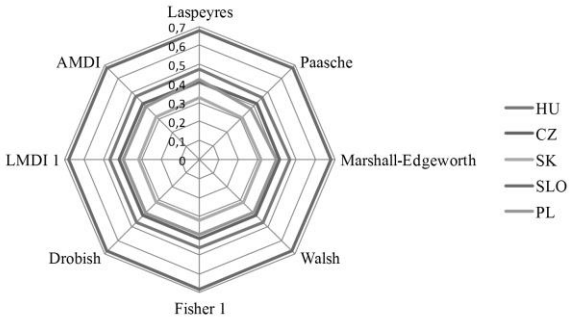
The next two indicators (D_{str}, D_{int}) are the difference of final intensity in the economic structure belonging to year 0 and year t. The difference between them is what factor is unchanged (basic year) in the counter. The D_{str} leaves the energy intensity of subsectors unchanged and so it shows the structural effect, which means the size of the effect in the final intensity (in the economic structure) caused by the shift in the economic structure (from the agriculture and industry sector towards the service sector).

$$D_{int}=\frac{\sum_i S_{i,0} I_{i,T}}{\sum_i S_{i,0} I_{i,0}}$$

D_{int} leaves the share of subsectors unchanged and it presents the effect of energy intensity changes (intensity effect), which means how the changes of the energy intensity of the subsectors affect the final intensity in the economic structure. The nearer D_{str} and D_{int} are to the value 1, the smaller the effect is. The equation includes a residual term for every method, which shows that not all of the effects are explained by the model. The value of the residual term is ideal if it is near to 1 (in the multiplicative method).

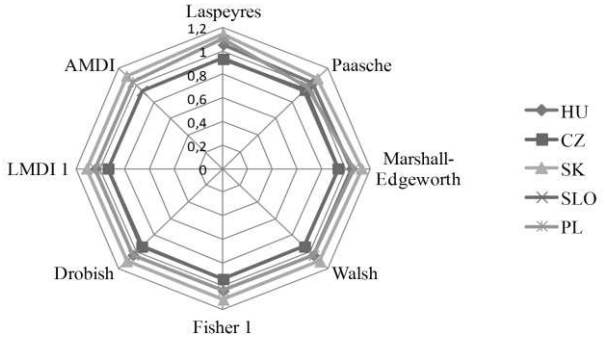
DATABASE

I used the final energy intensity of economic structures (primary, secondary, tertiary sector, 1000 toe) and the added value of these sectors (constant 2000 USD; % of GDP). The countries and time periods examined are: Hungary (1990-2008), Poland (1993-2009), Czech Republic (1990-2008), Slovakia (1993-2009), Slovenia (1990-2008). I used the Eurostat and the World Bank databases, which allows for the comparability of the results.



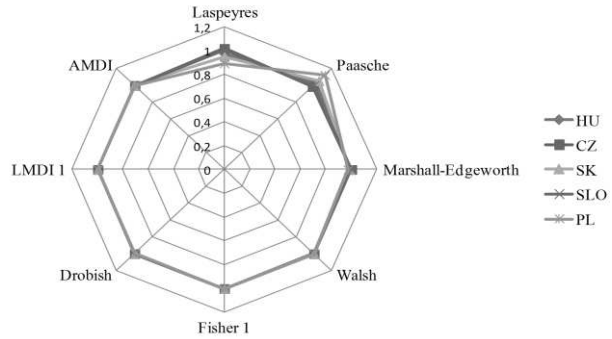
Source: author's own work

Figure 3. Results of index decomposition analysis (Dint, 1990-2009)



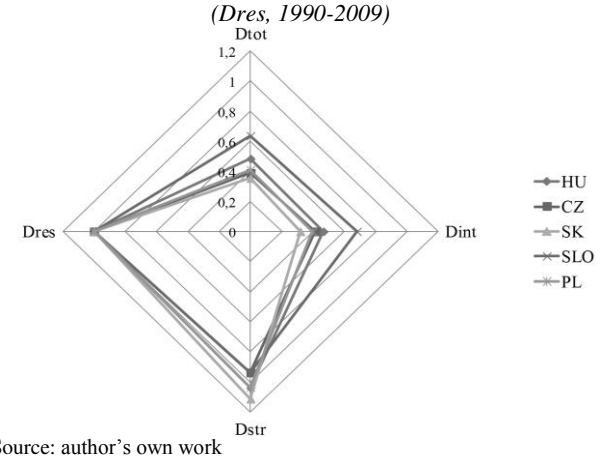
Source: author's own work

Figure 4. Results of index decomposition analysis (Dstr, 1990-2009)



Source: author's own work

Figure 5. Results of index decomposition analysis (Dres, 1990-2009)



Source: author's own work

Figure 6. Results of index decomposition analysis (Fisher I, 1990-2009)

EMPIRICAL RESULTS

For my analysis I used the Lapeyres, Paasche, Marshall-Edgeworth, Walsh, Fisher 1, Drobish, LMDI and AMDI methods. The results are displayed for Dint (Figure 3), Dstr (Figure 4) and Dres (Figure 5). The deviation of the results is really small, which relieves interpretation and increases confidence. The sum of my results is presented in a graphical illustration of the Fisher

I index (Figure 6). This model resulted in the smallest residual term (the residual term is one), which is significant. According to my calculations, in the time period 1990-2009 in every country the effect of the changes of the sectoral energy intensity was more significant in terms of the final intensity in the economic structure than the effect of the shift in the economic structure. This finding confirms Ang's conclusion that "… for the industrialized countries, declining sectoral energy intensity has generally been found to be the main contributor to decreases in the aggregate energy intensity … The impact of structural change is smaller in comparison" (Ang and Zhang, 2000:1162). It also supports Kuttor's statement that "it is important to state and emphasize that in spite of the vigorous tertiarisation of the economies, the industry has maintained its significance in the economies of the region [Visegrad countries], both in terms of the employment of workers and of the production of added value." (Kuttor, 2011: 51).

I made calculations for shorter time horizons as well: I divided the long time period into shorter periods of 5 years. Uliha (2011) recommends, based on Leamer E. E., the extreme bounds analysis (EBA) as an appropriate method: "EBA addresses the issue of specification uncertainty by computing the maximum and minimum values on a large set of model specifications. The highest and lowest estimates are called the upper and lower bounds." (Uliha 2011: 237). In the end these intervals are the result. In Table 3, I apply this method and present the maximum and minimum values.

Table 3
The results of index decomposition analysis with regard to the aggregate energy intensity

		1990-1995		1995-2000		2000-2005		2005-2009		1990-2009	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
HU	D_{int}	0.8418	0.8476	0.7876	0.803	0.8402	0.8469	0.8374	0.839	0.4598	0.4723
	D_{str}	0.9763	0.9829	1.022	1.042	0.9994	1.004	1.0069	1.0087	1.0245	1.0523
	D_{res}	0.9934	1.0066	0.98	1.02	0.992	1.008	0.9981	1.0019	0.9736	1.0271
CZ	D_{int}	0.8657	0.8774	0.7778	0.7797	0.7962	0.7964	0.7626	0.7724	0.4106	0.4173
	D_{str}	0.8668	0.8884	1.022	1.0235	1.0023	1.0026	1.0271	1.0403	0.9301	0.9452
	D_{res}	0.9757	1.025	0.9974	1.0026	0.9997	1.0003	0.9874	1.0128	0.9839	1.0036
PL	D_{int}	0.8682	0.875	0.7019	0.7124	0.8325	0.833	0.7664	0.7747	0.3741	0.4196
	D_{str}	1.041	1.0491	0.9832	0.9979	0.9974	0.998	0.9993	1.0102	0.9779	1.0971
	D_{res}	0.9923	1.0078	0.9853	1.0149	0.9994	1.0006	0.9893	1.0101	0.8914	1.1218
SK	D_{int}	0.8095	0.8098	0.7737	0.7751	0.6862	0.6882	0.6874	0.7321	0.3101	0.3267
	D_{str}	0.993	0.9932	0.9878	0.9896	1.0872	1.0904	1.0499	1.1181	1.0834	1.1416
	D_{res}	0.9998	1.0003	0.9982	1.0018	0.9971	1.0029	0.939	1.065	0.9491	1.0537
SLO	D_{int}	0.9841	0.9968	0.9792	0.9805	0.8869	0.8873	0.7912	0.7937	0.3101	0.3267
	D_{str}	0.8938	0.9001	1.0181	1.0193	1.0062	1.0066	1.0097	1.0129	1.0834	1.1416
	D_{res}	0.9873	1.0129	0.9988	1.0013	0.9996	1.0001	0.9968	1.0032	0.9491	1.0537

Source: author's own work

In the first period (1990/1993-2005) the aggregate energy intensity in East-Central Europe decreased, but the extent of the decrease varied. In Hungary, Slovakia, Poland and Slovenia the decline was caused mainly by the changes in energy intensity of the economic sectors (the Fisher Ideal index's results are 0.844; 0.81; 0.87; 0.89, respectively), not by the shift of the sectors (the Fisher Ideal index's results are 0.98; 0.99; 1.04; 0.98, respectively). In the Czech Republic the strength of these two effects was nearly equal (according to the Fisher Ideal index the results are 0.88 for both of these effects). For example in Hungary these values mean that as a result of intensity effect the aggregate energy intensity in 1995 would have been 0.84 times the value in 1990 and as a result of the structural effect in 1990 it would have been 0.98 times the value in 1990, so finally the aggregate energy intensity changed to 0.83 times at the end of the period.

In the period of 1995-2000, excluding Slovakia, the intensity effect became stronger: the value of the Fisher Ideal index averages out at around 0.78 (Hungary: 0.795, Slovakia: 0.774, Czech Republic: 0.779, and Poland: 0.707). The value of the structural effect is near 1, which means that during this period it does not significantly affect the aggregate energy intensity. In Slovenia this tendency is the opposite; the aggregate energy intensity did not change because the two effects exactly offset each other (the Fisher Ideal index with regard to the structural effect was 1.02 and the intensity effect was 0.98).

These trends were the same in the later periods (2000-2008/2009) but it is interesting that the structural effect in Slovakia exceeds the value of 1 (the Fisher Ideal index is 1.08), which is probably the consequence of the development of its automobile industry.

Analyzing the whole time period, in Hungary the aggregate energy intensity is 0.484 times in 2008 compared to 1990, which is mainly caused by the intensity effect (Fisher Ideal index 0.466), while the structural effect is quite weak (Fisher Ideal index 1.04). Elek (2009) examined the Hungarian energy intensity (1992-2007) – using the additive approach – and also

concludes that the intensity effect is more significant than the structural effect.

The same tendencies can be observed in the other countries (strong intensity and weak structural effect), except that in Poland and Slovakia the structural effect is under 1 (for both of them the Fisher Ideal index is 0.94). In Poland and Slovakia the structural effect would have impaired the energy intensity (Fisher Ideal index 1.04 and 1.11, respectively), but it was offset by the intensity effect.

CONCLUSION

The main difference between neoclassical and energy economics is their different opinions about the role of energy in economic development. According to the neoclassical approach, energy is just an intermediary input among other production factors (land, capital and workers), which determine economic development directly or indirectly. According to energy economists (Cleveland, Herring, and Stern), though, energy significantly affects revenue and the economy depends on the changes in energy consumption. The relationship of economic development and energy use has been a core topic for many centuries.

In this paper I examined how aggregate energy intensity is influenced by the shift in the mix of products or activities (structural effect) and the changes in energy intensity of economic sectors (intensity effect). My hypothesis was that both of these effects are significant. I performed the examination using eight different methods of index decomposition analysis. Significant differences between the results did not appear, and the size of the residual term was manageable. Since my objective was to determine the major effects I did not attempt to explain the size of residuum.

In every short time period – apart from the first period for the Czech Republic and Slovenia – the intensity effect was more important than the structural effect in each country. Thus, I have found that in the analyzed countries of East-Central-Europe between 1990 and 2009 the intensity effect contributed to a greater extent to the improvement of final intensity in the economic structure than the structural effect. The magnitude of the structural effect is smaller than that of the intensity effect from the energy intensity perspective.

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Appendix 1

Results of index decomposition analysis

HU				
1990-1995	Dtot	Dint	Dstr	Dres
Laspeyres	0,8273912	0,8418156	0,976395	1,0066267
Paasche	0,8273912	0,847394	0,9828652	0,993417
Marshall-E	0,8273912	0,8445715	0,9793522	1,0003123
Walsh	0,8273912	0,844583	0,9791287	1,0005269
Fisher 1	0,8273912	0,8446002	0,9796247	1
Drobish	0,8273912	0,8446048	0,9796301	0,9999891
LMDI 1	0,8273912	0,8439735	0,9792486	1,0011269
AMDI	0,8273912	0,8476375	0,9796029	0,9964389
1995-2000	Dtot	Dint	Dstr	Dres
Laspeyres	0,8206498	0,8029869	1,0419186	0,9808794
Paasche	0,8206498	0,7876333	1,0219965	1,0194933
Marshall-E	0,8206498	0,7951525	1,033046	0,9990513
Walsh	0,8206498	0,7952371	1,0319365	1,000019
Fisher 1	0,8206498	0,7952731	1,0319095	1
Drobish	0,8206498	0,7953101	1,0319576	0,9999068
LMDI 1	0,8206498	0,7954202	1,0319218	0,9998031
AMDI	0,8206498	0,7952584	1,0319576	0,9999719
2000-2005	Dtot	Dint	Dstr	Dres
Laspeyres	0,8435033	0,8469679	1,0038759	0,9920644
Paasche	0,8435033	0,8402466	0,9959095	1,0079991
Marshall-E	0,8435033	0,8436007	1,0002227	0,9996619
Walsh	0,8435033	0,8438081	0,9994228	1,0002161
Fisher 1	0,8435033	0,8436005	0,9998848	1
Drobish	0,8435033	0,8436072	0,9998927	0,9999841
LMDI 1	0,8435033	0,8441799	0,999406	0,9997924
AMDI	0,8435033	0,8439281	0,999475	1,0000217
2005-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,844768	0,8374483	1,0068626	1,0018651
Paasche	0,844768	0,8390102	1,0087406	0,9981384
Marshall-E	0,844768	0,8382319	1,0077185	1,0000784
Walsh	0,844768	0,8382303	1,0078063	0,9999932
Fisher 1	0,844768	0,8382289	1,0078012	1
Drobish	0,844768	0,8382292	1,0078016	0,9999991
LMDI 1	0,844768	0,8382987	1,007773	0,9999446
AMDI	0,844768	0,8382148	1,0077978	1,0000201
1990-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,4838303	0,4722561	1,0522928	0,9735963
Paasche	0,4838303	0,4597868	1,0245084	1,0271198
Marshall-E	0,4838303	0,4658626	1,0433804	0,9953884
Walsh	0,4838303	0,4659876	1,039496	0,9988398
Fisher 1	0,4838303	0,4659797	1,0383077	1
Drobish	0,4838303	0,4660214	1,0384006	0,999821
LMDI 1	0,4838303	0,4685391	1,0390441	0,9938325
AMDI	0,4838303	0,4690771	1,0382465	0,9934554

CZ				
1990-1995	Dtot	Dint	Dstr	Dres
Laspeyres	0,7691081	0,8872777	0,8884348	0,9756684
Paasche	0,7691081	0,8656888	0,8668177	1,0249384
Marshall-E	0,7691081	0,877121	0,8782718	0,998387
Walsh	0,7691081	0,8771443	0,8769638	0,9998496
Fisher 1	0,7691081	0,8764168	0,8775597	1
Drobish	0,7691081	0,8764832	0,8776263	0,9998483
LMDI 1	0,7691081	0,8774089	0,8765653	1,0000024
AMDI	0,7691081	0,8772838	0,8766962	0,9999956
1995-2000	Dtot	Dint	Dstr	Dres
Laspeyres	0,7969483	0,7797926	1,0246775	0,9973872
Paasche	0,7969483	0,7777552	1,0220003	1,0026196
Marshall-E	0,7969483	0,7787615	1,0235045	0,9998524
Walsh	0,7969483	0,7787772	1,0236137	0,9997257
Fisher 1	0,7969483	0,7787732	1,023338	1
Drobish	0,7969483	0,7787739	1,0233389	0,9999983
LMDI 1	0,7969483	0,7788055	1,0234574	0,9998419
AMDI	0,7969483	0,779153	1,0233227	0,9995275
2000-2005	Dtot	Dint	Dstr	Dres
Laspeyres	0,7982021	0,7964035	1,002563	0,9996961
Paasche	0,7982021	0,7961615	1,0022584	1,000304
Marshall-E	0,7982021	0,7962823	1,002428	0,9999829
Walsh	0,7982021	0,7962829	1,0024075	1,0000026
Fisher 1	0,7982021	0,7962825	1,0024107	1
Drobish	0,7982021	0,7962825	1,0024107	1
LMDI 1	0,7982021	0,7963126	1,0024085	0,9999644
AMDI	0,7982021	0,7962794	1,0024096	1,0000049
2005-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,7933336	0,7723954	1,0402562	0,9873607
Paasche	0,7933336	0,7626329	1,0271081	1,0128011
Marshall-E	0,7933336	0,7674179	1,0345264	0,9992689
Walsh	0,7933336	0,7671318	1,0341524	1,0000031
Fisher 1	0,7933336	0,7674987	1,0336613	1
Drobish	0,7933336	0,7675142	1,0336822	0,9999596
LMDI 1	0,7933336	0,7670205	1,034321	0,9999852
AMDI	0,7933336	0,7670167	1,0343141	0,9999968
1990-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,388138	0,4106221	0,9300635	1,016322
Paasche	0,388138	0,4173242	0,945244	0,9839401
Marshall-E	0,388138	0,4138517	0,9344824	1,0036223
Walsh	0,388138	0,4138799	0,9371364	1,0007118
Fisher 1	0,388138	0,4139596	0,937623	1
Drobish	0,388138	0,4139732	0,9376537	0,9999345
LMDI 1	0,388138	0,4154329	0,9369306	0,9971899
AMDI	0,388138	0,4147505	0,9380263	0,9976639

SK				
1993-1995	Dtot	Dint	Dstr	Dres
Laspeyres	0,8040714	0,809582	0,9929739	1,000221
Paasche	0,8040714	0,8097609	0,9931933	0,9997791
Marshall-E	0,8040714	0,8096711	0,993072	1,000012
Walsh	0,8040714	0,8096803	0,9931282	0,9999441
Fisher 1	0,8040714	0,8096714	0,9930836	1
Drobish	0,8040714	0,8096714	0,9930836	1
LMDI 1	0,8040714	0,8097329	0,9931058	0,9999016
AMDI	0,8040714	0,8094826	0,993061	1,000256
1995-2000	Dtot	Dint	Dstr	Dres
Laspeyres	0,7655698	0,775057	0,9895544	0,9981861
Paasche	0,7655698	0,7736511	0,9877595	1,0018172
Marshall-E	0,7655698	0,7743577	0,9887707	0,9998794
Walsh	0,7655698	0,7743711	0,9886409	0,9999933
Fisher 1	0,7655698	0,7743537	0,9886565	1
Drobish	0,7655698	0,774354	0,9886569	0,9999992
LMDI 1	0,7655698	0,7744554	0,9886401	0,9998853
AMDI	0,7655698	0,7743419	0,9886002	1,0000722
2000-2005	Dtot	Dint	Dstr	Dres
Laspeyres	0,7482041	0,6881915	1,0903924	0,9970755
Paasche	0,7482041	0,6861788	1,0872035	1,0029331
Marshall-E	0,7482041	0,6871416	1,0890924	0,9997908
Walsh	0,7482041	0,6871453	1,0888101	1,0000446
Fisher 1	0,7482041	0,6871844	1,0887967	1
Drobish	0,7482041	0,6871851	1,0887979	0,9999979
LMDI 1	0,7482041	0,6874802	1,0886575	0,9996975
AMDI	0,7482041	0,6871633	1,0886996	1,00012
2005-2009	Dtot	Dint	Dstr	Dres
Laspeyres	0,7685925	0,7320512	1,1181237	0,9389983
Paasche	0,7685925	0,6873949	1,0499163	1,0649646
Marshall-E	0,7685925	0,7084778	1,0892959	0,995919
Walsh	0,7685925	0,708391	1,0858955	0,9991601
Fisher 1	0,7685925	0,7093717	1,0834834	1
Drobish	0,7685925	0,709723	1,08402	0,9990102
LMDI 1	0,7685925	0,7077727	1,0861615	0,9997881
AMDI	0,7685925	0,707889	1,0858764	0,9998862
1990-2009	Dtot	Dint	Dstr	Dres
Laspeyres	0,3539938	0,326746	1,1415514	0,9490517
Paasche	0,3539938	0,3100989	1,0833913	1,0536833
Marshall-E	0,3539938	0,3178723	1,1272279	0,9879416
Walsh	0,3539938	0,3178696	1,1142534	0,9994539
Fisher 1	0,3539938	0,3183137	1,1120912	1
Drobish	0,3539938	0,3184225	1,1124713	0,9993167
LMDI 1	0,3539938	0,3192032	1,112601	0,9967565
AMDI	0,3539938	0,3168399	1,1136742	1,0032234

SLO				
1990-1995	Dtot	Dint	Dstr	Dres
Laspeyres	0,8909305	0,9840858	0,8937895	1,0129211
Paasche	0,8909305	0,9967893	0,9053273	0,9872676
Marshall-E	0,8909305	0,9900813	0,8995121	1,0003822
Walsh	0,8909305	0,9901784	0,8993019	1,0005179
Fisher 1	0,8909305	0,9904172	0,8995399	1
Drobish	0,8909305	0,9904376	0,8995584	0,999971
LMDI 1	0,8909305	0,9901496	0,8996679	1,0001401
AMDI	0,8909305	0,9911317	0,9001045	0,9986644
1995-2000	Dtot	Dint	Dstr	Dres
Laspeyres	0,9981996	0,9804643	1,0193454	0,9987671
Paasche	0,9981996	0,9792432	1,0180758	1,0012596
Marshall-E	0,9981996	0,9798479	1,0187168	1,000012
Walsh	0,9981996	0,9798556	1,0187198	1,0000013
Fisher 1	0,9981996	0,9798536	1,0187104	1
Drobish	0,9981996	0,9798538	1,0187106	1,0000122
LMDI 1	0,9981996	0,9798951	1,0187195	0,9999613
AMDI	0,9981996	0,9798564	1,0186817	1,0000379
2000-2005	Dtot	Dint	Dstr	Dres
Laspeyres	0,8927727	0,8869153	1,0061923	1,0004094
Paasche	0,8927727	0,8872784	1,0066042	0,9995907
Marshall-E	0,8927727	0,8870974	1,0063859	1,0000116
Walsh	0,8927727	0,8870883	1,0064052	1,0000027
Fisher 1	0,8927727	0,8870968	1,0063982	1
Drobish	0,8927727	0,8870968	1,0063983	1
LMDI 1	0,8927727	0,8872443	1,006415	0,9998171
AMDI	0,8927727	0,8870036	1,0063973	1,0001061
2005-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,8014004	0,7937303	1,0128943	0,9968101
Paasche	0,8014004	0,7911984	1,0096633	1,0032001
Marshall-E	0,8014004	0,7924563	1,0114646	0,999824
Walsh	0,8014004	0,7924255	1,011357	0,9999692
Fisher 1	0,8014004	0,7924634	1,0112775	1
Drobish	0,8014004	0,7924644	1,0112788	0,9999974
LMDI 1	0,8014004	0,7924367	1,0113674	0,9999447
AMDI	0,8014004	0,7924232	1,0113534	0,9999756
1990-2008	Dtot	Dint	Dstr	Dres
Laspeyres	0,6362692	0,6795306	0,9352569	1,0011543
Paasche	0,6362692	0,6803149	0,9363365	0,9988471
Marshall-E	0,6362692	0,6799096	0,9356937	1,000129
Walsh	0,6362692	0,679448	0,9359181	1,0005686
Fisher 1	0,6362692	0,6799226	0,9357965	1
Drobish	0,6362692	0,6799227	0,9357967	0,9999997
LMDI 1	0,6362692	0,6807545	0,9366528	0,9978651
AMDI	0,6362692	0,6801727	0,9367505	0,9986143

PL				
1993-1995	Dtot	Dint	Dstr	Dres
Laspeyres	0,9109153	0,8750081	1,049157	0,9922599
Paasche	0,9109153	0,8682354	1,0410364	1,0078005
Marshall-E	0,9109153	0,8715405	1,0453674	0,9998192
Walsh	0,9109153	0,8714248	1,0457689	0,9995681
Fisher 1	0,9109153	0,8716152	1,0450888	1
Drobish	0,9109153	0,8716218	1,0450967	0,9999849
LMDI 1	0,9109153	0,871494	1,0455874	0,9996622
AMDI	0,9109153	0,8708666	1,0454665	1,000498
1995-2000	Dtot	Dint	Dstr	Dres
Laspeyres	0,7004589	0,7123928	0,9978888	0,9853284
Paasche	0,7004589	0,7019408	0,9832483	1,01489
Marshall-E	0,7004589	0,7071723	0,991798	0,998698
Walsh	0,7004589	0,7069491	0,9908664	0,9999527
Fisher 1	0,7004589	0,7071475	0,9905415	1
Drobish	0,7004589	0,7071668	0,9905685	0,9999454
LMDI 1	0,7004589	0,7070778	0,9910045	0,9996313
AMDI	0,7004589	0,7070509	0,9909546	0,9997197
2000-2005	Dtot	Dint	Dstr	Dres
Laspeyres	0,8307531	0,8324668	0,99738	1,000563
Paasche	0,8307531	0,8329355	0,9979414	0,9994374
Marshall-E	0,8307531	0,8327008	0,997635	1,000026
Walsh	0,8307531	0,8327012	0,9976526	1,000008
Fisher 1	0,8307531	0,8327011	0,9976607	1
Drobish	0,8307531	0,8327011	0,9976607	0,9999999
LMDI 1	0,8307531	0,8329377	0,9976577	0,9997189
AMDI	0,8307531	0,8330331	0,9976605	0,9996016
2005-2009	Dtot	Dint	Dstr	Dres
Laspeyres	0,7741616	0,7746549	1,0101637	0,9893081
Paasche	0,7741616	0,7663724	0,9993631	1,0108075
Marshall-E	0,7741616	0,7704927	1,0054491	0,9993163
Walsh	0,7741616	0,7704572	1,0047523	1,0000554
Fisher 1	0,7741616	0,7705025	1,0047489	1
Drobish	0,7741616	0,7705137	1,0047634	0,9999711
LMDI 1	0,7741616	0,7706737	1,0047746	0,9997524
AMDI	0,7741616	0,7706403	1,0047037	0,9998663
1993-2009	Dtot	Dint	Dstr	Dres
Laspeyres	0,4103593	0,4196194	1,0970571	0,8914141
Paasche	0,4103593	0,3740546	0,9779322	1,121813
Marshall-E	0,4103593	0,3957826	1,0618455	0,9764416
Walsh	0,4103593	0,3943504	1,0414667	0,9991636
Fisher 1	0,4103593	0,3961825	1,0357835	1
Drobish	0,4103593	0,396837	1,0374947	0,9967041
LMDI 1	0,4103593	0,3949725	1,0431828	0,9959487
AMDI	0,4103593	0,3940426	1,0426847	0,9987761

Source: author's own work

The Age of the Welfare Revolution

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SUMMARY

The age of the welfare revolution has just begun. Several national and international organizations have attempted to define the main characteristics of welfare. During the financial crisis the governments have realised that in order to increase well-being they must include new objective and subjective factors in their public surveys. The aim of this article is to highlight the weaknesses and strengths of the existing indicators and to indicate the importance of this new agenda.
Keywords: welfare, well-being, subjective well being, quality of life, happiness
Journal of Economic Literature (JEL) code: D60; N30

INTRODUCTION

Robert F. Kennedy declared the following at the University of Kansas on 18 March 1969: "The gross national product does not allow for the health of our children, the quality of their education or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country, it measures everything in short, except that which makes life worthwhile." (World Bank, 2012. p.17)

This short quotation highlights the main question of this paper. Is it enough to focus on material conditions concerning quality of life or should we turn to other determinants of people's life? In the rapidly developing world people once in a while stop for a moment to take a glance at the surrounding world. When this occurs among economic professionals, and experts it forecasts paradigm change that points out a new path for the next generation of scholars. Nowadays a similar revolution is taking place again in the field of welfare economics.

The financial and economic crisis of 2008-2009 increasingly confronts not only the public, but the scholars as well. Unfortunately, the most important factor – the person him/herself – has been ignored for centuries. The question may arise: why should such attention be paid to people's welfare and its economic impact? The answer is very simple; the most important value is people. If we feel satisfied and live on welfare, we can contribute much more efficiently to economic development. This report highlights the difficulty to define the real essence of well-being. It carries conceptualisation difficulties, which is a controversial point among experts. Depending on various disciplines, welfare has several meanings and core components. Hence the different senses of the word have to be distinguished. I attempt to summarize briefly the core concepts regarding welfare research and the existing results. Finally I will present a new direction in welfare research, in particular The Organisation for Economic Co-operation and Development's (OECD) new indicator system and its underlying opportunities.

CHALLENGING TERMINOLOGY

Several researchers have attempted to define welfare, but in the literature there seems to be no general definition which is appropriate to describe people's life from an economics point of view. Nevertheless, this field of research had been ignored and omitted for ages till a new economic revolution occurred. In the following part of this paper, that is based on Mary Daly's book (Welfare) and Ruut Veenhoven's article (The four qualities of life. Ordering Concepts and Measures of the Good Life) I would like to illustrate some existing endeavours. The initial use of the expression welfare appeared in the 14th century. In this sense it meant fare and journey well (Daly, 2011, p 12). During a long term of evolution it has collected several meanings, such as material sufficiency, the absence of negative conditions, physical and mental health, and satisfaction of desires and provision of need (Daly, 2011, p. 13).

According to Veenhoven's article, we can realise that depending on which discipline one uses, it has different names and connotation. In ecologists' papers this concept appears as the quality of life. Sociologist and economists typically apply the word 'welfare' in the same way (Veenhoven, 2000, pp. 5-6). In Daly's Welfare (Daly; 2011) additional approaches of Fives, Williams, Fitzpatrick, Ryff and Wilkinson are demonstrated. Fives

(2008, pp. 3-4) states that it is "The possession of all-purpose means to attain one's ends and/or the satisfaction of one's desires and preferences." On the other hand, Williams (1999; p. 685) considers it as "Providing someone of the conditions for the realisation of mutual security, dignity and respect." Last but not least Fitzpatrick (2001, p. 23) declares that it is "The common denominator that we all share and which marks us out as members of the same social group" (cited in Daly, 2011, p.15). Quality of life, especially the subjective well-being, has seemingly become an important component of economic policy within the past few decades. For instance in the Netherlands well-being is used for social provisions and does not have the meaning of citizens' satisfaction (Veenhoven, 2000, pp. 5-6). Pusic (1966, p. 83) states that welfare is "An overall goal of the political community consisting in the optimal satisfaction of interests which the members of the community have in common" (Pusic 1966; p. 83).

In general welfare has two main manifestations. One is material well-being and the other is psychological well-being. Daly lists income and employment participation opportunities as the factors of material welfare, which are indicated by labour market participation and income levels, income inequality and poverty, chances of mobility, resources available through family, and personal relations (Daly, 2011, p. 112). Ryff (1989) lists the main dimensions of psychological well-being. He highlights self-acceptance, positive relations with others, environmental mastery, autonomy purpose in life, personal growth (making the best of talents and capacities) (in Daly, 2011, p. 41). In connection with these dimensions, we can take a great number of coefficients into consideration as well.

One example of sub-meanings of people's life is demonstrated in Table 1. The quadrants of quality of life were developed by, Ruut Veenhoven. In this framework the external features refer to the quality of the environment while the internal features refer to the individual. The outer factors, e.g. ecological, social, economic and cultural, belong to the first quadrant which determines the life chance, called 'Livability of environment'. It means the social capital, which is the general meaning of good living conditions. In this sense many researchers use quality of life or well-being for these. On the other hand, Veenhoven prefers 'livability' concept because it is not limited to the material circumstances. The second segment is for the inner qualities of life chance that includes, physical and mental health, knowledge, skills, art of living, for instance. In brief, it has many non material aspects. Therefore, this is the life ability of a person. With other words, it means "how well we are equipped to cope with the problems of life" (Veenhoven, 2000, p. 6). Veenhoven (2000, p. 6) points out that "a good life must be good for something more than itself." The 'Objective utility of life' sector highlights the characteristics that can determine the life results by outer qualities. Factors such as rearing children, care for friends, authenticity can't be precisely measured, however, they are essentially important to determine the real framework of quality of life. The 'Subjective appreciation of life' quadrant symbolises inner factors that determine the evaluation of life, e.g. appraisal of life, prevailing moods, overall appraisals, etc. Here subjective well-being, life satisfaction and last but not least happiness can be manifested (Veenhoven, 2000).

Table 1
Some sub-meanings within quality quadrants

	Outer qualities	Inner qualities
Life chance	Livability of environment – Ecological, – Social – Economic – Cultural	Life-ability of the person – Physical health (negative; positive) – Mental health (negative; positive) – Knowledge – Skills – Art of living
Life results	Objective utility of life – External utility For intimates For society For mankind – Moral perfection	Subjective appreciation of life – appraisal of life aspects (Satisfaction with job; satisfaction with variety) – Prevailing moods – Overall appraisals

Source: Veenhoven (2003) p. 11

Reflecting on the happiness approach, Wilkinson (2007) reveals the "risk of prioritising short-term, pleasure seeking activity and it is relatively insensitive to the context in which the emotion is experienced"(in Daly, 2011, p. 41).

MEASURING THE IMMEASURABLE

History of the welfare states goes back a long way and had a significant effect on research, but the methods were different from country to country. On the other hand, it is not surprising that welfare is increasingly becoming one of the most controversial and researched topics. "In the second half of the 1960s, social tensions brought into being the Social Indicator Programme. The first task of this programme was to build up a conceptual and methodological framework and then to interpret the social welfare" (Lengyel et al. 2002 p. 8). The next decades are likely to witness a significant rise in scientific attention in the field of qualitative and quantitative aspects of a person's life. In the middle of the 1970s, Hungary joined the mainstream with the work of Rudolf Andorka, who was the father of the theoretical Social Indicator Programme (Lengyel et al. 2002).

The year 1972 opened up a new horizon in the field of economics when a revolutionary new indicator, Gross National Happiness, was introduced by King Jigme Singye Wangchuck in Bhutan. It is built on four pillars: "the promotion of sustainable development, preservation and promotion of cultural values, conservation of the

natural environment, and establishment of good governance" (Daly, 2011, p. 39; Helliwell et. al., 2012). This means that welfare has broadened its conceptual horizon, has been complemented with the meaning of social provision and has become more objective (Gough et al., 2006). Thus, in the frame of this initiation the theory became practice.

During a crisis it is hard to speak about welfare. Nowadays governments are faced with the difficulty of handling the rapidly worsening well-being. Welfare is often addressed as the issue of a successful economic policy. In order to ensure it governments have to develop an effective tool which is convenient for measuring and following this phenomenon. The core problem of constructing and applying indicators is their validity and reliability. GDP suffers from a number of pitfalls. Moreover, "GDP is not appropriate to measure health status, life expectancy or education and satisfaction" (Lengyel, 2002, p.5). As a result, the hegemony of GDP is over. Hard indicators, such as gross national product or households' income, are well-documented so they can be used for prediction, but indicator, such as quality of life, is a hardly researched, and therefore it has to be treated carefully. The characteristics of quality of life are not well understood and hard to deal with in depth. Since the quality factors are still poorly observed at an international level, they can raise further difficulties in terms of time series and cross-sectional comparison. Nevertheless scientific initiatives state that the welfare revolution is only just the beginning.

In Table 2, based on the Handbook of Social Indicators, (Land et al., 2012), I would like to demonstrate the main existing and often used indicators which are intended to measure quality of life. A great many indicators have been developed at national and international level or on the initiative of international organizations as the OECD. Fortunately, more and more national statistic bureaus are joining in this effort, e.g. in the USA, the Netherlands, and Australia. Since 2011 the United Kingdom has been preparing social surveys in which we can find issues related to quality of life. In 2012 The Guardian has published the results, notably the Happiness Index of the United Kingdom, (Davies, L.; Rogers, S.; 2012) and it is the one which perfectly proves its growing importance among citizens and government too.

Table 2
Fourteen current quality of life indices and some of their properties

Index name	Disaggregates into subseries (domains)?	Disaggregates into subpopulations?	Standardizes each indicator?	Construction of index	Reflects citizens' importance
Human Development Index UNDP (2001)	Yes, income, education, health	Yes, in later indices for the poor and women	Yes: max-min. income is log, not linear.	Additive with equal weights. Log (income) + education + health	No survey, but experts preview
Genuine Progress Indicator Redefining Progress (1995)	Yes	No	Yes: to dollars	Additive with equal weighting for all money units	No
Index of Economic Well-Being Osberg and Sharpe (2000)	Yes, income, investment, inequality, insecurity	No	Yes	Additive with unequal weights	No, though does sensitivity analysis on alternate weights
National Well-Being Index Kahnemann et al. (2004)	Yes, 19 domains considered	Possible, but not reported	Yes: to affect on 6 point scale	Additive with weights equal to time spent on that activity	Yes, time-use survey
Index of Social Progress Estes (1997)	Yes	No, though some indicators include only at-risk population	Yes	Additive with equal weights	Yes, panel of expert citizens
Index of Social Health Miringoff and Miringoff (1999)	Yes, 16 indicators. But not calculated over entire population. Includes vulnerable subgroups only	No, though some indicators describe only vulnerable subgroups	Yes: max-min	Additive with equal weights	No, fails to include GDP, average life expectancy
Happy Life-Expectancy Veenhoven (1996)	Yes, subjective happiness, life expectancy	No, though possible	No: cardinal measurement of both domains	Multiplicative with equal weights	No
American Demographics Index of Well-Being Kacapyr (1997)	Yes: reports individual indicators	No	Yes	Additive with equal weights	No
Netherlands' Living Conditions Index Boelhouwer and Stoop (1999)	Yes, reports individual indicators but not sub-groups	Yes, reports by province	Yes	Additive with equal weights	No
Australian Quality of Life Index (-)	Yes, standard of living, health, relationships, what they are achieving in life, safety, community connection, future security	Yes	Yes	Additive with equal weights	No

Source: Land et al., 2012, pp. 190-191

The strengths of these indicators are that each seeks to involve individuals, and in order to succeed they try to evaluate them in depth. However, the strengths of these indicators are at the same time the weaknesses. Four shortcomings can be highlighted. First of all, they may not be able to measure the complete relevance of citizens' lives. Even though they attempt to cover the whole field of life, they involuntarily highlight particular coefficients while other and much more consistent ones are ignored. The second problem with these indicators is the inconvenient emphasis of the factors. Some factors are emphasized more despite of having a relatively low effect on quality of life, some coefficient are indicated as equal. The third problem is the unrepresentative population segmentation. Some indicators do not take subpopulations into consideration, although each sub-segment has different life circumstances and they have different chances for welfare (OECD, 2011). Due to this shortcoming, very little is known about the qualitative factors of life. The fourth issue is that some indicators are built up from basic indicators, such as crime, unemployment, life expectancy, etc., but they are not enough in themselves to present real quality value, such as subjective well-being or happiness.

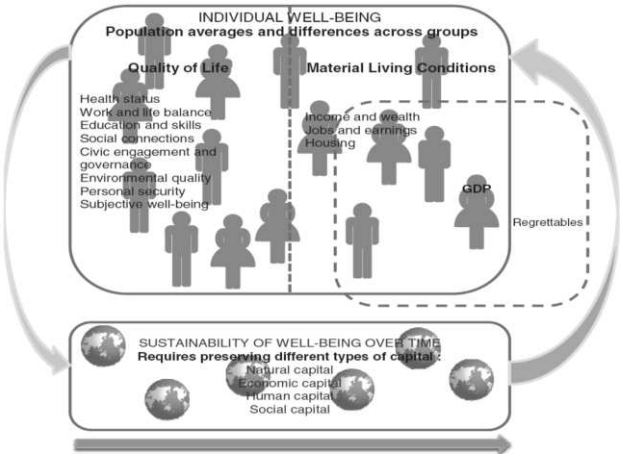
Land et. al. added to this group extra indicators referring to children's welfare: e.g. the Child and Youth Well-being Index, and Kids Count Index, which was introduced by the Annie E. Casey Foundation (Land et al. 2012 p. 191). Considering that they have less significance in terms of the objective of this paper, they are neglected here. In my opinion they rather correspond to subseries than a coherent and general social indicator.

In addition the newest aspiration is connected to the OECD. It has a major initial task in determining the core factors of well-being. It was also one of the institutions to attempt to facilitate quality of life research at international level in addition to the European Commission (Beyond GDP Partners; 2012). The first conference devoted to 'Statistics, Knowledge and Policies' was held in Palermo (Italy) in 2004. It was followed by other two further events. The conferences in Istanbul (Turkey) in 2007 and in Busan (South Korea) in 2009 contributed to a 'Global Project on Measuring in the Progress of Societies' as their main objective. The 50th Anniversary of the OECD brought the first revolutionary breakthrough when it began its 'Better Life Initiative' in May 2011. In 2011 the working paper of OECD, 'How's Life? Measuring the Quality of Life', attempted to revolutionize welfare research. In September 2009, a report published by the Commission on the Measurement of Economic Performance and Social Progress was published which provided a framework for this report (Stiglitz et. al., 2009; OECD, 2011). This Commission is led by prominent researchers, e.g. Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi. The Commission highlights 30 core points about how can the measurement and progress of well-being be improved. The 'How's Life? Measuring the Subjective-Wellbeing' points out the two main objectives: to contribute to welfare statistics; and to encourage policy makers by giving more adequate and proper information about social progress. In order to achieve its success, the OECD designated 11 core categories which were divided into sub-indicators:

1. Income and Wealth (Household net adjusted disposable income, Household net financial wealth, Household final consumption, Subjective evaluation of material well-being)
2. Jobs and Earnings (Employment rate, Long-term unemployment rate, Average gross annual earnings of full-time employees)
3. Housing conditions (Number of rooms per person, Lack of access to basic sanitary facilities)
4. Health status (Life expectancy at birth, Self-reported health status)
5. Work-life balance (Long working hours, Time for leisure and personal care, Employment rate of mothers with children of compulsory school age)
6. Education and skills (Educational attainment, Students' cognitive skills)
7. Social connections (Social network support)
8. Civic engagement and governance (Voter turnout, Consultation on rule-making)
9. Environmental quality (Air quality)
10. Personal security (Homicide rate, Self-reported victimisation)
11. Subjective well-being (Life Satisfaction, Affect balance) (OECD, 2011)

The strength of this survey is its involvement of more subjectivity (e.g. self-reported health status, social network support, self-reported victimisation, life satisfaction and affect balance), so human life can be correctly mapped. In order to involve general public, the OECD has launched a website where everybody can contribute to the survey by establishing their own Better Life Index (http://www.oecdbetterlifeindex.org/). At the end a quality of life circle is drawn which consists of the key elements of long-term prosperity.

Figure 1 is intended to reframe 'the relative importance of life' trying to avoid the main faults of the former indicators. In order to be successful, the OECD has not created yet another general indicator. It has only collected the core indicators which have a significant effect on welfare. It is no accident that 'well-being outcomes' and 'distribution of well-being across individuals' are in the centre of the OECD investigation. It reflects that each segment of the society reacts to the current or a new economic policy in a different way. This proves that researchers should focus on the returns on scale of an intervention instead of observing their inputs. As a consequence, it is worth aggregating and evaluating sub-segments of a society according to age, income, housing, or education (OECD, 2011).



Source: OECD, 2011, p. 19

Figure 1. The framework of individual well-being

OECD divides the potential factors of welfare into three main categories: quality of life, material living conditions and sustainability. The quality of life category covers such factors as health status, work and life balance, education and skills, social connections, civic engagement and governance, environmental quality, personal security and subjective well-being. Furthermore income and wealth, jobs and earnings and housing can influence the material living conditions. These two categories mean the personal sphere and the factors below mean the global effect. The implementation of well-being is described as a cycle in which people's quality of life contributes to sustainable well-being. As a consequence, a long-term material well-being comes into being for each citizen. Researchers of the OECD attempt to avoid the trade-off between today's and tomorrow's well-being. Those initiatives are not unique. They do not prevail at supranational; but they are increasingly widespread among national statistical offices (OECD, 2011). The key to final success is to be found in the relevant activities of national statistical offices and in openness to the initiatives.

CONCLUSION

The redistributive role of governments seems to be more valuable than it was formerly, thus we cannot focus on economic damage only, but we should identify social revival as a basic factor of economic progress. A realistic concept of the essence of human beings is extremely difficult to conceive; therefore welfare is a highly elusive phenomenon. It transcends the conceptualization framework. The real difficulty is based on the lack of a meaningful statistical tool. The map of the human notion is essential. As a result of previous work, attention is concentrated on the happiness of people and their prosperity to an increasing extent.

Many international and national organizations are committed to exploring the potential coefficient of welfare, particularly the quality of life. Some of them are very successful because they involve a great number of subjective factors. However, the existing indicators suffer from some pitfalls, such as a lack of correspondence in the field of the citizens' life; incorrect emphasis; unrepresentative population segmentation; and lack of real quality value. On the other hand, many of the indicators are very impressive and revolutionary. The OECD study is unique in its kind. Its researchers seek to build up a common methodological framework of the real quality of life and the factors influencing it. Nowadays researchers and government have the opportunity to establish a revised fiscal and social policy. By using these indicators, the economic policy reform will not be only an empty phrase but a realistic goal. Last but not least we must not forget that "the economy serves individuals, not individuals serving the economy" (World Bank 2012, pp.17).

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From One to Two – A Possible Model of Organizational Development and Development of Organizational Capabilities

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SUMMARY

The business management of most successful companies is a result of the coordinated operation of the processes, organizational structure, supporting systems and employees which make up the organizational capabilities of the company. Within the business processes, this includes development and continuous improvement of key internal rules and regulations, the division of spheres of power and responsibility, the requirements and the operation of fundamental checkpoints for organizational units, the provision of the most important technical conditions, improvement of human resource knowledge and skills and using all the above to promote strategic objectives in which competence development, performance management systems and knowledge-sharing techniques play key roles.

Keywords: organizational capabilities, organization development, method-choice criterion system, typology of work organizations, metaphoric approach to an organization
Journal of Economic Literature (JEL) code: L23

INTRODUCTION

The concept of organizational development is undergoing a significant transformation these days; the fact that the expectations of companies concerning organizational development have increased carries substantial importance. The emphasis is increasingly shifting towards the implementation of changes that support the achievement of strategic objectives, providing the greatest added value within a reasonable period of time. From a financial point of view, the attention is shifting towards tangible effectiveness and promptness. The leading Hungarian and international companies possess appropriately detailed strategies that show elements in their hierarchy of objectives that focus on financial effectiveness, internal organizational standards, employee competencies and customer satisfaction. As a foundation for such strategies, enterprises assess regularly, on the one hand, their own performance to date, and on the other hand, they compare themselves with competitors taking into account the market environment. It is important that the answers exist not only at the organizational level but also provide guidance for the staff in clarifying the requirements and planning individual contributions.

The elements determining organizational capability are illustrated in Figure 1.

Figure 1. Components of organizational capability (author's own work)

Based on these, it is apparent that the task to create an organization that meets the expectations listed above is very complex. Most managers can sense when an organization under their control does not work well, but only few of them know how to improve the situation. A radical reorganization has a rather intimidating effect. On the one hand, it is accompanied by a continuous balancing of advantages and disadvantages, negotiations and an infinite series of creating different versions. On the other hand, it has a divisive effect and often leads to personal conflicts and power games. Thus, when organization restructuring problems arise, managers often focus on the most important weaknesses while the entire structure is rendered more 'shapeless' and less strategic in nature.

Typical factors restricting the adequacy of organizational structure are as follows:

- organizational structures rarely result from systematic, methodical planning;
- the haphazard nature of structures is a constant source of frustration for top-level managers;
- clashes between different business areas about cooperation and sharing information with each other result in mutual limitations;
- structures are overly complex;
- the operation is shaped to a much greater extent by the current policy than by control principles;
- strategic initiatives are blocked due to the fragmentation of responsibilities;
- promising possibilities are lost due to a lack of managerial attention.

Due to these factors, environmental changes force companies and institutions to review and change their strategies and structures at ever-shortening intervals. The management often does not have reliable instruments and methodological knowledge for complex organizational restructuring, for systematic, regular mapping and logical structuring of the company and – within this – areas (organizational units) in a critical situation. Therefore, decisions are often based on intuition and individual ideas.

The structured transformation of a possible model of organization is presented below. In my opinion, the model carries the possibility of enlargement, and is also suitable for supporting capability development. In order to differentiate the development of a model, a typology of work organizations is elaborated, which allows for specifying and incorporating new areas of investigation (Table 1). In defining organizational characteristics, considerations of empirical studies were also taken into account.

In order to refine our way of thinking, the specific approaches of Morgan and Klein (1986, 1998; and, 2001) have been improved and metaphors are used to present the essence of an organization (Figure 2). When characterizing an organization, metaphors, on the one hand, can expand our thinking, providing a deeper understanding and a new approach, and on the other hand, they may be seen as one-sided and bothering. The significance of the presentation is that the metaphors of an organization are powerful tools in understanding individual elements of a complex phenomenon, but we get closer to the phenomenon as a whole only if we are capable of visualising these elements alternately or simultaneously and are able to break away from one single approach. In my opinion, in the development of organizational capabilities the departure from conventional thinking is well supported by a metaphorical approach.

With the fierce worldwide market competition, companies tend to feel and recognize that within a very short time they may lose their 'traditional' competitive advantage resulting from the development and excellent quality of their services, products and technologies, etc. That is how they become aware that a more durable competitive advantage can be acquired through competencies. The corporate or institutional level competencies make the company competitive only if it is able to present value-producing personal and group competencies and skills which, due to their uniqueness and perfection, cannot be reproduced by its competitors.

Today, due to the economic, political, technological and information globalization, the primary interests not only of large, but also of small and medium-sized enterprises include increasing their efficiency, reducing costs, and improving resource concentration and allocation, which can be best achieved by an improvement of competencies and capabilities.

In my opinion, capability development does not differ in its logic from the classical process of organizational development; however, we can find common elements and completely different, novel approaches and different emphases within the contents of the individual stages. The differences in the contents of the two processes – organizational development and capability improvement – are presented in Figure 3 as part of the classical process model of organizational development. Within the process model, differentiated presentation of the differences can be performed in the stages of identification of problem areas, mapping of characteristics of the qualifying system, and selection of organization analysis methods.

In the identification of problem areas, the organization developing elements are complemented by aspects describing the evaluation of capability improvement, which ensures a new approach in thinking. When recording the initial situation, the areas determining organizational capabilities are presented. One of the critical elements of successfully carrying out organizational development and capability improvement is the successful performance of the analysis.

Table 1
Typology of work organizations

Type of organizational structure / Organizational characteristics	Traditional			Divisional	Two- and multidimensional		Dual			Project	Network
	Linear	Staff Organisation	Functional		Matrix	Tensor	Strategic Business Unit	Team	Project		
Conditions for its development and effective operation	– Stable market, scientific, technical and technological environment, – Relatively transparent production/service activities, not too wide product/service structure			– Wide product range, heterogeneous product or service structure – Possibility to develop product families – Relatively dynamic environment	– Dynamic, heterogeneous external environment – Complex tasks within the organization – Division of labour based on different principles – Advanced communication skills of organization members		– Heterogeneous environment within enterprise – Diverse product and production structure – Secondary structure built on the primary structure			– Heterogeneous environment within enterprise – Diverse product and production/service structure	Willingness to cooperate
Type of subordination connections	Clear	Shared	Overlapping	Shared	Bidirectional subordination	Multidirectional subordination	Hierarchic levels partly overlapping			Multidirectional subordination	Built on voluntary membership
Formability of professional contacts	Encounters communication barriers	Coordination of strategic and operative levels	Negotiation difficulties in adjacent areas	Encounters communication barriers	Organized on the basis of professional relations						Fundamental driving force
Separability of routine and innovative activities	Fuzzy	Strongly separable	Concentrated on top management	Objective-oriented	Clearly separated		Integration based on development	Can be developed if objective-oriented			Members are well differentiated
Development of cross-sectional functions	Results in increase of centralization			Possible	Forms a center by establishing cross-sectional functions						
Reducibility of subordination steps	Results in increase of width fragmentation	-	Leads to concentration of functions	Possible if objective-oriented	Subordination levels are controlled by innovation chain		Partly or fully out of the subordination system (periodically)			Subordination levels are controlled by innovation chain	–
Specialization possibility	Restricted			Possible if objective-oriented	Possible if objective-oriented		Can be developed if objective- and task-oriented				Essential operation element, determining goal
Possibility of sharing spheres of power	– Centralized spheres of decision – Strict regulation	– Fitting the sphere of responsibilities	– Centralized spheres of decision – Strict regulation	– Decentralized decisions head office – division – Centralized decisions within division	– Dimension bound sphere intersections (overlapping regulation) – Centralization of decisions – Lower level formalization		– Double division of spheres → double hierarchy – Decentralization of strategic decisions			– Dimension bound sphere intersections – Lower level formalization	Double hierarchy based on contract
Demand for coordination	– Instruction-type vertical coordination mechanism – Technocratic instruments	– Establishing connections between operative and strategic tasks – Technocratic and person-oriented instruments	– Channels built for vertical coordination mechanism – Technocratic instruments	– Application of technocratic instruments (controlling) – Choice of leader	– Complex horizontal and vertical coordination prevails – Person-oriented coordination instrument		– Application of technocratic and person-oriented instruments			– Complex horizontal and vertical coordination prevails – Person-oriented coordination instrument	Totally built on technocratic coordination
Possibility of task-oriented flexible transformation	Restricted			Flexible overview provided according to needs	Flexible transformation possible according to needs						
Personnel placed within organization	Restricted by width and depth division			Determined by division size	Distributable proportionally to dimensions		Domination of primary structure			Optimal group size proportionally distributable between dimensions	Network size is flexibly
Possibility of personnel rearrangement	Encounters structural barriers	Limited due to specialists	– Encounters formal barriers – Interpretability of dual solutions	Easy within division or between discontinued divisions	Flexible					Localized in time	Flexible
Possibility of mobility	Professional and positional progress linked			Professional and positional progress linked							Unrestricted
Possibility to include interest decentralization	Determination of interest parameters is difficult (cost orientation)			Mostly built on them							Possible to relate to network membership
Lifespan				Bound to the period of time of performing task						Periodic	Built upon contract system
Environmental orientation	Depends on top management	Depends on staff organization	Depends on functional specialists	Environmentally oriented dimensional management			Depends upon lifespan				Total

author's own work

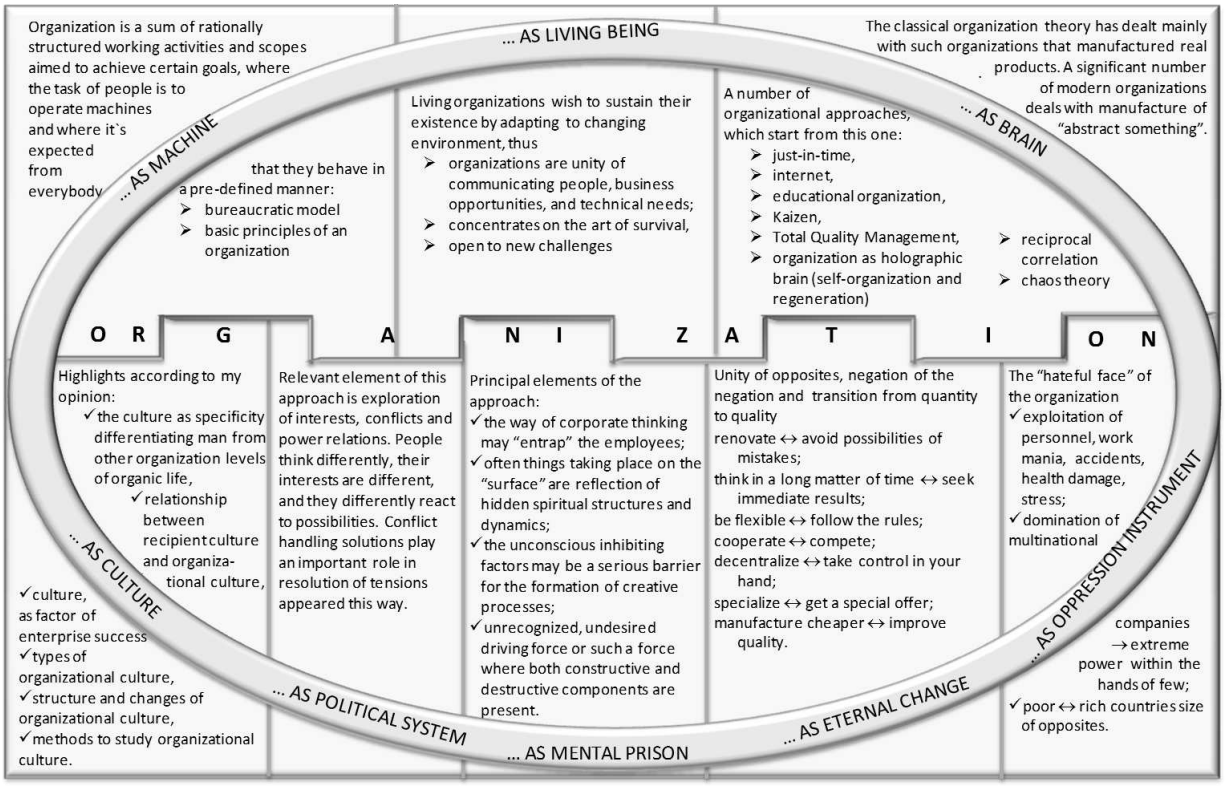

Figure 2. Metaphoric approach to an organization (author's own work based on the systematization by Klein (2001))

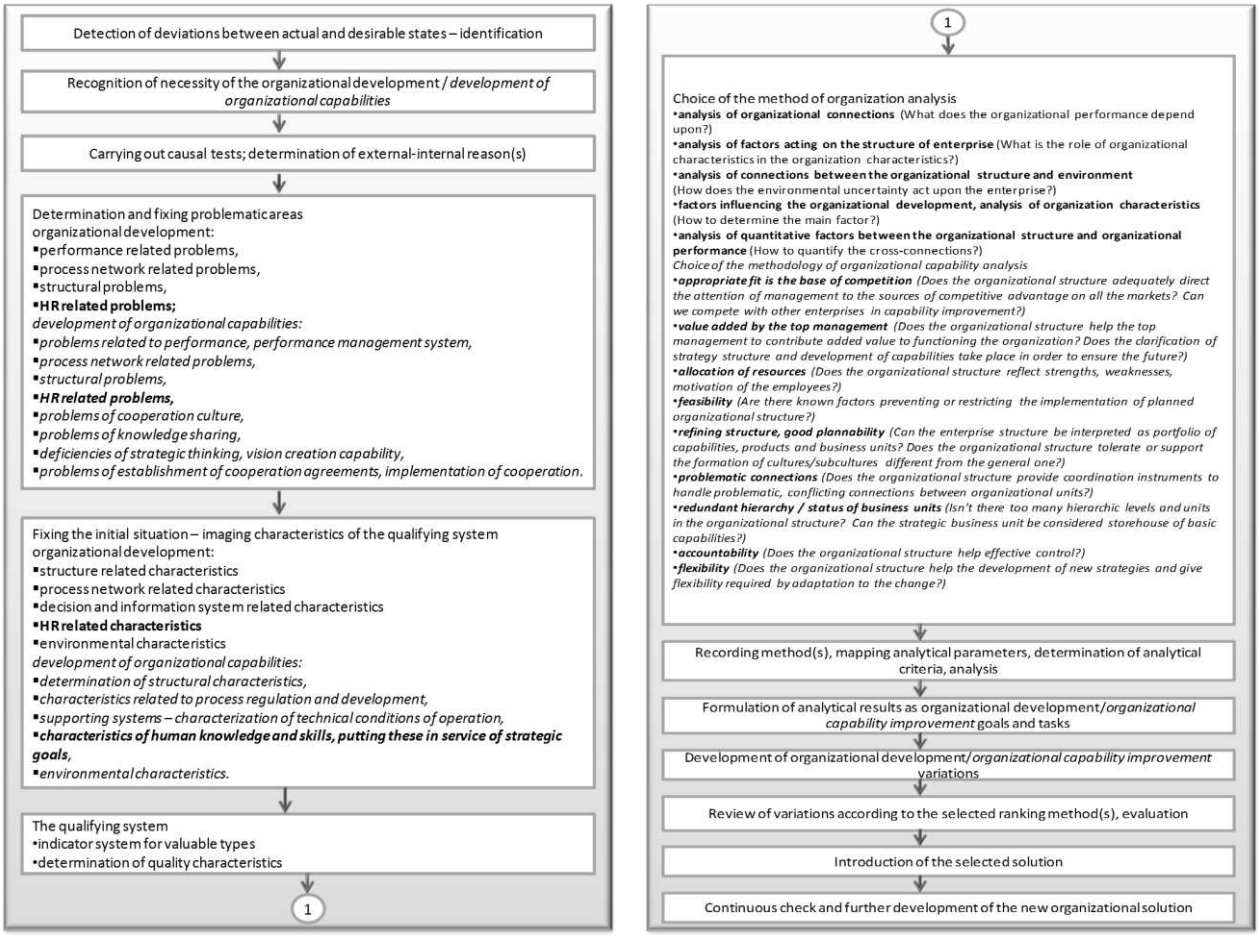

Figure 3. A classical model of organizational development – complemented by the development of organization capabilities (shown in italics) (author's own work)

What are the key features of the analysis? First of all, it should contain the designation of the boundaries of the situation study, that is an accurate definition of the subject, and then make a demarcation between the state and operation analyses. The actual structure of every organization – whether it has been created as a result of conscious or spontaneous organizational interventions – determines essentially its operation rules, effectiveness and limits. Their study and recognition is a prerequisite of any effective search for a solution. Accordingly, there exist state-dependent causes of failure, which depend on the level of organization of the subsystem/sub-capability examined. These error factors can be identified as a result of comparative measurement against recognizable effective organizational solutions in the given area. As for their nature, they can be classified into the category of corporate/institutional reserves. Thus state analyses concentrate on comparing the actual situation and the 'ideal' state. In addition, the operation of each subsystem/sub-capability is burdened by numerous detectable occasional or constant phenomena of failure. The group of recurrent operation failures, which can be recognised at a glance in their superficial form of appearance, includes the problems and operation failures that may arise during daily work and originate from a breach of regulations and rules determining the operation mode of the system, and from breach of working practices. These operation failures belong to the category of loss. They can be studied by comparing the planned and actual operation modes.

Operation studies, through an evaluation of harmony and efficiency of the objective–task–tool procedure, provide information for determining the optimal tightness of control, for the transformation of the incentive and motivation system, for the elimination of temporary failures and limits, while it is possible to analyze whether the intention of the designer of the system failed due to occasional or structural barrier factors. The determination of the objectives and directions of the organization and capability analysis is followed by selecting the method of the organization/ capability analysis. A potential system for its criteria is presented in Table 2.

Table 2
Criterion system for selecting the method to analyse the organization and its capabilities

Aspects	Interpretation domain / examples
Fundamental objective, determination of directions of organizational analysis	Organizational analysis – analysis of organizational connections, – analysis of factors acting on the organizational structure, – analysis of the relations between the organizational structure and its environment, – analysis of factors acting on organizational development and of organization characteristics – analysis of quantitative factors between organizational structure and organization efficiency, – analysis of strategy – structure – organization efficiency and environment. Analysis of organizational capabilities – appropriate match is the basis of competition, – value added by the top management, – allocation of resources, – feasibility, – good state of planning, – problematic connections, – redundant hierarchy, – accountability, – flexibility
Task size	complete organization / part of the organization / business branch / partial skills / personal skills
Demarcation of state and/or operation analyses	state / operation
Formal presentation of qualification system	quantitative and/or qualitative parameters
Mode of formation of evaluation parameter	– correlation of fulfilment indicators by criterion with maximum score, – function / cost ratio, – sum, ratio, preference and disqualification indicators, average, frequency values, – connection analysis, causal connections
Mode of evaluation	– sequential or interval scale – assortation graph – simulation – normative and diagnostic analysis
Condition of application	– hierarchic structure level – tests – textual aspects
Possible auxiliary method	NCM, BS, graph method, advantage-disadvantage analysis, questionnaires, PARETO analysis, Guilford type pair-wise comparison, RADAR, STEEPLE, VVI
Number of participants of the analysis	individual and/or group
Content elements of the qualification system	resources, centralization – decentralization, capabilities – results.

(author's own work)

In composing Table 2, the individual classification of the methodologies (such as factor and cluster analysis, correlation and regression calculation, combination of multivariable mathematical-statistical methods, KIPA, CHECKLAND, simulation model, etc.) was neglected; instead, interpretation examples are specified according to their aspects. In general, the following can be stated about the methodologies:

- the methods meet the respective requirements in different ways;
- they offer the user a number of approaches, which facilitates matching the decision-making situation, makes the decision-making process more efficient, and promotes matching the interest and influence relationships originating from user roles as well as adapting to the users' ways of thinking and communication patterns;
- the effectiveness of each method for a given problem can be determined.

Table 3

Criterion system of selecting the methodology for ranking the variations of organisational development

Aspects	Interpretation domain / examples
Task size	Random/limited from above/below depending upon the number of variations
Principle of sorting reference	Reference to one another, reference to the ideal, reference to the best, reference to the fastest
Recording the standpoints of those giving their opinions	– determination of extent of contribution to the objective to be achieved, – determination of percentage of variations compared to the ideal, – based on actual values as compared with target, – qualification of variations according to scales containing different grades, – determining the minimum value of weighted divergence, – determination of opinion centres, quantification of tightness of opinion agreement, – analysis and evaluation of reliability of forecasts with the help of connection testing, – determining the optimal performance concerning all objectives with single or multiple value(s).
Determining the dimensions of comparison	– qualitative dimensions/effects, – quantitative dimensions/actual quantifiable values, – qualitative and quantitative dimensions.
Determining the criteria expressing properties	– with the help of an auxiliary method (BS, Delphy, ...), – collecting factors helping the implementation of objectives and logically linked to them, – determination of functions affecting the implementation of the fundamental function, – PARETO analysis
Number of those giving opinions	person and/or group
Method of weighing criteria (presuming interpretation according to the criterion system)	– direct estimation, – pair comparison, – determination of importance grades by criteria, – determination of expected values of weight and scatter by criteria, – semi-matrix procedure, – in case of n criterion, formation of 1/m relative weight, – with the help of a qualitative scale, – presentation on interval scale – inhibition percentage of performance of the basic complex function by worst performance of the given function.
Measurement principle for ordering	– uses the measured values of sequence scales • Spearman-type rank correlation coefficient – determination of preference sequence based on preference ratio, – placing evaluation factors on the interval scale • consistence matrix, • relevance numbers, • relative importance coefficients, • determining the ratio of sum differences, • single and/or multiple evaluation, • using real inhibition factors of all functions, • usefulness functions; – determination of distance values, – classification of variations into five categories (K-S one-sample significance test), – advantage-disadvantage comparison, – comparison of qualification results and requirements by criteria.
Basis of measurement evaluation	– weighted, complex formal evaluation, – with the ratio of disadvantage series, – using individual and aggregate preference tables, – using the rank correlation matrix, – as weighted sum using determined total relevance numbers, – as simple sum using determined absolute importance coefficients, – with the sum of simulated step variation values, – product of weighted individual values, – construction of weighted distance values, – using implementation factor (by subtracting real inhibition factor from 100), – by systematic application of rules, – choice by weighing advantages/disadvantages, – selection by filtering rule and threshold, – using overall usefulness (sum of the products of usefulness and weights).
Suitability conditions	– recording the presupposition of effects, – hierarchic structurability of the system examined, – determining the limits of pre-selection, – restriction to a set of homogeneous systems.

(author's own work)

In order to choose the analytical methodology for the improvement of organizational capability and to perform the analysis, a series of aspects was composed, which can be interpreted for the purpose of evaluating existing structures and in creating new ones. There is a separate study performed for and a methodology applied underlying each of the aspects; their strength being not in their innovative nature but in their accuracy and completeness. In this approach, each element of operation should convey the same values and bring the company closer to the implementation of its strategic objectives. Finally, a system of criteria for selecting the methodology for the second critical phase of organizational development and capability improvement, the ranking of the variation, has been composed for the purpose of effective implementation.

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