Characteristics of the Dual Model among the OECD Countries – an FOI Model Analysis

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SUMMARY

Deciding on the development path of the economy has been a delicate question in economic policy, not least because of the trade-off effects which immediately worsen certain economic indicators as steps are taken to improve on others. The paper offers help to decide on such policy dilemmas, based on an analysis conducted among OECD countries with the FOI model (focusing on the future, outside and inside potentials). Several development models can be deduced with this method, from which only the dual model is discussed in detail. The dual model implies a development strategy focused on the attraction of outside resources, the instruments of which are also presented. The findings presented in the paper are part of a large OTKA (Hungarian Scientific Research Fund) study, which develops step by the step the methodology of the FOI model and discusses all of the development models found among OECD countries.

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GROWTH AND DEVELOPMENT IN ECONOMICS

Growth and development are mentioned almost as synonyms in this paper, although the literature usually addresses them separately. The simplest approach is to say that growth is the narrower, and development is the more complex class, as growth is usually defined as an increase in certain quantitative variables, while development describes a process of moving from a lower level of quality to a higher one (Szentes 2011). As the measurement of the phenomena economics usually deals with is problematic anyway, the most popular, formalised growthmodels (e.g. Domar 1947, Harrod 1948, Solow 1956, Romer 1986, Lucas 1988) concentrate on the national income or on its per capita version. These models therefore map the problem of growth/development through the quantitative change of a single indicator, so they offer tools to analyse the problem of growth, the narrower category.

The GDP however – being an aggregate indicator – veils more profound processes that are crucial for development, such as the structure of the economic system, changes in employment, income distribution or the institutional framework, etc. For this reason, from now on, we will use the more complex approach to development whenever we touch upon issues of growth and/or development paths, factors of growth and/or development, meaning that we interpret development as a combination of two things: growth in the indicators of national income, and the modernising of the socioeconomic structures.

Theories of Development

The different schools of economics have had different views on the rules of the economy, and they do not agree on the basic assumptions either; hence, a wide variety of theories have been developed over the centuries. While most schools implicitly assume that the models used are universal, List (1841) was convinced that the classical theories may only apply to the most developed economies; the followers of new institutionalism (see Williamson 2000, for example) point out that the institutional structure of different countries can be very different. A similar confrontation can be observed regarding the development paths. It is widely accepted that development is unilinear, meaning that all countries have to go through the same development stages (with timing being the only difference among them). Veblen (1919) on the other hand argued against the teleological approach of economics, and suggested an evolutionary one instead.

It worth mentioning that mainstream theories do not consider the effects of national interests and bargaining power in their models; heterodox schools on the other hand cannot accept the independent development of countries (although there is no agreement among them considering the exact nature of the interdependencies). It

may seem natural to choose the countries and national economies as the unit of analysis; Wallerstein (1974), however, when describing the economic history of medieval Europe, concludes that modernisation cannot be understood within the national economy framework. He chooses the worldsystem as the unit of analysis instead.

Some scholars have developed models with few explanatory factors; others have gone for more variables. The well-known growth theories pick one or two variables; Porter's diamond model (1990) combines four quite complex factors; the empirical study of Barro (1998) of 100 countries spanning over 30 years finds seven factors that are strongly connected to the growth rate of the real GDP.

The factors of development identified in the economics literature can be categorised along many principles, but the location of factors is probably the most important division line. One camp of economists traces back differences in economic development to reasons that can be found inside the country. They point to factors whose presence (e.g. physical or human capital) or lack (e.g. government failures) enables high growth rates. Another group of economists finds the causes of underdevelopment in outside factors. Usually these theories take the differences in the development level as given in the world economy, and they assume that these differences lead to asymmetric dependencies. The asymmetric dependencies on the other hand make it very difficult for underdeveloped countries to catch up with the rich world.The inside-outside distinction among the factors of development plays a crucial role in the model developed during our research.

The Inside Factors of Development

Adam Smith (1776) saw the division of labour as the main source of wealth. The countries that are able to extend the division of labour among their firms and citizens can become wealthier, as they are able to produce a higher quantity with the same labour input. The main finding of the Harrod–Domar model (1947, 1948) is that investments are the key to economic growth. Investments on the other hand are mainly dependent on the savings rate. Around a decade later Solow (1956) pointed out that investments and savings cannot contribute to growth in the long run. In his view, long-term economic growth is driven by technical change.

Keynes (1936) suggested crises are generated by limits in demand, and the latter may be strengthened by large income differences. The speculative demand for money of those who are well off can be especially high, which prevents a substantial part of the income from turning into effective market demand. Inequalities in income distribution thus can be a setback for balanced growth.

Schumpeter (1934) stressed that cyclical fluctuations should be regarded as a natural part of the economy, as entrepreneurs may only draw profits if they break the status quo of equilibrium. The way to break the status quo is through innovation, which therefore becomes the primary driver of the cyclical development. McClelland (1957) also emphasised the importance of the entrepreneurial class. In his view entrepreneurs are the pioneers of development, and their biggest motivator is not profit, but the achievement of some special goals (N-achievement).

When the big colonial empires collapsed, several academics explained the situation of the underdeveloped former colonies with a value system and social structure that was different from the Western one. In underdeveloped countries the rural characteristics of the society are dominant, meaning that labour is inefficient, immobile, the social structure is rigid, and the general attitude rejects individualism and risk taking (Meier 1964). When local values confront the Western values, the society is split into two groups, and a dual social structure is formed (Boeke 1953), which is completed with a dual economic structure as well (where the traditional and modern sectors are insulated from each other).

The role of human capital in growth and development is highlighted in various forms in the literature. Szentes (2011) quotes from A. Marshall: from a national perspective the capital invested in workers' children is just as productive as capital invested in horses or machinery. Newer theories unquestionably suggest that capital invested in children is far more productive than that invested in horses and machinery. Endogenous growth theories see increasing returns as a prime source of long- term growth, and they directly or indirectly explain increasing returns with human capital. Lucas (1988) treats human capital as a reproducible one, an element of capital that the society is able to broaden at a constant rate. The expansion of human capital, on the other hand, leads to a constant increase in the productivity of the physical capital. Romer (1986) also can be connected to human capital. In his model, investments made in research and development produce positive externalities that enable a constant increase in the productivity of physical capital.

Veblen (1919) points out that human behaviour is deeply affected by institutionalised rules of society. His views were taken over by new institutional economists (e.g. North 1993, Williamson 1998). According to them institutions affect the incentive system of an economy, while the incentive system on the other hand influences the behaviour, size and competition of firms, the level of investments and technological development, and so, ultimately the level of development of an economy. Underdevelopment thus is explained by institutional frameworks consisting of bad incentives, according to the new institutional school.

Partially connected to the institutional approach is the theory of government failures, which was mainly brought into the attention of development experts by Tullock (1993). It was back in the 1960es when Tullock

suggested (1967) that the super profit that monopolistic structures offer can be an incentive for firms to lobby for government regulations granting monopolistic positions and monopoly profits. According to calculations made by Krueger (1974), the rent seeking behaviour of firms in the field of import licences caused a 7.3% GDP loss in India, and a 15% GDP loss In Turkey in 1964. The more corrupt a country is, the weaker the state is, the heavier the costs of rent seeking are, and so rent seeking can be one of the major obstacles of economic development.

Porter's (1990) national competitiveness theory adds some highly complex factors to the literature of economic development. A somewhat similar idea is suggested by Freeman (1987), who developed the theory of national innovation systems. These systems are centred around cooperation among businesses, the education system and the research infrastructure.

The Outside Factors of Development

The theory of comparative advantage developed by Ricardo (1817) had become one of the cornerstones of the laissez-faire approach of international relations. According to Ricardo the highest welfare level can only be ensured if trade is conducted along the lines of comparative advantages, and there is a free flow of goods. This free trade principle was questioned by many. List (1841) argued against laissez-faire. He defended protectionism, and suggested protective tariffs for newly established industries (the infant industry argument). His suggestions echoed those of Alexander Hamilton (1791) made in the newly formed USA.

After the Second World War the focus of development economics shifted towards the power relations of different countries. Prebisch (1964) and Myrdal (1957) point out that underdeveloped states are dependent on richer countries, and so the current system of international division of labour is not based on comparative advantages. The internal economic structures of most of the developing countries are directly influenced by the developed ones through the colonial system (Myrdal: forced bilateralism). Balogh (1963) argues that as a result of power inequalities among parties, the economic structure of the developing countries has to be adjusted time after time to the changes generated by technical progress made in the developed economies, and the adjustment process prevents them from achieving longterm growth. The dependency relations lead to one-track specialisation (Singer 1964). The majority of exports of the developing countries are primary products and commodities, which leads to a decrease in the terms of trade over the long run. Bhagwati in his 1958 paper titled "Immiserizing growth" showed that the decrease in terms of trade can result in a decrease in the national income even if there is dynamic growth in the production of the export sector. One lesson learned from the literature of interdependencies is that a diversified export structure can be an important development factor.

Emmanuel (1972) has gone as far as claiming that trade between developing and developed countries is an unequal exchange, which is a manifestation of the imperialism of trade. Unequal exchange was triggered by wage differences, and is sustained by the immobility of labour. Wallerstein (1974) also accepted the concept of unequal exchange, though he argued that it is a result of the different bargaining power of nations. The core-periphery relations and the geographical position basically predestine the fate of nations, according to Wallerstein.

Table 1
Inside and outside development factors

Inside factors	Outside factors
Division of labour (Smith)	Free trade – international division of labour (Ricardo)
Savings rate (Harrod-Domar) Abundance-scarcity of capital	Protectionism Defence of infant industries (List)
Equal-unequal income distribution (Keynes)	Equal or unequal trade partners (Balogh) Pressure to fit to modern patterns (Balogh)
Drive to innovate (Schumpeter)	Unilateral dependency - diversification (Myrdal)
Entrepreneurial behaviour (McClelland)	One-sided specialisation (Singer)
Rigid-flexible social structure (Meier) Imported or organically developed social structures (Boeke)	Immiserising growth – terms of trade (Bhagwati) Forced bilateralism (Myrdal)
Dual-homogeneous economic structures (Meier)	International wage division-mobility of labour (Emmanuel)
Investments into human capital (Marshall) Human capital, as a renewable resource (Lucas) Positive externalities of R&D (Romer)	Geographical position – core and periphery (Wallerstein)
Institutional incentives (North) Path-dependent development	Investment strategies of multinational companies (Furtado)
Government failure (Tullock) Rent-seeking (Krueger)	Demonstration effect
National diamond (Porter) Innovation systems (Freeman)	
Rule of law, democracy (Barro)	

As the role played by transnational companies in the international flow of goods and capital became more and more dominant, a great deal of attention was directed towards them. Furtado (1970) suggested that the most important development factor is not the interdependencies among countries any more, but the investment strategies of transnational companies. Transnational companies can bring capital to a country, creating jobs, but the newly formed subsidiaries may be isolated from the local economy (Singer 1964). The ability of a country to attract foreign capital, especially if the capital is invested in fields that can fit in well to the

current economic structure of the economy, is another important development factor.

The demonstration effects of modern consumer societies are worth mentioning, too. Generally the consumers of the developing countries try to follow the consumption patterns of the developed nations. This usually has a cut-down effect on local growth, as the goods fitting to the most current consumption trends are generally produced overseas, so following the trends increases imports, and can contribute to the trade balance deficit.

The Role of Institutions in Development

According to the followers of the institutional school, institutions affect human behaviour, in other words they influence the decisions of economic agents. Veblen was the first to point that out (1919), and also added that it is an oversimplification to assume that market decisions can be analysed independently from any other outside factors, like family, culture, community, politics, etc. His views were neglected by mainstream economics, but the topic was brought into the forefront again by two new research agendas.

On the one hand it was proved by a series of psychological experiments that we are not capable of making such rational decisions as is assumed by economics. The notion of homo economicus was debunked by the theory of bounded rationality (Simon 1957). Agents with bounded rationality behave opportunistically. On the other hand Coase's pioneering article (Coase 1937) shed light on the fact that the transactions conducted among agents are not frictionless, and depending on the rate of frictions, very different market solutions may prove to be the most efficient ones. If we take a closer look at market transactions, it becomes clear that there are numerous social phenomena that are disregarded by mainstream economics, yet they influence the opportunistic behaviour of market agents and the rate of frictions during transactions. These social phenomena are collectively called institutions.

Hodgson defines institutions (2006) as systems of established and prevalent social rules that structure social interactions. According to the definition above, language, money, etiquette, the measurement system, and firms can all be regarded as institutions. Institutions make it easier to calculate and forecast the behaviour of agents, thus they contribute to the decrease of uncertainty and frictions during transactions. North (1993) offers a similar definition of institutions: institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction.

Williamson (1998) suggested a hierarchy that proved very useful during our analysis. He separated social analysis into four levels (Figure 1). The different levels are ranked according to the time needed to change them, but they also show what influences what in the society. Higher levels directly influence the level just below them, meaning that no practices may be adopted on the lower levels that are not compatible with the superior levels.

Social embeddedness is on top of the hierarchy (L1). Williamson puts norms, customs, ethical principles, traditions, conventions and religion into this category. Some development factors found in the literature at least partly belong to this level (e.g. the dual structure of the society, entrepreneurial behaviour).

The institutional environment forms the second level (L2). While the informal rules were placed in Level 1, the rules of L2 are formal, codified ones (e.g. constitution, laws, property rights). Although the change of Level 2 rules is also partly evolutionary in nature, calculated interference is also possible on this level (unlike on L1). Such interferences are called first-order economising, which is about finding the ideal combination of formal rules. Many of the development factors belong to the institutional environment: the rule of law, democratic rights, market regulation and protectionism.

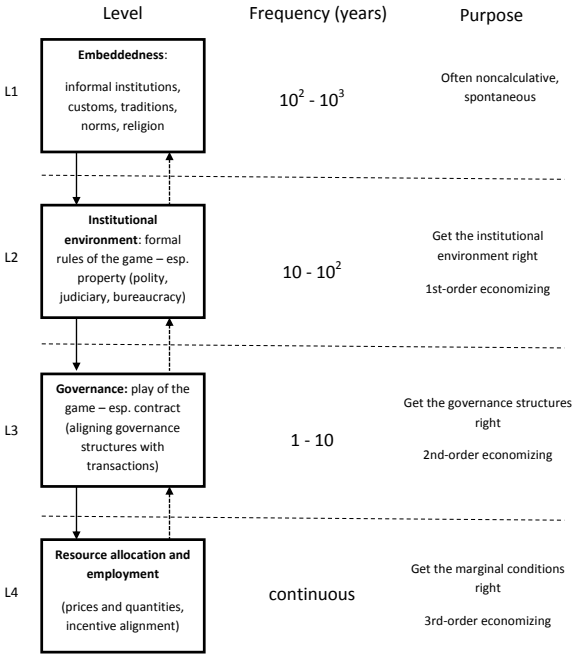

Figure 1. Economics of institutions (Williamson 1998, p. 26)

First-order economising, however, does not ensure the optimal economic structure. As agents behave opportunistically, they do not keep the formal rules of the economy all the time. Jurisdiction has also got its frictions, meaning that those who follow the rules are not able to enforce their rights against the opportunists instantly and without any costs. This is where the third level (L3) kicks in, called governance by Williamson. The unit of analysis in governance is the transactions made among economic agents, and the contracts mediating those transactions. Such development factors as the coordination of education and research, Porter's

national diamond, government failures or rent seeking, can all be reckoned among L3 items.

The final level (L4) is concerned with the allocation of resources, an area which is traditionally addressed by neoclassical economics. The factors of the better-known growth theories (quantities of labour and capital, savings, investments, etc.) all belong to this level.

Williams thinks that new institutional economics addresses problems belonging mainly to Levels 2 and 3. North's and Hodgson's definitions cited above, however, suggest that all phenomena belonging to L1, L2 and L3 can be regarded as institutions. This paper therefore treats all factors as institutional factors that can be categorised in one of the top three levels of Williamson's hierarchy.

METHODOLOGY

Structure of the Model

To identify the crucial development factors of Hungary, and in order to sketch potential development paths for the country, we developed the FOI model. The model is primarily based on the factors collected from the literature, but these factors are structured in a unique way which allows us to draw up characteristic development paths that can be clearly separated from each other. We used the following assumptions when the FOI model was set up:

- National economies are the unit of our analysis; international interdependencies are mostly disregarded in the paper.
- The key to development is not a single factor, but rather a combination of many factors. According to our assumption there are several important motors of development; sometimes these factors do influence each other, and it is very difficult to determine what causes what, still they can be equally important, and they all have to be used to draw up a potential development path for Hungary.
- Among the many factors considered in the model, the so-called institutional factors play a primary role. Institutional factors are detected using the hierarchy put forward by Williamson (1998). In fact the model was developed with the aim of stressing the importance of institutional factors in development.
- Development can take more than one shape and form. There are several feasible development paths, and Hungary is not constrained to only one of them, but may choose from a (limited) number of such paths. To determine these development paths, the FOI model was used to test the OECD countries.

The FOI model offers a new typology of development factors, but it is also capable of structuring these factors along three clear directions of development. As shown previously, the inside-outside typology of development factors is a standard part of the literature.The FOI model, however, is based on a three-dimensional structure. These three dimensions are:

- F, i.e. the future potential of a country;
- O, i.e. the outside potential of a country;
- I, i.e. the inside potential of a country.

All three dimensions are complex, composed of a large scale of factors. Yet they can still be clearly distinguished from each other, which is useful because the clear distinction can help in the formulation of distinctive development strategies.

The future potential includes factors that are regarded to be crucial for the sustainability and future competitiveness of the Hungarian economy. As sustainability has become one of the main paradigms of all social sciences, we felt that the inclusion of it as a separate development dimension was essential. In our case sustainability translates to ensuring that the typical signs and indicators of a developed country characterisenot only the current state of the economy but also the relatively distant future.

The outside potential includes factors that are crucial to the current world market position of Hungary. This second dimension can be treated as an equivalent of the outside factors listed based on the literature. Some of the elements of the outside potential may not be influenced from the inside; others, like the conditions affecting the international flow of goods, services and factors of production, are a standard part of economic policy.

The inside potential is made up of factors that are regarded to be crucial to the current well-being and development of Hungary. Most of the inside factors listed in Table 1 fall into this potential. Countries that offer favourable conditions to local entrepreneurs, and provide a high level of quality of life to their inhabitants, can have remarkable inside potential.

It is not difficult to spot that certain trade-offs exist among the three potentials. Higher wage levels, for example, are absolutely favourable from the perspective of the inside potential, but they can be dangerous for the outside potential of the country. They can also be threatening to the future potential, if the result of a high wage level is overconsumption. If a country is well endowed with natural resources, this can boost its inside and outside potentials, but the abundance of resources usually leads to high proportions of waste, which again harms the future potential. The three potentials were drafted with these trade-offs in mind.

Formulating a Measurement Method

During a brainstorming session a list of 50 indicators was compiled with the help of experts. These 50 indicators were chosen to measure the relevant development factors, and they were all included in a questionnaire. Experts were asked to rank all 50 indicators on a 1-7 scale (1=not relevant at all; 7= of

highest significance). Each indicator received three separate scores: one for future potential, one for outside potential and one for inside potential. The respondents had to give a high score to an indicator if they believed it greatly contributed to the sustainability and future competitiveness (F potential), current world market position (O potential) or current well-being (I potential) of Hungary. The questionnaire was completed by 28 experts. Most of them were active members of the Committee on Future Research of the Hungarian Academy of Sciences. Representing several academic fields (arts, engineering, medicine, natural and social sciences), they offered a wide perspective and a strong future-oriented attitude, values that are highly useful in this kind of research.

Table 2
The components of the future, outside and inside potentials

Future potential	Outside potential	Inside potential
Social responsibility (L1-3)	Trade to GDP ratio (L3-4)	Burden of government regulation (L2-3)
Industrial disputes (L1)	Country credit rating (L4)	Quality of life (L4)
Energy infrastructure (L3)	Exchange rate stability (L3)	Collected total tax revenues (L3)
Total public expenditure on education per capita (L3)	Financial institutions' transparency (L3)	Pension funding (L2-3)
Ageing of society (L1-2)	English proficiency (L4)	GDP (PPP) per capita (L4)
Renewable energies (L3)		Real GDP Growth (L4)
Healthy life expectancy (L3)		Ease of access to loans (L3)
Ecological footprint (L1-2)		Rigidity of employment (L3)
Total expenditure on R&D per capita (L3)		Labour force (L4)
Total R&D personnel nationwide per capita (L3)		Skilled labour (L3)
Educational assessment / Mathematics (L3)		

During the processing of the questionnaires every indicator was placed in the group (F, O or I potential) where it scored highest, meaning that an indicator could only be part of one of the potentials. In order to eliminate some of the less important factors (which received low scores in all three dimensions), we disregarded everything that had a score below average. The final transformation left us with 27 factors: 12 of them influence the future potential, 10 the inside and 5 the outside potential (Table 2).

The final version of the model was fine-tuned usingthe statistical data of the OECD countries.

THE FOI ANALYSIS OF THE OECD COUNTRIES

To quantify the future, outside and inside potentials, the FOI-indices were calculated. The value of the 27 components (listed in Table 2) were gathered for all 34 OECD members for the year 2010, and then all values were transformed to a 1-7 scale using the min-max method. By averaging the standardised values, we were able to calculate the F-, O- and I-indices of all 34 countries (Table 3).

Table 3
The F-, O- and I-indices of the OECD countries

	F	O	I
Australia	4.20	5.32	4.35
Austria	4.70	5.41	4.05
Belgium	3.90	5.56	3.47
Canada	3.90	5.41	4.50
Chile	3.80	5.03	4.13
Czech Republic	3.10	4.97	3.57
Denmark	4.80	5.77	4.30
Estonia	3.00	4.94	3.08
Finland	5.00	5.72	4.02
France	4.40	4.46	3.04
Germany	4.30	5.26	3.73
Greece	2.90	3.66	2.50
Hungary	2.90	4.56	2.55
Iceland	5.90	2.33	4.42
Ireland	3.90	4.17	3.91
Israel	3.60	4.89	4.13
Italy	3.50	3.82	2.66

	F	O	I
Japan	4.80	3.68	4.01
South Korea	4.00	4.26	3.33
Luxembourg	5.30	6.56	4.45
Mexico	2.70	3.98	2.85
Netherlands	4.40	5.54	3.83
New Zealand	4.20	4.52	4.00
Norway	5.20	5.70	4.13
Poland	2.90	4.42	3.07
Portugal	3.50	4.33	2.91
Slovakia	3.00	4.82	3.25
Slovenia	3.40	5.08	2.70
Spain	3.40	4.23	2.99
Sweden	5.10	5.22	4.13
Switzerland	5.40	5.37	4.89
Turkey	3.30	3.63	3.14
United Kingdom	3.90	4.35	3.60
USA	3.80	4.27	4.47

Factor Analysis

In order to better understand, what background factors drive the value of the different F-, O- and I-indices, a factor analysis was conducted with SPSS 19. Almost 150 variables were tested during the analysis. In the first step, we checked how closely related those variables are to the three index values in the OECD countries, and what the direction of the relationship is. As a second step, all variables were only considered in the factor analysis of the index they had the highest correlational relationship with.

We were able to establish three main groups of indicators that showed a significant correlation with the index of the future potential of the OECD countries. They were labelled Human capital, Accountable corporations and Quality of the education system. The Human capital factor is a combination of indicators measuring the education and health sectors, and the productivity. The Accountable corporations factor combines such factors as the ethical and social responsibility of organisations and the credibility of managers, and so it represents the social, ethical and environmental considerations of businesses. The third factor, Quality of education system, shows the returns on efforts made in the education system.

Two factors were found with the factor analysis of the O-index, namely National goodwill and Investment conditions. The main distinction between the two factors is the time frame within which their indicators may be influenced by the decision maker. The Investment conditions factor includes variables that can be influenced relatively easily, even over the short term; the National goodwill on the other hand may only be changed over the very long term.

Variables having a significant correlation with the I-index can be separated into three factors. These factors were labelled Business competitiveness, Government intervention and Availability of resources.The Business competitiveness factor measures the microeconomic position of all businesses (small and medium-sized enterprises and large corporations) along such dimensions as productivity, efficiency and R&D&I. The other two factors describe the macroeconomic environment of the businesses, where the Government interventions consists of the regulation part and the Availability of resources the allocation part.

Table 4
The factors of the F-, O- and I-index

F-index	O-index	I-index
F1 Human capital	O1 National goodwill	I1 Business competitiveness
Labour productivity (PPP) Overall productivity (PPP) Total health expenditure per capita Total public expenditure on education per capita Healthy life expectancy Total expenditure on R&D per capita	Parallel economy Investment risk Image abroad Country credit rating Brain drain Risk of political instability	Innovative capacity Productivity of companies Small and medium-size enterprises Information technology Large corporations
F2 Accountable corporations	O2 Investment conditions	I2 Government intervention
Ethical practices Social responsibility Credibility of managers	Foreign investors Exchange rate stability Capital markets Investment incentives State ownership of enterprises	Subsidies Finance and banking regulation Protectionism Legal and regulatory framework Ease of doing business Bureaucracy
F3 Quality of the education system		I3 Availability of resources
Educational assessment / Mathematics Educational assessment / Sciences Science in schools Educational system		Labour force Total primary energy supply per capita Burden of government regulation Employment rate Gross domestic savings

F-index: KMO=0.823, explained proportion 76.4%; O-index: KMO=0.803, explained proportion 73.7%; I-index: KMO=0.791, explained proportion 73.408%[1]

Forming Clusters

The FOI-indices and the factors determined during the factor analysis were used to identify typical clusters within the OECD countries. These artificial clusters were created based on the values of the F-, O- , and I-index, with the so-called half-scale method. As the indices canhave a value between 1 and 7, 4 is the mid-value. So all three indices were split into two groups: the values from 1 to 4 went into the group labelled as “low” (1), while the values above 4 were labelled as “high” (2).

[1] *The Kaiser-Meyer-Olkin (KMO) value helps in determining how suited our variables are to factor analysis. A KMO value above 0.8 means that the variables are highly suitable. Principal component analysis and Varimax rotation were used during the analysis.*

Theoretically all 8 clusters could represent feasible combinations, but most of the 34 OECD members fall into 4 groups (the distribution is shown in Table 5). Inour interpretation these four groups of countries represent the development models within the OECD.

The current paper focuses on Group 3, which is called the dual model. As half-scaling was used as a method of clustering, it is obvious that the countries of the dual model perform above average in their outside potential. A closer inspection of the factors shows, however, that these countries are especially strong in ensuring favourable Investment conditions, and their National goodwill (the other factor of the O-index) is below average. They are all characterised by liberalised capital flow regulations, exchange rate stability, accessible capital markets and incentive policies for investments. As far as the F-index is concerned, they perform poorly in the Quality of the education system and Human capital, while they are barely below average in the Accountable corporations factor. In the case of the I-index, the value of the Government intervention factor is slightly above average, although that cannot compensate for their weak performance in the other factors of Business competitiveness and Availability of resources.

Table 5
The clusters of OECD countries according to the half-scale method

Group & Code	Country
1 (111)	Greece, Italy, Mexico, Portugal, Turkey
3 (112)	Chile, Czech Republic, Estonia, Hungary, Israel, Poland, Slovakia, Slovenia, Spain
5 (211)	United Kingdom
6 (212)	Iceland
7 (221)	Belgium, France, Netherlands, Ireland, South Korea, New Zealand
8 (222)	Australia, Austria, Canada, Denmark, Finland, Germany, Japan, Luxembourg, Norway, Sweden, Switzerland, United States

The F-, O- and I-index values are indicated in brackets, where 1=countries with index values between 1 and 4; 2=above 4.
No countries fell into Groups 2 or 4.

It is not difficult to spot a strong focus on outside resources in the factor structure of the third cluster. These countries create a favourable environment for the world market-oriented companies, and they adopt policies that lead to a more liberalised government regulation. For this reason their economies may be characterised with the classical dual structure: a competitive, outside-oriented sector that relies substantially on outside resources, and a traditional sector applying local capital that is at least partially isolated from the other sector. The main characteristic of the dual model therefore is a strong focus on attracting outside resources, with the help of which the economy can be modernised and a higher growth rate might be achieved.

THE DUAL MODEL AS A DEVELOPMENT STRATEGY

The cluster and factor analysis based on the FOI-indices lead us to three promising development models (Clusters 3, 7 and 8). Here we discuss in detail the dual model, which implies a strategy that is focused on the attraction of outside resources. In other words we argue that if the goal is to move towards the dual model, the economic policy should concentrate on a strategy centred on the attraction of outside resources. If we draw a parallel between the development model (deducted from the clusters of countries) and the economic policy strategy, we can also tell which factors are most important for the outside-resources-oriented strategy. We have seen that the third cluster exceeds in one of the outside factors, called Investment conditions, and in one of the inside ones, called Government intervention. These two will be the areas that the economic policy needs to address when the strengthening of the dual model is the goal.

As a next step we checked which of the OECD members scored well in these two factors, and which of them has a comparable size to Hungary. In Investment conditions Ireland scores the highest, Austria is seventh, Finland and Denmark are eleventh and twelfth respectively; in Government intervention Finland is second, Denmark is fifth, Ireland is ninth and Austria is eleventh. Country studies were prepared of these four countries to detect those best practices that allowed them to excel in the areas measured by the two factors above. The country studies are fairly extensive and therefore cannot be included in the paper, but the lessons learned from them are featured in the final sections (the country studies are accessible in the Appendix of Bartha, Gubik and Tóthné Szita 2013). The final goal is to use the FOI analysis and the country studies to offer relevant policy recommendations for Hungary.

The Strategy Based on the Attraction of Outside Resources

In 2010 Hungary was part of the third cluster of the OECD countries, so it can be best characterised with the dual model. For this reason Hungary's adjustment strategy has been closest to the one based on the attraction of outside resources. This argument is further backed by the fact the best two scores of Hungary come in those two factors that are identified as the strongest of the dual model: the country is ninth in Investment conditions and eighteenth in Government intervention (this may not seem to be a good ranking, but they both can be considered as strengths compared to Hungary's twenty-fourth overall place). The outside-oriented strategy is not uncommon in the region either: all of the ex-communist OECD members (the Czech Republic,

Estonia, Poland, Slovakia and Slovenia) fall into the third group. But despite the fact that Hungary's two best scores come in Government intervention and Investment conditions, there is still plenty of room for improvement.

Table 6
Development areas for the strategy focused on the attraction of outside resources

Level	Component
L2	Advanced political culture Low level of corruption Stable and foreseeable socio-economic environment Stable public finances Exchange rate stability – Eurozone membership
L2-L3 transition	Social partnership in labour market affairs Collective agreement of employers and employees on national, sectorial and company level
L3	Transparent government, e-government solutions Regulatory impact assessment – measuring the effects of government interventions
L3-L4 transition	Persistently low corporate tax rate, with additional tax exemptions State of the art infrastructure Stable investment environment, coordinated tax and subsidy system Support for company-university-researcher cooperation
L4	Clearly defined development goals: research and development, information and communication technologies Substantial state subsidies on corporate innovation Substantial central help for start-ups and export expansion, involving subsidies, information and counselling services, and business support agencies Low level of corporate tax rates Flexible labour market

Our suggestions were put forward using Williamson's (1998) hierarchy (Table 6). As the lowest level (L4) summarises the current issues of resource allocation, the actions listed here theoretically can have an instant effect on the economy. Economic policy measures may belong to this level as well, if we assume that changes in regulations, taxes or subsidies have an instant effect on the market behaviour of firms and individuals. The longer-term effect of central intervention is that persistent measures change the structure of the market and the economy, and the relationships among firms. These belong to the governance part of the economy (L3). The strategy focusing on the attraction of outside resources requires a predictable government, and that on the other hand requires the stability of the political system. That is why Level 2 is also present in Table 6, but it has to be said that changes on this level may take decades, according to Williamson.

We shall start the presentation of our suggestions with those belonging to the highest level (L2). Because of the hierarchical system, the factors higher above are the prerequisites of anything below them. We have found that one of the pillars of best practice is the reliability of the economic policy. The corporate tax decrease policy in Ireland was started more than two decades ago, and it was consistently carried out; the many decades of minority governments has led to a special culture of political consensus seeking in Denmark that makes it possible to carefully plan and fine-tune long- term social policies; the state is committed to long-term development goals in Austria and Finland. Political stability is coupled with the transparency of the public sector and a very low level of corruption in all cases. The latter two further enforce the reliability of economic policy, as they decrease the chance of interest groups capturing the state, and destabilising the policy making.

Disciplined public finances are also an important part of the best practices. After the 2008 financial crisis it is clear that balanced budgets are important, but they seem to be an absolute must for a reliable investment environment. A stable budget position guarantees that the government does not have to take unexpected measures that affect company costs (e.g. tax raises or new taxes, withdrawing tax remedies, subsidies).

The reliability of monetary policy, more particularly the reliability of exchange rate policy, is equally as important as that of fiscal policy. It is well known that exchange rate stability is a central element of the economic policy measures of open economies. The euro partially ensures that stability, although the exchange rate against other major currencies can still be very volatile. Because at least two-thirds of the trade of the European countries is conducted within Europe, the euro is able to provide a relative stability on the continent, and lets the member countries get rid of the best part of their exchange rate risks.

The institutional framework that ensures the stability of the labour market was placed between Levels 2 and 3. Labour market issues are basically part of the allocation problem, so they should belong to Level 4. But it is also known that the pure market model is not an efficient one on the labour market, and usually there are dozens of institutional factors regulating it. This why the institutional framework of the labour market is higher up in Williamson's hierarchy. In Austria and Denmark the collective bargaining system is completely integrated into the institutions of the central government, and therefore it is linked to Level 2, but it also has an effect on the governance of companies (L3), which is why it was put as a transition between the two levels.

The dependency on the higher level structures is especially true of labour market institutions. More precisely, the Danish-Austrian type of social partnership and collective bargaining system can only be successful if the willingness to seek compromises and solidarity are an integral part of a country's culture (factors belonging to L1 and L2). Hungary had experimented with the system in the 1990es, but gave up on it after several failures, so the suggestions on L2-L3 are only for the sake of comparison. Immediate action cannot be taken based on them. What is worth remembering is that long-term labour market stability is key to the outside-resources-oriented strategy, and this can only be achieved if a well-functioning institutional framework is in place. Some

areas require some sort of central regulation and planning: the smoothing of cyclical fluctuations (e.g. compensating for lost income in case of becoming unemployed); balancing structural weaknesses (e.g. the feedback of labour market needs to the education system). In other cases institutional guarantees may be needed to prevent the state from distorting the market (e.g. separating real wage changes from market powers).

The second-order economising called governance by Williamson (L3) represents the efficiency of the government regulations in case of an economic policy analysis. This is important for the attraction of outside resources, because the administrative burdens of the bureaucracy increase the transaction costs of everyone, including the owners of foreign resources. The extent of transaction costs caused by the state therefore is a prime indicator of both capital investors and immigrants. Denmark and Finland are front runners in e-government solutions. These solutions provide huge advantages: e.g. they make bureaucracy more transparent, increase the speed at which services can be provided by the state, make it easier to declare and pay taxes, and help in creating huge databases that make public policy decisions more reliable.

Ireland is a great example for regulatory impact analysis. Stating from 2000 they gradually adopted the principle that the market distortion effects of government regulations are assessed. Basically a systematic attempt was made to quantify the transaction costs and changes in market behaviour caused by the intervention of the state. Thanks to the regulatory impact analysis the instruments that have the strongest market distortion effect may be filtered out, and the costs of both the state and the business sector can be decreased. The introduction of this approach has the added bonus of showing a more rational image of the bureaucracy, and making it look more attractive for investors.

All of our other suggestions consist of economic policy measures that have a direct effect on the allocation of resources, and an instant impact on the economy, and so they belong to Level 4 (or to the transition between L3 and L4). The hierarchical structure still applies,of course; the lower-level suggestions can only work efficiently if they are compatible with the higher-level characteristics of the country.

Ireland, Denmark and Austria have each set up a tax system where the relatively high overall tax burden is achieved with a low corporate tax rate (although the orders of magnitude are different: Ireland has one the lowest corporate tax rates in the world, its effective value is below 10%; the Danish is somewhat higher than the Irish, while the Austrian corporate tax rate can only be considered low if we compare it to the average of the developed welfare states). As the tax rate is a pivotal point in the investment decisions of the transnational companies, a consistently low corporate tax can be a great attraction.

In all countries the state support for clusters is a main priority. Clusters usually involve the cooperation of companies, research institutes, universities, development agencies and risk capital firms, but they are also supported by the state. The practice of Denmark, Austria, Ireland or Finland shows that state support alone is not enough; the clusters may only be successful if they carry special knowledge that is competitive in the world market. Those industries are worth supporting that have traditionally performed well and whose main companies are well known on the world market (good examples for the Danish are food, pharmaceutics and wind energy, for the Finnish wood or information technology, for the Irish process innovation, and for the Austrians car manufacturing clusters).

The flexible labour market is another attraction for transnational companies. If the termination of employment does not require a lot of administrative tasks, and can be carried out with relatively low costs, companies are able to adjust to the fluctuations in the world market demand. Denmark also has a social safety net, and applies several active labour market instruments that ensure that the unemployed can find a new job relatively quickly.

The suggestions in Table 6 will not only strengthen the model based on the attraction of outside resources, but the FOI analysis showed that they primarily affect the factors that are the pillars of such an economic policy orientation. The economic policy should concentrate on these instruments, if the main priority is the attraction of outside resources.

CONCLUSION

The dual model detected with the FOI model can be characterised as a development strategy based on the attraction of outside resources. Countries choosing this as a priority try to create an internal business and regulation environment that will make them attractive to outside investors. The more attractive environment may encourage the inflow of outside resources, which are needed because the local capital and knowledge generation is not sufficient. Many historical examples confirm that such a development strategy can prove successful, but the global environment has its risks as well. On the one hand overreliance on outside resources can result in a dependent position, because the sudden withdrawal of resources may lead to the collapse of the economy. The dependent position on the other hand can push the country toward an institutional environment favouring outside agents to the local ones – a process that further strengthens the exposure of the country.

What steps are recommended to adopt a development strategy based on the attraction of outside resources?

- ➢ Long-term commitment to relevant policy incentives, such as:
  - decreasing and keeping corporate tax rates low;
  - exchange rate stability;
  - tax remedies and subsidies targeted towards large corporations;
  - infrastructure development;
  - or a combination of the above.
- ➢ Making the central bureaucracy and government decision-making process more transparent, introducing a wide variety of e-government solutions.
- ➢ Labour market mix: easing of the recruitment and layoff rules, increasing the flexibility on the one hand, maintaining stability on the other hand (minimal loss of working hours, modest wage increase).

The hierarchy presented in Figure 1 shows that careful consideration of instruments is needed before any steps are taken, because positive outcomes can only be expected from economic policy measures that are in harmony with the institutional framework of the country.

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Output and Staff Number in Hungarian Manufacturing before, during and after the Crisis

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SUMMARY

The paper describes outcomes of recent research about connection between output and staff number related to specific sectors of manufacturing in Hungary. The method was to examine the existence of a linear relationship between the variables with cross correlation and regression modelling. The examined period includes the nadir of the crisis and the first years of recovery. In the textile and food industries co-movement of time series show a strong correlation between output and staff number. There is a strong positive correlation in the case of the automotive industry, but no linear relationship can be proved between the variables in the chemical industry.
Keywords: manufacturing; sector; staff number; output
Journal of Economic Literature (JEL) code: M20, M21, N60

INTRODUCTION, GOAL OF THE RESEARCH

The human resource or labour force, as one of the basic factors of production, is one of the main resources of corporate activity. Many factors affect the staff number employed in the sectors and the changes in that number. The three most significant factors are: increase in productivity caused by technological development, changes in sector output and changes in staff costs. Zimmermann presented the results of a study conducted on the data of 16 German manufacturing enterprises, the most important conclusion of which is that an increase in demand increases the demand for labour as well (Zimmerman 1991). Based on German data, Zimmermann found no correlation between the changes in labour costs and the sector labour demand. Based on their observations concerning the entire manufacturing of 28 developing countries, Mehta & Mohanty (1993) found that an increase in sector output increases the sector labour demand.

Based on the above research findings, I focus on the observation of output and number changes as the main research goal. In addition I pay attention to discovering the possible effects of labour costs on the staff number. To characterise the sectors I also observed other factors (ratio of export revenue, changes in gross added value, R&D intensity). Four sectors were included in the analysis: the manufacture of textiles, textile products, leather and leather products; the manufacture of food products, beverages and tobacco; the manufacture of transport equipment; and the manufacture of chemicals, chemical products and man-made fibres.

The following perspectives were dominant with regards to the choice: the availability and comparability of data concerning the sector, the role of the sector in employment and its conjunctural features. In the course of the analysis I avoid the use of the expressions labour demand or employment in order to separate the analysis this way from special labour economy questions (my analysis investigated the number of staff). For similar reasons I will not deal with the topics of job creation and job destruction, or adaptation costs. Based on Surányi (2002), the adaptation costs in Hungary are asymmetric, but low. This could serve as reason for I do not investigate this question here.

METHODOLOGY OF THE RESEARCH

I used the sector data of eleven years (2001-2011) for the analysis. Most of the data comes from the company tax databases of the National Tax and Customs Administration of Hungary (hereinafter: NTCA). Data concerning labour costs was obtained from the databases of the Hungarian Central Statistical Office. The NTCA gathers the data in the course of yearly mandatory data provision from Hungarian enterprises. The obligation

concerns every enterprise operating in Hungary having double-entry bookkeeping. The Office produces sector-level data by summarising the company data, so the database represents the significant majority of Hungarian enterprises. The output is indicated on nominal values, so I calculated the output values based on 2001 prices. I used sector producer price indexes to define real values.

I first tested the correlation between the time series with cross-correlation calculations and then with regression alignment where a significant linear connection occurred. I decreased the possible significant autocorrelation distortion by using chain ratios. I consider the labour homogenous.

THEORETICAL BACKGROUND

Several empirical research results have been published worldwide that analyse the effect of different independent variables on labour demand or to some category close to staff numbers. Table 1 contains a brief review of frequently examined variables and the outcomes. Based on their research conducted on the processing industries of 28 developing countries, Mehta & Mohanty (1993) state that technological development has a tendency to decrease the staff number. Zimmermann (1991) came to the same conclusion observing German manufacturing sectors, finding that increase in demand for the product of an enterprise and the increase of output increase the demand for labour. Examination of the effects of technological development is included in both influential works, and their results also match; that is, technological development has a tendency to decrease the staff number. Falk & Koebel (2002) pointed out that the increase in output also increases the demand for heterogenic labour force. Considering labour costs, Zimmermann (1991) found that it had no defining role in the 1980s in German manufacturing. Instead he found changes in product market demand – that can be related to the changes in output – and technological development to have effective force. International studies concerning the wage flexibility of labour demand usually have found the labour market of the United States to be more flexible than the markets of the Euro zone. This is in connection with the industrial traditions and the greater power of European trade unions. The literature about Hungary mentions that in the end of the 1990s wages were not a significant part of company policies. At that time the most important challenges were the capital market and the labour market limitations. As a result of (basically beneficial) increases in the minimum wages that started in the beginning of the 2000s which were realised in several steps changes in wages again had a serious impact of staff number in certain sectors (e.g. in the textile industry). (Concerning miminum wages it could be interesting for foreign readers that Hungary has more than one minimum wages, depending on the educational level of the employee, which is quite unusual.)

Some studies have been published about the new European Union member states in this topic with regards to the change of regime. The most influential works abroad are, among others, Singer (1996) on the Czech Republic; Basu et al. (2000) on Poland, Hungary, the Czech Republic, Slovakia and Russia; and Brown & Earle (2005) on Hungary, Romania, Russia and Ukraine. These works present the effects of the structural changes accompanying the regime change on sector employment.

Important results in Hungary were published by Kőrösi (1997, 2000, 2002), Köllő (1998), and Kertesi & Köllő (2002), among others. Kőrösi states that capital costs do not significantly affect the labour demand Kőrösi (2000). The most important conclusion of Kőrösi (2002) is that changes in productivity do not affect directly the labour demand in a significant way (but greatly affect its production flexibility and to a smaller extent its wage flexibility, too). Among the international results concerning productivity Davis et al. (1998) and later Nordhaus (2005) found when observing manufacturing in the USA that an increase in productivity positively affects the sector, while Mahmood (2008) did not find a connection between the two variables when observing the SMEs of Australian manufacturing. Mann (2011) came to the conclusion that the increase in productivity decreases sector employment rates from his simulations based on sector life curves. The results of Falk & Koebel (2002) showed that sector capital increase enhances the heterogenic nature of labour demand. Yun (2008) came to the conclusion based on research on Swedish manufacturing that the effects of the intensity of R&D and commercial openness are dependent on the skill requirements characteristic of the sector.

In summary, it can be stated that many factors can affect the staff number employed in the sectors. The research results relevant here are unanimous that among the factors affecting the number of the workers (labour demand), the effect of the changes in output is obvious. Observed for a long enough time, the staff number in the sector (labour demand) changes in the same direction as the change in output in the sectors of manufacturing.

A similarly obvious relationship can be seen between technological development and changes in the staff number in the sector. This study does not examine this latest correlation. A negative direction relationship is usually considered to be found between labour costs and changes in the staff number, but the known research results did not prove it in the case of the manufacturing of Germany (Zimmermann 1991). Based on the above, my research involving four sectors of the Hungarian manufacturing primarily analyses the past correlation between the output and the staff number. In addition I try to predict the sectors in which possible future wage changes (e.g., further raising the minimum wage) could cause a significant change.

Table 1

Source	Sample	Independent variable	Dependent variable	Connection	Remarks
Mehta and Mohanty 1993	28 emerging countries manufacturing	change in technology	labour demand	negative	
		output		positive	
		input substitution		neutral	
William Nordhaus 2005	USA manufacturing	productivity growth	employment	positive	
OECD 2007	OECD members	offshoring	labour demand	no connection or slightly positive	
Muhammad Mahmood 2008	Australia manufacturing SMEs	labour productivity	employment	no connection	
Martin Falk and Bertrand M. Koebel 2002	Germany manufacturing	output	demand for heterogenous labour	positive	
		capital growth		positive	
Lihong Yun 2008	Sweden manufacturing	R&D intensity	demand for labour	positive and negative	positive in „high skilled sectors", negative in „low-skilled sectors"
Stefan Mann 2011	based on simulation model	productivity	employment	negative	consecutively by industry life cycle
K. F. Zimmermann 1991	Germany 16 manufacturing sectors	technological advance	employment	negative	in some cases
		demand for products		positive	in every case
		labor costs		not significant determinant	
Davis et al. 1998	USA manufacturing	capital intensity	net employment growth	negative	less capital intensive creates more jobs
		energy intensity		negative	depends on energy prices
		total factor productivity growth		positive	

Source: collected by the author

RESEARCH RESULTS

Manufacture of Textiles, Textile Products, Leather and Leather Products

Sector Characteristics

Before the change of regime this sector was considered to be one of the greatest employers in the Hungarian economy. As the result of continuous transformation, nowadays contract work for European factories has become a characteristic business solution. In the course of the process European textile manufacturing ended up with a competitive disadvantage compared to its Asian rivals, so the market prospect of Hungarian production based on contract work also deteriorated.

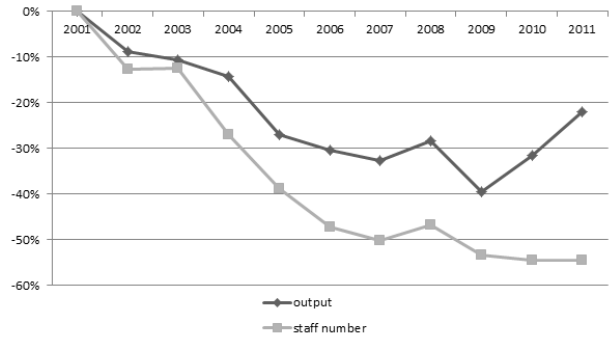
The staff number in the sector decreased to less than half during the examined period. The ratio of textile production decreased to about 30% within the sector and the production of other textile products became dominant. (In 2011 the division of employees was: 30% textile production, 44% clothing production, 26% leather, leather products, footwear production. Within textile production: 16% weaving textile threads, 6% textile weaving, 5% textile preparation, 73% production of other textile products.) In 2011 the ratio of export revenue was 72%, higher than the manufacturing average (61%). The labour costs to total costs ratio was 23%. This is significantly higher than the manufacturing average (9%). The average wages are low, 58% of the average characteristic of manufacturing. Labour intensive production is specific in the sector, connected to low wages. Technological development is relatively slow in this sector.

Output, Staff Number and Work Productivity

The staff number in the sector decreased by 55% (43,852 employees) between 2001 and 2011. The output decreased by 22% calculated at 2001 prices (to 290.2 billion HUF). The increase in producer price was 9.6% during the 11 years examined. Work productivity increased significantly (from 3.86 M HUF/employee to 6.62 M HUF/employee), due to the decrease in staff number exceeding the decrease in output.

The correlation between the time series is strong (0.74). (To decrease autocorrelation I measured the strength of the correlation with chain ratios, which basically gives lower correlation values than if it had

been calculated from the original data). It can be clearly seen in Fig. 1 that by 2009 the output had decreased to 60% of the 2001 value, while the staff number also decreased by 50%. As the effects of the crisis passed, the output significantly grew from 2009 to 2011, while the staff number stagnated.



Source: calculations of the author based on NTCA database

Figure 1. Output and stuff number base ratios in the textile industry

Conclusion

The increasing work productivity is the consequence of the general market problems, the decrease of output. Raising minimum wages can have an effect, decreasing the staff number, because wages are relatively low and the labour costs to total costs ratio is high. The increase in output experienced since 2009 is not accompanied by an increase in the staff number (although its tendency to decrease has stopped), which is positive from a work productivity perspective, and negative from the perspective of sector employment goals.

Manufacture of Food Products, Beverages and Tobacco

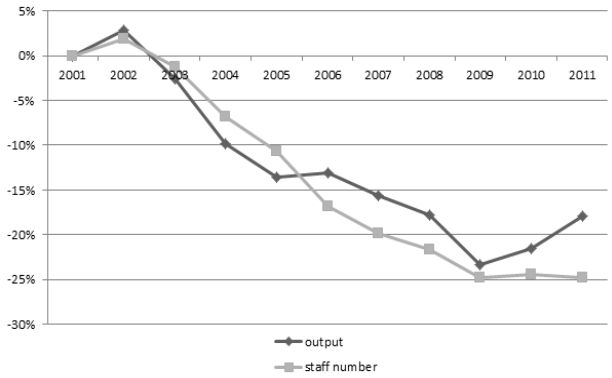
Sector Characteristics

We can find two well separated groups of enterprises in the sector: enterprises adapted for mass production and enterprises producing goods by traditional methods. The food industry is a sector with slow technological development. The labour costs to total costs ratio is around 9%, which corresponds with the average value in the manufacturing. Average wages decreased to 80% of the manufacturing average by 2011. The ratio of export revenue is low (28%).

Output, Staff Number and Work Productivity

The staff number decreased by 25% from 2001 until 2011 (to 91,033 employees), meanwhile the output became lower by 18% calculated at 2001 prices. The cumulative producer price index is 51% in the full period; calculated on nominal value the output showed growth. Work productivity changed from 17 billion HUF/ employee to 19 M HUF/employee.

The correlation between the change in output and in staff number is moderately strong (0.59). It is a weaker strength than the correlation measured in the textile industry, but since the measured value concerns chain ratios, linear correlation can be qualified as strong. Similar to the textile industry, the two examined variables are characterised by decreasing tendencies until 2009, after which output started to grow (Fig. 2), and the decrease in the staff number stopped.



Source: calculations of the author based on NTCA data-base

Figure 2. Output and staff number base ratios in the food industry

Conclusions

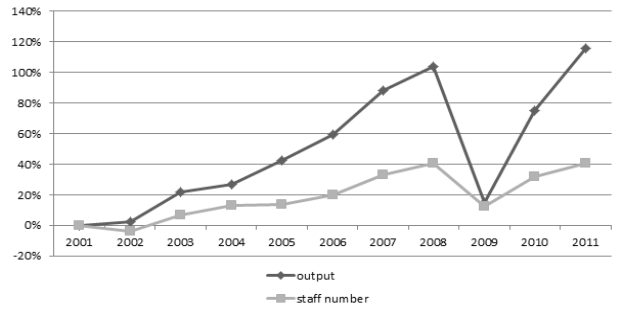
Both output and the staff number significantly decreased before the crisis. The results indicate that the decrease of output had a role in the decrease in the staff number. When the industry was starting to overcome the crisis, the decrease in the staff number stopped, but enterprises did not replace the labour dismissed earlier, despite their increased production. This process is beneficial from the perspective of work productivity, but is very harmful from the perspective of employment. In the case of an increase in labour costs or a raise in the minimum wages, it is nearly certain that the staff number will decrease in this sector.

Manufacture of Vehicles

Sector Characteristics

In the sector the importance of suppliers is steadily growing, both in the value chain and in employment. In the past years several significant green field investments and factory expansions were realised in Hungary. Labour costs to total costs ratio make up 13% of all expenditures (the overall manufacturing ratio is 9%). The average wage is 18% higher than the manufacturing average (in 2011). The sector produces 92% of goods for export. Vehicle production gives 43% of the R&D costs of all manufacturing. The gross added value grew by 151% in

11 years. The technological development pace of the sector is rapid.



Source: calculations of the author based on NTCA data-base

Figure 3. Output and staff number base ratios in the automotive industry

Output, Staff Number, Work Productivity

The 2011 output of the sector is 116% higher than the 2001 level. (3,568 billion HUF on real value). The cumulative producer's price index is only 10% considering the 10 years, so nominal value data did not decrease significantly due to the method of deflation. The staff number is 40% higher than it was in 2001 (54,858 employees). Work productivity is exceptionally high, moreover, it grew by 55% within 10 years (to 65 M HUF/employee). The correlation between output and the changes in the staff number is very strong (0.93). Based on this we can assume that the increase in productivity is primarily due to the increase in output. In Fig. 3 it can be clearly seen that the output decreased back to almost the 2003 level in 2009, and the staff number decreased to the 2004 level due to the crisis. The sudden great depression was followed by fast growth from 2009, so by 2011 output exceeded and the staff number again reached its 2008 level.

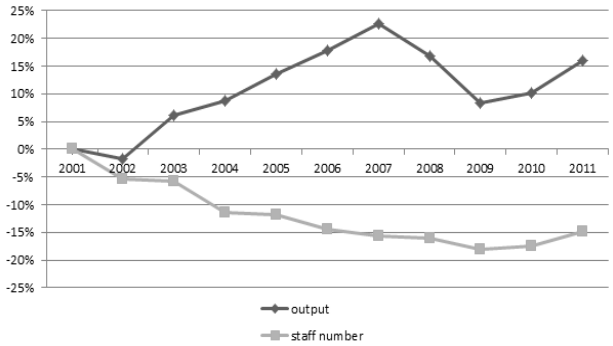
Conclusions

There is a strong correlation between the time series of sector output and staff number. A very significant increase occurred in both series of data, considering the full period. The ratio of output increase is almost three times the ratio of the increase in the staff number, which results in the beneficial situation that besides expanding the sector employment a significant increase of productivity also occurred. During the period the average wages were relatively high and growing.

Manufacture of Chemicals, Chemical Products and Man-made Fibres

Sector Characteristics

The petrochemical industry and pharmaceutical industry are two great fields of the Hungarian chemical industry. The sector is classified as a sector with rapid technological development. The labour costs to total costs ratio in 2011 was the same as the 9% ratio that is usual in the manufacturing. Wages exceed the average manufacturing value by 39%. The ratio of export revenue is below average (55M HUF/employee). The chemical industry accounts for one quarter of the total R&D costs of manufacturing.



Source: calculations of the author based on NTCA database

Figure 4. Output and staff number base ratios in the chemical industry

Output, Staff Number and Work Productivity

During the examined 11 years output increased by 16% (to 901 billion HUF). Without the correction with the 104% cumulated producer price index the nominal output shows a 137% increase. The staff number decreased by 15% during the period (to 27,623 employees), and work productivity increased by 37.5%. We can observe an increase in real value output until 2007, while the number of workers decreases (Fig. 4). From 2007 the output also starts to decrease, and from 2009 both time series show an increase. The cross correlation value calculated for the full period is 0.26, which does not assume a real linear connection.

Conclusions

Compared to the previously examined sectors the changes that occurred in the chemical industry have a unique picture. This is the only sector where there is no actual connection between output and the changes in the staff number in the beginning of the period, and from 2009 the data change rise in parallel. The rate of technological development is fast, and we see that the staff number decreased, despite the significant increase in output before 2007. If we assume that the statements of Zimmermann (1991) and Mehta & Mohanty (1993) concerning technological development are true for Hungarian manufacturing, then we can state that the tendency of technological development to decrease the staff number is strong, and the tendency of the increase in output to increase the number of the workers is accidental.

SUMMARY

The study presents the results of the research done on the correlations between sector output and the staff number concerning four sectors of the Hungarian manufacturing. In addition I examined the possible effects of labour costs on the staff number. The data come from a period between 2001 and 2011, and I calculated the output on year 2001 values. In the textile industry, decreasing output and staff number is characteristic. Tests concerning the co-movement of time series show a strong correlation between output and the changes in staff number. In the food industry the staff number also decreased together with the decrease in output. The cross-correlation between the two variables is strong, although weaker than in the textile industry. In both the textile industry and the food industry we can see that the decrease in output before the crisis strongly correlated with the decrease in the staff number. Unfortunately, the correlation gets weaker during the period of overcoming the crisis: although the increase in production stopped the further decrease in the staff number, it did not increase the staff number. The forced increase of wages can have a tendency to decrease the staff number in both sectors of industry. Vehicle production is a high productivity sector with fast technological development. Output increased very significantly, even on real value, followed by a smaller but still significant rate of increase in the staff number. Changes in the two factors are strongly connected; the correlation between them is strong, as was expected. Results measured in the period of the crisis present new proof for the well-known dependency of the sector on economic trends. An increase in output and decrease in the staff number can be found in the chemical industry, though no clear correlation can be proved between the changes of the two characteristics. Accepting the unanimous statements of researchers on the topic, my results can be interpreted to mean that, the effects of technological development on decreases in the staff number is strong, and the tendency of an increase in production to increase the staff number is relatively weak in the sector. Summarizing the results we could come to the conclusion that in regards to sector policies, we have to be careful when making predictions or implement measures with a common assumption about manufacturing. There are significant differences among sectors according to the effect of growth on new labour generated. In the textile and food industry demonstrative correlation were measured (in a period of decreasing output), but in the chemical industry it is not proved to be true. In the automotive industry the correlation is strong. One of the reasons that chemical industry has specific features can be traced back to a unique profession structure. Investigating this question could be the topic of a different research. However that kind of project would demand special knowledge about labour skills and profession structure with regard to Hungarian labour market. My intention in contrast is to develop the research by involve input prices, primarily the effects of the cost of labour.

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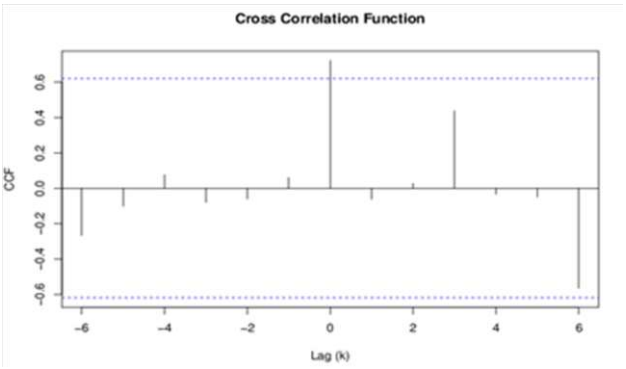
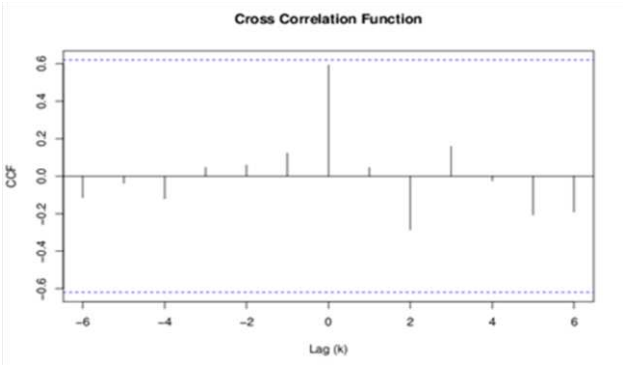
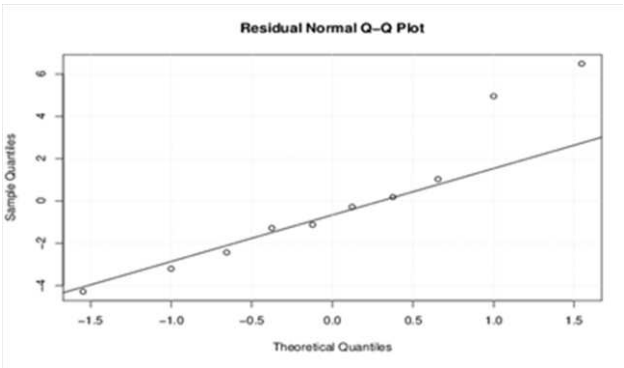
Appendices

Appendix A: Textile industry

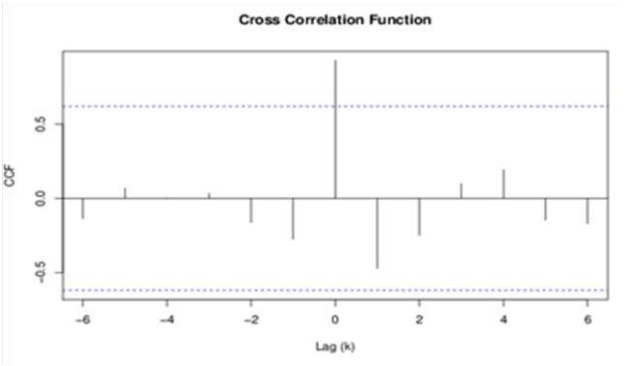


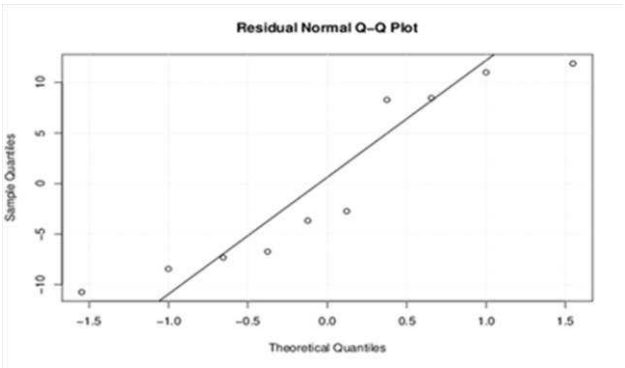
Appendix B: Food industry





Appendix C: Automotive industry





Integrated Approach to Managing Sustainability

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SUMMARY

Achieving a higher level of sustainable development needs both individual and corporate efforts. An effective solution needs an integrated approach that allows the consideration of environmental and social values in addition to the economic interest. Additional management tools may be useful but sustaining them needs often untenable efforts from the organisations.
This paper draws up a framework for how to integrate the values of sustainable development into the corporate activities by using competence management.
Keywords: competence management; sustainable development; environmental management
Journal of Economic Literature (JEL) code: M14, Q56

INTRODUCTION

It is the responsibility of environmental management to coordinate corporate activities to meet a higher level of sustainable development. There are many application problems, even though the tool set of environmental management is well established. New methods may lead to resistance on the personal and corporate level as well. Development actions shall consider the existing management system instead of forcing additional elements upon the organisation.

Competence management exceeds the disciplines of pedagogy: it is general in corporate human resource management and development. Dedicated competence management is a novelty for most companies but the approach is implicitly represented. Human resource management shall explore, acquire and keep competent staff. The aim of developing organisational competences is to achieve a higher level of coherence between abilities, capabilities and corporate strategy.

The key competences of lifelong learning defined by the EU are general. For greater consistency of organisational development actions (including increasing environmental and social sensitivity) this basis should be used.

INDIVIDUAL AND ORGANISATIONAL COMPETENCES

Spencer and Spencer (1993) define competency as an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation. Competence can be generally defined as knowledge and ability for performing certain tasks or roles.

Interpretation and categorization of the topic is not uniform. The content of the definitions depends on the purpose of the researchers. It is also problematic that while some languages have one word, others have more for the expression. The English language distinguishes between competence and competency but consensus on the content is missing. For example Boak (1991) regards them as synonymous. Others (e.g. Burgoyne 1988) use competence related to workcontent and competency related to possessing the necessary abilities. Competency can be interpreted as a behavioural expectation as well. Woodruffe (1991) proposes to separate competency (as a person-oriented expression) and competence areas. The approach of Lóth (2007) is useful for isolating the requirements and the performance. This approach defines competence as the capacity to perform job functions and competency as the actual performance.

This paper does not focus on the comprehensive interpretation of competences and competencies. Based on the European Reference Framework (2007) the word ‘competence’ is consequently used where it is suitable for analyzing the integration possibilities of sustainable development.

The competence management is broadly defined.The wording of Laakso-Mannien and Viitala (2007:27) says that it is the “activity that aims to safeguard and strengthen a company’s operating capability and competitiveness by means of its knowledge base. Competence management nurtures and develops a

company's competencies on all levels" and in order to achieve it includes direction, definition, evaluation, planning and development.

Competence management is generally built into the human resource managementprocesses. Kiss Tóthné (2012) highlights that competences have an influence on every field of human resource management. Expectations of the organisation are formulated as competence requirements which give selection criteria of staff. Establishing a comprehensive competence management system enables the companies to match their human resources with the human resource needs. The scope and content of competences depend on the tasks and the corporate culture.

There are various typologies ofcompetences. In an organisational view Szabó (2008) summarizes in her PhD Dissertation four categories of competences based on the practice-oriented approach of the European Union:

- Basic competences: general and frequent ones that are used in various areas of the life. These give the basis for developing other competences.
- Keycompetences: general elements of each profession. It is categorized by an EU framework and can be defined as important competences from a specified aspect.
- Generic competences: general and independent support elements of successful work, e.g. decision-making skills, innovative approach, problemorientation.
- Functional competences: special skills and abilities in connection with a specified job.

It is useful and critical to consider the norms of the European Union that focuses on key competences. This categorization is not the particularization of key competences mentioned by Szabó (2008). The individual competences can be classified based on the two approaches parallel.

The eight key competences of the EU (European Reference Framework, 2007) are necessary in order to realize the objectives of lifelong learning:

- Communication in the mother tongue: ability to express and interpret concepts, thoughts, opinions etc. in both oral and written way.
- Communication in foreign languages: it has a similar role to communication in mother tongue but it allows the understanding between various cultures and countries.
- Mathematical competence and basic competences in science and technology: basic mathematical and scientific knowledge and thinking is necessary to solve problems in everyday situations, and to understand the happenings around us.
- Digital competence: digital communication has a broad role in the organisation and in our whole life, including the access to learning materials as well.
- Learning to learn: it is related to learning processes by establishing the ability to carry on and organise learning in one's own way.
- Social and civic competences: social competence refers to personal, civic competence to interpersonal and intercultural situations and problem solving.
- Sense of initiative and entrepreneurship is the ability to turn ideas into action: it involves creativity, innovation and risktaking, as well as the ability to plan and manage projects to achieve objectives.
- Cultural awareness and expression: it covers appreciation of the importance of the creative expression of ideas, experiences and emotions in a range of media (music, performing arts, literature and the visual arts).

Competence and performance measurement are inputs for organisational development. Personal and organisational competences should be harmonized to increase the business competitiveness. Knowledge, readiness, and preparedness of people as workers has a significant effect on corporate performance. Elementary, secondary and higher education systems shouldprovide knowledge that prepares students for success at work but most of the requirements come from the employer. Some elements of knowledge, ability and skills are to be learned only in the organisation. (Berényi 2012)

Awuah (2001) interprets organisational competence as the sum of personal and organisational abilities, knowledge and capacities. Of course organisational competence and competency are more than the simple sum of personal competences; synergic effects can be expected.

In a simplified approach an organisation should focus on the organisational competences to increase its competitiveness. Based on the individual knowledge and competence necessary corporate tasksarecollecting knowledge, selection of employees, seeking for motivation points, supporting the flow of knowledge by coordination tools (meetings, teamwork, etc.), building up databases and knowledge bases.

BARRIERS OF SUSTAINABLE DEVELOPMENT

The way and content of contributions to sustainable development has been the subject of research in the last 30 years. The principle and fundamental aim of sustainable development is known but there is no consensus on how to achieve these objectives. The economic pillar of sustainable development means the source of solving environmental and social problems but it often gives an escape point for people, companies and governments. Actions are postponed by claiming the lack of necessary resources.

"The Business of business is business". This statement of Friedman (1970) refers to the main responsibility of companies being to increase their profit. Efforts towards environmental protection and social actions decrease the profit so the company steals from the owners. But integrating environmental and social problems in the corporate strategy can be a source of future profitmaking in long term. Friedman points out that an organisation does not have a conscience, only the people. Integrating environmental sensitivity can be interpreted as a game: companies try to recognize and/or build up the consumers' sensitivity, the important decision-making criteria and establish an optimal strategy. This strategy should consider sustainability but the lack of information and economic interests may lead to 'satisfactory decision-making'. The real environmental and social impacts of the decision are impossible to predict, i.e. that the deficiencies of the decision-making may derogate the achievement of sustainable development.

Sustainability is obvious in ecological systems: usage of the natural resources does not exceed the rate of their regeneration. However, the diversity of goals in a social system makes interpretation difficult. Education experts (such as Bábosik 2004) state that education and as a result behaviour cannot be independent of the accepted values. This leads to an evaluation problem: judgment of the behaviour will depend on the actual values of the those judging. Sustainable development is a global challenge with different interpretations and successfactors.

In summary the main barriers to achieving a higher level of sustainable development are the following:

- The presence of several social values makes the interpretation of sustainable development difficult;
- Profitorientation and conflicts between individual and corporate interestshinder effective activities;
- Information asymmetries make planning and evaluation difficult.

It can be concluded that the general barriers of sustainable development limit the functionality of corporate initiatives (e.g. environmental management systems or corporate social responsibility) as well. Achieving sustainable development is not possible by forcing environmental/social programs or systems upon people; there is a need for a comprehensive approach that integrates environmental consciousness with the daily operation. Local (corporate) values of sustainability must be formulated horizontally, woven into the values and the management system.

Competences and competencies seem to be the most effective tool for integrating sustainability.

THE ROLE OF ORGANISATIONS IN ACHIEVING SUSTAINABLE DEVELOPMENT

Individual (personal) needs and wants relegate the environmental pollution and prevention of the pollution to the background. A significant part of pollution can be attached to production but this is derived from the consumer demand. Companies and other organisations have special roles related to pollution prevention and to the general development of sustainability. The reason for this is that people during their work activities subordinate themselves to the organizational rules. It should be expected that the effect of an organisation on the individuals is usually more dominant than the other way around. It is possible to integrate the values of sustainable development into the regulation of operation so that the environmentally conscious behaviour of people can be influenced even beyond the work.

There are structural and cultural challenges to solve in order to establish sustainability. Szegedi (2001) analyses them as barriers. Structural factors are the following:

- Division of labour: staff members see through sub-problems, both responsibility and capacity for action are limited. Everybody should know and understand their own role to enhance the effectiveness.
- Separation of decision-making competence: decision makers and executives are not the same people. Information asymmetry or retained information lowers the effectiveness of decisions.
- Traditional command hierarchy: resistance to commands can be expected when it is a formal command. Spill over of this problem leads to collective irresponsibility. Involvement of the staff may increase the acceptance of the corporate will.

Cultural factors are the following:

- Strict behavioural expectations: new members usually try to learn the dominant norms. These norms may lead to different behaviour than the person's own behaviour patterns. The workplace has the possibility to integrate environmental consciousness into the norms.
- Cohesive communities: rivalry between formal/informal groups may lead to hostility. The result is frozen coordination and communication that slow down decision-making as well. The inverse of this culture is a problem-oriented one that supports the new initiatives.

- Unclear priorities: it is impossible to consider each viewpoint in decision-making. Priorities shall be established but there is the risk that economic interest will override the values of sustainable development.
- Retained information practice: it is a bad practice that the management tries to hidedamaging information. A missing information base lowers the effectiveness of decisions and if the secrets are revealed, the trust in management will crash.

There are fundamental problems to be solved in order to integrate the values of sustainability into the organisational strategy and operation:

- The content of the values,
- The process of integration.

Defining the content of values of sustainable development is a difficult challenge because of economic and cultural barriers and diversity. Global problems are common but the local representation may significantly differ by nation and geographical area. Establishing values and managing the related processes is much easier to implement.

ENVIRONMENTAL COMPETENCES

Varga (2009) has a useful approach to the description of environmental competences. Because of the difficulty of direct specification he interprets key competences the European Reference Framework (2007).

Using the mother language both in written and oral form is necessary to be able to understand and communicate information. Recognizing both the frames and details of the problems is only the first step on the way of becoming sustainable. Collecting background information, working out action plans and discussing them with others needs the adequate knowledge of the mother language. The fact that environmental and social problems have a global nature requires the knowledge of foreign languages. Digital competence is important for implementing data analysis and searching for information as well as for electronic communication.

Factual knowledge (mathematics, natural sciences, technology) should be applied to development actions. An environmental or social program shall consider each future effect of the activities in order to achieve desired objectives.

Living in a sustainable way is a challenge for most people and organisations. New concepts, tools and solutions should be learned and accepted. The learning process is lifelong but often in non-school form. Workplaces can enforce atypical forms of behaviour but the goal is changing attitudes. It also assumes that people shall re-learn how to learn.

Social, civic and entrepreneurship competences cover two pillars of sustainable development. Furthermore, the existence of these competencies may enhance the acceptance of the development actions.

Of course other requirements can be formed like accuracy, reliability, saving money, helpfulness, etc. that may include environmental or social expectations. The system of competence requirements needs to be harmonized with the corporate strategy and the expectations of the stakeholders. The focus and content of sustainability depend on the scope of activities. However, there are competence dictionaries, related research reports and industry best practices that can be addressed in building up an organisation's own solution.

It is the responsibility of the management to form the competences and to evaluate the competencies. Environmental and social values can be summarized in an ethical codex, but its usability may be limited if it is only "shop window decoration" (Szegedi 2012). Operating procedures and human resource management processes can indicate the topic. A general mistake is to force separated expectations in connection with sustainability from other expectations. This leads to neglectingthe interest of sustainability in case of any economic problem. In addition sustaining the related management activities requires unreasonable efforts. Management must think about how to contribute to sustainability with each task and formulate the appropriatecompetences.

PROCESS OF INTEGRATION

The source of the competences is the environment, primarily the customers. Management needs to explore the external expectations and translate them into internal requirements. Strategic and operational plans shall consider the requirements to achieve satisfaction while realizing business profit. The Quality Management Process model (Figure 1) summarizes the critical elements of management focus.

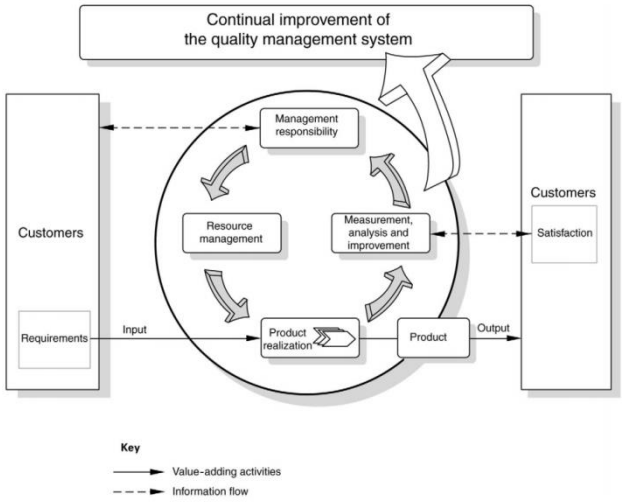

Figure 1. Model of a Process-based Quality Management System (ISO 9001)

The model of ISO 9001 describes how to satisfy customers. If this can be achieved, the organisation could identify the relevant competence requirement and could manage the individual and organisational competences. Figure 2 summarizes the main steps of this process and its extension to the supply side.

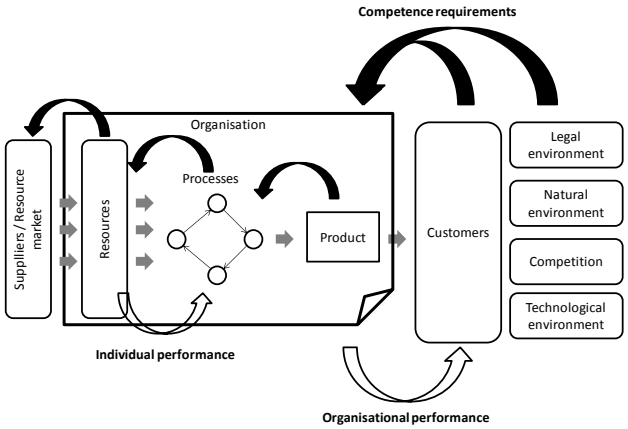

Figure 2. Competence requirements and performance in the organisation

The responsibility of the management is to identify the external expectations and barriers, including the customer requirements, legal possibilities, natural and technological possibilities and the position of competitors. The expectations are the source of the product-requirement and the organisational competences which may manifest as corporate image.

Product requirements appoint directly the main characteristics of the production processes. Requirements of other processes and resources (including the competence of the staff) can be deduced jointly from the product requirements and the corporate image.

Satisfaction of customers mainly depends on the performance of the product but in the long term corporate image influences the organisational performance. Social acceptance is important because society gives the future customers. Product performance (quality) depends on several factors. Beyond the subjective judgement of the customer,the quality of raw materials or machines and conformity of procedures can be noted (Szintay 2005). Product requirements designate the competence requirements of processes and resources (including human resources) and the performance of the resources finally determinesthe performance of the organisation.

This process gives a framework for integrating the values of sustainability with effective content and allows the controlling of success.

The limits gobeyond a single organisation. In the resource market an organization is a customer with specified expectations. By integrating the values of sustainable development into the supplies the whole supply chain can work and develop its activities based on shared values and the interpretation of sustainable development. These values are horizontal values, so the same content can be adapted for various activities.

EVALUATION OF ENVIRONMENTAL CONSCIOUSNESS

Environmental and social competence requirements need to be integrated into other requirements but it the management is recommended to pay attention to evaluating the effectiveness of the efforts. This allows an increase in the environmental performance.

Based on the idea that environment and environmental problems go beyond the individual or organisation, evaluation needs a comprehensive approach. The model in Figure 3 fulfils the requirements.

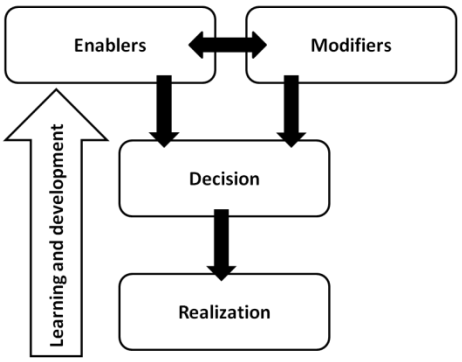

Figure 3. Comprehensive model of environmental consciousness (based on Berényi 2009)

The core of the model is based on the process of decision making because decision is a critical point of each action, including both everyday shopping and work activity.

- People have specified objectives and a specified level of knowledge. They have conceptions about good and bad, handsome, useful and ugly. These opinions and the actual knowledge may be difficult to change, so these shall be handled as enablers.
- There are situational circumstances. When alone, with friends or with family our behaviour may be different. Sometimes these circumstances motivate people to decide inconsistently. This is another conflict between financial possibilities and desires.
- Decision making means choosing between the known possibilities. Realisation is the accomplishment and evaluation of the selected solution.
- Learning is based on the evaluation. New experiences will confirm or overwrite the factors covered as enablers in my model. Even in similar situations the decision may be different.

The evaluation progress based on this model allows the management to work out and develop the sustainability content of competences.

CONCLUSION

Achieving sustainable development is a serious challenge. There are many methods and tools available for individuals and organisations for evaluating and developing their operations but several barriers should be considered. Engel (2000) emphasizes that wide dissemination is important and easy tools shall be established in order to achieve it. In my opinion breakthrough can be expected if the values of sustainability are integrated into the organisational strategy, structure and culture. Forcing environmental departments or corporate social responsibility programs on companies will fail because of the commitment of maintenance.

Nowadays competence management is very popular both in the business world and EU regulation so it is inevitable. Actual studies generate useful databases and competence dictionaries which are widely available. Competences include both professional and behavioural expectations which can give a frame to integrating values of sustainability.

Through a harmonized management system of competencies it is possible to make them a part of the culture, establishing the appropriate behaviour and performance without any additional tools. This way effectiveness and acceptance can be enhanced.

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Main Changes in European Tax Policies between 2007 and 2011

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SUMMARY

The paper is devoted to studying the tax policy changes of the European Union countries in the period of economic crisis. The main aim of the paper is to categorise the main types of tax policy responses to the economic challenges and the major influencing factors determining these responses. The main findings are the followings: the crisis intensified the tax competition among the countries. The countries with relatively low indebtedness and deficits tried to decrease the tax rates (especially the income tax rates) to reinstate their international competitiveness. Countries with high indebtedness and/or deficits could not follow this route without cutbacks in spending and finding new source of revenues. And finally there were countries that did not enter the field of tax competition.
Keywords: tax policy; European Union; economic crisis
Journal of Economic Literature (JEL) code: H20

INTRODUCTION

Near the end of the first decade of the 21th century clear tax policy tendencies can be detected in the European Union countries. The free movement of production factors (capital, enterprises and labour force) led to specific tax competition, which was more intensive in the recently joined, less developed countries. The core reason for tax competition is to decrease the tax burden of production factors (i.e. the marginal rates of corporate and personal income taxes) in order to encourage the direct capital investments and economic growth. (Noregaard-Kahn, 2013) The decreasing revenues were financed from loans or from increasing other types of taxes – especially indirect taxes.

The economic crisis in 2008 meant a break in this process. The heavily indebted counties could not continue decreasing the direct tax rate; the increasing budget deficit caused by the consolidation of the bank system and by the crisis generally forced the policymakers to find new source of finance. But a tax increase can threat the chance of economic recovery and may lead to an vicious circle. The tax increase further deteriorates the competitiveness, investments fall, and the recession decreases the budget revenues, which provokes further tax increases. If the government cuts the expenses, the same would happen. The fall in demand caused by the public spending cut can freeze the economy, while poorer public services may lead to social tensions and/or weaker competitiveness.

In this paper I study the tax policies applied by the European Union countries in order to categorise the main types of response to the challenges of economic crisis and to detect the main influencing factors determining the response. The study examines the relationship among GDP growth, tax burden, and foreign direct investment, creating clusters by gross public debt/GDP, export/GDP, public deficit/GDP and balance of current accounts/GDP. The data for the examinations are obtained from the Eurostat databases.

TAX POLICY TENDENCIES BEFORE THE CRISIS

Taxation has almost the same age as the mankind. As Benjamin Franklin said, “In this world nothing can be said to be certain, except death and taxes.” (cited in Adókalauz, 2009). Taxation is an integrated part of fiscal policy and the taxation is different in the particular countries. The main reasons for this phenomenon are the following (Taxation trends, 2013):

1. The ratio of public spending to the GDP differs significantly in each country. Where the public spending is more significant, the rate of taxation should be bigger.
2. For historical reasons we can observe meaningful differences in the rate of direct and indirect taxes. Direct taxes are levied on incomes and wealth, while indirect taxes are those in regard to the consumption of products and services.

3. The direct taxes may employ progressive or flat tax rates. The flat tax regimes use the same rate independently of the tax base size. The progressive tax rates are higher if the tax base is greater.
4. The tax system can use special taxes levied on particular sectors or products. Furthermore, the tax systems can differ from each other in point of employed tax allowances and tax exemptions. The complexity of tax rules, the frequency of tax declarations and payments, and the various approaches of double taxation also differ country to country.

This paper examines how the taxation has changed in answer to the crisis in the European Union countries, and what the effect of tax policy was on economic growth and public budget deficit, according to the available Eurostat data. In the analysis I examine only the first two aspects, as the database enables only this.

Although the tax systems differ, several common global tax policy tendencies were observed before the economic crisis broken out in 2007 (Norregard & Khan, 2007). The main features were the following:

1. Widespread use of Value Added Tax (VAT) – VAT was introduced by France in 1957, then it became the first harmonised and official tax of the European Union. Since then the VAT has been introduced in several countries outside the EU. Currently only 11 countries among the world's 160 countries have no VAT. The most meaningful exemption is the USA (Ebrill et al. 2001).
2. Globalisation and within this the freedom of capital movement strengthened the tax competition among countries. It meant that the capital began to move to the countries with lower corporate tax rates from the countries with higher ones. An efficient defence against tax havens has not been built up, so the capital-hungry countries were forced to decrease the corporate tax rate and the rates of other taxes on company profits. At the same time several countries began to use flat personal tax regimes. The flat taxes are extremely popular in the Eastern European region, where all of the countries except Poland introduced it by 2011. (Keen et al. 2006). However in 2011 one of the early introducers – Slovakia – turned back to a progressive personal tax.
3. Similar process can be traced in case of other types of labour taxes. The creation of new jobs became more and more important, and the multinational companies play a crucial role here. The cost of labour has got major significance in the settlement decision, which can be influenced by the fiscal policy if it lowers the tax burden of employment or increases tax allowances.
4. The tax competition decreased the share of direct taxes in the state budgets. Since the redistribution role of the state did not decrease, the share of indirect taxes to GDP increased before the crisis.
5. Globalisation strengthened the demand for tax harmonisation – especially in case of indirect taxes. Harmonisation – except for tax rates – has occurred in the case of VAT and excise taxes, but the harmonisation of direct taxes came up against difficulties. Tax harmonisation is not only the feature of the European Union. The same process can be observed in the case of the Central American Customs Union, too. (Ter-Minassian, 1997)
6. Double tax avoidance agreements are widespread; in the frame of this the taxation of capital income (interest and dividend) decreased or was eliminated.
7. From the 1980s the demand to support sustainable growth has appeared in taxation. During the 1990s several environmental taxes have been introduced. In line with this the consumption of fossil energy (natural gas, crude oil) was also more heavily taxed. The increasing concern about global warming and the insufficient fossil energy reserves forced policymakers to moderate energy consumption with tax policy measurements.
8. The weight of property tax increased especially in the taxation of local governments (Ter-Minassian, 1997).
9. Finally the economic cycles plays an important role in the tax policy. In the economic recovery period tax incomes increased, which stimulated the economic policy to decrease the tax rates. This tax rate moderation strengthened the economic boom and had a pro-cyclical effect. The short-term political popularity undermined long-term responsible thinking, so the tax moderation threatened the stability of pension and health systems where the birth rate was low (Tax reforms…, 2012).

In my research I examined Features 2, 3 and 4 in the European Union countries.

THE HYPOTHESES OF RESEARCH AND THE INPUT FACTORS

This paper examines which countries try to get a competitive advantage by tax moderation, and what the major influencing factors are to enter a tax competition. Secondly, I examine whether entering the tax competition leads to greater economic growth or not.

The data used come from the website of Eurostat and the analysed period was the 11-year period between 2002 and 2011. The chosen period is split by the crisis, since I tested with time series analysis if the deductions are prevalent in the different phases of economic cycles. The research covers the 27 member states of the European

Union. Croatia was excluded from the analysis, because during the examined period it was not yet a member of the EU.

The hypotheses of research were the following:

1. The smaller the GDP per capita, the greater the country's stimulation to enter the tax competition. If the economic development is low, generally the amount of tax revenues is also low compared to the GDP, so the foreign investment to the country can be increased by the lower taxation.
2. The relatively high economic growth rate enables the decrease of tax rates, since the tax base increase can compensate the effect of lowering rates. So the higher the GDP growth rate, the more the stimulation to enter the tax competition increases.
3. A high export ratio and a high foreign investment ratio also strengthen the stimulus for tax competition. Since economic growth is heavily determined by international competitiveness, economic openness makes the tax competition stronger.
4. There may be two factors which constrain the ability to enter a tax competition. Firstly the size of the public deficit, secondly the size of gross public debt. A European country will not take the risk to be in an excessive deficit procedure in long run, since this leads to the suspense of transfers and paying fines. That is why a higher level of public debt or deficit decreases the opportunity to take part in a tax competition.

RESEARCH METHODOLOGY

The test of the above hypotheses has been done by the following way:

The data required to test my hypotheses were downloaded from the website of Eurostat. The database gov_a_tax_ag provided detailed information about the tax revenue types compared to GDP. The main tax rates can also be downloaded, similarly the functional distribution of governmental spending compared to GDP.

After downloading the taxation figures, the public deficit/GDP, gross public debt/GDP, GDP per capita, GDP growth rate, FDI stock, export, and the GDP nominated in euro were also downloaded. To compare the country data, foreign investment and the export data were divided by the GDP.

The description of my input variables, the testable hypotheses and the abbreviation of input variables are shown in Table 1.

Table 1
Characteristics of input variables

Abbreviation	Description	Name of Eurostat database	Testable hypotheses
country	full name of the particular country		
abb	short name of the particular country		
def	deficit/GDP	gov_dd_edpt1	The larger the GDP, the smaller the tax rate decrease.
deb	gros debt/GDP	gov_dd_edpt1	The larger the gross debt, the smaller the tax rate decrease.
gdp	GDP per capita in euro	prc_ppp_ind	The larger the GDP per capita, the higher the tax burden and the smaller the tax rate decrease.
gro	GDP growth rate	nama_gdp_k	The higher the economic growth rate, the bigger the tax rate decrease.
fdi	Foreign direct investment to GDP	bop_fdi_main	The higher the ratio of FDI stock to GDP, the larger the tax rate decrease.
exp	annual export to GDP ratio	bop_exp_main	The higher the ratio of exports to GDP, the larger the tax rate decrease.

Source: Eurostat database, own

The arithmetical average of input variables was calculated between 2002 and 2011 for all of the 27 member states.

CREATING CLUSTERS BY THE INPUT VARIABLES

The countries were classified into four clusters by the input variables. I employed clusters, since I supposed that the countries in the same cluster have got the same motivation for tax competition. In economic policy several factors should be considered, and therefore the hypotheses cannot be examined as a function of only one variable. The result of cluster analysis gave distinct and interpretable country groups.

The cluster analysis was done by SPSS. After several trials the hierarchical cluster analysis gave the best interpretable solution, where I created the clusters by the Ward method using Euclidean distance. The Ward method strives to minimise the in-group variance and to maximise the variance among groups. Since my variables were quantitative variables, the Euclidean distance had relevance. Table 2 shows the main characteristics of the clusters.

Table 2
Clusters of the input variables

Countries of the cluster	Name of cluster	Number of countries	Geographical and cultural features
Germany, United Kingdom, Finland, Belgium, Denmark, Sweden, Austria, Ireland, the Netherlands, Spain, Italy, France	Developed	12	The most developed old member states belong to here. Geographically it covers the western half of the Union.
Czech Republic, Portugal, Malta, Greece, Slovenia, Cyprus	Average	6	Except for two former socialist countries these are Southern European countries. Their development is around the average of the EU with moderate economic growth potential.
Poland, Bulgaria, Rumania, Estonia, Lithuania, Latvia, Slovakia, Hungary	Less developed	8	Most of the the former socialist countries belong to this group. This cluster covers the Eastern half of the Union.
Luxembourg	Very developed	1	In point of input variables Luxembourg was too far from the other clusters to place in any group. There were indeed cluster types which split the EU into Luxemburg and the rest of the Union.

Source: Eurostat, own computation

I calculated the arithmetical average of input variables in case of each cluster. The results are shown in Table 3.

Table 3
Average of input variables in each cluster

Factors	def	deb	gdp	gro	fdi	exp
Developed	-0.27	57.98	26,391.67	2.47	46.36	59.76
Average	-3.84	57.47	18,451.85	3.26	40.34	62.39
Less developed	-2.49	29.98	11,005.56	5.69	40.17	61.89
Very developed	2.43	7.23	55,900.00	4.13	134.01	436.38
Average	-1.60	47.70	21,161.3	3.70	46.40	74.90

Source: Eurostat, own calculation

From the data it looks as if the convergence of the European Union country groups has increased in this period. The less developed country group showed the highest economic growth, while the developed country group has the lowest figure. The average deficit and the average growth rate of the developed group was the lowest between 2002 and 2011. However, their GDP per capita and foreign direct investment stock was the highest. The developed countries have large internal markets, which is why the share of exports is a moderate percentage of their GDP compared to the other country groups.

The averagely developed group has the highest state debt and deficit, but their openness was the highest. While the less developed group showed the same openness pattern as the average group, their average GDP growth rate was higher and their deficit lower than the average group.

Luxembourg has got a special situation. This is the smallest member country, but economically this is the most developed. Luxembourg is a very open economy with a disciplined fiscal policy and relatively high growth rate.

A one-factor variance analysis was carried out to test the significance of these variables as cluster-building factors. I excluded Luxembourg from the analysis and treated it as an outlier. The results are given in Table 4.

Table 4
Relevance of clusters

Factors	def	deb	gdp	gro	fdi	exp
Variance among clusters	2.2	171.2	93,540,886.6	1.9	8.3	0.0
Total variance	6.8	673.9	183,491,353.4	3.1	813.7	0.1
Ratio	31.8%	25.4%	51.0%	61.2%	1.0%	1.1%

Source: Eurostat, own calculations

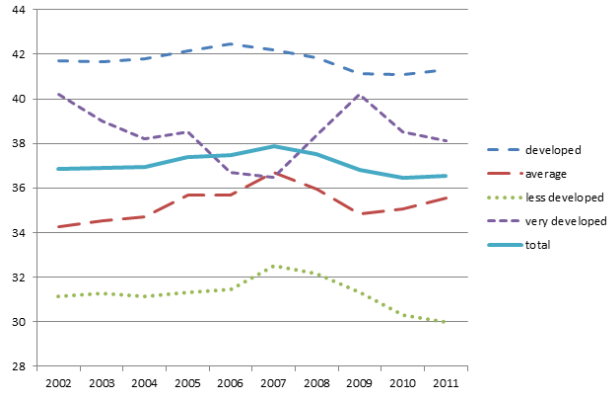
The explanation power of the clusters is strongest for development indicators (GDP level, and growth). The explanation power is moderate in the case of indebtedness indicators (deficit and gross debt) and insignificant for openness (foreign direct investment and export to GDP ratio). So the clusters are suitable for testing Hypotheses 1, 2 and 4 – which consider the linkage between economic growth, economic development, indebtedness and tax competition, but the relationship between economic openness and tax competition cannot be tested by using these clusters.

THE STATEMENT OF ANALYSIS

In the analysis the relationship between the tax income/GDP ratio and the clusters was examined in order to focus on the tax rates for the following reasons:

1. In point of tax competition the pure tax rates have no significance. If a country uses a high tax rate, but employs several allowances and tax relief, the real tax burden in terms of enterprises and households can be favourable. This statement is especially true in the case of personal and corporate taxes, where the tax base and the methods of tax deduction may differ widely.
2. If the black economy plays a significant role, the high taxes are only paid by a few honest taxpayers, and the tax rate cannot be a perfect figure to measure the real tax burden for the whole economy.

Let us look first at the overall tax burden. The collected tax revenues in European Union declined moderately during the period. This declining trend was not interrupted by the crisis. Figure 1 shows that the less developed EU countries have got smaller tax burdens than the more developed ones.



Source: Eurostat, own calculations

Figure 1. The average tax income/GDP rate of country clusters between 2002 and 2011

The lower income level and the smaller gross debt of the less developed countries encouraged them to decrease their average tax burden in this period. It is interesting that the major tax decrease happened after the eruption of the crisis. Because their indebtedness was much lower than the average, they could stimulate their economy by offering lower tax rates to investors. In the average group the tax burden increased. This also fits the hypothesis of my research, since the indebtedness and the deficits were highest here. Here the reinstatement of financial equilibrium was the top priority target, and they were unable to enter the tax competition.

If we focus on the importance of the various tax types we can derive a deeper conclusion regarding the tax competition. The international competition is worsened first of all by taxes on capital and income, while the role of consumption taxes is not so vital. The consumption taxes have no importance for the exporting sectors – only the domestic prices will be higher and therefore the domestic demand may be lower, which affects the profit of enterprises producing for the domestic market. But taxes on profit and employment decrease directly the profit of all enterprises. In the case of consumption taxes there are no big differences among the clusters, as you can see in Figure 2.

Note how the consumption tax burden varied over time and how close their GDP shares were to each other. The rules of consumption taxes are harmonised in the EU except for the rates. Although there are some minor differences by the country groups, the differences are much lower than for the average tax burden (see Figure 1).

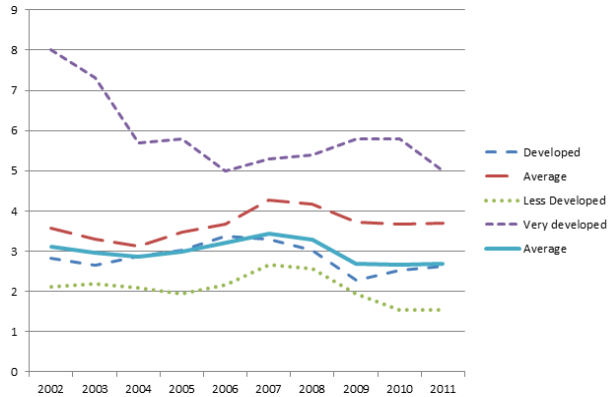
Source: Eurostat

Figure 2. Consumption taxes/GDP ratio in the clusters between 2002 and 2011

The indirect tax burden increased in all three country groups after the eruption of crisis (not in Luxembourg, however). It seems, that majority of the countries tried to compensate for the lacking tax revenues by increasing the taxation of consumption. By the way, this policy helps to balance the current account (by taxing imports) and indirectly to encourage savings and debt repayment.

If we look at the variance of indirect tax burden, only approximately 10% of the variance can be explained by the clusters (excluding Luxembourg); 90% of variance come from the clusters inside. So we can state that the level of indirect taxes does not depend on the indebtedness or economic growth indicators in the EU.

In point of tax competition, direct taxes have more relevance, since the final target of tax reduction is to improve the competitiveness of manufacturing. Within the category of direct taxes, corporate tax is of more importance than taxes on employment. Now significant differences can be observed among the country clusters. Let us look at first the changes in corporate tax income (Figure 3).



Source: Eurostat

Figure 3. Corporate tax income/GDP in the company clusters between 2002 and 2011

After the crisis the corporate tax income decreased in each country cluster. However, this decrease is better explained by the smaller tax base (fall in company profit) than the decrease in tax rates. But as a sign of tax competition the decrease was bigger in the less developed segment than for the other country groups, with the exception of Luxembourg. Here the corporate tax rates were also reduced.

If we study the variances, the explanatory power of clusters increased from 40% (2002) to 71% (2011). This means that the country clusters harmonise their corporate tax strategies, while the difference among the clusters increased. However, there was a moderate decrease in total variance (from 1.45 to 1.38).

Even larger differences can be observed for the taxes on employment. Taxes on employment include social contribution fees, personal income tax, and other taxes paid by employer or employee. Figure 4 shows the change in taxes on employment.

Data source: Eurostat

Figure 4. Taxes on employment/GDP ratio in the country clusters between 2002 and 2011

It is obvious that the developed countries have the largest burden on employment. These countries have got generous health and pension system whose financing requires sources. To finance the social contribution, the share of these taxes remained the same in the average and the developed cluster. But the less developed country cluster the tax burden decreased, regardless of whether we look at the pre- or post-crisis period.

One-factor variance analysis underlines the significant differences among the group. Here the variance among clusters rose from 81% to 89% (excluding Luxembourg) for total variance. In the less developed segment the lowering of taxes on employment seemed to be a common strategy to manage the post-crisis economy.

These clusters were not appropriate to test the linkage between tax competition and economic openness, because there was no significant difference in openness among the clusters. That is why I try to directly examine the relationship to draw the relationship in scatterplot. I plotted several charts for direct taxes, the change in direct taxes and the two indicators of economic openness (export to GDP, FDI to GDP). But the plots appeared ramdomly and did not indicate a relationship. The other examinations carried out in this way brought the same result. So I cannot justify Hypothesis 3. The failure max be caused by the fact that governments stimulate the settlement of multinational companies rather by giving targeted subsidiaries and tax allowances and by granting overall low tax environment. In addition, a favourable tax environment is only one factor which the companies consider when choosing a location: there are other more vital factors (security of investment, accountability of economic environment, skill and competence of labour force) which affect the decision.

CONCLUSIONS

From the analysis I have found that the tendency towards tax competition is the strongest in the less developed country cluster. These countries decreased the taxes on employment and corporate income rather than indirect taxes. This tendency was valid not only before, but also after the crisis. But after the crisis the stimulus for tax competition increased in the less developed country cluster.

The economic growth of the less developed cluster was significantly better than that of the other country clusters, but the level of public debt to GDP was lower. These two factors make it possible to enter the tax competition.

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Tax Evasion or Tax Optimization: is there any Narrow Path between the Two?

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SUMMARY

There are three disadvantages of the taxation system in Hungary: the explicit and implicit taxes on work income, its transparency and the long-term predictability of tax regulation, and the extent of tax evasion. Minimizing tax evasion has always been a significant task in defending a country's budget-based income. Besides the loss of revenue, tax-avoidance also deforms the effects of the tax system's redistribution, simply because it causes an unintended redistribution between those who pay and those who avoid taxes. Discovering the causes and repairing the tax morals are only possible after a thorough 'diagnosis'. In the present phase of the research, the different forms of tax evasion are dealt with.
Keywords: tax evasion, tax wedge, competitiveness, tax regulation, tax reform, tax morals
Journal of Economic Literature (JEL) code: H260

INTRODUCTION

In Hungary, regulations about not letting the moral risks grow could be one – if not the only – solution for breaking out of the long-existing (economic) stagflation. The Department of Economics of the University of Miskolc (DE-MU), in collaboration with the National Tax and Duty Office (NTDO), aims at researching the possible causes and forms of tax evasion, ways of repairing the tax morals, and the formation of the present opinions on the NTDO as an organization. This article summarizes the present state of the research.

Minimizing tax evasion has always been a significant task in defending the budget-based income of a nation. Colloquially, the two concepts mentioned above in the title – tax evasion and tax optimization – are often used interchangeably. Tax evasion clearly means an illegal activity, while tax optimization functions within legal frameworks. Based on an example of an enterprise, hiding and not providing tax declaration of the actually acquired income is tax evasion (or simply tax avoidance[1]). However, presenting the same income as capital income (instead of work-income) can be considered tax-optimization[2] (Scharle et al., 2010).

OPTIMUM TAXATION

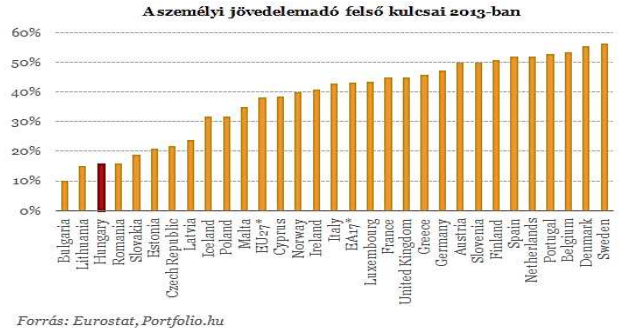
Based on tax theories and empirical results, there are three disadvantages of the taxation system in Hungary: the explicit and implicit taxes on work income (especially the different social allowances), the transparency and long-term predictability of tax regulation and the extent of tax avoidance. Merely reconstructing the present tax system is not enough for economic growth, but tax reform can strengthen the positive effects achieved in other areas. The financial crisis puts a burden on such reform ideas, but on the other side it forces/encourages the reconstruction of Hungarian economic regulations (Elek & Scharle, 2008).

Taxes Imposed on Work

Comparison reports by international organizations state that the taxes imposed on work in Hungary are too high, despite the significant lowering of the income tax rate (Scharle et al., 2010). This is in fact also the most dominant barrier to economic growth. As a result of tax regulations, the proportion of work taxes (within the GDP) dropped; however, from the global investment

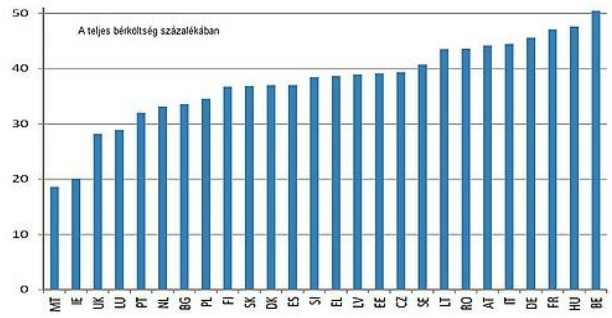
[1] *In present study, considering that the two concepts (tax avoidance as part of tax evasion) are the same from a budgetary deficit point of view, they will be used interchangeably.*
[2] *This is particularly emphasized in tax systems where the two types of income fall under different taxation methods (i.e. capital income has a lower tax proportion than work income).*

point of view, it remained high in comparison to the regional competitors. The explanation for this ambivalence is that in the last few years (as a result of the global crisis), the European countries also lowered the taxes on work in order to keep up a normal level of purchasing and consumption. The core process is well-presented by the tax wedge: the 55% tax wedge in the years before 2010, due to the 16% flat-rate personal income tax, dropped to 49% by 2013. Despite this 6 % drop, our position has not changed due to strong tax competition. Figure 1 & 2 gives an indication of the situation described above.



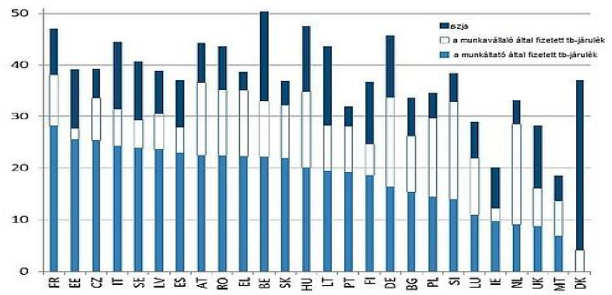
Source: Eurostat, Portfolio.hu

Figure 1. The upper tax bracket of the personal income tax in 2013



Source: Eurostat, Portfolio.hu

Figure 2. Taxes imposed on work in proportion to the full income in %, 2013



Source: Eurostat, Portfolio.hu

Figure 3. Percentage indication of taxes imposed on work (dark blue: personal income tax, white: the social insurance paid by the employee, light blue: social insurance paid by the employer)

Among the EU countries, Hungary occupies the second place after Belgium in the tax wedge proportion list. This position was also typical in the last decade. Therefore, as lowering the tax rate does not seem to help in the country's competitiveness, further lowering proposals should be considered carefully. Figure 3 indicates in which areas potential lowering can occur.

In Hungary, the general tax level per income, in the form of personal income tax and social insurances paid by the employer and employee is higher than the EU average. Consequently, it is a question of political values, economic rationality and fiscal force, by which figure (employer or employee), in which area (tax or contribution), and to what extent taxes imposed on work can be lowered. Obviously, further research is required on which tax types should be enhanced and which investments from the budget should be cut down on in order to counterbalance this process.[3]

Tax Regulation

Besides the rate of taxes, the lack of the tax system's transparency and predictability poses the largest threat to the country's competitiveness and judgement about its business environment quality. The administrative burdens connected with taxation and the effect of the different legal regulations on the economic figures also belong to this dilemma.

The main characteristic of the Hungarian tax system is its complexity and ever-changing nature (Kátay, 2009). According to theoretical models and empirical research, the unpredictability of the tax system reduces the volume of investment. In general, uncertainty lowers the future value of the income of enterprises. Great uncertainty, nevertheless, postpones the decision about irreversible investments. The most significant source of uncertainty is the (lack of) authenticity of the economic-political steps. The investor should consider in advance whether a given reform is durable enough or not. In case of an economic-political step with questionable authenticity, the waiting time is prolonged, and obviously, investments are postponed. A general feature in decision-making observed in ex-socialist countries is that the stability and predictability of the incentives is far more important than the mere proportion of the incentives (Bélyácz, 2009).

Besides their real function, legal regulations and their changes always have an unintended negative effect on society. The cost of tax administration is an example of this. The main question is: what costs do the tax imposition; its collection and its verification carry in themselves? On the one hand, they usually emerge in the public sphere in the form of direct costs of the tax-collection and verification institutions. On the other hand, they emerge in households and enterprises. In these last two cases, the most notable loss of costs (which can be

[3] *The research of this essential problem is not part of the present study.*

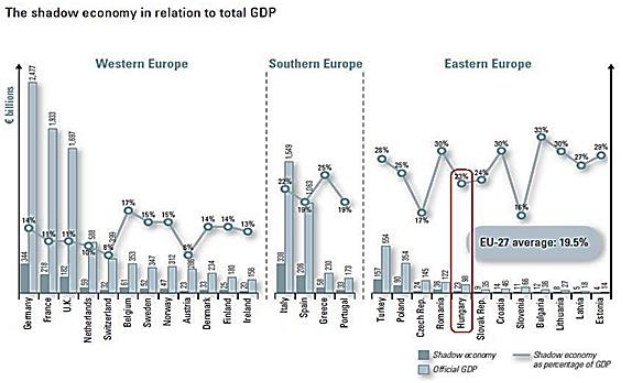
neglected on a social level) is the costs of the actual payment of taxes and the cost of fines (Deloitte, 2009). From a social point of view, further costs on a national level are also significant to mention. One part of them is the costs of investment and education connected to obeying the tax regulations; another part is the costs of registration and the continuous declaration. These emerging costs are not necessarily correlated with the income generated by the present type of tax; they rather show a connection to the frequently changing, complex and often ambiguous legal regulations[4] (Barr, 2004).

The sustainability of a tax reform largely depends on the reactions of the entrepreneurs. If an economic-political step is not credible and thus the enterprises do not respond, without the intended prosperity (as a self-fulfilling prophecy), the government is forced to withdraw the reform ideas. Another typical example of the effect of taxes is when the various tax- and subsidy elements change the behaviour of the economic figures. For instance, when the tax imposed on work keeps the employee from activities on the labour market; when the enhancement of the work costs lowers the labour demand of enterprises; when the interest tax influences savings; or when the corporate tax cuts down on the investments of enterprises. These examples are of essential value and influence – although to various extents – the income and expenditures of public finance (Brys, 2010). For now, it is sufficient to be able to recognize the phenomenon; later in the article it will be differentially examined.

Tax Avoidance

In the present phase of the research the different forms of tax avoidance are dealt with. Discovering the causes and repairing the tax morals are only possible after a thorough 'diagnosis'. Besides the loss of revenue, tax avoidance also deforms the effects of the tax system's redistribution, simply because it causes an unintended redistribution between those who pay and those who avoid taxes. It also affects the economy, because nowadays in several industrial branches the avoidance of taxes is leading pricing practices and creating employee expectations. Therefore, those who do pay taxes have to face a vast competitive disadvantage, while tax-avoiding enterprises gain an unrightfully high level of competitive advantage. A further negative consequence is that the tax avoiding possibilities (without the tax avoidance) in fact lead investments towards less profitable activities. Nevertheless, if the tax system makes other economic activities impossible, then from a social welfare point of view tax evasion and the continuation of the present activity could be seen as advantageous. The tools of legal inspection cannot always catch up with the tax avoiding techniques, so these inspections often reach individuals who do fulfil their taxation responsibilities. As a consequence, the moral tension is growing in taxing processes, which turns even the regularly taxing individual towards tax avoidance (Fortin et al., 2007).

Based on recent estimations of the OECD about the shadow economy, tax avoidance can be seen as a general characteristic in Hungary. The extent of the problem is indicated in Figure 4, showing that the untaxed incomes are equal to 23% of the GDP. The tax effect of this is 2 trillion HUF.



Source: Eurostat, Portfolio.hu

Figure 4. The shadow economy in relation to total GDP 2012

In view of the Hungarian budgetary data, it becomes evident that if by the reparation of the tax morals, structural reform of the tax system and broadening the rate of tax-payers, the role of the grey economy could be lowered to the EU-average of 19.5%, then it would mean a 1 trillion HUF budgetary income growth for the country.[5]

Possible Causes

In studies about the grey- and black economy and corruption, research question about the causes of tax-avoidance often rises. Obviously, various answers can be found among countries with different taxation cultures.[6] According to the standard economic view, tax avoidance depends on the rate and inspection of taxes. Inspection, however, has two essential aspects: the risk of being caught red-handed and the rate of the fine (Slemrod & Yitzhaki, 2002).

The inspection of the Tax Authority can only be successful if it has adequate remedies against tax-avoidance. This statement from the economic figures' point of view is as follows: tax avoidance depends on its relative yield; in other words, what is the degree of 'savings' by fraud in proportion to tax paying? A risk-neutral tax payer will be lawful if the degree of tax is lower than that of the expected fine.[7]

[4] *In case of certain environmental product prices, the costs can be in proportion to the budget income, generalized by the tax type.*
[5] *Such an amount would obviously in itself compensate for the budgetary deficit.*
[6] *This could be a particularly interesting comparative analysis, using cross-cultural elements, which would provide useful information for governments and international companies.*
[7] *The expected value of the fine is the probability of being revealed multiplied by the combination of the fine and the taxation responsibility.*

An effective counter-act to tax evasion is the enhancement of fines and inspection procedures.

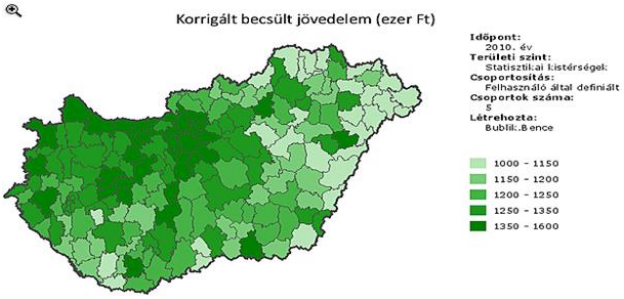
According to applied models, the risk of being unveiled and the degree of the fine is always in inverse ratio to tax avoidance. The degree of the tax, however, does not show correlations with tax avoidance; tax rates can positively or negatively affect tax avoidance, depending on the calculation method of the fine and the speculations about being revealed (Ali et al., 2001). The tendency to pay tax in reality cannot be explained only by the risk of being caught red-handed or by the rate of the fine; as opposed to the forecasts of standard models, more people pay taxes than expected. However, models that take social correlations into consideration make a more accurate estimation. According to these models, social influence can have three resources:

- The need for conformity, following rules, and belonging to groups
- The possibility of learning from others
- The need for justice

Therefore, the following aspects may also influence a tax paying tendency: information about others' tax paying customs, information about tax evasion methods, a well-balanced distribution of tax burden, the quality of governmental policy and the customer-friendly functioning of the tax office (Fortin et al., 2007).

Existing Consequences

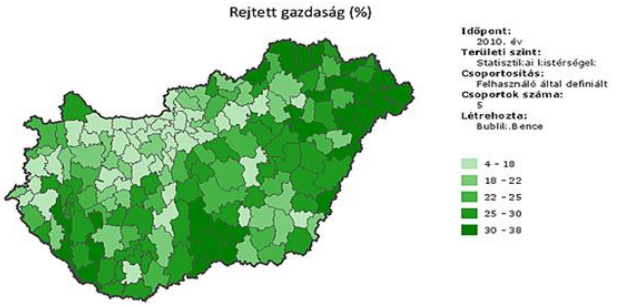
The economic split of Hungary is a well-known fact. Numerous studies have dealt with the comparison of the western and eastern regions (e.g. Fazekas et al., 2013). There is no homogeneity on a regional level, but the phenomenon exists, fuelling social and economic problems. Considering it from a tax evasion point of view, there is also a well-defined line between the western and eastern regions; however, having a closer look at the more homogenous micro-regions, interesting patterns can be seen. In Figure 5, the income division of the small regions can be observed. The lighter shades indicate lower average incomes.



Source: Economic and Regional Studies of the Hungarian Academy of Sciences

Figure 5. Corrected estimated income (in thousand HUF), 2010

North-East Hungary and the Northern Great Plain, along with the southern part of the Great Plain and southern Transdanubian regions, belong to the lower income line. Contrarily, Central Hungary and the northern Transdanubian regions show higher income rates. This not so surprising result for economic experts and laymen alike is worth further analysis, using Figure 6. On this map of the hidden economy, Hungary is also divided into small regions, where the darker areas indicate the presence of hidden or shadow economy.



Source: Economic and Regional Studies of the Hungarian Academy of Sciences

Figure 6. The division of shadow economy by micro regions

This map of Hungary seems to be the reflection of that depicted in Figure 5. Tax avoidance as a response to tax rates thus not only varies among countries or country groups. According to the chart it has become obvious that within a country (belonging to a certain tax culture) the regions can also simultaneously show different tax morals. Discovering the causes of this phenomenon can greatly contribute to the explanation of tax avoidance and the definition of the parameters for enhancing tax morals, which could form the aim of the next phase of the study.

THE MOST FREQUENT ECONOMIC CRIMES

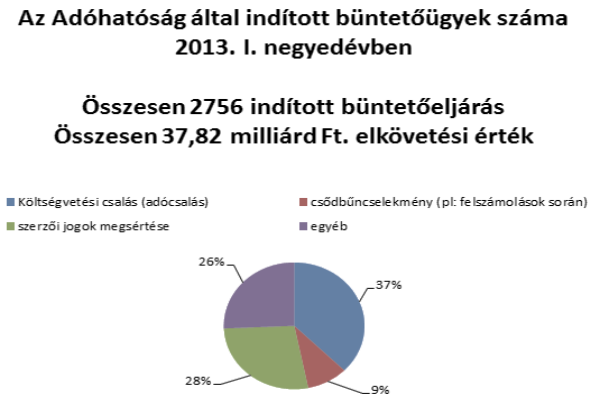
The two most important categories of economic crimes involve budgetary fraud (including tax evasion) and bankruptcy crime in windup processes. Figure 7 gives an indication of the criminal procedures[8] initiated by the NTDO's Criminal Directory department in the first quarter of 2013.

In total 2756 criminal procedures were initiated for 37.82 billion HUF; blue: budgetary fraud (tax fraud); green: violating copyrights; red: bankruptcy crime (e.g. windup processes); purple: other.

The economic crimes[9] known up to this point can be broken into 37.4% budgetary fraud, 27.54% violation of copyrights, and 9.4% bankruptcy crime. In all, 77.84% of the 37.82 billion HUF deficit (i.e. 29.44 billion HUF) was caused by crimes belonging to budgetary fraud.

[8] *In case of bankruptcy crime it is usually not the NTDO who starts the prosecution, but rather the enterprise itself who initiates the windup.*

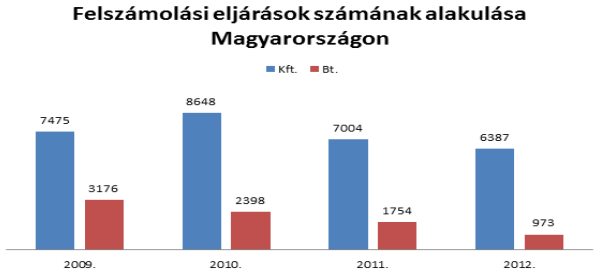
[9] *In 2012, the financial detectives of the NTDO discovered various economic crimes with a total value of 121 billion HUF. The budgetary fraud (mainly tax fraud) committed at the expense of the Hungarian state was worth 94.86 billion HUF.*



Source: NTDO Criminal Directory

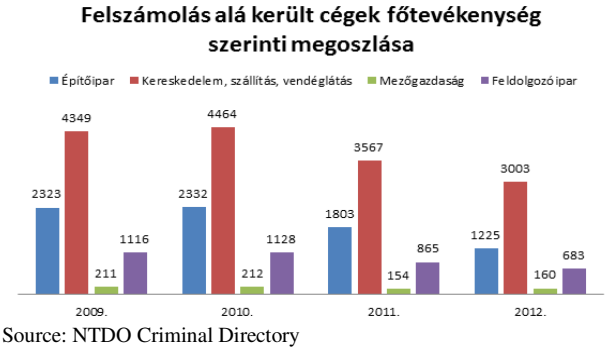
Figure 7. Criminal procedures initiated by the NTDO (1st quarter of 2013)

Budgetary fraud is the most frequent crime in inspection reports. Along with this, the perpetrator is also sued for the falsification of private documents, as the tax declaration is in fact a private document. The most important cause of prosecution within budgetary fraud is connected to the VAT; however, other types of misuse with social insurance and other social allowances cannot be neglected. In windup procedures, the most important cause is indicated as bankruptcy. Figure 8 depicts windup procedures in the last few years.



Source: NTDO Criminal Directory

Figure 8. Windup procedures in the years 2009-2012. Blue – limited corporations; red – partnerships



Source: NTDO Criminal Directory

Figure 9. Distribution of main activities of companies undergoing windup procedures, 2009-2012. Light blue – construction; red – trading, hospitality; green – agriculture; purple – processing industry.

As a result of the financial crisis, the tendency for number of companies winding up to continue growing has been disrupted, and, although the numbers are still high, nowadays a reduction can be observed. When researching this tendency of this economic structure, dividing windups into the main activities of these enterprises can be revealing. The results are indicated in Figure 9.

This division according to industrial branches may contribute to the efforts taken to reach the goals of present study.

SUMMARY

In the last period, the fight against tax avoidance has been moving through an essential process, as a result of which a better tax system is about to evolve in Hungary, living up to international standards. It is the foremost task of the NTDO to synchronize, unite and develop the efforts against tax avoidance. Due to professional cooperation, the discovery of tax evasion and other economic crimes is year by year more efficient, contributing to the 'whitening' of the economy. However, it would be an illusion to say that tax avoidance can be completely eradicated. There will always be individuals/enterprises who try to represent income gained from tax fraud as legally obtained. Therefore, emphasis should be put on prevention, based on a tax system and inspection structure that is able to resist tax avoiding intentions. Its realization should occur on an international level as economic crimes know no national bounds. Cooperation with international organizations and living up to the international conventions and protocols are a keystone for effective prevention. Immediately adopting the international practise is especially significant, since tax avoiders have good knowledge of the regulations of different countries. They tend to establish their enterprise in a country where the measures still prove to be weak against their tax-evasive methods. Although the focus of present study lies somewhere else, this could be an interesting research topic.

A tax reform can be considered successful if it enhances economic performance, lowers the administrative burdens around taxation and tax avoidance itself, and if the government's value corresponds with the social justice, as also defined in the tax laws (Sivák, 2012). Namely, the market figures react sensitively to taxation changes. Consequently, the demand and supply of the labour force, the investments, savings and the consumption may also change. In case of unexpected reactions of the economic figures,[10] substantially less or more income from taxes can appear in the revenue. These consequences should not only be the priority of economic politicians who aim at enhancing the competitiveness of the country and keeping up the budgetary balance, but also that of the Hungarian society.

[10] *This predictability can be transformed into a highly accurate prognosis with the help of targeted efficiency examinations.*

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Quality Improvement in Accounting

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SUMMARY

Over the last decade the expectations of quality have become involved in the product, service, production and business process. In the last few years, however, quality related expectations have been completed with sustainability (economic, social and ecological) considerations. Therefore the application of the appropriate management/business process and systems are needed to measure the fulfillment of the new quality expectations or company's performance. The aim of this paper is to introduce the new approaches for the appraisal of the company's performance, beginning with conventional accounting through environmental accounting to sustainability accounting. A case study demonstrates the successful implementation of the sustainability accounting system in a Hungarian company.

Keywords: quality; sustainability; sustainability accounting
Journal of Economic Literature (JEL) code: M41, Q56

INTRODUCTION

Sustainability: the new quality? Over the last decades the role and importance of quality was overestimated because quality is a device for obtaining a competitive advantage. According to its general (ISO) definition quality reflects the real and latent expectations of the customer with reference to the product, service and process. These quality-related expectations should not only be involved in the production processes but in the business process, too, more precisely in the course of the operation of an accounting system.

Although the notion of quality is related to the product, service (output) and process, it also could be connected with the customer. However, this does not mean that output can be only a tangible product or service, or the customer only could be interpreted as an external utilizer. The accounting information produced within the company also could be considered as a special output for which the principle of quality is valid as well. The internal organization units of the company too can be a receiver or utilizer of information, thus those expectations relating to quality cannot be less important than the expectations of an external customer. In the 21st century these expectations comprise the requirements – economic, social and ecological values – of sustainability, too as a new component of quality. All this can be provided by planning and operating a sustainability accounting information system.

From the changes of recent decades it is clear that traditional accounting does not offer sufficient relevant information for stakeholders about the creation of sustainability, and thus it must be reformulated and expanded. This had led to developments in accounting. In spite of the fact that there is now a relatively wide range of literature dealing with environmental accounting (Gray 1993, Debnath et al. 2012), and many have studied the subject from many perspectives, only a few articles have focused on sustainability accounting (Jasch & Lavicka 2006, Ngwakwe 2012).

The aim of this paper is to introduce the approaches for the appraisal of a company's performance. We shall begin with conventional accounting, discuss environmental accounting, and finally focus on sustainability accounting. A case study is discussed to demonstrate the contribution of sustainability accounting to obtaining a competitive advantage in a Hungarian company. The article brings new insights to the discussion on planning and operating sustainability accounting system; thus, it fills the gap between theory and practice.

FROM SUSTAINABILITY TO CORPORATE SUSTAINABILITY

A very rich literature is available on sustainability, so it is an important task to properly define the content of this concept as a starting point of further examination. After clarifying its content, the incorporation of the conceptual elements of corporate sustainability becomes possible.

The Dimensions of Sustainability

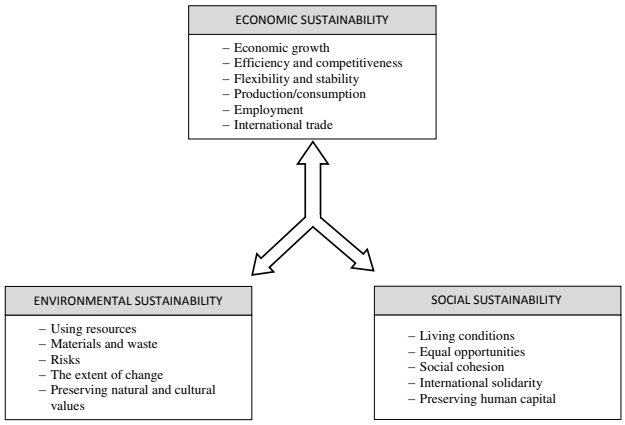
The philosophy of sustainability derives from the ideas laid down in the so-called Brundtland Report (1987). According to the report, 'sustainable development' is defined as follows:

"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs (...) Sustainable development is not a fixed state of harmony, but rather a process of change in which

- the exploitation of resources,
- the direction of investments,
- the orientation of technological development, and
- institutional change

are made consistent with future as well as present needs." (Brundtland 1987, p. 16-17)

According to a wider interpretation of the above-mentioned definition, sustainable development means the harmonisation of economic, social and ecological values. The three "dimensions" of sustainability strongly interact with one another, including a variety of factors as shown in Figure 1.



Source: own construction, 2013

Figure 1. Three dimensions of sustainability

There is no doubt that a complex, multifactorial system is needed for the management of the implementation of sustainability, making the measurement of the achieved results complicated. While improvement is experienced in one dimension, in some cases deterioration can be seen in another one. Usually, there is a debate over whether an overall improvement or deterioration has occurred. In addition, it also has to be taken into account that the results achieved at the global level do not necessarily mean efficiency at the level of each and every nation, region, company and individual. However, the established goal has to be the aim of improvement at every level, which, based on our current knowledge, is a major challenge to achieve (Szlávik 2007).

The issues of sustainability can be discussed at various levels, and therefore they require several different approaches. In this study the concept of sustainability is associated with companies and examined at the level of companies.

The Theoretical Foundations of Corporate Sustainability

In the majority of cases, corporate sustainability is seen as an alternative to the traditional growth and profit maximization model by the corporate executives. In reality, it is a new, emerging paradigm. While acknowledging the need for profitability, it differs from the traditional growth and profit maximization models. It expects companies to keep social and environmental goals in mind, particularly the goals related to sustainable development, such as the environment, social justice and equity, and economic growth.

The concept of corporate sustainability borrows elements from the following four well-established concepts:

- sustainable development,
- corporate social responsibility,
- stakeholder theory,
- corporate accountability.

The contribution of sustainable development to corporate sustainability is twofold. First, it helps set out the areas that companies should focus on: environmental, social, and economic performance. Second, it provides a common societal goal for corporations, governments, and civil society to work toward: ecological, social, and economic sustainability.

In the most general terms, corporate social responsibility deals with the role of business in society. Its basic premise is that corporate managers have an ethical obligation to consider and address the needs of society, not just to act solely in the interests of the shareholders or their own self-interest (Kerekes & Wetzker 2007).

Stakeholder theory defines a stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives." The basic premise of stakeholder theory is that the stronger your relationships are with other external parties, the easier it will be to meet your corporate business objectives; the worse your relationships, the harder it will be (Freeman 1984).

The concept of corporate accountability refers to the legal or ethical responsibility to provide an account or reckoning of the actions for which one is held responsible. Accountability differs from responsibility in that the latter refers to one's duty to act in a certain way, whereas accountability refers to one's duty to explain, justify, or report on his or her actions (Fama & Jensen, 1983). Clarify the reporting requirements to help determine the nature of the relationship between the company's managers and the rest of society.

Based on the above concepts Schaltegger et al. (2006) define the concept of corporate sustainability as follows: the economic, social and environmental dimensions of sustainability are integrated into corporate strategies and activities. Therefore it is necessary to secure the sustainable operation of the company from each of the three sides.

- In economic terms, a company can be considered to be sustainable if – beyond the reimbursement of fixed costs – it fulfills the owners' profitability requirements, with the potential of making some more profit and in addition it brings. The economic turning point comes when all costs are paid back and the profitability requirements of the company are also met (Illés 2002).
- In social terms, companies operating in a sustainable way make their contribution to social value creation through increasing individual human capital and supporting social goals. They manage social capital in such a way that stakeholders can understand its motivations and can broadly agree with the company's value system (Dyllick & Hockerts 2002).
- According to the ecological approach, sustainable companies are characterized by the rational exploitation of natural resources and the aim to minimize the damaging environmental impact of their production activities. All this is done to preserve the quality of natural resources as well as the economic opportunities offered by them (Institute for Development and Methodology, State Audit Office of Hungary, 2005).

Currently, not all companies operate in line with the principles of sustainability. However, some companies are publicly committed to the application of the appropriate sustainability management methods and tools.

COMPARISON OF TRADITIONAL, ENVIRONMENTAL AND SUSTAINABILITY ACCOUNTING SYSTEMS

Based on the above approach, companies need to build up and operate an accounting information system that meets the requirements of sustainability. The development stages of accounting towards this direction are described below.

Changes in Traditional Accounting

Traditional accounting systems are information systems supporting the daily operation of economic organizations, with the purpose of observing, collecting, recording, measuring, and classifying the economic events that have an influence of the company's assets, financial and earnings position, together with their impact. Therefore, the aim of accounting for stakeholders (owners, managers, creditors, inspection bodies, etc.) is to provide accurate information for making future decisions.

The modern approach to traditional accounting can be divided into two areas: financial accounting and management accounting. Financial accounting provides external stakeholders with information by financial reports through "the changes in the tools and resources required for the management as well as the accounts of the economic performance" (Musinszki 2012, p 35), and its practical implementation is regulated by the Act on Accounting. Whereas management accounting is "the complex of decision support methods and procedures, satisfying the information needs of the various management levels and internal users", its task is to identify, estimate, analyze, and provide cost and other internal information for the management (Musinszki 2012, p 35).

In the light of sustainability, however, the generally accepted accounting principles, the range of those demanding accounting information and the content of accounting information all have to be reinterpreted.

1. A new approach to the going concern principle:

One of the most fundamental principles in accounting is the going concern principle, which states that "in the course of book-keeping and preparing the accounts, it must be assumed that the enterprise will maintain its operation in the foreseeable future, will be able to carry on its activities, and a significant decrease or closing down its activities is not expected for any reason" (Act C on Accounting §15 (1), 2000). This wording suggests that only a stable external environment allows the company's activities on an unchanged continuation, and assumes what is also emphasized in Aras and Crowther's (2008) work, namely, observing the going concern principle results in keeping the company's operations maintainable. However, a company's external environment should include the business (economic) environment in which it operates, the local and regional social environment in which it is located, and the natural environment, which, in turn, gives natural limitations to the company's operations (Hódi Hernádi, 2012).

2. Reconsidering the content and the range of those demanding accounting information:

Since the information provided by accounting systems is suitable for preparing and establishing decisions, it is important to make the demanded information available. However, it would be reasonable to give an extended interpretation on the range of stakeholders. Therefore, according to Hódi Hernádi (2012), the population, meaning society itself, the natural environment, especially at local and regional levels, as well as future owners, employees, the next generations, and the future state of the natural environment all have to be taken into

account. After all, the point of sustainability focuses on their needs in order to make all those decision-making opportunities accessible to them that are currently in place for present-day stakeholders.

The fundamental task of accounting is to provide reliable and real information on the operation of the company for market participants. However, different information is needed by different stakeholders. Therefore, an accounting information system should be established that is capable of collecting and organizing the social and environmental information necessary for making various decisions, and is capable of presenting and interpreting them to both internal and external users in a reliable and accurate way. In response to these changing requirements, traditional accounting systems have to change and improve accordingly. The next step of this improvement is the development and the implementation of environmental accounting systems.

The Characteristics of Environmental Accounting

The concept of environmental accounting and reporting appeared in the literature nearly a decade ago. According to Schaltegger and Burritt's (2000, p. 30) definition, "environmental accounting is a branch of accounting that deals with activities, methods and systems; recording, analysis and reporting; and environmentally induced financial impacts and ecological impacts of a defined economic system". Environmental accounting systems basically consist of two parts, one of which deals with the environment-induced financial impacts, i.e. environment-related expenditures and savings, while the other part is concerned with the environmental impacts of the company's business, that is, how the natural environment changes as a result of the company's operations (Almássy 2006). Environmental accounting systems present the above-mentioned effects both by measuring in natural units and expressing in terms of money, as – opposed to traditional accounting – non-monetary and qualitative factors are also strongly emphasized here.

Thus, basically there are four areas of environmental accounting (Csutora & Kerekes 2004): internal ecological accounting, environmental management accounting, external ecological accounting, and environmental financial accounting. "So environmental accounting facilitates establishing a connection between environmental and economic performance together with the presentation of the interaction between these two types of performances" (Pál 2011, p. 128).

By focusing on the company's financial and environmental dimensions, environmental accounting systems ignore the impact of corporate activities on society. However, there are approaches (Yakhou & Dorweiler, 2004) that interpret society as part of the natural environment and consider the sustainability of the natural environment to be the basis of man's well-being, therefore they should not be treated separately. However, according to the conclusion of the present paper, all three dimensions must be taken into account in the development of accounting systems, giving way to sustainability accounting systems.

The Theoretical Framework of Sustainability Accounting

Borrowing the notion made by Burritt and Schaltegger (2010) sustainability accounting is the peak of accounting. Sustainability accounting, reaching far beyond environmental accounting, examines business operations by putting all three – economic, social and environmental – dimensions into its focus, and most importantly, it emphasizes the interaction of these dimensions in accordance with corporate sustainability.

The most widely accepted definition was presented by Schaltegger and Burritt (2010, p. 377):

- "Sustainability accounting describes a subset of accounting that deals with activities, methods and systems to record, analyse and report:
- First, environmentally and socially induced financial impacts,
- Second, ecological and social impacts of a defined economic system, and
- Third, and perhaps most important, the interactions and linkages between social, environmental and economic issues constituting the three dimensions of sustainability."

It can be legitimately asked whether sustainability accounting systems should be treated as completely self-contained, new accounting systems or as simply part of or an extension of traditional accounting systems. According to Schaltegger et al. (2006), the former alternative would be desirable, as it gives opportunities for the actual mapping of the economic, social and environmental risks and benefits, and to the integration of these dimensions into the company's accounting system. Most authors, however, believe that the latter approach is closer to the actual practice, since the gradual modification and expansion of the existing accounting system causes a minor change in the company's strategic management process.

The development of a sustainability accounting system includes the following five elements: the aim of operating a sustainability accounting system; the principles and requirements of operating the system; methods and devices for data collection, data recording, measurement and analysis; sustainability accounts and reports; and the qualitative characteristics of the resulting information (Lamberton 2005). The components of a logical model of sustainability accounting systems as well as the relationships between them are shown in Figure 2.

1. The aim of sustainability accounting systems:

Sustainability accounting information systems are primarily designed to evaluate the performance of the

economic organization in terms of sustainability, i.e. paying special attention to its economic, social and environmental aspects.

Similarly to traditional accounting, sustainability accounting can also be divided into two areas according to whether it provides external or internal users with the necessary information. The external stakeholders' need for information focuses on the accountability of the organization's operations both in social and environmental terms. In addition to this, sustainability accounting information systems provide internal stakeholders – the management – with information relevant to decision making, thus playing an important role in strengthening the internal management of the organization. As it is possible to determine the effects and consequences of the measures taken to achieve sustainability objectives in the course of performance evaluation, it gives a good basis for the preparation of a possible intervention, that is, for feedback.

2. The principles and requirements of operating a sustainability accounting system:

During the development of a sustainability accounting system, some important principles and requirements should be taken into consideration that specify the methods and devices applied in the course of data collection, measurement, and evaluation, as well as the content and the process of reporting.

The sustainability accounting system is elaborated at a corporate level, and because of this, it applies to economic organizations obliged to prepare reports and it is not relevant at the macro-level.

As already mentioned, with the reinterpretation of the going concern principle, existing accounting principles also gain new meanings both in social and environmental terms. Lamberton (2005) highlights one of those principles, namely the principles of sufficiency. According to his approach, it is not possible to record and analyze all impacts on society and the natural environment, thus, those impacts should be put forward that pose potential threats to mankind and the natural environment or that are essential for the company's decisions.

The following principle is the interpretation of sustainability at a corporate level. It is an important issue because it determines the framework of the whole system. The company's sustainability goals, the compound realization of economic, social and environmental sustainability raise the issue of their integrated measurement and performance evaluation. Due to the complexity of the company's sustainability performance evaluation, the boundaries of the sustainability accounting system have to be clearly marked in a way that the system can still be managed by the company. It has three levels. First, the essential inputs and resources that influence or incidentally limit the operation of the company have to be taken into consideration, then the direct effects of the company's activities on the society and the natural environment, that is the outputs. The supply of inputs, in other words, the environmental and social performance of suppliers, also has to be taken into account (Lamberton, 2005).

The following essential requirement is the selection of the proper period for accounting, evaluation and analysis, that is, the determination of the period in which the company is evaluated in terms of sustainability. It is advisable to choose a monthly, quarterly or annual period in accordance with the traditional accounting standard. However, the sustainability accounting system needs to be applied in a longer time frame since it has to take into account the social and environmental impacts of the company's products and services through their entire life-cycle.

The evaluation of the social and environmental impacts caused by corporate activities or the entire life cycle of a product requires the application of non-monetary, qualitative indicators beside the usual monetary indicators for measuring economic or financial performance.

3. Methods and devices for data collection, data record, measurement and analysis:

The sources used for collecting and recording data are wide-ranging and abundant, however, in the selection process some cost-benefit aspects should be enforced.

Based on the collected economic, social and environmental data, it becomes possible to measure the company's sustainability performance, and this requires a variety of benchmarks and evaluation methods. Some of these are the cost estimation of decision alternatives regarding sustainability (Bebbington & Gray, 2001), input-output analyses, life cycle analyses, and the mapping of social and environmental impacts. One of the most complete methods available for the management is the Sustainability Balanced Scorecard (SBSC), an integrated indicator system aimed at evaluating the company's performance (Fülöp and Hódi Hernádi, 2012), which is the basis for decision-making and monitoring the realization of objectives.

Considerable attention should be paid to the evaluation of environmental protection measures and the costs of social and environmental liabilities in order to make the company accountable in terms of sustainability.

4. Sustainability accounts and reports:

The fourth part of sustainability accounting focuses on distributing both quantitative and qualitative information to users. Here, there are two key questions to be answered. What is the appropriate form and content of a sustainability account? How often should these reports be prepared and published?

Sustainability accounting information are presented by the SBSC including a wide variety of performance indicators, and other sustainability reports based on the guidance of the Global Reporting Initiative (GRI).

Such reports should be made regularly through the entire lifetime of a product. It is reasonable to present and publish the company's accounting information related to sustainability on its website. The sustainability of the

company's accounting information should be presented and published on the website, thus this continuously updated information on sustainability is made available promptly to the stakeholders.

5. The qualitative characteristics of information on sustainability:

The information provided by sustainability accounting systems has to meet a number of important requirements. These are based on the characteristics of traditional accounting information, as well as on the guidelines of GRI sustainability reports. The two highlighted features are transparency and controllability. Transparency demands the complete publication of processes, procedures and assumptions (GRI, 2002). Controllability requires that the recording, organizing, analysis and publication of the presented data and information should be done in a way that enables auditors to certify data reliability (GRI, 2002).

The further requirements concerning sustainability information are: completeness, credibility, neutrality, clarity, materiality, timeliness, comparability and readiness for interpretation in the context of sustainability.

It is reasonable for companies wishing to comply with the requirements of sustainability to design and operate sustainability accounting systems since it is a kind of financial language for decision-makers. According to SIGMA (2003), sustainability accounting is a bridge which leads the company to the bank of a sustainable operation and behavior. The main characteristics of the different accounting systems are summarized in Table 1.

Since traditional, environmental and sustainability accounting systems examine the company's sustainability performance through different dimensions, the content of the obtained information varies,, giving different tasks to the particular accounting systems. The modified range of tasks is noticeable in the areas and the applied methods of the accounting systems. Despite the fact that there are so far no compulsory standards for the operation of sustainability accounting systems, these requirements will certainly appear in the long term.

Table 1

Comparison of the characteristics of traditional, environmental and sustainability accounting systems

Aspects for comparison	Traditional accounting system	Environmental accounting system	Sustainability accounting system
Dimension	– Economic (financial) situation	– Relationship between economy (company) and environment	– Integrating economy (company), society and environment
Target	– Presenting general economic situation – Cost management	– Presenting environmental performance – Presenting environmental liabilities and costs	– Presenting sustainability performance (including economic, social and environmental performances)
Field of application	– Financial accounting – Management accounting	– Environmental financial accounting – External ecological accounting – Environmental management accounting – Internal ecological accounting	– Sustainability financial accounting – Sustainability management accounting
Method	– Evaluation processes – Cost accounting	– Evaluating environmental performance – Life-cycle analysis – Analyses on environmental costs and savings	– Evaluating sustainability performance by applying the methods of other disciplines (biology, sociology) – Sustainability Balanced Scorecard
Unit of measurement	– Money (inventories excluded)	– Money and natural units	– Money and natural units
Forms of accounts	– Financial and accounting reports – Internal reports	– Environmental reports and accounts	– Sustainability reports and accounts – Global Reporting Initiative
Regulation strictness	– Compulsory due to legal regulations (financial accounting) – Voluntary (management accounting)	– As part of the Act on Accounting, some reporting requirements on environmental performance	– Not regulated, voluntary

Source: Hódi Hernádi, 2012

THE ILLUSTRATION OF THE OPERATION OF A SUSTAINABILITY ACCOUNTING SYSTEM

The following case study illustrates how a sustainability accounting system can be operated in one of Hungary's largest chemical companies.

Background Information on TVK

The Tiszai Vegyi Kombinát Public Limited Company (TVK) has 1,097 employees today and its annual sales revenue is about 374,584 million HUF. It is a production company which makes ethylene and propylene by processing naphtha and gasoline as raw materials that are further processed into small-, medium- and high-density

polyethylene and polypropylene by applying state-of-the-art technologies. It supplies raw materials not only to the domestic market but also to plastic manufacturing companies throughout Central, Eastern and Western Europe. The plastic products made from the raw materials supplied by TVK are essential for both industrial users and the broader public.

Along with Slovnaft Petrochemicals, s.r.o., located in Bratislava, TVK composes the Petrochemical Division within the MOL Group, which holds a leading position in petrochemical sector in Central-Eastern Europe and – in terms of its production capacities – is one of the ten largest polymer producers in Europe.

The structure of TVK's Sustainability Accounting System

The company is aware that nowadays the benchmarks of long-term success and social acceptance cannot be observed only in economic indicators. Its activity is increasingly evaluated in the light of the company's ability to reduce negative effects on both the environment and society. This goal is served by the development and operation of a sustainability accounting system.

1. The aim of TVK's sustainability accounting system:

TVK's sustainability accounting system contributes to the long-term realization of sustainability by providing a well-established and applicable planning, decision-making and operating process. On this basis, the operation of the system is annually reviewed by using such benchmark documents as the Dow Jones Sustainability Index and the expectations of the international conventions for the purpose of complying with industry best practices; furthermore, existing and missing elements are continuously identified in order to see "what progress the company has made".

Its sustainability accounting system evaluates the efficient implementation of the sustainability objectives; furthermore, it encourages continuous improvement efforts, and helps to increase the level of awareness and transparency.

2. The principles and requirements of operating TVK's sustainability accounting system:

Every industrial sector and every corporation have different objectives and, therefore TVK is not exceptional in individually identifying and defining its objectives and tasks in terms of sustainability, which reads as follows: Sustainable development is a corporate commitment for us that is aimed at equally integrating economic, environmental and social factors into our daily business operations, maximizing long-term value and keeping the license we received from society to carry on our operations (TVK 2013). As a chemical company, it has a significant impact on the environment and society; the negative consequences of its operations are reduced by applying the principles of precaution and responsible care.

The company marks the boundaries of its sustainability accounting system following the guidelines made by is the UN's Global Compact and the GRI. In practice, it means that the company defines its objectives within the three dimensions of sustainability, and evaluates its sustainability performance. The economic aspects primarily mean value creation, but the increase of customer satisfaction, the development of the local economy and infrastructure as well as reducing the possibility of corruption are also included. The social dimension is filled with the involvement of stakeholders, the organization of social investment programs, the improvement of employability, the development of human capital, ensuring the society's health and safety conditions and raising customers' environmental consciousness. The environmental aspects extend to energy use, water consumption, reduced pollution, waste management, the moderate use of hazardous materials, the use of recycled materials, the protection and rehabilitation of the land and the conservation of biodiversity.

The evaluation period of the company's sustainability performance is basically determined on a yearly basis. During product development, however, the "cradle to grave" concept also appears, that is, the health and environmental effects of these products are taken into account through the whole life cycle of the product.

The currency unit employed by TVK, according to its size and international influence, is expressed in million HUF or in thousand Euros. In addition, metric tons are commonly used as a natural unit of measure, partly for measuring the weight of the produced goods and partly for measuring environmental impacts.

3. Methods and devices for data collection, data record, measurement and analysis:

The nature of information its sustainability accounting system is required to collect is derived from TVK's sustainability objectives. In most cases, the indicators are based on measurement and calculations but sometimes it also happens that they are based on estimations, depending on the subject or on the premises. The operational environment and the company's performance are constantly analyzed and evaluated in order to fully meet the shareholders' expectations.

Economic performance is evaluated by the quantification of environmental and social costs and revenues, the application of risk matrices, life-cycle analyses and benchmarks. The impact on society is examined with the help of stakeholder analyses and social efficiency indicators. The company's environmental performance is monitored by applying condition test methods, eco-efficiency indicators, and input-output analyses. Since TVK pays special attention to developments contributing to sustainability, it measures the percentage of the realization of such investments together with their average level of preparedness.

For the integrated evaluation of corporate sustainability performance the Sustainability Balanced

Scorecard is used. Apart from this, the company examines its compliance with the requirements of the GRI, its position in the ranking of sustainability and corporate social responsibility, and it also appears in the definition of the Dow Jones Sustainability Index and the Oekom Research index.

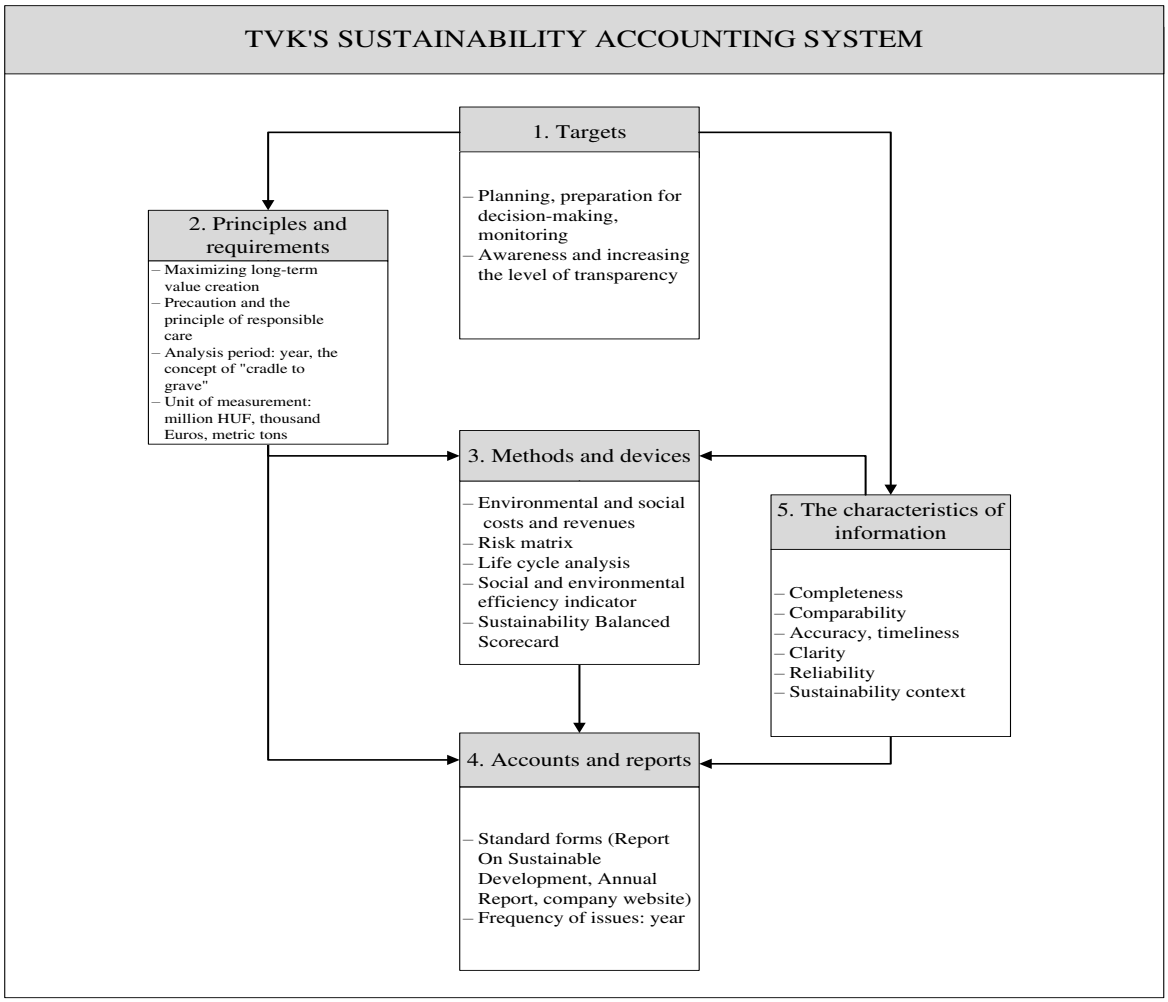
4. TVK's sustainability accounts and reports:

From the above, it is obvious that TVK is committed to sustainability and communicates its achievements to the stakeholders. An annual report is issued on the company's sustainability performance. Although monthly and quarterly reports are issued for to the board of directors, they usually focus on the financial situation of the company, lacking any social and environmental information. The evaluation of sustainability investments and projects is an exception, provided that they report whether their realization is carried out in due time, in the required quality and below the originally approved budget.

The company developed a standard form for its reports, ensuring the comparability of its accounts. In terms of economic and financial issues, detailed information can be found in the Annual Report, while more can be read about the company's sustainability performance in its Report on Sustainable Development. It has to be emphasized that the company's Annual Report also includes data reflecting its sustainable performance in an integrated way.

5. The qualitative characteristics of information on sustainability:

By providing as much detailed and accurate industry-specific information as possible, TVK aspires to the greatest level of transparency in order to minimize the risks related to the anticipated economic, social and environmental changes and developments, and to ensure the comparability of the results. Therefore, the accounting information on its sustainability performance has to be relevant, complete, comparable, accurate, timely, clear and reliable and they equally have to be concerned with both the positive and negative effects (a balance should be sought after), they have to be in line with the stakeholders' expectations, and they have to present sustainability connections as well. As a summary of the above, a logical model of TVK's sustainability accounting system is shown in Figure 2.



Source: own construction based on Lamberton (2005)

Figure 2. The logical framework of TVK's sustainability accounting system

The Benefits of Operating Sustainability Accounting Systems

Sustainability accounting systems must primarily meet the needs of those demanding the information. Accordingly, the function of a sustainability accounting system is to identify, collect, analyze, and communicate feedback on the company's economic, social and environmental performance. TVK's sustainability accounting systems provide appropriate, reliable and real information on the sustainability results of the company. Apart from supporting managerial decision-making, the information provided by sustainability accounting systems can also be utilized in other areas that give a basis for reports on sustainability. The major corporate as well as micro- and macro-environmental benefits resulting from operating the sustainability accounting system of the investigated company are summarized in Table 2.

Table 2
The benefits of operating sustainability accounting systems

Corporate benefits	Micro- and macro-environmental benefits
– Presents the impact of sustainability performance on balance sheet earnings – Maps cost-saving opportunities, revenues and financial advantages originating from sustainability -oriented operation – Evaluates, handles and reduces social and environmental risks, liabilities, cost and expenses – Creates more favourable conditions in the course of economic or investment negotiations, widens the range of potential investors – Helps to determine the cost of production as well as set the price of a product more accurately – Supports establishing cleaner production projects, the evaluation of investments (by mapping the social and environmental effects of investment decisions) – Facilitates appearance on the list of 'eco' suppliers – Facilitates tracing energy and material flows more accurately, contributing to increased resource efficiency – Helps the management to make responsible decisions – Fosters the social and environmental awareness of employees while performing their tasks and strengthens their commitment and motivation	– Satisfies the information needs of external users – Makes better relationships with the stakeholders – Ensures and improves the legitimacy, credibility and the reputation of the company – The public recognizes corporate accountability, transparency and trustworthiness in social and environmental issues, thus improving the company's general acceptance – Facilitates the comparability of the company's sustainability performance to other companies or industrial sectors – Promotes the application and improvement of sustainability accounting by acquiring knowledge on the best practices – Contributes to sustainable development on a corporate, national and global level

Source: Fülöp and Hódi Hernádi, 2013

RESULTS AND SUGGESTIONS FOR FURTHER RESEARCH

The novelty of the paper could be summarized as follows:

- The comprehensive overview of the developing phases of the accounting in the last two decades from the aspect of to what extent the system integrates the principles of the sustainability into itself: traditional accounting (economic factors), environmental accounting (economic and environmental factors), and sustainability accounting (economic, environmental and social factors).
- The comparison of the characteristics of the different accounting information systems (dimensions, target, field of application, method, unit of measurement, forms of accounts, regulation strictness) in order to support the selection of the measures and tools.
- The specification and introduction of a logical model of sustainability accounting system (targets, principles and requirements, methods and devices, form and content features of the information).
- The classification of the company, micro- and macro-environmental benefits of the system.

Obviously, all of this can contribute to complying with the different kinds of quality expectations the companies are facing.

These results, of course, can be regarded as the initial steps of a fresh research project that needs further specification on both theoretical and practical perspective in the future. The following research tasks are needed to achieve these goals:

- Practical application of the conceptual model of a sustainability accounting system.
- The clarification of the impact of the sustainability accounting information supply to the decision makers on the sustainability performance of the company.
- Carrying out further domestic and international case studies for the more explicit illustration of the interactions between quality and sustainability with the application of a sustainability accounting system.

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Intellectual Capital Valuation and Stock Market Performance in an Era of Financial Turmoil: Blue Chip Banks Listed in Stock Exchanges of the Visegrad Countries

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SUMMARY

The core purpose of this empirical study is to investigate the influence of intellectual capital on stock market performance of the Visegrad countries in era of financial turmoil. This study is prompted by increasing evidence that the major drivers of value creation focus on a firm's intangible assets rather than its physical tangibles. In this quantitative analysis, nine listed large banks concentrated in particular national stock exchanges in Prague, Budapest, Warsaw and Bratislava are investigated. The study uses empirical data from Bloomberg Terminal Platform for data management that cover 2006-2012 and Intellectual Capital methods based on market capitalization.

Keywords: Banking sector, financial crisis, valuation, stock exchange, intellectual capital.
Journal of Economic Literature (JEL) code: G01, G10, G21, G32

INTRODUCTION

The financial crisis emerged in the summer 2007, and a year later, with the bankruptcy of the investment bank Lehman Brothers, in the present decade the apogee of panic was reached. It was an unprecedented event in the history of the postwar economy, and had huge implications for the global financial environment. The financial crisis showed the weakness of financial institutions in most developed countries. Fundamental credit condition problems in the region led to pressure on bank capitalization and profitability. Banks had to face real financing problem and roll up their own short-term debt. The examples of financial institutions embroiled in the process of mortgage securitization and securities trading with negative consequences started to cross the geographical borders of the United States. The rapid drop in the US housing market was the trigger for spreading the influence of the crisis to other areas where assets were held. It became obvious that the subprime crisis had transformed into a banking crises and started to steadily infect other assets, not only in developed western countries but in emerging markets as well. The scale of the crisis reached a global dimension, no matter what kind of liberal or conservative policy was dominating in particular markets.

Aalbers (2009) pointed that crisis started in 2007 when credit indicators on the US real estate market began to creep up, accompanied by the fall of prices. The increasing interest rates bit by bit swept away the frontier of the solvency of households and over time they became massively insolvent. The subprime mortgage securities depreciated while more credit institutions went bankrupt or posted large losses. Large credit institutions of the United States such as Citigroup, Merrill Lynch, Goldman Sachs and Morgan Stanley suffered billions of dollars in losses by the end of 2007.

Then a dramatic turn occurred: in 2008 real estate prices in the US dropped by 20% and in some cities the fallen was up to 30%. According to Egedy (2012), another problem was that rating firms were closely intertwined with lending companies like banks, which led to the confusing situation that rating agencies often rated their own decisions. Financial speculation and panic due to deterioration of the situation also became factors in the outbreak of the global fiscal crisis. A similar point of view was presented by Akerlof and Schiller (2009), who pointed out that speculation on the financial markets was the main reason for the crisis. Bookstaber (2007) and Authers (2010) emphasized that problems caused by the crisis lie, on the one hand, in institutional structures and lack of control, and in the weaknesses of state institutions on the banking system and, on the other hand, in the wide-spread misconception that such long-established, large institutions do not go bankrupt.

THE INTELLECTUAL CAPITAL CONCEPT

There is increasing evidence that the major drivers of value creation in present decade focus on a firm's intangible assets rather than its physical tangibles. Over the last three decades the concept of intellectual capital has become popular among many researchers. Even today, after so many years of investigation, there is no universally accepted definition of Intellectual Capital (IC). For instance, Edvinsson and Sullivan (1996) define Intellectual Capital as knowledge that can be converted into value. From the perspective of Hunter et al. (2005), who categorize IC as a subset of Intangible Capital, the term intangible refers to assets that do not exist physically, and capital relates to assets retained by the organization to contribute to future profits. On the other hand Ross and Ross (1997) define IC as all the processes and the assets which are not normally shown on the balance sheet, as well as all the identifiable intangible assets which may be observed on balance sheets, like trademark, patents and brands.

It is often emphasized that the essence of intellectual capital is based on three pillars: human capital, organizational capital and relation capital with customers and business partners. False illusion lies in the belief that knowledge alone is sufficient to gain an advantage. Knowledge is just the source to achieve the possibility of transformation of potential included in the three pillars into real value for the company. Then we can assume that the formation of intellectual capital in that way becomes the most precious resource in the entire company's assets, making the possibility for the creation of a competitive advantage in the market.

In order to describe the role of IC, Edvinsson and Malone (1997) compared organizations to a tree, observing that both are living organisms with corresponding elements. Available financial documents are represented in the visible components of the tree like leaves and fruit. Assuming that this represents the true nature of the tree, or even of its future health, is misleading. In fact, the root system significantly determines the future health of the tree. According to Stewart (1991) IC is one part of a revolution. Within this radical era of transition to a knowledge economy, information replaces working capital, and intellectual assets replace physical ones. We are now in an era in which natural resources and physical labor have largely been replaced by knowledge and communication as the fundamental sources of wealth. Intellectual Capital is the most important value driver in companies. Additionally Nonaka and Takeuchi (1995), emphasize that a company cannot establish a sustainable competitive advantage without proper knowledge management.

THE CONCEPTUAL FRAMEWORK

The conceptual framework of the present study is to investigate the relationship between Intellectual Capital valuation and the stock market performance of large listed banks in the stock exchanges of the Visegrad countries during the global financial turmoil. Previous investigations and empirical results of studies exploring the connection of IC and stock market performance were inconclusive, as I will discuss later. The second aim of this study is to analyze how the global crisis has affected stock market performance and intellectual capital value. This research focuses only on large listed banks from Visegrad countries for various reasons: the banking sectors in these countries have undergone a major restructuring process in the transition from a centralized to a market economy system. Banking systems in these countries share high levels of foreign bank penetration due to strong economic and financial integration with the advanced European countries. Finally, during the crisis their banking systems became highly susceptible to deepening European debt and the banking crisis.

The basic ambition was to extend the actual empirical studies about IC and the stock exchange and focus particularly on some large banks from countries that are less penetrated and investigated. That is why my basic research question is whether the Intellectual Capital value change of listed banking blue chips from the Visegrad countries affects their stock market performance during global financial turmoil.

The first step in my research is to determine the appropriate indicators of IC valuation among all available that correspond to market capitalization and return on assets and then analyze the empirical results. The hypothesis was defined as follows:

H1: The Intellectual Capital value change of listed banking blue chips from Visegrad countries, affect their stock market performance during global financial turmoil.

For hypothesis-testing purpose I use methods that are based on market capitalization and return on assets. I decided to use the VAIC methodology (Pulic 2000), MVA methodology (Stewart 1990) and MV/BV ratio (Stewart 1997). All information for the application of these methodologies is available in the companies' accounts and public databases. This research uses quantitative analysis and is based on empirical data from Bloomberg Terminal Platform for data management that cover the period of time from 2006 to 2012.

The empirical analysis is undertaken for the four Visegrad banking sectors over the period 2006 to 2012 and involves nine listed blue chip banks: FHB Mortgage Bank Co Plc, OTP Bank, OTP Banka Slovensko, Všeobecná úverová banka, Komerčni banka, Bank Handlowy S.A., Bre Bank S.A., Pekao S.A., and PKO BP S.A. A blue chip company refers to large and

creditworthy company, well established that has financial strength, stability and good history of dividend payments to investors. According to New York Stock Exchange Gropu Inc. (2011) blue chip stock is stock in company with national reputation for quality, reliability and the ability to operate profitably in good times and bad.

RESEARCH METHODOLOGY

Bearing in mind that research is focusing on companies listed on the stock exchange from the banking sector, the research methodology needed to consider the specification of bank's financial statements and data availability. There is no universally accepted IC measurement and evaluation method. Sveiby (2007) categorizes the methods into four groups: market capitalization methods, direct IC measurement methods, scorecard approaches and economic value added approaches. Based on the research of Sledzik, Czerwinska et al. (2010), there is a group of IC valuation methods selected by experts as the most applicable and best suited to the purpose of research. Among them the highest scores were assigned to the following methods: MVA (190), KCE (170), MV/BV (140), VAIC (130), CIV (105) and EVA (65).

Market Value to Book Value Ratio

The Market Value to Book Value ratio (MV/BV) was proposed by Stewart (1997) and is based on conception that intellectual capital is the difference between a company's market value and its book value (Gutherie, 2001). According to the suggestions of Urbanek (2008), construction of the ratio is as follows:

$$\text{MV/BV} = \frac{\text{price\_of\_shares\_x\_number\_of\_shares}}{\text{assets\_-\_debt\_capital}} \quad (1)$$

$$\text{MV/BV} = \frac{\text{market\_value}}{\text{book\_value}} \quad (2)$$

Market value is calculated by multiplication of the actual market price of the shares and the total number of shares, whereas book value is calculated by looking at the firm's historical cost according to the financial statement, in line with accounting rules. This method has been criticized because IC value is determined by accounting policy and the volatility of market price of equity in some circumstances may reflect the mood of investors and be the results of panic. However, the ease of calculation and data availability is making this method one of the most used tools to evaluate IC among others. Further, Ghosh and Wu (2007) identify the market-to-book value ratio (MV/BV) as a proxy measure for measuring the investor response.

Market Value Added

The MVA concept was presented by Stern Stewart & Co. in the beginning of the 1990s. It measures the difference between the market value of the firm and the amount of capital invested. According to Shil (2009) when total market value of a company is more than the amount of capital invested in it, the company has managed to create shareholder value. If the market value is less than capital invested, the company has destroyed shareholder value. The construction of the ratio is as follows:

$$\text{Market Value Added} = \text{Company's total Market Value} - \text{Capital Invested} \quad (3)$$

With the simplifying assumption that market and book value of debt are equal, this is the same as:

$$\text{Market Value Added} = \text{Market Value of equity} - \text{Book value of equity} \quad (4)$$

Further, Thenmozhi (2000) identifies market value added as being identical in meaning to the market-to-book ratio. The difference is only that MVA is an absolute measure and market-to-book ratio is a relative measure. According to Stewart (1994), market value added tells us how much value the company has added to, or subtracted from, its shareholders investment. Successful companies add their MVA and thus increase the value of capital invested in the company. Unsuccessful companies decrease the value of the capital originally invested in the company. The biggest disadvantage of this method is the simplification that intellectual capital value is just the difference between market and book value and in some cases could be negative.

Value Added of Intellectual Coefficient

According to its founder, this methodology shows the abilities of a company in value creation and represents a measure for business efficiency in a knowledge-based economy (Pulic, 1998). VAIC was designed to provide a means by which to measure the efficiency of three types of inputs: physical and financial capital, human capital, and structural capital (Pulic, 2000).

The model has been explored and explained by various approaches to the research application of the model in various stages of the literature. For example, Bontis (2001), made an extrapolation on the theory of reasoned action with additional variables leading to an action theory model of consumption. Additionally, Wang and Chang (2005) classify intellectual capital into four elements – human capital, customer capital, innovation capital and process capital – and relate these elements to

the performance of the firm. Further, Chen et al. (2004) found a significant relationship between the scores of the four IC elements and the business performance of firms, providing evidence of the validity and rationality of the VAIC model and the qualitative index system.

According to Sledzik, Czerwinska et al. (2010), the main advantage of the VAIC ratio is the simplicity of the calculation and the fact that all the necessary data are available in the financial statements of banks. In addition, the indicator allows a comparative analysis between companies operating in the same competitive sector and introduces basic standards for measuring the effectiveness of their activities. However, the VAIC ratio has been subjected to criticism. For example, Puntillo (2009) was unable to confirm the link between the variables involved. The only statistically significant correlation was found between CEE and business performance indicators. Further, Samiloglu (2006) found no significant relationship between the MV/BV coefficient and the VAIC model. The value added of intellectual coefficient can be written as follows (Pulic, 1998):

$$VAIC™ = HCE + SCE + CEE \quad (5)$$

where VAIC = value added intellectual coefficient as an overall indicator of capital employed efficiency, HCE = indicator of human capital efficiency, SCE = indicator of structural capital efficiency and CEE = indicator of asset value efficiency.

The VAIC ratio is determined in five steps: (1) estimation of total value added VA, (2) determination of the human capital efficiency ratio HCE, (3) calculation of the efficiency ratio of structural capital SCE, (4) calculation of the capital employed efficiency ratio CEE, and finally (5) addition of the indicators listed in Steps 2, 3 and 4.

A company's value added VA is defined as a difference between sales outputs OUT, which represents sales, and inputs IN which includes all expenses except labor costs. The formula is as follows:

$$VA = OUT - IN \quad (6)$$

The next step is determining the human capital efficiency ratio HCE. It includes the company's value added and human capital HC, measured by yearly labor costs:

$$HCE = \frac{VA}{HC} \quad (7)$$

Later, we need to calculate the efficiency ratio of structural capital SCE, which includes structural capital SC and the company's value added. It can be written as follows:

$$SCE = \frac{SC}{VA} \quad (8)$$

where structural capital SC is defined as the difference between VA and HC.

The next to last step is calculation of the capital employed efficiency ratio CEE, which is the value added created by one unit of physical and financial capital of a company:

$$CCE = \frac{VA}{CE} \quad (9)$$

Last but not least, we add HCE, SCE and CEE in order to obtain the result of the VAIC ratio.

RESEARCH RESULTS

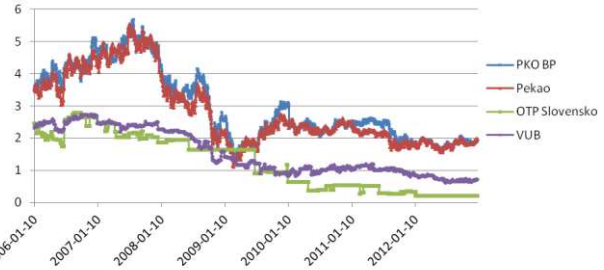
The conceptual framework of the present study was to investigate the relationship between IC value and the stock market performance of nine listed companies in the banking sector of the Visegrad countries between 2006 and 2012. Based on the research question, three major methodologies were selected as best suiting the purposes of the research: MV/BV ratio, Market Value Added, and Value Added of Intellectual Coefficient.

Methodology Results of Measuring Intellectual Capital by MV/BV Ratio

The Market Value to Book Value ratio, calculated by multiplication of the actual market price of the shares and total number of shares by the book value of shares, is one of the most commonly used methods by researchers to present the evidence of intellectual capital in the company. Values of the MV/BV ratio for the nine investigated banks over the period of 2006-2012 are shown in Table 1.

In terms of ratio MV/BV value was the highest for the whole group of investigated banks in 2006 and 2007, before the global financial crisis had reached its apogee in 2008. Among the best performing in 2006 were PKO BP (4.66), Pekao (4.26) and FHB Mortgage Bank (4.17).

The lowest values in the same year were recorded for Bank Handlowy (2.09), Komercni Banka (2.37) and OTP Banka Slovensko (2.65).



source: own calculations based on data from Bloomberg Terminal Platform

Figure 1. The best and worst performing banks by MV/BV ratio values in 2006-2012

Table 1
MV/BV values for investigated banks, 2006-2012

No.	Bank	Country	2006	2007	2008	2009	2010	2011	2012
1	FHB Mortgage Bank Co Plc	Hungary	4.17	3.81	1.11	1.09	1.06	0.57	0.50
2	OTP Bank	Hungary	2.92	2.76	0.77	1.29	1.08	0.64	0.79
3	OTP Banka Slovensko	Slovakia	2.65	1.86	1.64	1.17	0.53	0.32	0.20
4	Vseobecna Uverova Banka	Slovakia	2.71	2.27	1.57	0.84	1.06	0.87	0.72
5	Komercni Banka A.S.	Czech Rep.	2.37	3.34	1.82	2.21	2.25	1.60	1.55
6	Bank Handlowy S.A.	Poland	2.09	2.33	1.11	1.47	1.88	1.38	1.74
7	BRE Bank S.A.	Poland	3.92	4.50	1.50	1.87	1.85	1.29	1.42
8	Pekao S.A.	Poland	4.26	4.05	2.07	2.32	2.33	1.74	1.97
9	PKO BP S.A.	Poland	4.66	4.41	2.54	2.32	2.54	1.76	1.94
	mean		3.31	3.26	1.57	1.62	1.62	1.13	1.20
	standard deviation		0.89	0.93	0.51	0.54	0.66	0.51	0.62

source: own calculations based on data from Bloomberg Terminal Platform

The panic on the stock exchange occurred in 2008 due to financial instability related to mortgage credit, the growth of uncertainty and the bankruptcy of Lehman Brothers Bank in the US. The average MV/BV ratio in 2008 decreased by 52% compared to 2007, from 3.26 to 1.57. However the high volatility on the market and stock price drop did not yet result in the worst value of the ratio; the lowest MV/BV ratio was recorded in 2011 (mean 1.13) and for some banks one year later. Among the banks in 2011 with the weakest results over the whole period were OTP Bank (0.64), BRE Bank (1.29), Pekao (1.74) and PKO BP (1.76). In 2012 the weakest results over the period 2006-2012 were experienced by OTP Banka Slovensko (0.20), FHB Mortgage Bank (0.50), Vseobecna Uverova Banka (0.72) and Komercni Banka (1.55). There is only one example of a bank which recorded its lowest MV/BV ratio in 2008 compared to other years (Handlowy Bank, at 1.11).

After the peak of the financial crisis for all investigated banks, the value of MB/BV ratio was no higher than at the beginning of the research period in 2006-2007. Furthermore, the mean value of MV/BV ratio at the end of 2012 was lower by 64% than in 2006 and 63% lower than in 2007.

On examining the relationship between MV/BV ratio and share price it is found that all banks except for Komercni Banks (r = 0.3922) showed a high correlation with the average being r = 0.7239. Among banks with high correlation were: OTP Bank (r = 0.8391), Vseobecna Uverova Banka (r = 0.8390), OTP Banka Slovensko (r = 0.8333), Peako (r = 0.7918), FHB Mortgage Bank (r = 0.7878), Bank Handlowy (r = 0.7557), PKO BP (r = 0.6712) and BRE Bank (r = 0.6045).

Methodology Results of Measuring Intellectual Capital by MVA Ratio

Market Value Added is essentially the difference between the company's current market value, as determined by its stock price, and its economic book value. The MVA of selected banks shows that at the end of 2006 and 2007 all investigated banks had positive MVA, as given in Table 2.

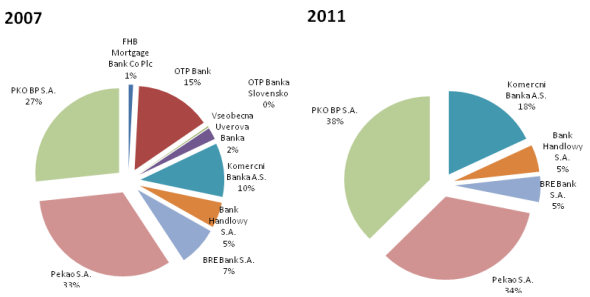
Table 2
MVA values of selected banks in million EUR, 2006-2012

	2006	2007	2008	2009	2010	2011	2012
FHB Mortgage Bank	430.74	362.09	40.11	73.27	172.41	-3.90	-87.49
OTP Bank	6 662.85	6 314.11	-880.84	1 268.07	368.04	-1 624.35	-1 005.19
OTP Banka Slovensko	142.00	90.00	67.00	15.00	-41.00	-60.00	-91.00
Vseobecna Uverova	1 073.00	992.00	350.00	-156.00	59.00	-147.00	-320.00
Komercni Banka	2 474.97	4 461.15	2 104.99	3 334.42	3 672.82	1 850.93	2 389.07
Bank Handlowy S.A.	1 543.73	2 116.00	155.78	717.96	1 444.00	543.63	1 438.16
BRE Bank S.A.	1 920.09	3 268.82	467.58	877.04	1 484.11	516.76	1 120.88
Pekao S.A.	7 551.34	14 093.74	4 123.80	5 878.87	6 758.07	3 532.01	5 306.25
PKO BP S.A.	9 623.12	11 525.16	5 196.17	6 595.12	8 282.04	3 879.50	5 476.53
mean	3 491.32	4 802.56	1 291.62	2 067.08	2 466.61	943.06	1 580.80

source: own calculations based on data from Bloomberg Terminal Platform

The intellectual capital represented by MVA ratio was the highest in 2007, with the average value of 4.8 billion EUR. Pekao S.A., PKO BP and OTP Bank were the top three companies by MVA value, with more than 30bln of EUR. An year later the average value of MVA decreased by 73%, from 4.8 to 1.3 billion EUR. Each year in the period of 2008 and 2010 only one bank showed negative MVA each year, consecutively OTP Bank, Vseobecna Uverova Banka and OTP Banka Slovensko.

During the year 2011 and 2012 four banks – FHB Mortgage Bank, OTP Bank, OTP Banka Slovensko and Vseobecna Uverova Banka – had negative MVA and depreciated it's shareholder value. The lowest average value of MVA was recorded at the end of 2011, with the value of 943 million EUR, decreased by 80%, compared to 4.8 billion in 2007. There were five banks – Komercni Banka, Bank Handlowy, BRE Bank, Pekao and PKO BP – that experienced positive MVA value each year over the period 2006-2012. The biggest contributions to the total value of MVA were made by PKO BP, Pekao, Komercni Banka, BRE Bank, Bank Handlowy, as shown in Figure 2.



source: own calculations based on data from Bloomberg Terminal Platform

Figure 2. Percentage share of MVA values for investigated banks in 2007 and 2011

In 2007 all investigated banks participated in the creation of total MVA value, with the shares holding adequately by Pekao S.A. (33%), PKO BP (27%), OTP Bank (15%), Komercni Banka (10%), BRE Bank (7%), Bank Handlowy (5%) and the rest with less than 4%. The top three banks – Pekao S.A., PKO BP and OTP Bank – aggregated three quarters of the total MVA value in 2007, while in 2011 the top three held around 90% (PKO BP, Pekao S.A. and Komercni Banka).

The total MVA value between 2011 and 2007 decreased by 34.7 billion EUR, from 43.2 to 8.5 billion EUR. The biggest slumps were experienced by OTP Banka Slovensko (-167%), OTP Bank (-126%), Vseobecna Uverova Banka (-115%) and FHB Mortgage Bank (-101%). In contrast, the other banks kept a positive MVA value in 2011, despite decreases in MVA value: Komercni Banka (-58%), PKO BP (-66%), Bank Handlowy (-74%), Pekao (-75%), and BRE Bank (-84%).

On examining the relationship between MVA and share price of company it was found that share price is highly correlated to MVA, ranging from 0.6465 to 0.8491. For the investigated banks, the correlations were as follows: FHB Mortgage Bank (0.7987), OTP Bank (0.8415), OTP Banka Slovensko (0.8386), Vseobecna Uverova Banka (0.8491), Komercni Banka (0.6465), Bank Handlowy (0.8323), BRE Bank (0.7869), Pekao (0.7098), and PKO BP (0.8359).

Methodology Results of Measuring Intellectual Capital by VAIC Ratio

The biggest advantage of this method is that data for calculation can be found in financial statements. In general, the larger the size of VAIC ratio for the selected bank, the better efficiency in the use of capital employed, human capital, structural capital and better value added size. The results of VAIC ratio for the investigated banks in 2006-2012 are presented below.

Table 3
The Value Added of Intellectual Coefficient (VAIC) ratio for investigated banks in 2006-2012

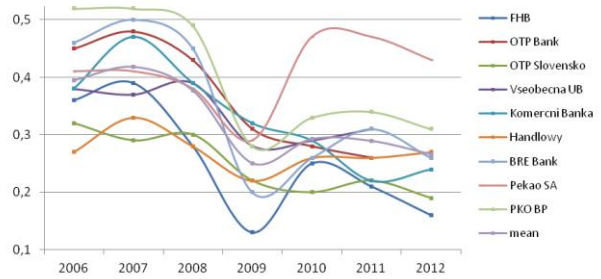
No.	Bank	Country	2006	2007	2008	2009	2010	2011	2012*
1	FHB Mortgage Bank Co Plc	Hungary	4.09	3.72	7.08	7.80	12.01	9.51	5.22
2	OTP Bank	Hungary	4.45	4.08	3.79	3.29	3.14	2.96	-
3	OTP Banka Slovensko	Slovakia	2.56	2.64	2.85	1.94	1.58	2.08	1.64
4	Vseobecna Uverova Banka	Slovakia	4.13	4.37	4.42	3.80	4.10	4.28	-
5	Komercni Banka A.S.	Czech Rep.	4.87	5.21	4.95	4.35	4.66	3.61	4.45
6	Bank Handlowy S.A.	Poland	3.75	3.59	3.05	2.89	3.37	3.29	3.73
7	BRE Bank S.A.	Poland	3.53	3.74	3.95	2.28	3.35	4.11	4.07
8	Pekao S.A.	Poland	4.08	4.05	4.41	3.79	6.17	6.41	6.53
9	PKO BP S.A.	Poland	3.44	3.90	3.95	3.35	3.92	4.24	4.04
		mean	3.88	3.92	4.27	3.72	4.70	4.50	4.24

source: own calculations
* For 2012 two banks had not reported their audited annual reports by the point when data was gathered.

On examining the relationship between VAIC ratio and the share price of company it was found that share price is moderately correlated to the value of VAIC ratio, in a range from -0.4307 to 0.6653. Correlations for the investigated banks are as follows: FHB Mortgage Bank (-0.4307), OTP Bank (0.6473), OTP Banka Slovensko (0.6653), Vseobecna Uverova Banka (0.3704), Komercni Banka (0.1376), Bank Handlowy (0.6594), BRE Bank (0.1327), Pekao (-0.3153), and PKO BP (- 0.3067).

The leaders in terms of the efficient use of capital invested in the bank in 2006 include the PKO BP (CEE = 0.52), OTP Bank (CEE = 0.45) and BRE Bank (CEE = 0.46). The lowest values of CEE in the same year were recorded for Bank Handlowy (CEE = 0.27), OTP Banka

Slovensko (CEE = 0.32) and FHB Mortgage Bank (CEE = 0.36). The efficient use of capital invested for the period of research is shown in Figure 3.



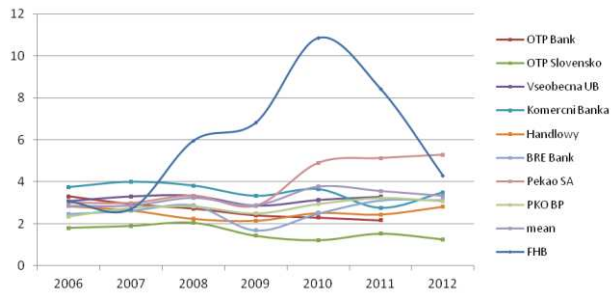
source: own calculations

Figure 3. Capital Employed Efficiency (CEE) ratio for investigated banks, 2006-2012

All tested banks recorded a decrease in the efficient use of capital invested from the peak of 2006-2007 to the bottom, in 2009. Some of the investigated banks have even continued the negative trend to the end of 2012, such as Komercni Banka and OTP Banka Slovensko, and OTP Bank to the end of 2011. The banks recording the biggest slump were FHB Mortgage Bank (-64%), BRE Bank (-56%), PKO BP (-46%), and Pekao SA (-29%) over the period 2006-2009. The major reason was due to the growth of capital employed over the value added between 2006 and 2009. The average value and median value of CEE over the period 2006-2012 amounted to 0.33 and 0.2, respectively.

The highest efficiency of human capital in 2006 was shown by Komercni Banka (HCE = 3.75), OTP Bank (HCE = 3.30) and Vseobecna Uverova (HCE = 3.08). The lowest HCE ratios in the same year were recorded by OTP Banka Slovensko (HCE = 1.80), PKO BP (HCE = 2.34) and BRE Bank (HCE = 2.47).

The values of the structural capital efficiency (SCE) ratio of the investigated banks in the period 2006-2012 are presented in Figure 4.



source: own calculations

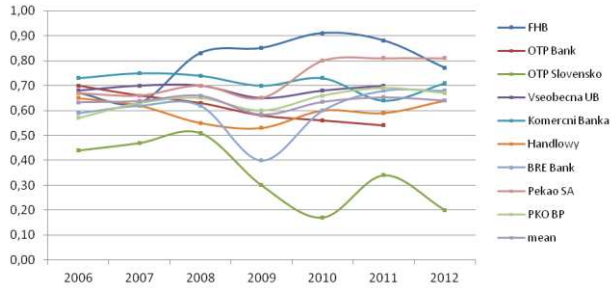
Figure 4. Structural capital efficiency (SCE) ratio of investigated banks, 2006-2012

Regarding the HCE ratio, values have been stable and smooth for the majority of banks over the period 2006-2012 because of low volatile human capital values. The case of FHB Mortgage Bank is an exception, mainly due to a rapid decline of 58% in human capital between 2007 and 2008, but it began to rise again from 2011. The least volatile HCE ratio among banks were Vseobecna Uverova, with a coefficient of variation of 0.052, and Handlowy (CV = 0.098). The most volatile HCE ratios were found for FHB Mortgage Bank (CV = 0.455) and Pekao (CV = 0.264).

The highest efficiency of human capital in 2012 was found for Pekao SA (HCE = 5.29), FHB Mortgage Bank (HCE = 4.29) and Komercni Banka (HCE = 3.50). Most of the investigated banks improved their HCE ratio in 2012 compared to 2006.

A deterioration of HCE ratio was observed for OTP Bank of (-34%), OTP Slovensko (-30%), Komercni Banka (-7%) and Handlowy (below 1%). The mean value of the HCE ratio was the highest for all banks in last three years, between 2010-2012, and was HCE = 3.77, HCE = 3.56 and HCE = 3.33, respectively. Even if we exclude FHB Mortgage Bank, the mean value in the period between 2010 and 2012 will be the highest. The lowest value of average human capital efficiency ratio, HCE = 2.39, occurred in 2009.

The values of the structural capital efficiency (SCE) ratio of banks in the period 2006-2012 are presented in Figure 5.



source: own calculations

Figure 5. Structural capital efficiency (SCE) ratio of investigated banks, 2006-2012

The highest SCE ratios in 2006 were noted for Komercni Banka (SCE = 0.73) and OTP Bank (SCE = 0.70). The lowest value of SCE was recorded in 2009 for OTP Slovensko (SCE = 0.30), BRE Bank (SCE = 0.40) and Handlowy (SCE = 0.53). The lowest average structural capital efficiency ratio, amounting to SCE = 0.35 over the period 2006-2012, was noted for OTP Slovensko due to its weak relation between value added and human capital value. In contrast, the highest average SCE ratios were recorded by FHB Mortgage Bank (SCE = 0.79) and Pekao SA (SCE = 0.73).

Most of the investigated banks noted a decrease in the SCE ratio between 2008 and 2009, except FHB Mortgage Bank, which reported a moderate growth of 2.41% year to year. On the other hand, BRE Bank and OTP Banka Slovensko noted the biggest drops in SCE ratio in 2009 compared to 2008, 35.48% and 41.18%, respectively.

CONCLUSIONS

This paper presents an investigation of the relationship between intellectual capital value and the stock market performance of nine companies listed on the stock exchange from the banking sector of the Visegrad countries between 2006 and 2012.

The methodology used in this study includes MV/BV ratio, MVA ratio and VAIC ratio for calculating IC. It was found that the relationship between the MV/BV ratio and share price is positively correlated between r = 0.3922 and r = 0.8391. All banks except for Komercni Banks (r = 0.3922) showed a high correlation with the average being r = 0.7239. The average MV/BV ratio in 2008 decreased by 52% compared to 2007, from 3.26 to 1.57. However the high volatility on the market and stock price drop did not yet result in the worst value of the ratio; the lowest MV/BV ratio was recorded in 2011 (mean 1.13) and for some banks one year later.

The intellectual capital represented by MVA ratio was the highest in 2007, with the average value of 4.8 billion EUR while an year later the average value of MVA decreased by 73%, from 4.8 to 1.3 billion EUR. Each year in the period of 2008 and 2010 only one bank showed negative MVA each year, consecutively OTP Bank, Vseobecna Uverova Banka and OTP Banka Slovensko.

Furthermore, the relationship between MVA and the share price of listed banks is even higher, correlated in a range from 0.6465 to 0.8491. In contrast, when testing the relationship between VAIC ratio and the share price of the bank, it was found that the share price is correlated to the value of VAIC ratio, ranging from -0.4307 to 0.6653. Those methods which correspond with market capitalization, like the MV/BV ratio and MVA, have shown a higher correlation in relation with intellectual capital value than the VAIC methodology. Negative correlations was investigated only for three banks as follows: FHB Mortgage Bank (-0.4307), Pekao (-0.3153), and PKO BP (-0.3067). All tested banks recorded a decrease in the efficient use of capital invested from the peak of 2006-2007 to the bottom, in 2009. Some of the investigated banks have even continued the negative trend to the end of 2012, such as Komercni Banka and OTP Banka Slovensko, and OTP Bank to the end of 2011. Regarding the human capital efficiency, values have been stable and smooth for the majority of banks over the period 2006-2012 because of low volatile human capital values. The case of FHB Mortgage Bank is an exception, mainly due to a rapid decline of 58% in human capital between 2007 and 2008, but it began to rise again from 2011. Most of the investigated banks noted a decrease in the structural capital efficiency between 2008 and 2009, except FHB Mortgage Bank, which reported a moderate growth of 2.41% year to year.

Nowadays, it is becoming clear that intellectual capital is a key hidden asset value of a company and represents the ability to obtain a competitive advantage.

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Outsourcing and Organisational Innovation: the Example of a Service Provider

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SUMMARY

The history of the gas and oil industry in Hungary goes back to the mid-19th century. This industry and its participants have gone through an organisational structural transition that presents an exclusive example for establishing the modern corporate structure as well as ofvalue-creating opportunities in organisational development.

In the present paper the notion of modern corporate organisation, the reasons for its establishment and its stages are presented through the example of a Hungarian gas provider, supported by theoretical outlooks.

The organisational development of one of the largest Hungarian gas providers made since the market opening (2004) is an appropriate way of representing the economic and organisational benefit within the application of modern organisational theories and strategies. This development presents the effects of the implementation of modern efficiency measuring means and methods (Economic Value Added) in the management operation to meet the expectations of investors. Decisions and steps determining the changes in the corporate organisation give a good example of measures taken to improve the efficiency implemented by centralizing as well as by process optimizing restructurings according to LEANmanagement principles.

The frequent presentation of decisions in classical (IT, mass data management) and competence-assessment-based outsourcing provides examples for effects of cost-saving opportunities and efficiency-improving measures.

The main purpose of the paper is the presentation of organisational development based on the practical evidence of organisational theories and relationships through which theoretical conclusions are proved. In addition, the conception that the efficient practical application of relationships developed by theories means economic benefit for companies is also presented.

However, development is still in progress. On the basis of the practical examples of the past and their theoretical connections there are further challenges in the networking of organisations and the virtual organisational structure.

Keywords: outsourcing, organisational innovation and organisational effectiveness
Journal of Economic Literature (JEL) code: L2

INTRODUCTION

The history of the gas and petroleum industry in Hungary dates back to the mid-19th century. This sector of industry has a long history and its players have experienced favourable structural changes, which set businesses a good example of how to establish a modern corporate structure and offer value-creation opportunities hidden in developing an organisation.

HISTORY OF OUTSOURCING

A Brief History of Natural Gas Production in Hungary

By the 1840s and 1850s several European and overseas countries were involved in extracting petroleum. People had been using petroleum or crude oil and its products for a variety of purposes for years. The industrial-scale production of crude oil began when customers' demand for illumination and lubricants needed to be met. Later people started to use hydrocarbons and their compounds.

The first Hungarian natural gas deposit was discovered in the Transylvanian basin and described by Valentin Frank von Frankenstein, the royal judge from Nagyszeben (Sibiu), in 1690. The first research into petroleum in Hungary began in the 1850s. Several decades later, on 15 July, 1938, the Hungarian-American Petroleum Corporation (Hungarian acronym: MAORT) was founded, which was producing enough oil to fully meet the country's needs in 1940.

In the late 1950s the role of hydrocarbons increased rapidly in the energy sector, leading to the emergence of a hydrocarbon processing industry. The Hungarian Oil Trust was founded. The Hungarian gas industry joined the Trust in 1960 and the Hungarian Oil and Gas Trust (Hungarian acronym: OKGT) was established.

After several re-structuring processes, the Hungarian Oil and Gas Company Plc (known as MOL), was founded in 1991 as a legal successor to OKGT. The Hungarian petroleum industry currently operates within the framework of this company. With the establishment of MOL, an integration of the entire Hungarian hydrocarbon industry was performed after a carefully considered selection process (Vince, YEAR). (Vince: 2009)

This stage in the history of this industry can be considered to be preparation for privatisation and market liberalisation, both from a Hungarian and a European prospective. The European Union opened its natural gas market in compliance with Directive 98/30/EC and its amendments, which entered into force on 8 October 2000 and have been in force for eligible consumers since then. The market opening resulted in the following phenomena (Index, 2008)

- competition on the energy marketwas created;
- service provision was concentrated;
- complex energy services were provided when a service provider had a right to offer several energy and various services.

Since Hungary did not apply for derogation in the energy sector, Act XLII of 2003 on natural gas supply stipulated some business activities, as a result of which MOL lost its monopoly in January 2004. Any holder of the 'licence for the access to the cross-border natural gas transmission pipeline' had the right to import natural gas to Hungary. (Borbély, 2006)

TIGÁZ, THE LARGEST REGIONAL GAS DISTRIBUTOR COMPANY IN HUNGARY

Natural gas was discovered in 1925 in Hajdúszoboszló when thermal water was being searched for. It was primarily used for generating electric power for trams and illuminating train compartments, and later it was compressed, stored in cylinders and sold. The members of the city council of Hajdúszoboszló formed the Hajdúszoboszló Natural Gas Production and Distribution Public Company, a company that produced gas filled in cylinders, on 13 June 1950. This small public company was integrated into the Hungarian Oil and Gas Trust in 1967 and began its activity under the new name of Transtisza Gas Provider and Maintenance Company (Tigáz). Tigáz was the first company in the EU that applied gas pipes made from polyethylene, a very advanced, durable and safe material.

In the late 1980s and early 1990s Tigáz acquired a stake in the Schlumberger plant in Hungary, which produced gas meters. This move considerably contributed to further development of the Hungarian gas network. In the early 1990s, the company became suitable for the implementation of the privatisation programme announced by the Hungarian government. By spring 1994 the national government had elaborated the basic privatisation principles of special strategic sectors.

On 22 November 1995 the Italgas-SNAM consortium acquired a majority stake in Tigáz Plc and Tigáz became a member not only of the Italgas group, but of Eni, an Italian multinational oil and gas company as well. A small gas supplier company operating in two settlements with nearly one hundred consumers in 1957 had by 2000become one of the largest regional gas suppliers in Hungary and a recognised member of Eni group, one of the major energy companies in the world.

ORGANIZATIONAL STRATEGY AND CHALLENGES OF ENI, A MULTINATIONAL COMPANY

Eni is a universal, open and dynamically developing company, whose principle values lie in sustainability, corporate culture, partnership, innovation and efficiency. The main elements of Eni's corporate culture and success are as follows:

- placing people and their wellbeing in the centre of attention;
- developing people's skills and expertise;
- ensuring employees do their job effectively and allowing them to fully exploit their hidden potential and creativity;
- creating a working environment that ensures everybody equal and discrimination-free opportunities and complies with 'value' community norms; (eni Strategic Plan:2012)

In order to achieve the implementation of these fundamental principles, Eni continuously elaborates organisation development projects that ensure adaptability, growth and sustainability. Special attention is paid to human resource management. In 2001 Eni further developed the new organisational model that was suitable for providing efficient support to develop strategic directions of the company group. This move involved delegation of decision-making processes and responsibilities to operative units. The company prepared a basis for the renewal of corporate management, the integration of the Eni Corporate University (www.eni.com) and launched the Internal Communication project. In the following years the direction of organisational development shifted towards controlling centralisation and targeted equilibrium between management and control. In 2003 Eni reviewed the role of the Board of Directors, the corporate governance system, adopted the regulations of Internal Control Committee and Compensation Committee and reviewed several other issues related to corporate governance.

The Board of Directors defined Strategic Guidelines for sustainable development for the period encompassing 2007 and 2010 and set up a special unit for their implementation. The principles of these guidelines can be

seen on the Tigáz website. (www.tigaz.hu)The first sustainability report was published and a sustainability organisational model was elaborated. The Welfare Project and the Health Project were also introduced. Since currently the main objective of the company is to fight against corruption, the New Eni Regulatory System has been adopted.

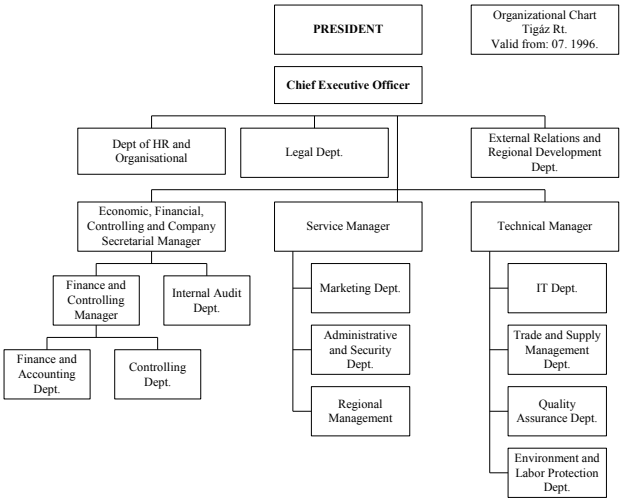

Figure 1. Tigáz organisational structure in 1996

ORGANISATION INNOVATION AT TIGÁZ

The evolution process of a modern corporate structure can be observed at Tigáz. The organisation development process presented in this paper follows the corporate structural and theoretical modernisation trends in an eclectic way, illustrating and justifying the basic principle of the 20th and 21st centuries.

The Conventional Organisational Model

In 1996 -- at the time of its privatisation -- Tigáz was the largest natural gas service provider in Hungary, employing 5,370 people, and had a vertical structure with a broad spectrum of separate departments and directorates involved in great variety of activities. The main activities of the company encompassed the provision of natural gas to the general public (not to the public sphere) and its distribution through natural gas pipelines within distribution areas belonging to the company. The company operated in the form of a public limited company. It had a Directorate General with a president CEO who managed the company's operations. Under the CEO there were directorates and main departments that directly reported to him (see Figure 1).

The territorial units that directly belonged to the Director of Services performed the main activities of the company. However, all territorial units operated completely independently. They were 'autonomous companies'. The term 'line of business' may be used for characterising the operation and clearing system of the territorial units of that time. The territorial directorates within the company structure were independent clearing units. This organisational structure resulted in a broadly vertical and decentralised company operation (see Figure 2).

After the company's privatisation, the corporate objectives – which already included investors' needs and expectations – were incorporated in the company's operation and became one of the inductive factors of high priority in the motivation elements for innovation. However, investors' expectations were primarily aimed at achieving increase in the invested capital. This increase in value could be measured by share prices. However, the changes in share prices did not always reflect the company's performance. Realising this fact, the company management looked for a model for measuring the company's performance. In the early 1980s, the Economic Value Added (EVA) model was adopted, which measured companies' performance more accurately than the natural value of share prices. The EVA metric offered by Stern Stuart Management Services creatively linked the corporate accounting data and performance with the company's performance on the Stock Exchange. Unlike share evaluations, EVA is continuously applicable to performance evaluation.

EVA is calculated from the net operating profit after tax minus 'suitable' alternative costs of the invested capital (WACC x invested capital). Contrary to market-based evaluations like MVA (market value added), EVA is calculated at division or sector levels (a strategic economic level). Contrary to the accounting-based profit like EBIT, Net Income and EPS (earnings per share), EVA is an economic indicator that covers both operating and capital costs.

The Economic Added Value calculations at Tigáz presented in this paper have always produced negative numbers since the company's privatisation. This economic indicator proves that the corporate management has faced serious challenges in order to improve efficiency and increase business results. The reason for such an extremely negative EVA was the high financing costs invested by shareholders during and after privatisation of the company. The return on this huge investment does not seem to be ensured even at present, which makes the current management face exciting challenges (see Table 1).

A positive value for EVA in the examined period was achieved only in 2007, which was the period of legal separation. However, this value is not relevant if the available Tigáz-DSO Ltd data are taken into consideration, since this figure shows the effect of capitalregrouping between the two companies.

Another aspect of the investors' approach is the increasing market competition and globalisation, which has placed corporate adaptability and initiative skills in the focus of attention through turbulent market, technical

and environmental changes in order to stay competitive. Thus, since 1990 the term 'innovative organisation' has been linked with the company's ability to change, rapidly adapt and take the initiative. The direction of structural changes can be considered to be systematic efforts made towards decentralisation, which involve reduction of organisational levels, setting up divisions and using market-based external and internal services. Special attention is paid to integration processes, mainly to the systems supporting company management (VIR, ERP, BSC). Organisational processes have changed since the company became both vertically and horizontally integrated, which is primarily experienced in IT and process management.

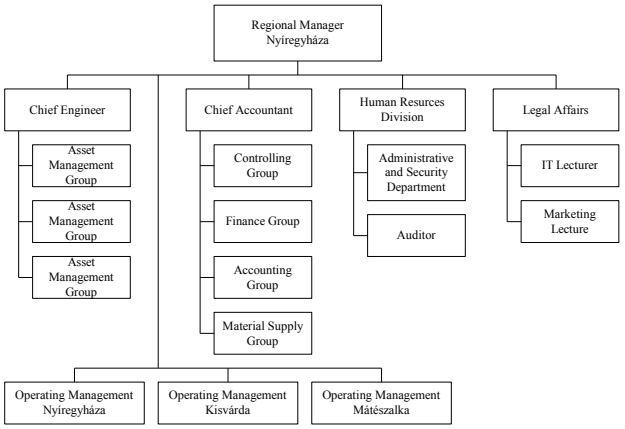

Figure 2. Tigáz territorial directorate organisation in 1996

Table 1
Tigáz's derived economic value added

Data in million HUF	1996	2006	2007	2009	2010	2011	2012
Revenue+other revenue	46 834	234 037	294 564	325 770	312 714	292 598	287 618
Total cost	45 795	234 503	273 859	322 681	310 739	294 529	304 739
EBIT	1 039	-466	20 705	3 089	1 975	-1 931	-17 121
Tax	185	0	0	0	38	0	0
Earnings after taxes net income	854	-466	20 705	3 089	1 937	-1 931	-17 121
WACC	n.a.	6,0%	6,6%	8,5%	8,0%	7,5%	7,9%
Equity	27 228	35 118	158 603	144 498	145 077	138 083	62 191
Cost of Capital [WACC*(Equity+Debt)]	n.a.	2 104	10 420	12 282	11 606	10 356	4 913
EVA (million HUF)	n.a.	-2 570	10 285	-9 193	-9 669	-12 287	-22 034
Staff	3 572	1 814	586	567	583	585	563

In the past a division or a department was operated for strategic reasons and acted as a potential source of development or flexibility, or for historical or sentimental reasons, as in the case of Tigáz. At present this policy does not fit in with tough financial pressures.

THE FIRST STEPS OF PRIVATISATION AND THE EVOLUTION OF A MODERN CORPORATE FORM

Since the investors' objectives changed, the company with its vertical structure concentrated its efforts on implementing disintegration. The company's profile was changed to increase the company's profitability. The activities were redesigned to recoup the losses. The organisation was streamlined and middle managerial and some other positions were eliminated. The amount of the long-term tied-up capital was decreased. The profitability was improved. Due to modularization of services, the logistics and ITsystems rapidly developed. The scarce resources were concentrated on the activities which were drivers of real competitive advantages. As Arun Maira, a product manager at Arthur D. Little, Inc., formulated, "structure is an old paradigm and we have to forget the description of an organisation. Weare actually speaking about organisation – organisation of a process and not about the structure."(Szintay, 2011:4)

Centralization and Cost Efficiency

In terms of organisational optimisation processes, the main objectives are as follows:

- establishing independent sectors of industry for operating natural gas distribution;
- separating natural gas trading and service provision from the organisational structure
- establishing an independent 'Customer Service Directorate' to meet the existing and emerging market and customer needs more effectively in a very competitive environment (see Figure 3).

After reviewing the business activities of the gas industry, it becomes clear that trading with natural gas starts from purchasing the gas through selling it to consumers and finishes with its distribution, which means 'transmitting' the natural gas to consumer points. This process encompasses two completely different business activities in terms of character and content. Trading activities are of service character, whereas distribution activities have a considerable technical content since they involve operation, development, measuring and gas meter reading activities. The listed main activities provided bases for measuring their value- added skills and establishing independent organisations to perform these activities.

The priority given to trading with natural gas resulted from the core character of this activity. The company's fundamental activity was determined and separated from

the other core sectors, namely from distribution as well as from supporting units (HR, legal and financial activities).

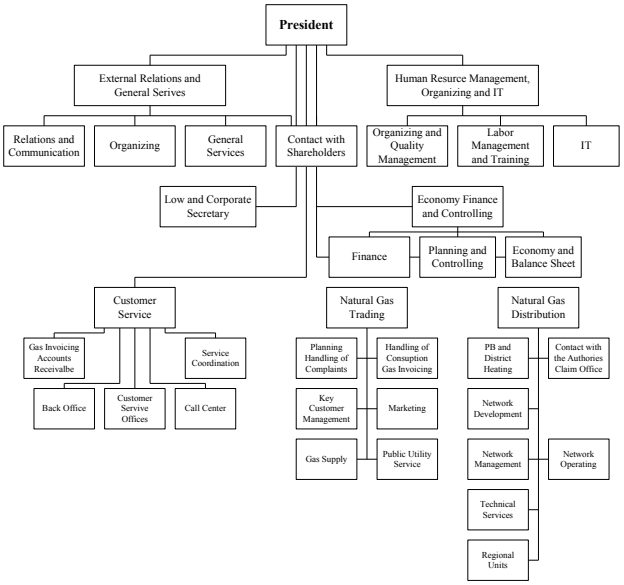

Figure 3.Organisational structure of Tigáz Plc. in 2007

Putting a 'Customer' in Corporate Objectives is a Response to Market Competition

Liberalisation of the natural gas market and increase in market competition resulted in a new need, namely the need to provide 'modern' services to customers. New natural gas service providers operating in a competitive market are not only trying to set customer-friendly prices in order to increase their own sales, turnover and customer base, but they also attempt to provide a broader range of services to achieve higher customer satisfaction and convenience and to ensure customers a better access to more information as well. Thus, a Customer Services Directorate was formed to respond to customer enquiries and provide customer service related to the following areas:

- invoicing and collecting the outstanding dues on the accounts,
- offering back office functions,
- operating customer service offices,
- operating call centres.

Another aspect of increasing efficiency of an organisation is to promote centralisation and cost efficiency. In order to achieve this goal, the activities supporting and assisting the work of core organisations are concentrated and delegated to directorates which directly report to the president.

Model Changes in the Natural Gas Market and Legal Separation

The Model Oil and Gas Conservation Act entered into force in 2004 and was facilitated by Act XLII of 2003 on natural gas supply. The fundamental principles and the model change formulated in the Model Act were further amended by a new Gas Act in 2008. Thus, the regulations of the Hungarian natural gas sector complied with the EU directives. Following this Act, the Tigáz Group shifted from vertical integration towards networking and strategic outsourcing processes, which triggered the development of the organisation in a completely new legal environment.

Customer Services Directorate, as a Supporting Organisation and Lean Management

Both the ever increasing and diversified competition and the competitive market environment made Tigáz review its internal processes and organisational structure in 2008 and 2009 in order to improve its operation and to adapt the lean management practices.

LEAN management is a strategy which helps organisations operate more efficiently and optimize processes. LEAN management means 'creating value with no waste'. Its objective is to optimize all the activities required for value creation and eliminate *muda*, a Japanese word for waste. LEAN thinking results in creating customer-oriented processes. Descriptions of processes and interface, clearly-defined responsibilities, early reactions to committed mistakes and application of simple organisational methods promote stable processes resulting in offering high quality products. (Szintay, 2008)

Organisations fundamentally rethink processes of corporate operations and form a new supporting organisation in order to operate more flexibly, faster and in a more standard way, which leads to increase in efficiency and lays bases for making the first step towards corporate modernization.

New ideas in companies' lives are taking shape. Apart from a 'customer' who is actually a consumer in the core corporate business activity, a 'partner' is emerging. The 'partner' is an organisational unit which uses the services of another organisational unit. An internal service provision emerges since services are ordered and provided; partners' needs are identified and met within corporate processes and operation.

One of the tasks of the new supporting organisation is to ensure services and provide assistance to core organisations in the areas which do not belong to a non-direct core activity. As for Tigáz, its core organisations are Sales and Distribution (DSO). As for the supporting organisation, it is Customer Service, since this organisation was engaged in performing activities related to customers after a great variety of changes had been introduced in the company. Thus, the processes which were centralized after the core areas had been identified were integrated the most efficiently.

The company restructured these functions and integrated customer services in the organisation (see Figure 4). A new supporting organisation was established with the following activities:

- managing customer accounts starting from taking the reading of gas meters to billing customers,
- ensuring uniform collection of outstanding dues on the accounts starting from managing customer accounts through collecting outstanding dues to terminating services,
- promoting customer and communication areas (Office of Complaints, Back Office, Front Office, and Contact Centre),
- establishing an advanced technical and IT background and service coordination.

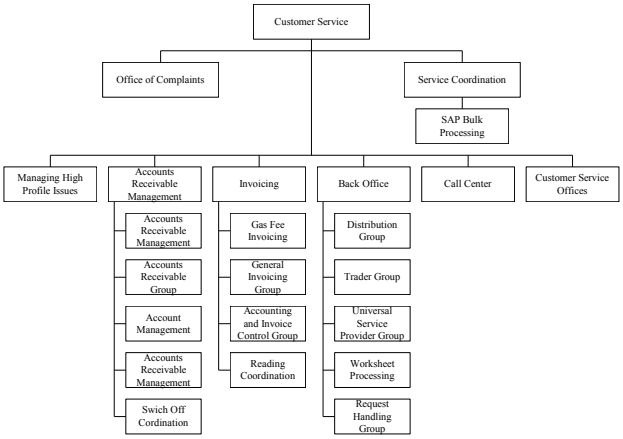

Figure 4. Organisational chart of Customer Services Directorate at Tigáz Plc. in 2009

Outsourcing, a New Organisation Development Method at Tigáz

Tigáz is dedicated to preserving its traditions and corporate culture, which are rooted in large organisational structure, direct management and organisational principles in terms of 'remaining within the boundaries of a sleeve'. As for the further development of the company, there were favourable signs showing that the company still had some activities and processes under its sleeve. There were inefficient business operations and unprofitable investments that caused the company to incur significant expenses and other costs. The return and the efficiency of these activities were not measurable (see Figure 5). At first, Tigáz concentrated on in-company skills, on its strengths and on the 'what are we strong at?' category. Then the company shifted towards external or market factors in order to remain competitive within the national grid. An accurate systematisation of outsourcing objectives was done on the basis of internal and external competencies. The Insigna-matrix provided an outsourcing strategy that the company adopted.

According to most researchers, outsourcing has been given much attention in the past few years because it has been realised that 'it is not the possession of capabilities that counts, but rather the company's ability required to control and build majority of critical capabilities'. Instead of possession companies must strive for capability outsourcing to strengthen their market position, cut costs, streamline the organisation and improve quality. (Szintay, 2011) Outsourcing at Tigáz followed the classical outsourcing processes and was performed in two phases.

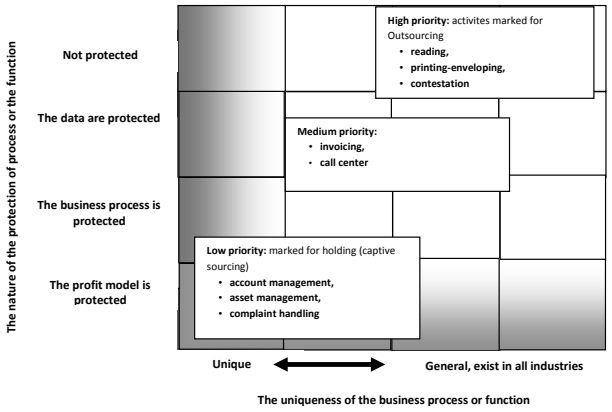

Figure 5. Protection assessment of functions and processes in customer service offices at Tigáz

Classical Outsourcing Practices at Tigáz

Informatics operations and data processing services were the first areas that were outsourced by Tigáz. Tigáz, being a natural gas service provider with the largest area coverage in Hungary, served over 1,200,000 customers. The informatics operations and data processing services of such a huge number of customers involved tasks related to mass data processing (SAP MM, SAP ISU), which could be resolved by ensuring back support. Thus, the Customer Master Data Management as a support to Back Office organisations was outsourced.

Another huge task of mass data management was to handle fact sheets which contained the nature of the work carried out at the consumers' place, such as taking the reading of gas meters, inspecting and exchanging them, etc. All data were registered on paper fact sheets by workers at territorial units and forwarded to the headquarters. The company generated about 450,000 fact sheets a year. Transferring the information from the fact sheet to the SAP business system also belonged to the company's basic activities which were not of strategic importance. Thus, the operation activities related to shipping the fact sheets from territorial units to the processing centre on a daily basis and uploading the information on the fact sheets to the VIP system were also outsourced and supported by an outsourcing agreement. This outsourcing decision resulted in saving costs (see Table 2). In addition, the time that the fact sheets spent in the pipeline was decreased; since they were delivered to the processing place faster, their processing time became shorter, their processing was performed in a concentrated way and the data required for

billing were uploaded to the SAP system in a shorter period of time. This resulted in a more efficient billing procedure and revenue generation for the company.

Table 2
Impacts of Master Data Outsourcing on cost effectiveness

Cost before outsourcing (fictive figures		
Master data management	number of staff	15
	number of worksheets	350 000
	specific human cost (HUF/person/year)	4 208 800
	overhead (HUF/person/year)	162 400
	total cost amount (HUF/year)	65 568 000
Work order processing	number of staff	20
	number of worksheets	600 000
	specific human cost (HUF/person/year)	4 208 800
	overhead (HUF/person/year)	162 400
	total cost amount (HUF/year)	87 424 000
Total (HUF/year)		152 992 000
Cost of the outsourcing activities (HUF/year)		118 250 000
Total cost reduction (HUF/year)		34 742 000

Outsourcing Decisions Improving Cost Effectivenessat Tigáz

In 2007 the second phase of outsourcing decisions targeted such non-strategic business operations as optimization of processes and promotion of organisational efficiency. Reading gas meters represented a key challenge to Tigáz since utility workers carried out the reading of the gas meter and inspected it on site each monthly billing cycle. Before 2007 this work was done by people who had valid temporary contracts with Tigáz and were directly managed by the company. This work was extremely labour intensive and was not really efficient. Outsourcing gas meter readings could be considered to be an attractive decision of business process management. The contracted external parties, whose core activities involve visiting consumers, carry out meter readings cost-effectively. The outsourced reading activities ensure that the contracted parties actually physically visit and read the meter and prove this by taking photos of the meters, which are uploaded to the SAP system and improve process efficiency. In addition, photos of gas meters help discourage utility theft and enable the company to inspect actual natural gas usage. The natural gas provider would like to concentrate its activities on inspection and not on execution of it. However, the company pays special attention to liaising with strategic partners who generate the company revenues by providing accurate and reliable gas meter reading services (see Table 3).

Table 3
Comparison of meter reading services before and after outsourcing

Indicators of meter reading effectiveness		
	Before Outsourcing	After Outsourcing
Status of readers	self-employed trustee	entrepreneur
Reading frequency	monthly	yearly
Documentation of reading	data sheet (meter balance)	data sheet (meter and consumer data) + photo
Effectiveness of reading - meter	100%	97%
Effectiveness of reading - photo	0%	97%
Checking of reading	telephone (based on a sample)	documented with photos

Future Directions in Organisational Development- Integration of Processes

The primary objective of Tigáz Group is to further develop by adapting to the ever changing internal and external challenges and to optimize its operations to achieve sustainable development. The current economic and market environment imposes strict requirements on natural gas industry and natural gas service providers. The current difficult economic situation requires that Tigáz continually focus on customer retention and broadening the customer base. The serious deterioration in the economic situation makes the collection of the outstanding depts on customers' accounts extremely difficult. Tigáz should develop special incentive programmes to motivate customers to meet their contractual requirements and in this way to generate more stable company revenue. Apart from these extrovertal interactions, the company also concentrates on intra-company processes, cutting costs and further increasing efficiency to achieve sustainable development.

Tigáz is making every effort to nurture and grow customer relationships and reacts to this challenge by integration tools and organisational development. The primary aim of integration is as follows:

- implementing integration of tasks and human resource management to improve performance, maximize efficiency and cut costs,
- showing more flexibility in delegating tasks while taking into consideration workload to increase work efficiency,
- setting customer service standards in customer service operations and performance measurements to foster customer satisfaction,
- introducing technological developments to provide support to the aforementioned operations. Customer Services is aimed at establishing two interactive units (see Figure 6):
- the Contact Centre will manage tasks related to 'external customers' (consumers) through both

electronic and face-to-face communication channels,

- back offices supporting business processes will be integrated in a single organisation to improve efficiency.

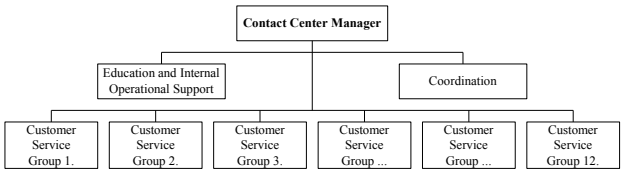

Figure 6. Contact Centre in 2012

The planned measures are expected to result in a more optimal utilization of available resources, flexible delegation of workloadand saving resources and costs.

The development of IT management and governance will provide a basis for implementation of integration to enable the organisational units and groups to perform their work supported by electronic communication and a work-flow system.

CONCLUSION

An organisation of the future is an integrated organisation that has sophisticated IT support, continuously measures performance and keeps the organization in balance to achieve the best performance. The future vision of the integrated organisation formulated in the objectives places Tigáz Group among modern companies and channels it into paths where the company can fully meet the requirements of sustainable development.

This analysis is a basis for further research work aiming to identify and analyse corporate synergies. Identifying and defining the benchmarks and synergies will lead to determining the potential benefits of further integration of the organisation.

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Technological Audit as a Method of Evaluation of the Commercial Attractiveness of the Objects of Intellectual Property

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SUMMARY

Considered in this paper are the questions used to assess the commercial potential of intellectual property objects in the theory and practice of the technological audit. A mechanism for the valuation of the level of commercial attractiveness of intellectual technologies is proposed, and the theoretical provisions of principles, objectives, and outcomes of technological audit are discussed. The features of the technological audit of the results of intellectual activities of industrial enterprises are determined.
Journal of Economic Literature (JEL) code: M15

INTRODUCTION

In modern society intellectual products are traded as purchases of global importance in the background of the rapid and comprehensive development of science and industry. Sustainable success in business and development can be achieved by the enterprise or country that closely follows technological novelties and is at the forefront of scientific and technical progress. Analysis of products of the machine-building industries allows to assert that any firm that does not use the achievements of the past five years in their field of activitybecomes uncompetitive and is much less effective than companies paying due attention to scientific achievements.

Evaluation of the commercial attractiveness of the objects of intellectual property (OIP) is the most important task in the innovation strategy of the economies of developed countries of the world (Abramov A.A., 2012).This is due to the fact that the solution of this problem directly affects the international competitiveness of national production. The object of the cognitions of objects of intellectual property goods is the commercial realization of forming a new feature of industrial organizations (Allen K., 2007). Intellectual property consists in the creation of a specific product which can be introduced into the economic turnover (Brett A., 1995; Zabelina I.N, 2006).

A STUDYOF THE EXISTING SITUATION

In an innovationeconomy, the competitiveness of an organization is determined not only by its ability to satisfy the public demand for production and realization of products, but also the ability to create, implement legal protection and to implement intellectual property on the domestic and the world market (Allen K., 2007). Today the majority of domestic organizations are in the typical situation where the composition of their assetsincludes the objects of intellectual property, which for many years not only were “dead weight”, but which even at the stage of creation were not intended for actual use (Zabelina I.N, 2006).The company regularly continues to bear the costs for maintaining a patent in force, despite the absence of any economic effects of it (Kletkina Y.A., 2008). However, the realities of the modern Ukrainian economy are such thatthe need to protect the innovations which are able to improve the efficiency of production and generate income should be put in first place.This is necessary because of the diversity of the results of scientific-technical activities, so that promising objects of intellectual property with the greatest commercial potential need to be highlighted.

THE ADVANTAGES OF THE PROCESS OF COMMERCIALIZATION

The commercialization of intellectual property is the process of the involvement of the objects of intellectual property in economic turnover, using intellectual property in the business activities of enterprises. We list here a number of practical advantages of commercialization (Kozyrev, A.N., 2003; Pestunov M.A., 2006; Rodionova E.M., 2009; Spiridonov E.A., 2009; Kocziszky G., 2012; Rogers E.M., 1995):

- owners of intellectual property to be founders of companies without paying real money: money replacing the intellectual property contributed to the share capital of the company;
- additional income can be received for the transfer of the right of use of intellectual property;
- intellectual property can be used as collateral for obtaining credit;
- intellectual Property secures new products from competitors in the early stages of its life cycle, as well as protection against unfair competition;;ó
- intellectual property contributes to the creation of the advertising image in providing information about the legal protection of the products or work on the license of a well-known manufacturer;
- intellectual property enables the reduction of the tax on profits by reducing the taxable base by the amount of depreciation of intangible assets and the amount of expenses for creation of objects of intellectual property;
- intellectual property allows to reduce the tax to the added cost, if the transaction is executed as a patent, license or acreator's agreement.

THE SOURCES OF THE EFFECTIVENESS OF THE OBJECTS OF INTELLECTUAL PROPERTY

The economic sense of the commercial realization of intellectual property relations is in receipt of income. The form of the receipt of income is determined by the dual nature of intellectual property objects (Zabelina I.N., 2006; Kocziszky G., 2012; Rosenberg N., 1982). On the one hand, the objects of intellectual property may serve as a factor of production, representing a part of the resource potential of the enterprise or its intangible assets. On the other hand, objects of intellectual property may be a separate object of purchase, that is, the goods. Moreover, another option may be equally effective, to use the results of intellectual activity. The scheme of receiptof income from the commercial realization of intellectual property is represented in Figure 1.

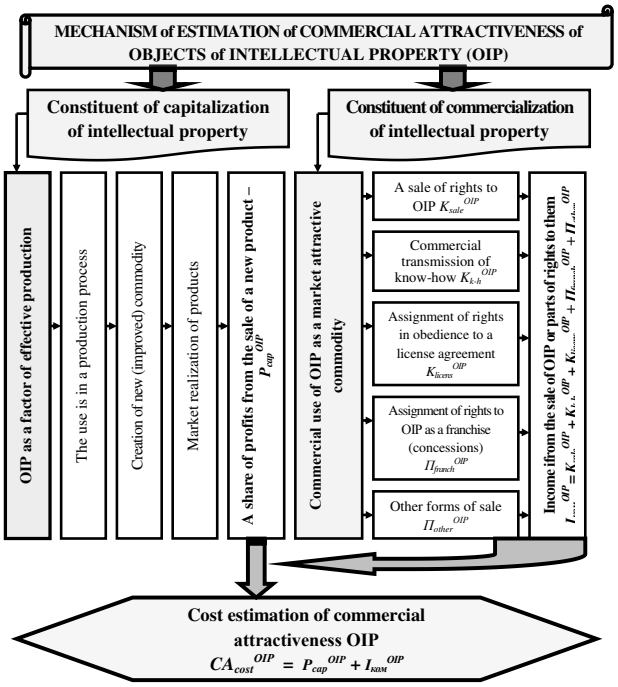

Figure 1. The mechanism of reception of the income from commercial realization of intellectual property

In the process of commercialization of objects of intellectual property as a factor of production there is a gradual transfer of value of intangible objects based on the value of the products produced, the so-called process of capitalization. In this case, the income is a part of the profit from the sale of the finished product, created with the use of innovations.

The implementation of the economic interests of the owner of the results of intellectual creative activity is possible not only at the stage of production, but also in the process of exchange through the commercialization of intellectual property, when the transfer of the rights to the income arises in the form of revenue from sale of the object or of some powers from the range of intellectual property rights. Capitalization and commercial use of intellectual property objects have a significant economic effect (Zabelina I.N., 2006).

TECHNOLOGICAL AUDIT AS A METHOD OF EVALUATING THE COMMERCIAL POTENTIAL OF OIP

Studies have shown (Brett A., 1995; Kletkina Y.A., 2008; Kocziszky G., 2012) that a technological audit is an important method of assessing the prospects of innovative development of an organization and its current technological condition and health.

In a general sense an audit is a process of accumulation and evaluation of information related to a particular economic system, in order to compare it with the established criteria. A technological audit is a variation of the operational audit and is an examination of the OIP, technological processes, methods, techniques, and procedures used in the organization, with the aim of evaluating their performance and effectiveness (Kocziszky G., 2012).

The implementation of the operational audit is, as a rule, a more complex task than that of other types of audit, as the efficiency of operations is usually much more difficult to evaluate objectively than, say, the financial statements based on generally accepted accounting principles. The criteria for the assessment of technological information are less stringent than in the case of financial statements, and are more subjective in nature. Therefore, an operational audit (and in particular, a technologicalaudit) is to a certain extent similar to a consulting company's administration (Table 1).

Table 1
Comparative characteristics of a technological and a financial audit

Aspect of comparison	Financial audit	Technological audit
The main objective of the audit	Tests for compliance of the financial statements with generally accepted accounting principles	Assessment of the efficiency of production and management technologies
References to the time period	Largely retrospective character; focused on the past	For the prospects of economic activity; focused on the future of the business entity
The main users of the information obtained in the course of the audit	Informing external counterparties (creditors, shareholders, tax and statistical bodies, etc.) and managers of the organization	Designed mainly for managers of the organization

Clarifying the essence of the technological audit is assisted by its comparison with the audit of the financial statements on a number of characteristics. While in an audit of financial statements the auditor focuses on whether the economic operations are reflected in the financial statements, in the technological audit emphasis is placed on efficiency and productivity technologies. The audit of financial statements is focused on the past (has a retrospective character),while the technological audit for the prospects of economic activity is focused on the future of the organization. In the audit of the financial statements auditor's report, as a rule, is intended for many users (shareholders, bankers), while the technological auditing is intended first of all for managers (administration) of the organization.

A technological audit is in operation an objective assessment of the capacity of OIP as an object of commercialization. In view of the fact that the commercialization of technologies is a long and expensive process, then, before a lot of time and financial resources are spent, it is necessary to appreciate the feasibility of the sale of the idea or invention or of its successful transformation into a market product. A study of the existing definitions of the technological audit has allowed the author to develop her own definition of this economic category. The technological audit allows us to understand the analysis of the object of intellectual property, new technologies (technology), the state of production equipment, which are involved in the production or, potentially, may be introduced in production or sold on the market. In other words, it is an evaluation of intellectual and industrial potential, as well as the technological capabilities of the enterprise from the point of view of the possibility of their promotion on the market, the economic effect of scientific and technical results, selection of optimal ways of using new technologies and the accumulated scientific developments.

The objects of the technological audit of the industrial enterprises are likely to become:

- objects of intellectual property;
- technologies;
- innovative programs and development plans or reorganization of production;
- production equipment;
- technological regulations and instructions;
- technological road maps;
- cost;
- investment projects.

As a result of these multiple objects, the technological audit of the enterprise can produce very different results. Their composition and priority depends on the tasks set. The author proposes that the main objectives of the technological audit should include the following:

- allocation of new intellectual technologies with commercial potential;
- the allocation of opportunities for their application at the enterprise (sale on the market and increasing the efficiency of production facilities;
- definition of the most probable ways to realize each opportunity;
- identification of opportunities to maximize the profit from the existing scientific development or technology;
- formation of a source of information for the elaboration of the strategy of management of the production potential of the enterprise;
- definition of ways of combining the existing production facilities with new production directions of activity;

- definition of stages of the introduction of new production areas and their value;
- definition of the reasons for instability of enterprises and over-consumption of resources. Development of a plan of activities ensuring a stable production process;
- examination of conformity with requirements of process regulations,such as for production equipment; identification of causes of non-compliance with expenditure norms;
- development of measures for management of the cost price of the technological process.

The process of conducting a technological audit in organizations can be divided into three main stages.

The first step is to review the technologies being used at the enterprise, and evaluation of opportunities of the enterprise in respect of the application of these technologies.

The second phase is an overview of the technologies used in other organizations, primarily those of competitors, and the identification of technological standards, i.e. the best technology usedin practice. The main management tool for solving these tasks is benchmarking.

The third step in the audit process is to compare the use of technology in the organization with the technological standards, which allows to evaluate the effectiveness, and hence the market perspective. The main tool for solving problems of the third stage is the analysis of the technological portfolio of the organization.

To evaluate the commercial potential of the idea (invention) or other object of intellectual property it is necessary to conduct research and search for answers to many questions. The author proposes a methodology for technological audit of the OIP that includes the most important provisions, the essence of which can be reduced to the following provisions.

1. Authorship. In carrying out a technological audit first of all it is necessary to find out:

- who is the author of the object of intellectual property;
- who funded the creation of this object.

Unfortunately, the authors of the invention often do not attach due importance to the issue of financial sources of their development. However, if the invention was made in the course of implementation of scientificresearch, experimental design or technological work under contract, then according to Ukrainian legislation, the customer has the right to use the results of the work provided to it by the executor, including those capable of legal protection, and the contractor shall have the right to use the work results obtained by him for his/her own needs. This means, if the contract did not specify the distribution of the ownership of the treaty in the course of work results, all rights to inventions made during the execution of the work and transferred to the customer, the customer owns and authors can get a return on their invention with the consent of the customer (the usually - written).

2. Patent search. This is carried out with a view to:

- the search for similar inventions;
- search of alternative decisions of task the technological audit of which is conducted.

The existence of a patented identical invention invalidates the further development of the idea (invention). The presence of other solutions to this problem leads to the need to assess the prospects of an idea (invention), not only from the point of view of competition with existing products on the market, but also to the possible competition from another unsold on the market as a product of the invention. Moreover, due to lack of information on the authors of these inventions intention, evaluation must be conducted in any case, even if the invention in the future will not be converted into a marketable product.

A patent search can be done:

- independently, using the available database of patents, the search systems, the Internet, etc.;
- on the server Ukrpatent to conduct a search of Russian patents (a search is partly paid, partly free of charge);
- on the servers of the European patent organization, with the help of the free search engine system Espacenet;
- on the network server Espacenet, which provides access to the interface in Russian language to the world databases of patent information and to patent funds of different countries and international organizations;
- using the services of a patent attorney.A complete list of patent attorneys in Ukraine can be founded on the site Ukrpatent;
- order the carrying out of a search organization, rendering services on conducting a patent search.

3. Inspection of technical feasibility. The method of obtaining the results consists of two consecutive stages:

- checking the reliability of the concept;
- assessment of the performance of the product in the real world.

Validation of the concept is often quite a time-consuming process, because there are only "general considerations" on the reliability of the concept, so it is necessary to confirm the calculations and test them in practice by experiments (in some cases, by simulations). A successful practical proof-of-concept should evaluate the performance of the product (technology) under real conditions of operation, which will be created on the basis of the proposed concept. This assessment will help:

- identify some obvious obstacles to the use of an intellectual product by the end user;
- approximately evaluate the technical characteristics of a possible intellectual product;
- find new areas of application of the intellectual product (technology).

4. Definition of technologies for comparison. To assess market prospects of the intended product (technology) it is necessary to conduct a search of products and technologies existing on the market that solve the same problems and meet the same needs of the buyer. Such a search is best carried out with the help of search engines, which allow you to specify the parameters of search queries. Researches show that the authors of ideas on objective reasons often over-estimate the nicety of the idea, therefore in descriptions of projects, offered for practical realization, a phrase is present "unique technology, not having analogues in the world". In the vast majority of cases (although, of course, there are exceptions), this phrase means only that the authors did not conduct a patent search and search of similar technologies and products, or a search was conducted but not thoroughly. The results of the search should contain the following information:

- products and technologies available on the market and similar in purpose;
- their technical characteristics;
- their cost characteristics (including maintenance).

5. Determination of the market benefits of technology. Assessment of the market advantages of the intellectual product or technology is made up of several components.

In the case when the product has no analogs on the market, the potential market of a product may be very extensive. In this case, the manufacturer most likely will need a substantial investment of financial resources for the advertising campaign of a new product in order to convince the buyer that he (the buyer) must satisfy hisneed (of which he had not known) for a new product. In such a situation it is necessary to carefully assess the market of the intended product.

In the case of analogs of the prospective product being already on the market, we should:

- compare the prices of the intended product and analogs;
- assess the degree of improvement of technical and consumer properties in comparison with the analogs;
- compare the value of the intended product and analogs;
- compare the estimated operating costs and the operating costs of the analogs.

6. Evaluation of market prospects. In evaluating the market prospects of the intended product (technology) it is necessary to take into account the following factors:

- actual presence of market of this object of intellectual property (whether there is a requirement in this commodity);
- the size of the market and its dynamics. Studying the market of any products and forecast of its dynamics over the next few years is a very difficult task and thebest solution is to contact the experts. It is quite possible that the size of the market for the new product is restricted, or negative dynamics mean that by the time of the release of the new product demand will be very small.
- competition in the market. The existence on the market of active competition and large companies–competitors with significant resources–significantly reduces the likelihood of successful commercialization of ideas or inventions.

7. Practical feasibility. Evaluation of the practical feasibility of the idea (invention) is carried out in the following directions:

- the availability of specialists, both in the technical and the commercial realization of the idea;
- estimation of the cost of ideas and the availability of funding;
- availability of materials for realization of the idea;
- term of realization of the project for the commercialization of ideas and a payback period of invested funds;
- procedural restrictions on the production of the intended product.

Now let us consider what is evaluated during the technological audit, how and according to what criteria. Selection of evaluation criteria directly depends on the purpose of the audit and can quite vary greatly depending on the branch of industry, on the situation in the business sphere of a region or country, and on the specifics of the object of evaluation. In general, though its development innovative technology can act on the various aspects of the existence and activities of both the company and its particular enterprise. Therefore, the emphasis and the importance of the criteria for the evaluation of technologies can vary considerably. Table 2 shows the main parameters for carrying out an assessment of the commercial potential and the capacity of transfer of technologies (Brett A., 1995). Comparison of the identified technologies usually begins with such a table. In the cells of the table in the mode of active discussion a score is given for each of the technologies identified in the course of technological audit. Various systems of scoring occur In different countries. In this case either a five-point system (modeled on schools)or some other five-point evaluation system (for example, from -2 to +2) seems convenient with the semantic content of each assessment:

- +2 - excellent,
- +1 - good, acceptable,
- 0 - satisfactory, medium (as well as vague, unknown),
- -1 - poor, significantly below the average,
- -2 - verypoor.

Table 2
Matrix calculation for capacity for commercialization and building technology transfer

Potential for commercialization of intellectual property objects		intellectual property objects		
		№1	№….	№ N
1	The reasonable cost of the commercial establishment of the OIP			
2	The opportunity to obtain not one, but a family of products or applications			
3	The existence of a market			
4	Competitive advantages			
5	Industrial elaboration already carried out or being conducted at the present time			
Final assessment of potential commercializationof the OIP				
The potential transfer of the OIP				
1	OIP is sufficiently prepared to transfer			
2	There is a group that can help in the development or transfer of intellectual property objects			
3	OIP is worthy of attention from a market point of view			
4	Terms of commercialization are reasonable			
5	Actual or potential buyers of technology or license have been identified			
Final assessment of the potential transfer of the OIP				
Total assessment				

In addition, it is possible to go beyond these interval estimates, if any parameter of technology is fundamentally unacceptable (for example, from an environmental point of view, or by reason of dual-use prohibited by specific agreements), or promises such high profits that it may outweigh minor flaws in the other dimensions.

According to the results of completion of the summary matrix for all technologies identified by the customer in the course of the audit, the sum of the points are simply calculated as total points characterizing separately the commercial potential and the potential of the transfer, as well as the final score given as the sum of these two summary points. By the result of audit and there is a report of these three marks on all technologies, on the basis of what recommendation is formulated about the preference of work on the transfer of technologies, collecting maximal marks, and on occasion – and recommendation about the most preferable strategy of transfer or commercialization.

CONCLUSION

The results of the study showed that technological auditing is one of the essential conditions of successful implementation of the results of innovation activities in any country. The individuality of innovative products requires each of the enterprisesto develop their own approach to this process. Therefore, for the effective commercialization of objects of intellectual property enterprises need to pay particular attention to the selection of a method of commercialization. The enterprise which can not only develop an innovation, but also the right to implement it, is able to preserve its competitiveness and increase the efficiency of its activities.

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Forming the Strategic Potential for Development of Machine-building Enterprises: The Balanced Scorecard in Use

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SUMMARY

The methodological approaches to strategy development for engineering companies using balanced scorecard are described in the article. The results are given of an analysis of strategic potential of modern Ukrainian machine-building enterprises. An indicator of the current state of the base potential and integral index of the potential of the enterprise forinnovative development is proposed that characterizes the use of the strategic potential of Ukrainian machine-building enterprises.
Keywords: strategic potential, internal and external environment
Journal of Economic Literature (JEL) code:M11, M40

INTRODUCTION

The long-term effective operation of any company, including an engineering firm, requires that its growth and development are determined by the right choice of strategic guidelines that allow the best way to realize the potential human capital and other resources of the enterprise. The strategy that the company selects must ensure sustainable economic growth and development of the company, increasing its competitiveness. Therefore, engineering firms are now faced with the task of development of effective management, including strategic management, in order to take the lead.

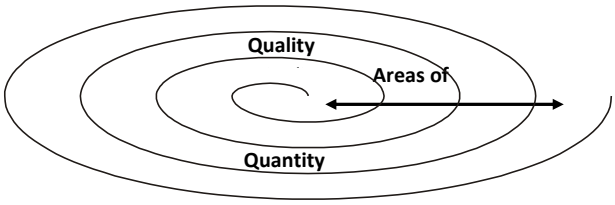
The problems of strategic management, how to evaluate and formulate strategic directions of development potential, and problems of methodological of predicting outcomes of development strategies are important for modern enterprises and are analyzed through various aspects in a number of scientific works.In particular, Kaplan and Norton studied the causal relationships between strategic objectives of enterprises and structural units and functional services based on the Balanced Scorecard. Marytnenko andIgnatieff described the basic principles of strategic management. Rampersad paid attention to the formation of the mission and strategic goals based on the concept of a universal system performance of the enterprise. Fedulova, Ivakina, and Malyarets described and studied a modern criteria balanced scorecard (BSC) for defining and shaping an effective strategy for avcompany. Shekhovtsova, Mizyuk, Shershneva, Thompson and Strickland explored the nature of management and its place in the management system,ad analyzed the content management objective laws governing the functioning and development of the organization's management system in market conditions.

The basis for practical calculations is primarily statistical and financial information of machine-building enterprises of the Kharkov region in 2007 to 2011. To achieve this goal a system of general and special methods was used.

POTENTIAL DEVELOPMENT OF MACHINE-BUILDING ENTERPRISES

It must be noted that modern enterprises for sustainable development should be considered as a condition of the internal environment, as well as constant and variable conditions of an unstable external environment. At the same time we believe that the strategic development of the company has properties as shown in Figure 1:

- cyclicity - a property that is to move from quantity to quality, new quality gives the further development, etc.;
- helicity - the property that is the change of the spiral, with different influences in the development of the object. Direction can be positive or negative for object development. There are both upward and downward spirals of development.

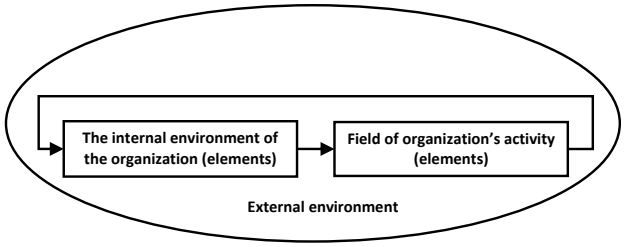


Source: own development

Figure 1. Properties of strategic development of industrial enterprises

Consider the development of the organization as a positive impact of development, so that a negative effect or a negative development will lead, ultimately, to the liquidation of the company.

The overall system organization as shown in Figure 2 represents a set of elements of the internal environment that characterize the capabilities and limitations of a company, which through the development and implementation of strategic and operational decisions form the elements of the scope of the enterprise, describing the organization's activities in the environment of operation.



Source: own development

Figure 2. General system of the organization

Internal elements of the enterprise environment affect the formation of element areas that allow for better internal environment elements. The properties of the organization reflect the cyclical and helical development.

The elements of internal environment that characterize the capabilities and limitations of this company, in our view, should include:

- Raw materials (their quality, quantity, price, etc.);
- Technology (existing in the enterprise);
- The means of labor (fixed assets, their characteristics);
- Company personnel (structure, quantity, quality characteristics, etc.);
- Financial resources (equity and debt, generating funds, investment, etc.);
- Structure of the enterprise (the division of responsibilities and work, hierarchy, degree of freedom in decision making, etc.);
- Management system (principles and tools of management, planning, organization, control, motivation, and coordination);
- System information (documents, characteristics, information security, etc.);
- The process of converting raw materials into a finished product (value chain, cost, etc.).

Development of the elements of the internal environment of the organization increases the possibilities and reduces limiting on the activity of the company, and thus contributes to the development of reasonable and timely strategic and operational decisions, which in turn creates and develops the scope of activity of the enterprise.

The scope of the enterprise, which characterizes the activities of the organization in its environment functioning includes, in our opinion, the following elements:

- Finished product (the quality, price, consumer value, etc.);
- The market and consumers (market share, new markets, old and new customers, etc.);
- Position within the industry (competitors, suppliers, distribution system and sales, etc.);
- Technology (technology applied, innovation, novelty, etc.).

Development of the elements of the business sector enables a company to more effectively set strategic and operational objectives, increase productivity and efficiency of activities of the organization, and provides opportunities for the development of its internal environment.

Strategic management is now seen as not only a set of strategic management decisions that determine the long-term development of the enterprise, but also concrete action to ensure rapid response to changes of the external environment that may require strategic maneuvering, revision of goals and choosing a new direction of development (Ivakina I., 2007).

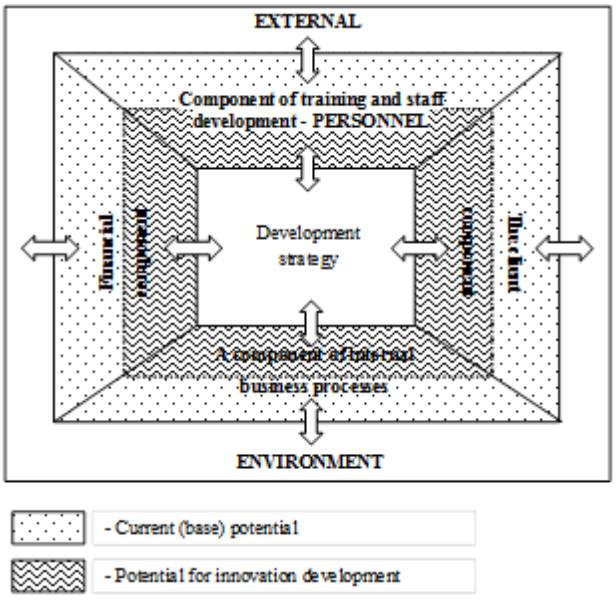
For their existing conception about the state of the implementation of selected goals for objective measurement of the results of implementation strategy, the management of many Ukrainian machine-building enterprises has used the traditional system of financial-accounting indicators. In our opinion, in today's conditions of development, which has replaced the earlier industrial competition, now it is the time of information competition, meaning that reconsideration is needed of approaches to the formation, control and efficient allocation of financial, industrial, intangible and labor assets of the company. Enterprises need an additional evaluation system, which is linked to accurate and reliable financial evaluation of such intangible assets as market promotion of new products and services, potential ability, experience, interest in employee flexibility, customer loyalty, innovation projects, investment in production and workers, and other assets.

In order to satisfy the needs of Ukrainian enterprises, we are proposing to use the method of Balanced Scorecard (BSC) (Kaplan R. and Norton D., 1992). BSC complements the financial parameters system which reflect the results of grading the development prospects system of enterprises. Objectives and indicators of the

system are formed depending on the ideology and strategy of each organization and consider its activities on four criteria: financial, customer relationship, internal business processes, as well as training and staff development (Kaplan R. and Norton D., 2003).

Figure 3 shows the relationship and subordination between the components of BSC by shaping the strategy of development of a modern engineering enterprise. This vision is based on the proposed dual structure of potential strategic development of industrial enterprises (including engineering), which combines the current state of the underlying potential and the ability of companies to develop, i.e. the effectiveness of innovative potential.

Thus, in our view, the modern industrial enterprise faces two major tasks: first, creation of a system of indicators, and second, its use as an integrated system of strategic control for their development.



Source: own development

Figure 3. Subordination and the relationship between components of BSC in the formation of development strategy

One of the main methods of management for the development potential of industrial enterprises is to develop a system of evaluation and development of methods of assessment on development potential and its prediction to identify the priority capacity of a development enterprise environment.

As a result, there is a need for quantitative and qualitative assessment of the current (base) potential and capacity for innovation development to guide the process of formation of competitive advantage and provide evaluation and formulation of strategic directions of engineering enterprises.

ANALYSIS OF DEVELOPMENT POTENTIAL

For solving the problems that relate to the company's further development and creating the most effective strategy, tabulated lists of indicators that are part of the BSC are given for assessing the current potential (Table 1) and the potential for innovative development (Table 2). Application of the proposed system performance will, in our view, take into account their integrated impact on the competitive advantages of machine-building enterprises.

Table 1
Indicators for evaluation of the current (base) potential of machine-building enterprises

Indicator	Symbol
1.1 The financial component	
1.1.1 Ratio of general (current) liquidity	$X_{1.1.1.}$
1.1.2 Return on equity	$X_{1.1.2.}$
1.1.3 Net return on sales	$X_{1.1.3.}$
1.1.4 Share of labor costs in operating expenses	$X_{1.1.4.}$
1.1.5 Share of social transfers in operating costs	$X_{1.1.5.}$
1.2 Staff	
1.2.1 Rate of utilization of time	$X_{1.2.1.}$
1.2.2 Share of workers aged 18 to 55 years	$X_{1.2.2.}$
1.2.3 Proportion of employees with university degrees	$X_{1.2.3.}$
1.2.4 Proportion of additional salary	$X_{1.2.4.}$
1.2.5 Share of administrative costs in the cost of goods sold	$X_{1.2.5.}$
1.3 The client component	
1.3.1 Net profitability on sales	$X_{1.3.1.}$
1.3.2 Rate of turnover of receivables	$X_{1.3.2.}$
1.3.3 Rate of credit turnover payable	$X_{1.3.3.}$
1.3.4 Share of cost of marketing in the cost of goods sold	$X_{1.3.4.}$
1.4 Business processes	
1.4.1 Coefficient of autonomy	$X_{1.4.1.}$
1.4.2 Coefficient of financial stability	$X_{1.4.2.}$
1.4.3 Coefficient life of fixed assets	$X_{1.4.3.}$
1.4.4 Reduction factor for fixed assets	$X_{1.4.4.}$
1.4.5 Share of production costs in the cost of goods sold	$X_{1.4.5.}$
1.4.6 Average annual outputper worker, thousandUAH/person	$X_{1.4.6.}$
1.4.7 The share of investment in fixed assets of own capital	$X_{1.4.7.}$

Source: author

A development strategy for machine-building enterprises involves finding out the current strategy and analysis of the current (base) potential and efficiency in using the company's potential for innovation development.

Table 2
Indicators for evaluation of the potential for innovative development of engineering enterprises

Indicator	Symbol
2.1 The financial component	
2.1.1 Share of investments in intangible assets in total assets	$X_{2.1.1.}$
2.1.2 Share of investment in informatization of the total investment in intangible assets	$X_{2.1.2.}$
2.1.3 Share of domestic investors investment in total spending on innovation	$X_{2.1.3.}$
2.1.4 Share of investments of foreign investors in the total expenditure on innovation	$X_{2.1.4.}$
2.2 Component of training and staff development	
2.2.1 Share of workers with knowledge of new professions	$X_{2.2.1.}$
2.2.2 Share of workers who raised their qualification within the last year	$X_{2.2.2.}$
2.2.3 Share of workers who are inventors and innovators	$X_{2.2.3.}$
2.3 The client component	
2.3.1 Image resource	$X_{2.3.1}$
2.3.2 S of expenditure on participation in trade shows and other image events in total costs of product sales	$X_{2.3.2.}$
2.3.3 Share of spending on marketing and advertising	$X_{2.3.3.}$
2.3.4 Share of shipped innovative products in total sales of products	$X_{2.3.4.}$
2.3.5 Share of new products set for export in total new products	$X_{2.3.5.}$
2.3.6 Proportion of new technologies transferred abroad in the total transferred technology	$X_{2.3.6.}$
2.4 Business - Processes	
2.4.1 Share of investment in innovation in total capital	$X_{2.4.1.}$
2.4.2 Share of investment in innovation in equity	$X_{2.4.2.}$
2.4.3 Share of expenditure on research and development (excluding depreciation) of the total expenditure on innovation	$X_{2.4.3.}$
2.4.4 Share of expenditure on machinery, equipment and software associated with the introduction of innovations in the total expenditure on innovation	$X_{2.4.4.}$
2.4.5 Share of own investments in technological innovation in the total cost of innovation	$X_{2.4.5.}$
2.4.6 Proportionof products shipped that underwentsubstantialtechnological changein the totalshippedproducts	$X_{2.4.6.}$
2.4.7 Proportion of products shipped produced using an improved process of manufacture in total products shipped	$X_{2.4.7.}$
2.4.8 Proportion of transfer of new technologies in Ukraine in total transferred technology	$X_{2.4.8.}$

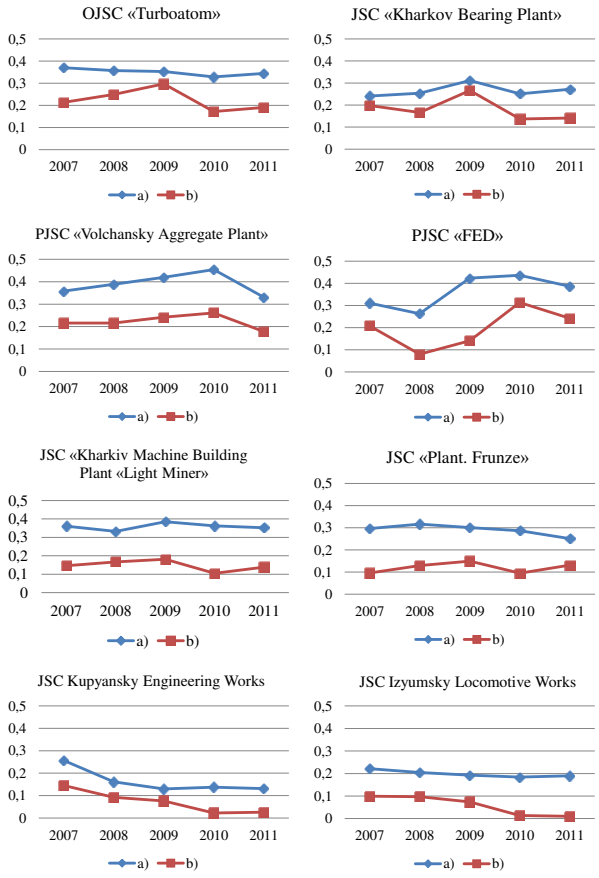
Source: author

Implementation strategy associated with conducting strategic changes should lead to three challenges: 1) the prioritization of administrative tasks in accordance with the strategy adopted, 2) to establish whether the chosen strategy and development processes of resources are a potential component of selected components of BSC, 3) reduction in accordance with the chosen strategy management capabilities of the enterprise.

For the study we selected 19 leading, famous engineering companies in Ukraine, Kharkov. Among them the most competitive companies are: Open Joint Stock Company(OJSC) ”Turboatom” which is manufacturer of enginesand turbinesfor nuclearand electricpower plants, Joint Stock Company(JSC) “Kaharkov Bearing Plant” which is manufacturer ofball androller bearingsand theirparts, Public Joint Stock Company (PJSC) “FED” which is manufacturer of aircraft and spacecraft, PJSC “Volchansky Aggregate Plant” which is of aircraft and spacecraft, cars, it is a researcher inthe field of engineering, JSC “Kharkiv Machine Building Plant “Light Miner” which is manufacturerof machinesand equipment formining and construction industries, research in technical sciences, JSC “Plant. Frunze” which is manufacturerof pumpsand compressors, JSC “Kupyansky Engineering Works” which is manufacturerof machines and equipmentfor processingagricultural products, JSC “Izymsky Locomotive Works” which is manufacturerof railway rolling stock.

Financial and statistical reports of enterprises for 2007 - 2011 years were obtained for the analysis. Requiredand mostinfluentialparameterswere obtainedbymultivariatefactor analysisusing the package STATISTICA 6.0.The integral parameters of the current (base) potential and efficiency potential of innovative development of engineering enterprises were calculated based on the performanceevaluationsystem(Table1 and2) andthe relevant data.

Analysis of the use of strategic development potential was carried out for 2007 to 2011. The overall results of the analysis are shown in Figures 4.



Source: own development

Figure 4. Dynamics of integral parameters of (a) the current (base) potential and (b) efficiency potential of innovative development of four engineering enterprises

The effectiveness of strategic development potential should be basedon an analysis ofthe calculated integral index ofthe current state of basic capabilities and the integrated parameterpotential of the enterprise for development andinnovation.

Graphically presented information shows insufficient effectiveness use of basic capabilities and potential of innovative development for 2007 - 2011 years of selected companies. The largest integral parameter of the current (base) potential reaches 0.36 in 2007 and 0.35 in 2011 in the JSC "Kharkiv Machine Building Plant "Light miner". The smallest integral parameter of the current (base) potential reaches 0.13 in the JSC "Kupyansky Engineering Works". The calculated indicators do not reach1 or 100%. Currentpotential of thesecompaniesis used only13%-40%. This indicates theexistence of problemsin the managementof enterprises,the lack ofstrategicplanning,the shortcomingsin personnelpolicies andweakmarketing.

Presented graphically dynamic potential of innovative development is evidence of itssmallsize andtendency tosmall changes. The largest integral parameter of potential of innovative development reaches 0.21 in 2007 and 0.19 in 2011 in the OJSC "Turboatom". The smallest integral parameter of potential of innovative development reaches 0.09 in 2007 and 0.13 in 2011 in the PJSC "FED". The calculated indicators do not reach1 or 100%. Potential of innovative development is used only13%-40%. This suggests the need for additional investment in these enterprises for development of innovative activity. Also it required staff training, updating of material and production base, the introduction of new technologies, the usage of progressive forms and methods of management.

CONCLUSIONS

The analysis of the dynamics of integrated indicators characterizing the use of strategic capacity development for local engineering industry indicates the following:

- the existence of negative trends, which is evident in the decline of manufacturing engineering products that are competitive on the domestic and foreign markets;
- formation of negative trends associated with the influence of a rapidly changing external environment and the lack of a clear strategic program for long-term business development in machine-building enterprises and of strategic management of its potential;
- strategic development potential is the most important factor for the economic and strategic security of an engineering enterprise and defines the base for creating a long-term competitive advantage.
- the balanced scorecard approach can provide accurate and timely information about the current (base) potential and the potential for innovative development of engineering enterprises. We believe that this information will allow for more efficient shaping of competitive advantages and improve strategic decision making at engineering companies.

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Optimizing the Number and Location of Warehouses in Logistics Networks Considering the Optimal Delivery Routes and Set Level of Reserve Stock

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SUMMARY

Forming the optimal structure of a warehouse network is one of the main strategic tasks in arranging an efficient logistics network. The suggested mathematical model and iterative method allow an optimal number and location of warehouses (in the area served by the logistics network) to be defined – with the minimum of total logistics costs for shipping of goods from suppliers through warehouses to customers. The focus is on optimal delivery routes and the optimal level to set for reserve stock contained in the storage network.

Keywords: logistics network, warehouse, optimal warehouse location, logistics costs, optimaldelivery route.
Journal of Economic Literature (JEL) code: C21

INTRODUCTION

The globalization of business requires efficient management in the movement of goods between manufacturers, resellers, and consumers, which can only be ensured by the establishment of large multi-format logistics networks. At the heart of setting up any logistics network (dealing with distribution of material flows in the field of supply and distribution logistics), there is the complex task of arranging the optimal structure for its most important subsystem – the warehouse network, which includes defining the number of warehouses and their geographical location in the service area. The solution of this task requires a large amount of initial data: the scope of supply and demand for goods, locations of suppliers and consumers, estimated capacity of warehouses, features of transportation services, logistics costs, etc., which requires the use of economic-mathematical methods and models.

The urgency of the task is due to the fact that the number of warehouses and their locations in the logistics network (with extensive transport infrastructure) have a significant effect on costs involved in the delivery of goods to consumers, thus affecting the final cost of sold products. Given that transport and storage costs show different responses to a change in the number of warehouses and their locations (with regards to producers and consumers), the dependence between total costs for the operation of a logistics network and the number of warehouses is parabolic, i.e., the task can be formulated as a search for an optimal or sub-optimal (close to optimal) solution.

ANALYSIS OF EXISTENT METHODS

The complexity and multi-factor character of this complex task have led to (in the majority of cases) separate solutions for its two components.

The first task – defining the number of warehouses – is solved by the method of economic compromises, regarding the totality of all costs associated with their maintenance. This task is a basis for the establishment of centralized and decentralized distribution of goods. The best-known approach to its solution is based on the qualitative dependence between various logistics costs and numbers of warehouses, which assumes the selection of their optimal number – in the absence of formulas and quantitative characteristics, based on logic and common sense (Coyle et al., 1985). The analytical method of solving this task assumes selecting the number of warehouses with use of a linear programming model, which optimizes the general costs (including the costs for construction of warehouses, costs for shipping of goods to consumers, and costs for warehouse handling) (Dybskay, 2008).

The second task (choosing the warehouse location) was first reviewed within the theory of labor forces siting (production companies) – by German scientist A. Weber, who formulated it as mathematical problem of choosing the lowest transportation costs for shipping of goods between warehouse and a group of spatially distributed consumers (while considering the distance factor only) (Weber, 1929).

With development of logistics as an economic science, there was an increase in the importance of tasks aiming to define the location of warehouses (when forming a spatially distributed logistics network). While formulating the three basic strategies of positioning the distribution warehouses (depending on the principle of their arrangement: near markets, near production sites, or in an intermediate location), well-known "golden rules" of sales logistics still require some mathematical calculations (to determine the specific areas of their placement) (Hoover, 1948).

Later, the methodology of solving a task on defining the location of warehouses (distribution centers) in logistics networks developed towards a combination of economic-mathematical models – due to more complete accounting of influencing factors and economization of its optimizing criteria.

A conceptual vision of the task (spatial location of warehouses in logistics network) and the main approaches to its solution (regarding the possible restrictions, optimizing and multi-purpose nature of the task) are presented in Tansel et al. (1983a, 1983b). A typology of tasks (placing the objects in a logistics network depending on management objectives), parameters affecting their solution, and performance indicators were reviewed in Brandeau and Chiu (1989).

Depending on the nature of variation, they distinguish the methods of solving a continuous and discrete task (defining the location of warehouses). In one case, the warehouse may be located anywhere (in the area under review); in the second case it should be at pre-defined locations, which is more realistic (given the actual transportation services of logistics networks).

Methods of solving the continuous task have included the center of gravity method for cargo flows (Bowersox, 1974) and,,based upon it, the method of the equilibrium system center, which accounts for transportation costs (serving as weight factors) (Coyle et al., 1985; Mirotin, 2002), as well as the method of searching for minimum transport work (Sergueyev, 1997). In methods based on the "mass center of a physical body", distances (even average-weighted) are determined by coordinate axes (considered in straight lines), which requires the imposition of a coordinate grid on the map of potential warehouse locations and is effective only if the area under review is provided with a developed network of transportation services. The fundamental difference of a method searching for minimum transport work lies in defining the distance between objects as a "hypotenuse", as well as in applying the iterative algorithm of combined search, which allows the detection of optimal warehouse location (through successive evaluation of options).

The majority of methods for solving a discrete task (defining the warehouse location) are not optimizing methods. The method of factor-rating systems lies in a point-based assessment of factors affecting the choice of warehouse location; despite the possibility of accounting for qualitative indicators, this method has the significant drawback of all expert methods – subjectivity in defining the point scale and in assessment of factors (their weight ratios) (Wild, 1995). The autoregressive method, which enables more strict definition of the most important features (during selection of warehouse location), requires a large scope of statistical material and does not allow the dependence of variables (multicollinearity of factors) (Chase et al., 1998). In some scientific papers, the solution of a discrete problem is viewed using a method of defining the zones of influence (on consumers), which are used in marketing: the method of isochronous lines (Engel, 1995), method of potential sales areas (Tjapuhin, 2001), method of identifying and segmenting the trade zones (Yager, 1982). However, all of these are characterized by a high degree of subjectivity and do not ensure an optimal solution.

The majority of the above-mentioned methods can solve either the task of defining the number of warehouses or the task of defining their location; at that, the warehouse is usually viewed only as a source of material flow, which does not reflect the specifics of arranging the logistics networks, where the warehouse is a link between suppliers and consumers (both in the field of supply and sales).

In this view, particular interest is caused by methods for solving a complex task which consider the interaction of warehouses with all members of a logistics network. As a rule, such methods assume the shared use of optimization models and heuristic methods, which adjust the obtained theoretical solutions based on actual network infrastructure, transportation services, features of vehicles, possible variations in demand, level of reserve stock, time restrictions, etc.

There are several approaches to the formulation of a complex task, which differ in optimization criteria: the first one focuses on distance characteristics (Wilson, 1974); the second on cost characteristics, while using the full cost of the storage network (Giddings et al., 2000) or total transport work (Lukinskiy (Ed.), 2007) or total transport and storage costs as indicators (Khumawala and Kelly, 1974); the third one considers time characteristics (O'Kelly, 1986); and the fourth (complex) one simultaneously considers multiple characteristics (Cheong et al., 2007; Salihov, 2007).

Among the main drawbacks of actual approaches to solving a complex task, we should distinguish among one-criterion character of models, two-stage optimization of the delivery process (before/after the warehouses), and a snap-to-coordinate grid, which, apart from additional heuristic procedures required to specify the location of

warehouses, also cannot consider the diversity of actual transportation services (in the area served by the logistics network) or define the optimal routes for door-to-door delivery of goods (from suppliers, through warehouses, and to consumers).

The purpose of this paper is to develop a model and method for optimizing the number and location of warehouses – regarding optimal routes of cargo delivery in the logistics network, storage costs, andthe set scope of reserve stock of goods at warehouses.

MODEL

Let us review the logistics network comprising of suppliers I and consumers J (for a certain kind of goods) and having geographical pointsMpossible locationsof warehouses (for their storage and handling).

Initial data for the task:

$W_i\left(i=\overline{1,I}\right)$ – scope of supplying the goods from the i-th supplier;

$V_j\left(j=\overline{1,J}\right)$ – scope of demand in goods of the j-th consumer, while $\sum_{i=1}^{I} W_i \geq \sum_{j=1}^{J} V_j$;

$\mu_i\left(i=\overline{1,I}\right)$, $\beta_j\left(j=\overline{1,J}\right)$ – weight factors of the i-th supplier and j-th consumer, respectively (reflecting the additional factors that affect the plan on optimal attachment of consumers to suppliers – e.g., impossibility of direct transit (warehouse) supplies or their priority with regards to other supplies);

$d_{ij}\left(i,j=\overline{1,M}\right)$ – distance between all points of the logistics network (linked by relevant transportation services);

Z – scope of total stock reserve for certain type of goods, which must always be maintained in warehouses of the logistics network under review.

It is necessary to determine the optimal number of warehouses and their locations in potential points of logistics network at the smallest possible total of logistics (transportation and storage) costs. Cost indicatorsare shown inconventional monetary units (CMU).

Regarding the minimizing nature of optimality criterion, it would be appropriate to convert and normalize the weight factors:

$$\mu_i^{'}=\frac{1}{\mu_i};i=\overline{1,I};\qquad \beta_j^{'}=\frac{1}{\beta_j};j=\overline{1,J};$$

$$\bar{\mu}_i=\frac{\mu_i^{'}}{\sum_{i=1}^{I}\mu_i^{'}};\qquad \bar{\beta}_j=\frac{\beta_j^{'}}{\sum_{j=1}^{J}\beta_j^{'}}.$$

A mathematical model of the task (defining the number and location of warehouses in the logistics network, based on actual transportation services and the need to maintain reserve stocks in the warehouse network) looks like:

$$\begin{aligned}
&B(X,Y)=\Big[\sum_{i=1}^{I}\sum_{k=1}^{N} d_{ik}\bar{\mu}_i x_{ik}+\sum_{k=1}^{N}\sum_{j=1}^{J} d_{kj}\bar{\beta}_j y_{kj}\Big]T_0+\\
&\varphi\left[G_{k_1}^{(N)};G_{k_2}^{(N)};...;G_{k_N}^{(N)}\right]\rightarrow\min,\\
&\sum_{k=1}^{N} x_{ik}\leq W_i;i=\overline{1,I};\\
&\sum_{i=1}^{I} x_{ik}\leq G_k;k=\overline{1,N};\\
&\sum_{i=1}^{I} x_{ik}-\sum_{j=1}^{J} y_{kj}\geq\frac{Z}{N};k=\overline{1,N};\\
&\sum_{k=1}^{N} y_{kj}=V_j;j=\overline{1,J};\\
&x_{ik}\geq 0;i=\overline{1,I};k=\overline{1,N};\\
&y_{kj}\geq 0;k=\overline{1,N};j=\overline{1,J},
\end{aligned}\qquad (1)$$

where B(X,Y) – total logistics costs for transportation of goods from suppliers to warehouses and from warehouses to suppliers (including the storage costs);

N – required number of warehouses in points of the logistics network;

d_{ik}, d_{kj} – distances between suppliers and warehouses, warehouses and consumers (accordingly);

$X=\left\|x_{ik}\right\|_{I,N}$ – matrix – scopes of goods transported from suppliers to warehouses;

$Y=\left\|y_{kj}\right\|_{N,J}$ – matrix – scopes of goods transported from warehouses to suppliers;

T_0 – freight rate, CMU/t·km;

$\varphi[G_{k_1}^{(N)};G_{k_2}^{(N)};...;G_{k_N}^{(N)}]$ – function of storage costs (depends on number and capacity of warehouses);

$G_k^{(N)};k=\overline{1,N}$ – capacity of the k-th warehouse (at N-th number of warehouses).

Ratios – equations and inequations of the model include:

- limitations on the total export of goods from each supplier (to warehouses);
- limitations on the total import of goods from suppliers (to each warehouse);
- limitations on the size of reserve stock (at each warehouse);
- limitationson the needsof consumers andnon-negativityconditionson thequantity ofthe goods transported.

Task (1) assumes mathematical programming; its solution would cause no trouble if the location and number of warehouses (N) were known. For large logistics networks, determining a solution via sorting the possible number of warehouses and their locations is unacceptable (due to the inevitably large number of solution options).

METHOD

We suggest an iterative method of solving the task (the algorithm is shown in Fig. 1).

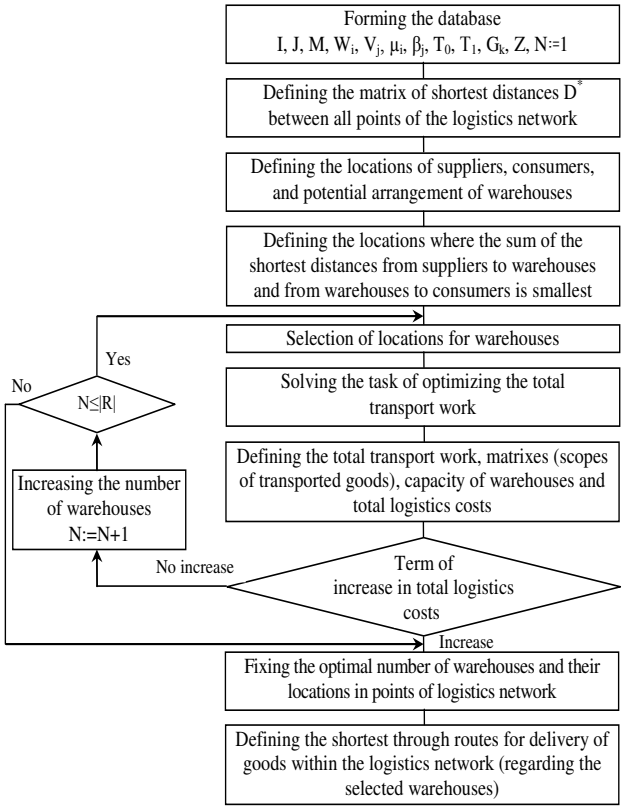

Figure 1. Algorithm of optimizing the number and location of warehouses in logistics network

Let us review in detail the main stages of the suggested task-solving procedure:
First stage. Let us define the matrix of distances between points of logistics network $D = \left\| d_{ij} \right\|_{M,M}$ as follows:

d_{ij}, if points i and j are directly linked to each other;
$D_{ij} = \infty$, if points i and j are not directly linked;
0, if i = j.

Second stage. Let us define the matrix of shortest distances between all points of the logistics network $D^* = \left\| d_{ij}^* \right\|_{M,M}$, while using a Bellman–Shimbel algorithm of search for the shortest path (Golstein, 1966):

$$d_{ij}^{2r} = \min_{1 \le \lambda \le M} [d_{i\lambda}^r + d_{\lambda j}^r], r = 1,2,... \quad (2)$$

For convenience of recording the expressions, let us assume that suppliers are located in points: 1,2,…,I and consumers – in points: M-J+1,M-J+2,…,M.

Let us define the set R as a subset of logistics network points {I+1,I+2,…,M-J} (possible locations of candidate warehouses) regarding the various constraints: geographic, economic, technical, social, etc. Thus, the warehouses can be placed in locations: $R \subseteq \{I+1, I+2, ..., M-J\}$.

Third stage. Let us define the points of logistics network $k_s \in R; s = \overline{1,|R|}$, where the sum of the shortest distances (from suppliers to warehouses and from warehouses to consumers) is minimal:

$$k_1 = \arg\min_{k_s \in R} [\sum_{i=1}^{I} d_{ik_s}^* + \sum_{j=M-J+1}^{M} d_{k_s j}^*];$$

$$k_2 = \arg\min_{\substack{k_s \in R \\ k_s \neq k_1}} [\sum_{i=1}^{I} d_{ik_s}^* + \sum_{j=M-J+1}^{M} d_{k_s j}^*];$$

. . . (3)

$$k_{|R|-1} = \arg\min_{\substack{k_s \in R \\ k_s \neq k_1; k_s \neq k_2, ..., \\ k_s \neq k_{|R|-1}}} [\sum_{i=1}^{I} d_{ik_s}^* + \sum_{j=M-J+1}^{M} d_{k_s j}^*];$$

$k_{|R|}$.

Fourth stage.The total transportation work can be applied as the objective function instead of the total logistics costs in order to avoid the nonlinearityof the Task (1). The total transportation work is the essential characteristic of the carriage of goods process from suppliers to consumers via warehouses as well. Thus, the solution of the Task (1) can be similarly provided as a solution of the linear programming task:

$$F_1(X,Y) = \sum_{i=1}^{I} \sum_{k=1}^{N} d_{ik} \bar{\mu}_i x_{ik} + \sum_{k=1}^{N} \sum_{j=1}^{J} d_{kj} \bar{\beta}_j y_{kj} \to \min,$$

first, at N=1 ($k = k_1$), let us assume that the initial value of storage capacity is large enough (e.g. $G_{k_1} = \sum_{i=1}^{I} W_i$) and determine (for this case) the total transportation work $F_1^{(1)}$, matrixes (scopes of goods transported from suppliers to

warehouse $X^{(1)} = \| x_{ik}^{(1)} \|_{I,1}$ and from warehouse to consumers) $Y^{(1)} = \| y_{kj}^{(1)} \|_{1,J}$, as well as capacity of the warehouse: $G_{k_1}^{(1)} = \sum_{i=1}^{I} x_{ik_1}^{(1)}$.

In this case, the minimum total (average-weighted) logistics costs (storage and transportation) will be:

$$B^{(1)} = [\sum_{i=1}^{I} \overline{\mu}_i L_{ik_1}^{(1)} d_{ik_1}^{*} + \sum_{j=1}^{J} \overline{\beta}_j L_{k_1 j}^{(1)} d_{k_1 j}^{*}] T_1 + \varphi(G_{k_1}^{(1)}), \quad (4)$$

where $L_{ik_1}^{(1)}, L_{k_1 j}^{(1)}$ are the number of cargo trips from the i-th supplier to the warehouse and from the warehouse to the j-th consumer, respectively, defined as:

$$L_{ik_1}^{(1)} = [\frac{x_{ik_1}^{(1)}}{q\gamma}]; \qquad L_{k_1 j}^{(1)} = [\frac{y_{k_1 j}^{(1)}}{q\gamma}],$$

where q – rated carrying capacity of vehicle used for transportation;

γ – factor of utilizing the carrying capacity of vehicle;

T_1 – freight rate, CMU/km;

$\varphi(G_{k_1}^{(1)})$ – function of storage costs at one warehouse.

Then, while solving Task (1) for its objective function (total transportation work), where N=2 ($k = k_1, k = k_2$), let us define the total transportationwork $F_1^{(2)}$, matrixes (scopes of goods delivered from suppliers to two warehouses: $X^{(2)} = \| x_{ik}^{(2)} \|_{I,2}$ and from warehouses to consumers: $Y^{(2)} = \| y_{kj}^{(2)} \|_{2,J}$), as well as capacities of both warehouses: $G_{k_1}^{(2)} = \sum_{i=1}^{I} x_{ik_1}^{(2)}$, $G_{k_2}^{(2)} = \sum_{i=1}^{I} x_{ik_2}^{(2)}$.

In the case of two warehouses, the minimum total (average-weighted) logistic costs (storage and transportation) will be:

$$B^{(2)} = [\sum_{i=1}^{I} \sum_{s=1}^{2} \overline{\mu}_i L_{ik_s}^{(2)} d_{ik_s}^{*} + \sum_{s=1}^{2} \sum_{j=1}^{J} \overline{\beta}_j L_{k_s j}^{(2)} d_{k_s j}^{*}] T_1 + \phi[G_{k_1}^{(2)}; G_{k_2}^{(2)}], \quad (5)$$

where $L_{ik_s}^{(2)}, L_{k_s j}^{(2)}; s = \overline{1, N}$ are the number of cargo trips from the i-th supplier to the two warehouses and from the two warehouses to the j-th user, respectively, defined as:

$$L_{ik_s}^{(2)} = [\frac{x_{ik_s}^{(2)}}{q\gamma}]; s = \overline{1, N}; \quad L_{k_s j}^{(2)} = [\frac{y_{k_s j}^{(2)}}{q\gamma}]; s = \overline{1, N};$$

$\varphi[G_{k_1}^{(2)}; G_{k_2}^{(2)}]$ is thefunction of storage costs at the two warehouses.

Fifth stage. If total logistics costs for one warehouse are less than total logistics costs for two warehouses:

$$B^{(1)} \le B^{(2)},$$

then one warehouse should be enough for the logistics network under review.

Otherwise, there is a transition to the fourth stage of the algorithm and Task (1) is solved for its objective function (total transportation work), where N=3 ($k = k_1$, $k = k_2$, $k = k_3$), etc., with relevant checks at the fifth stage, either till meeting the term of increase in total logistics costs or till having tried all items in the logistics network (subsets R from I+1 to M-J), which is practically improbable.

Sixth stage. Let us assume that optimal number of warehouses N and their locations in logistics network: $k_1, k_2, ..., k_N$ have been defined. Following the solution of Task (1) for this set of warehouses, we obtain the optimal values of total transportationwork $F_1^{(N)}$, matrixes (scopes of goods transported to/from the warehouses $X^{(N)} = \| x_{ik}^{(N)} \|_{I,N}$, $Y^{(N)} = \| y_{kj}^{(N)} \|_{N,J}$), and capacity of all warehouses in logistics network:

$$G_{k_1}^{(N)} = \sum_{i=1}^{I} x_{ik_1}^{(N)}, \quad G_{k_2}^{(N)} = \sum_{i=1}^{I} x_{ik_2}^{(N)}, \ldots, \quad G_{k_N}^{(N)} = \sum_{i=1}^{I} x_{ik_N}^{(N)}.$$

In this case, the minimum total (average-weighted) logistic costs (storage and transportation) will be:

$$B^{(N)} = [\sum_{i=1}^{I} \sum_{s=1}^{N} \overline{\mu}_i L_{ik_s}^{(N)} d_{ik_s}^{*} + \sum_{s=1}^{N} \sum_{j=1}^{J} \overline{\beta}_j L_{k_s j}^{(N)} d_{k_s j}^{*}] T_1 + \phi[G_{k_1}^{(N)}; G_{k_2}^{(N)}; ...; G_{k_N}^{(N)}], \quad (6)$$

where $L_{ik_s}^{(N)}, L_{k_s j}^{(N)}; s = \overline{1, N}$ are the number of cargo trips from the i-th supplier to N warehouses and from N warehouses to the j-th user, respectively, defined as:

$$L_{ik_s}^{(N)} = [\frac{x_{ik_s}^{(N)}}{q\gamma}]; s = \overline{1, N}; \quad L_{k_s j}^{(N)} = [\frac{y_{k_s j}^{(N)}}{q\gamma}]; s = \overline{1, N};$$

$\varphi[G_{k_1}^{(N)}; G_{k_2}^{(N)}; ...; G_{k_N}^{(N)}]$ – function of storage costs at the N-th number of warehouses.

Seventh stage. Using the values of distance matrix D and shortest distance matrix D^*, let us define the optimal through routes for delivery of goods $\{i, \lambda_1, \lambda_2, ..., \lambda_s, j\}$ (from suppliers, through warehouses, and to consumers):

$$l_{i\lambda_1} = \min_{i \le \lambda \le M} [d_{i\lambda} + d^*_{\lambda j}];$$

$$l_{\lambda_1\lambda_2} = \min_{i \le \lambda \le M} [d_{\lambda_1\lambda} + d^*_{\lambda j}]; \quad (7)$$

$$\vdots$$

$$l_{\lambda_s j} = \min_{i \le \lambda \le M} [d_{\lambda_s\lambda} + d^*_{\lambda j}]$$

for $i = \overline{1, I};\ j = k_1 k_2, ..., k_N$, and then for $i = k_1, k_2, ..., k_N;\ j = \overline{M - I + 1, J}$.

AN EXAMPLE OF APPLICATION OF THE MODEL AND METHOD

Let us imagine the implementation of developed the model and method on the example of logistics network consisting of a six consumers, three suppliers (A, B and C) and four pointspossible location ofthe warehouse (I, II, III and IV) (Fig. 2).

Initial data for modeling the supply processare presented in Table 1.

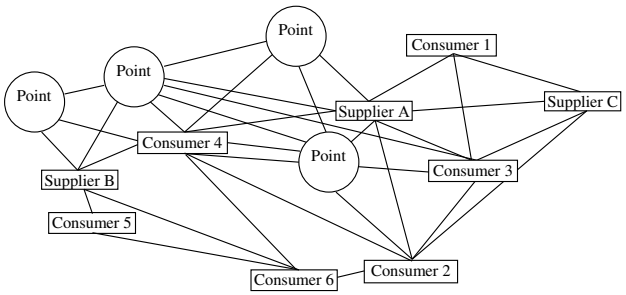

Figure 2.Graphic location scheme elements of logistics network (example)

Table 1
Initial data for modeling the supply process (example)

Parameters	Supplier A	Supplier B	Supplier C	Consumer 1	Consumer 2	Consumer 3	Consumer 4	Consumer 5	Consumer 6
W, t	2500	4000	1600	-	-	-	-	-	-
μ	0,5	0,3	0,2	-	-	-	-	-	-
V, t	-	-	-	800	1200	1500	700	1400	2300
β	-	-	-	0,14	0,18	0,1	0,3	0,08	0,2
q, t	20	20	20	10	10	10	10	10	10
γ	0,87	0,87	0,87	0,9	0,9	0,9	0,9	0,9	0,9
T_0, CMU/t·km	7	7	7	10	10	10	10	10	10

The scope of total stock reserve of goods, which should always be maintained in warehouses of the logistics network, is equal to 60 tons.

Storage costsconsist ofcosts relatedthe Exploitationthe warehouse,the cost of maintainingstocksand administrativecosts.Suppose that the functionstorage costsisdiscrete. Change instorage costs, depending on the capacity of warehouse for four possibleoptions shown in Table 2.

Table2
Change instorage costs, depending on the capacity of warehouse, CMU (example)

Capacity of warehouse, t	15	20	30	60
Costs relatedthe Exploitationthe warehouse, CMU	52000	57000	67000	146000
Costs of maintainingstocks, CMU	20000	24000	34000	68000
Administrativecosts, CMU	24000	27000	36000	64000
Storage costs, CMU	96000	108000	1370000	278000

The matrix of distances between the points of logistics network $D = \|d_{ij}\|_{13,13}$ is shownin Table 3.

The matrix of shortest distances between all points of the logistics network $D^* = \|d^*_{ij}\|_{13,13}$ is shownin Table 4.

Table 3
The distances between the points of logistics network, km

The participants logistics network	Supplier A	Supplier B	Supplier C	Point I	Point II	Point III	Point IV	Consumer 1	Consumer 2	Consumer 3	Consumer 4	Consumer 5	Consumer 6
Supplier A	0	∞	76	111	40	41	∞	42	121	51	106	∞	∞
Supplier B	∞	0	∞	70	∞	∞	68	∞	∞	∞	45	29	72
Supplier C	76	∞	0	∞	∞	∞	∞	68	∞	39	∞	∞	∞
Point I	111	70	∞	0	95	108	22	∞	∞	160	50	∞	∞
Point II	40	∞	∞	95	0	51	∞	∞	∞	∞	84	∞	∞
Point III	41	∞	∞	108	51	0	∞	∞	97	∞	97	∞	∞
Point IV	∞	68	∞	22	∞	∞	0	∞	∞	∞	69	∞	∞
Consumer 1	42	∞	68	∞	∞	∞	∞	0	∞	63	∞	∞	∞
Consumer 2	121	∞	∞	∞	∞	97	∞	∞	0	151	90	∞	31
Consumer 3	51	∞	39	160	∞	∞	∞	63	151	0	156	∞	∞
Consumer 4	106	45	∞	50	84	97	69	∞	90	156	0	∞	73
Consumer 5	∞	29	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	81
Consumer 6	∞	72	∞	∞	∞	∞	∞	∞	31	∞	73	81	0

Table 4
The shortest distances between the points of logistics network, km

The participants logistics network	Supplier A	Supplier B	Supplier C	Point I	Point II	Point III	Point IV	Consumer 1	Consumer 2	Consumer 3	Consumer 4	Consumer 5	Consumer 6
Supplier A	0	151	76	111	40	41	133	42	121	51	106	180	152
Supplier B	151	0	227	70	129	142	68	193	103	201	45	29	72
Supplier C	76	227	0	187	116	117	209	68	190	39	182	256	221
Point I	111	70	187	0	95	108	22	153	140	160	50	99	123
Point II	40	129	116	95	0	51	117	82	148	91	84	158	157
Point III	41	142	117	108	51	0	130	83	97	92	97	171	128
Point IV	133	68	209	22	117	130	0	175	159	182	69	97	140
Consumer 1	42	193	68	153	82	83	175	0	163	63	148	222	194
Consumer 2	121	103	190	140	148	97	159	163	0	151	90	112	31
Consumer 3	51	201	39	160	91	92	182	63	151	0	156	230	182
Consumer 4	106	45	182	50	84	97	69	148	90	156	0	74	73
Consumer 5	180	29	256	99	158	171	97	222	112	230	74	0	81
Consumer 6	152	72	221	123	157	128	140	194	31	182	73	81	0

The model was implemented in Solver Add-In for MS Excel 2010.

As a result of the modeling, the optimum variant of a storage facilities organization for logistics network was determined. It is the variant with two warehouses located at the points III and II.

The values of the traffic volume indicators between the logistics network elements and storage capacity for three variants considered within the research are shown in the Table 5.

Table 5
Indicatorstraffic volumes andcapacityof warehouses, tons

The elements ofthe logistics network	Onewarehouse (Point III)	Two warehouses		Three warehouses		
		(Point III)	(Point II)	(Point III)	(Point II)	(Point I)
Supplier A	400	400	-	390	10	-
Supplier B	600	-	600	-	-	600
Supplier C	260	260	-	-	260	-
Consumer 1	80	-	80	-	80	-
Consumer 2	250	250	-	250	-	-
Consumer 3	170	-	170	-	170	-
Consumer 4	150	-	150	-	-	150
Consumer 5	50	-	50	-	-	50
Consumer 6	500	380	120	120	-	380
Capacity of warehouse	1260	660	600	390	270	600

The dynamics of change of the transportation work values for the considered variants of the logistics network construction are shown in Fig. 3.

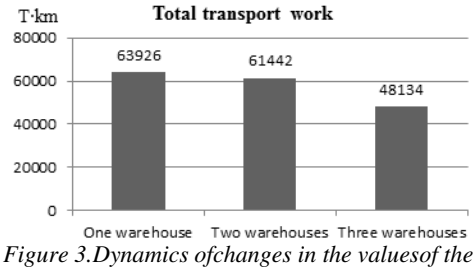

Figure 3.Dynamics ofchanges in the valuesof the transportwork

The dynamics of change of the logistics costs values for the considered variants of the logistics network construction are shown in Fig. 4.

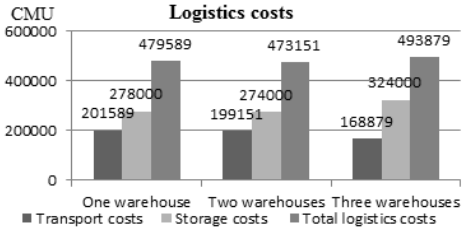

Figure 4.Dynamics ofchanges in the valuesof logistics costs

The best routes of cargo delivery from suppliers to customers through warehouses for the selected option of constructing a logistics network shown in Fig. 5.

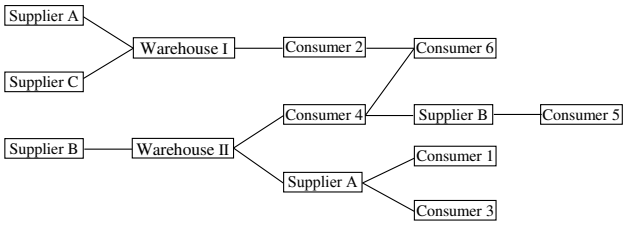

Figure 5.The best routesof cargo delivery tologistics network

CONCLUSIONS

The best logistics network (serving a larger territory with a larger number of spatially distributed links – providers, warehouses/distribution centers, consumers) is a network ensuring a high level of customer service at minimum total logistics costs.

The mathematical model and method suggested in the paper allow the definition of:

- the optimal number of warehouses for the logistics network under review, with set locations for suppliers and consumers;
- the optimal location of warehouses in points of logistics network, based on actual transportation services and a set level of total reserve stock at network warehouses;
- the optimal number of warehouses and their locations regarding the other influencing factors (reflected by weight factors of suppliers and consumers);
- total logistics costs, total transportation work and capacity of network warehouses;
- the shortest through routes for delivery of goods (in the logistics network).

This method can serve as a basis for development of methods defining the optimal number of warehouses and their locations in multi-format logistics networks (with developed transportation services), with additional restrictions on location of warehouses and regarding the multi-nomenclature character of goods, diverse nature of vehicles, and other factors influencing the optimal arrangement of a warehouse network.

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Problems of Corporate Governance in the Practice of Machine Building Enterprises of Ukraine

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SUMMARY

This paper presents an analysis of the current state of corporate governance for mechanical engineering in Ukraine, and the main problems and features of corporate governance. It focuses on the current situation with corporate governance machine building enterprises in the Kharkov region. The objectives of the study are to identify the basic problems in the activity of corporate governance machine building enterprises in the region.as well as the features and limitations of corporate governance.
Keywords: Ukrainian machine building, corporate governance
Journal of Economic Literature (JEL) code: M21, M38

INTRODUCTION

The transition of Ukrainian enterprises to a market economy was accompanied by the processes of privatization and corporatization. The most common form of business organization has become shareholder, due to its many advantages over other forms (the ability to transfer property rights and, at the same time, control of the company; capital increase through an additional share issue, while maintaining the financial stability of the company, etc.) .

This process did not pass over engineering industries. Thus, the most common form of ownership in the modern engineering industry is corporate. This is attested to by statistics. According to the State Property Fund of Ukraine, between 1998 and 2012, the number of joint stock companies in Ukraine has increased markedly. Overall, since the beginning of the privatization process, and as of July 1, 2012, 127901 enterprises in Ukraine changed ownership. With the development of the market environment, the functioning of these units has been directed towards the search for a niche market. Companies that were weak, usually unable to compete, ceased to exist.

However, the current state of corporate governance in the Kharkov region of Ukraine is characterized by a low level of corporate culture, a discrepancy between the existing corporate governance practices and generally accepted principles, lack of coordination of government in the regulation of corporate relations, poor management of state corporate law, etc. "On Joint Stock Companies" (2008).

Therefore, in the present conditions the development of corporate relations, especially in the machine-building industry, is important in order to attract investments to the Ukrainian economy, stock market development and the growth of national wealth.

Until recently, the privatization and corporatization in Ukraine was aimed at promoting the effectiveness of the individual entities and the revenue of the state budget. Now the emphasis should shift towards an integrated, systemic solution for how to increase the competitiveness and efficiency of basic industries and the economy in general, and on this basis people's livelihoods.

METHOD

Studies of corporate governance of enterprises in Ukraine conducted by the example of machine-building enterprises of Kharkov region. Among them, OJSC "ROSS" (OJSC "Kharkov plant modular machines"), OJSC "Plant Frunze", OJSC "Kharkov plant dies and pressform", OJSC "Kharkov Bearing Plant", OJSC "Kharkov Tractor Plant. S. Ordzhonikidze", OJSC "Turboatom", OJSC "Light Miner", OJSC "Potential", OJSC "Hidropryvid Kharkov Plant", OJSC Factory "Index", JSC "HZEMI", JSC "Electric machine", JSC "Ukrelectromash HELZ", OJSC "Teploavtomat", OJSC "Tochprybor", OJSC "Volchansky aggregate Plant", OJSC "Lozovskii forging-Mechanical Plant", OJSC

"Avtramat", CJSC "Finprofile" ("Stock market infrastructure" , 2012).

The main directions of research and implementation of corporate governance in selected enterprises include reorganization, the election of the chairman and members of the Supervisory Board, the decision to terminate their mandate as possible reasons for convening the extraordinary meetings of the past in 2012, the availability and variety of committees of the supervisory board, the competences of shareholders in the definition of the strategy, the existence of the internal documents of the company, including its own corporate code, etc. ("Stock market infrastructure", 2012) (Figure 1).

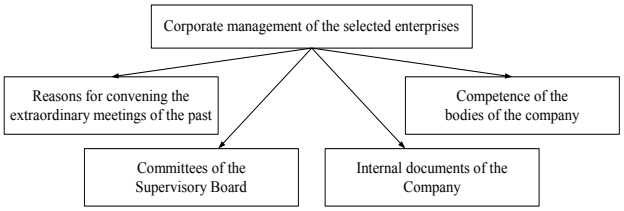

Figure 1. The main directions for studying corporate management of the selected enterprises

RESULTS

Analyzed companies is not a classical company created by combining capital and the privatization of the practice of their development as a joint-stock companies. It is this fact that determines the characteristics of corporate governance in Ukrainian enterprises. One such feature is the combination of management and ownership. However, among the studied companies the tendency is to reduce the share of management in equity.

The most effective form of corporate governance is provided by enterprises owned by foreign investors. Scientists of the Institute for Economy in Transition "Russia" conducted research in enterprises in the Czech Republic, Hungary, Russia, and Bulgaria, and found that the transformation of the enterprises with foreign capital is the best way, but the share of foreign capital should not be less than 30%.

In research conducted in Ukrainian enterprises, foreign investors are present in manufacturing plants in a small amount (less than 35%). This result means that the enterprises studied here have low attractiveness to foreign investors In addition, none of the companies quotes its shares on the stock market. This means that the management of enterprises is not trying to go for external financing through the sale of their shares.

Another important issue is the concentration of ownership in enterprises. The presence of a shareholder (or group of shareholders) in the company owning 70% of shares or more may mean a lack of mutual respect in the decision-making capabilities of minority shareholders to participate in management (decisions on all issues, including those which require a qualified majority, are taken by one person or a group of related persons). In fact, the minority shareholders become passive investors, and their shares essentially cease to be voting. This reduces the motivation of minority shareholders to participate in enterprise management, the effectiveness of management decisions and, consequently, the efficiency of the company. On the other hand, the greater the share of the largest shareholder-manager in a company, the less advantageous to him to withdraw the company's resources for personal consumption ("Industrial of Ukraine", 2013).

A significant lack in corporate relations in the engineering sector in Ukraine is the almost complete absence of committees of the supervisory board, although the Ukrainian and international principles of corporate governance consider it appropriate to consider the existence of such structures, and recommend implementation of the supervisory board of the Corporate Secretary. Up to the end of 2012 the Committee had been established in none of the studied companies, In the structure of the supervisory board of other engineering enterprises of Ukraine, along with the corporate form of governance there are such committees as the committee for strategic planning, audit committees, the appointment and remuneration and investment committees, but the position of corporate secretary has been not enough implemented.

Among the requirements for the members of the Supervisory Board, as shown in internal documents, in the researched companies the most common are industry knowledge and experience in the area (47% of surveyed companies) and personal qualities such as honesty and responsibility (46% of surveyed companies). In addition, there are claims for knowledge in the field of finance and management, and it is specified that there must be no conflict of interest. Requirements as to the age of members of the Supervisory Board were not detected. Of the enterprises, 13% did not have any requirements set in their documents. This low set of requirements for the members of the Supervisory Board indicates a lack in the level of development and implementation of corporate relations in the engineering sector in the Kharkov region (Figure 2).

Not enough attention is paid by the management of companies to internal corporate documents. However, these documents are often a means of resolving disputes and internal conflicts. Such documents may include Provisions on the General Meeting of Shareholders, the Supervisory Board of the executive body (Management Board) of the company officials, the audit committee, the company's shares, reports on the distribution of profits, etc. But among the studied companies domestic regulation documents are not used, which indicates the underdeveloped corporate relations.

Another important aspect of the activities of Ukrainian joint stock companies is the disclosure of information about their activities. The essence of the

disclosure is to ensure access by interested parties, including the shareholders, to complete and accurate information about the industrial, economic and other activities of the company.

Almost all of the financial statements and the results of activities of the investigated engineering companies extend to the general meeting published in the press, as well as a public information database of the Securities Commission on the Securities Market. In addition, for the documents available for inspection joint-stock company, a copy may be obtained on the request of the shareholder, and the information made available on the website of the company.

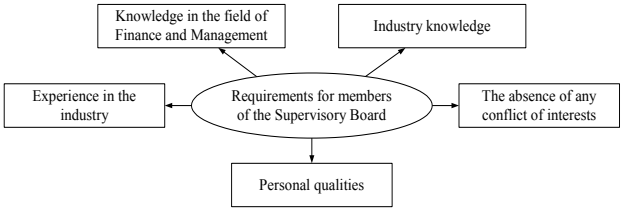

Figure 2. Requirements for members of the Supervisory Board

Furthermore, they published information oo shareholders holding 10% or more of the authorized capital, the composition of management bodies, the charter and by-laws (in their own web page on request of shareholders), minutes of general meetings of shareholders after meetings. Information on the remuneration of company officers is not made public.

Among Ukrainian joint stock companies it is not common to refer to consultants in the field of corporate governance and financial management. The enterprises surveyed have not received paid services of such consultants within the last few years, reflecting stagnation in the development of domestic corporate relations ("Industrial of Ukraine", 2013).

Recently, many foreign companies have corporate governance codes. The practice of multinational corporations suggests that the availability of its own code provides help in dealing with a wide range of applications. Corporate codes have been widely used in developed countries since the 1980s. Now 80% of the companies on the list of the 500 best companies in the world have such codes. But among the studied domestic engineering companies with the corporate form of management, there is no enterprise that has set up its own corporate code.

Thus, as the results of the study it can be concluded that the main problems of the corporate engineering enterprises in the Kharkov region associated with ownership are:

1. Low corporate culture;
2. Lack of investment attractiveness of enterprises;
3. The need to increase capitalization;
4. The need to improve the access of joint stock companies to the capital markets and reduce the cost of their involvement;
5. The poor reputation of the company in the domestic and international markets, as well as of its directors and managers;
6. Complicated control systems for corporate rights;
7. Lack of balance between the interests of the minority and majority shareholders;
8. Vague definition of the objectives of the corporation and how to motivate its owners;
9. The choice of organizational structure, inadequate goals;
10. Incompetent directors from the joint Soviet era;
11. Weak legal framework (particularly in the context of the interaction between business entities);
12. Low rate of market infrastructure facilities (stock and commodity exchanges, consulting and design firms, developed infrastructure of the labor market, etc.);
13. Conflicts of interest in government;
14. Low awareness of entrepreneurs and managers of the basic elements of corporate governance;
15. Ability to manipulate the composition and content of internal regulations;
16. Insufficient degree of transparency.

CONCLUSION

Thus it is clear that the current situation in the corporate sector of engineering enterprises in Ukraine requires the implementation of specific measures at the level of corporate enterprises. The quality of corporate governance is an important factor in the effectiveness of a company. During the financial crisis the cost of debt remains high, and outsourcing by the issue of shares is virtually nonexistent. Therefore, improving the level of corporate governance can provide a quick and significant financial effect, reducing the cost of capital to ensure the company and the growth of its market capitalization.

One source of constraints on the effective implementation of corporate management in engineering enterprises in Ukraine, as in other countries, is that the interests of shareholders and, for example, those of managers disagree. Despite recent interest in increasing the size of the corporation, its power and prestige, managers are often paid by a fixed salary (company income has no effect on the salary), thus the fate of the manager depends on the stability of a company and he/she aims to minimize risky investments in order to avoid bankruptcy and layoffs. But the majority of shareholders want to take risks in order to obtain large dividends. On the contrary, lenders may not be particularly interested in the high profits of the company – they are much more interested in the presence of these revenues. Therefore, they are skeptical of what they perceive of as very profitable but very risky operations. The topic chosen for this article is relevant to large complex corporate enterprises in Ukraine and requires further research.

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